

ABB INDUSTRIAL DRIVES

ACS880-604LC 3-phase dynamic brake units as modules

Hardware manual



ACS880-604LC 3-phase dynamic brake units as modules

Hardware manual

Table of contents



4. Cabinet construction



6. Electrical installation



8. Start-up



Table of contents

1 Introduction to the manual

Contents of this chapter	11
Applicability	11
Safety instructions	11
Target audience	11
Categorization by frame size and option code	12
Use of component designations	12
Related documents	12
Terms and abbreviations	12

2 Operation principle and hardware description

Contents of this chapter	15
Product overview	15
Operation principle	15
When is resistor braking necessary?	15
Overview diagram of the drive system	16
Cooling system	17
Brake module hardware	17
General	17
DC connection and capacitor charging	17
Frame R8i hardware	18
Module layout	18
Coolant connectors	18
Connectors X50...X59	19
Fiber optic connectors	20
LEDs	20
Overview circuit diagram of the brake unit	21
Brake unit control devices	22
Overview of the control connections of the BCU control unit	22
Parallel connected units connection diagram	23
The control panel	23
Control by PC tools	23
Fieldbus control	24
DC switch and charging switch	24
Type designation label	25
Type designation key	26

3 Moving and unpacking the module

Contents of this chapter	27
Moving and unpacking the module	27

4 Cabinet construction

Contents of this chapter	29
Limitation of liability	29
General	29



Installation of the brake control unit (BCU)	29
Cabinet configuration overview	29
Installation examples	30
R8i module in a 600 mm wide Rittal VX25 enclosure	31
Layout without DC switch/disconnector	31
Layout with DC switch/disconnector	32
Pipe routing example	33
Installation stages	34
Overview of kits	35
Stage 1: Installation of common parts	36
Stage 2: Installation of side plates, module mounting mechanics and quick connector	37
Stage 3: Installation of output terminals (for cabling) and cable entries	38
Stage 4A: Installation of DC busbars (without DC switch/disconnector or charging)	39
Stage 4B: Installation of DC busbars (with DC switch/disconnector and charging)	40
Stage 5: Installation of incoming resistor connection busbars	41
Stage 6: Installation of cooling components	42
Stage 7: Installation of module	43
Stage 8: Installation of swing-out frame and shrouds	44
Generic enclosures	45

5 Guidelines for planning the electrical installation

Contents of this chapter	47
Limitation of liability	47
Generic guidelines	47
Selecting the brake resistor	47
Selecting and routing the brake resistor cables	48
Resistor cable sizes and length	48
Minimizing electromagnetic interference	48
Selecting the location for the brake resistors	48
Selecting the resistor thermal switch circuit cable	49
Protecting the system against thermal overload	49
Protecting the system against short-circuits	49

6 Electrical installation

Contents of this chapter	51
Safety and liability	51
Electrical safety precautions	51
General notes	53
Printed circuit boards	53
Optical components	53
Measuring the insulation resistance of the brake resistor circuit	53
Connecting the brake resistor cables and thermal switch	54
Connection diagram	54
Connection procedure of the brake chopper cubicle	55
Connection procedure of the resistor cables	56
Connection procedure of the thermal switch cable	56
Connecting the control cables	57
Installing option modules	58

Connecting a PC	60
7 Installation checklist	
Contents of this chapter	61
Checklist	61
8 Start-up	
Contents of this chapter	65
Start-up procedure	66
9 Maintenance	
Contents of this chapter	69
Maintenance intervals	70
Description of symbols	70
Recommended maintenance intervals after start-up	70
Cooling system	71
Power connections	71
Retightening the power connections	71
Cooling fans	72
Replacing cooling fans	72
Fan replacement	72
Brake module	74
Replacing the brake module	74
Removing the module	74
Reinstalling the module	77
Control unit	78
Replacing the memory unit	78
Replacing the BCU control unit battery	78
Capacitors	79
Reforming the capacitors	79
LED indications	80
Control panel and panel platform/holder LEDs	80
R8i module LEDs	80
Functional safety components	80
10 Ordering information	
Contents of this chapter	83
Kit code key	83
Brake modules	85
Control panel	86
Control electronics	87
Control unit	87
Fiber optic cables	88
Mechanical installation accessories	88
Side plate kit	88
Module top/bottom guides	89
Swing-out frame	89
Shrouds	90
Lifting device	91
DC-side components	91
Common DC Flat-PLS assembly	91



DC connection flanges and busbars	92
DC fuses	94
DC fuses (IEC)	94
DC fuses (UL)	94
DC switch/disconnector kits	94
DC charging kits (for units with DC switch/disconnector)	95
Charging resistors (for units with DC switch/disconnector)	95
Resistor-side components	95
Quick connector	95
Outgoing resistor connection busbars	96
Resistor fuses	96
Cable entry kit	97
Cooling system parts	97
Coolant distribution manifold kits	97
Piping	99
Heat exchanger	99
Cooling fan	100
Miscellaneous	100
CIO-01 I/O module	100

11 Internal cooling circuit

Contents of this chapter	101
Applicability	101
Internal cooling system	101
Connection to a cooling unit	103
Connection to an ACS880-1007LC cooling unit	103
Connection to a custom cooling unit	103
General requirements	103
Coolant temperature control	103
Filling up and bleeding the internal cooling circuit	104
Drive line-ups with an ACS880-1007LC cooling unit	104
Drive line-ups with a custom cooling unit	104
Draining the internal cooling circuit	105
Maintenance intervals	105
Technical data	106
Coolant specification	106
Coolant type	106
Temperature limits	106
Pressure limits	108
Coolant flow rate limits	108
Cooling circuit materials	108

12 Technical data

Contents of this chapter	109
Ratings	109
Definitions	110
Derating	111
Surrounding air temperature derating	111
Coolant temperature derating	111
Antifreeze content derating	111
Altitude derating	112

Modules used, noise, DC capacitance	112
Fuses	112
Dimensions and weights	112
Free space requirements	113
Installation orientations	113
Losses, cooling circuit data and efficiency	113
Energy efficiency data (ecodesign)	113
Typical power cable sizes	114
Typical resistor cable sizes	116
Maximum cable length	116
Input power (DC) connection	116
Resistor connection	116
Control connections	116
Coolant connections	116
Auxiliary power consumption	117
Control equipment	117
Cooling fans	117
Definitions	117
Protection classes for module	117
Ambient conditions	118
Materials	119
Color	119
Package	119
Disposal	119
Standards	119
Markings	119
Tightening torques	120
Electrical connections	120
Mechanical connections	120
Insulation supports	120
Cable lugs	120
Disclaimers	120
Generic disclaimer	120
Cybersecurity disclaimer	121

13 The control unit

Contents of this chapter	123
General	123
BCU-x2 layout	124
Default I/O diagram of the brake control unit	126
Connecting motor temperature sensors to the drive	128
External power supply for the control unit (XPOW)	128
The X485 connector	128
Safe torque off (XSTO, XSTO OUT)	129
FSO safety functions module connection (X12)	129
SDHC memory card slot	129
Connector data	130
BCU-x2 ground isolation diagram	133

14 Dimension drawings

Contents of this chapter	135
--------------------------------	-----



Brake module	136
Quick connector	137
Control electronics	138
BCU control unit	138
DPMP-01 control panel mounting platform	139
DPMP-02 control panel mounting platform	140
DC fuse blocks (Bussmann)	141
Size 3	141
Size 23	141
Switchgear and charging components	142
DC switch/disconnector	142
OT1200U11, OT1600E11	142
Charging switch	143
OS100GJ04FP	143
OS160GD04F	144
Switch handles	144
OHB65J6	144
OHB150J12P	145
Auxiliary contacts	145
OA1G10	145
OA3G01	145
Charging resistor	146
BSFC-12C charging controller	147
CIO-01 I/O module	148

15 Example circuit diagrams

Contents of this chapter	149
Component designations used in the diagrams	149
Frame 2×R8i - Main circuit (sheet 001a)	150
Frame 2×R8i - Main circuit (sheet 001b)	151
Frame 2×R8i - Charging circuit (sheet 002a)	152
Frame 2×R8i - Charging circuit (sheet 002b)	153
Frame 2×R8i - Module control circuit (sheet 005a)	154
Frame 2×R8i - Auxiliary voltage supply (sheet 020a)	155
Frame 2×R8i - Auxiliary voltage supply (sheet 020b)	156
Frame 2×R8i - 230/115 V distribution (sheet 021a)	157
Frame 2×R8i - (230/115 V distribution (sheet 021b)	158
Frame 2×R8i - 24 V distribution (sheet 022a)	159
Frame 2×R8i - 24 V distribution (sheet 022b)	160
Frame 2×R8i - Fan control (sheet 026a)	161
Frame 2×R8i - Control unit 1 / RO (sheet 040a)	162
Frame 2×R8i - Control unit 1 / DI (sheet 040b)	163
Frame 2×R8i - Control unit 1 / AI, AO, DIO (sheet 040c)	164
Frame 2×R8i - Control unit 1 (sheet 040d)	165
Frame 2×R8i - Control panel (sheet 041a)	166
Frame 2×R8i - Control unit 2 / RO (sheet 042a)	167
Frame 2×R8i - Control unit 2 / DI (sheet 042b)	168
Frame 2×R8i - Control unit 2 / AI, AO, DIO (sheet 042c)	169
Frame 2×R8i - Control unit 2 (sheet 042d)	170
Frame 2×R8i - Option modules (sheet 043a)	171

Further information

1

Introduction to the manual

Contents of this chapter

This chapter gives basic information on the manual.

Applicability

The manual is applicable to ACS880-604LC 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 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633 [English])*.
- Read the **software-function-specific warnings and notes** before changing the default settings of a function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read the **task-specific safety instructions** before starting the task. See the section describing the task.

Target audience

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

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

Categorization by frame size and option 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 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 +D151). 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 component designation in brackets (for example, [Q20]). This will help you to identify the components in the circuit diagrams of the drive.

Related documents

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



Manuals for ACS880 multidrives modules

Terms and abbreviations

Term	Description
BCON	Type of control board
BCU	Type of control unit
BDPS	Module internal power supply board
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

Term	Description
CIO	I/O module for controlling cooling fans
Control unit	The part in which the control program runs.
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC link	DC circuit between
Drive	Frequency converter for controlling AC motors
EMC	Electromagnetic compatibility
Frame, frame size	Physical size of the drive or power module
Intermediate circuit	DC circuit between rectifier and inverter
Inverter unit	Inverter module(s) under control of one control unit, and related components. One inverter unit typically controls one motor.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object. For example, variable, constant, or signal.
Supply unit	Supply module(s) under control of one control unit, and related components.
ZMU	Type of memory unit, attached to the control unit

2

Operation principle and hardware description

Contents of this chapter

This chapter describes the operation principle and construction of a liquid-cooled brake unit that consists of ACS880-604LC modules and related components.

Product overview

The ACS880-604LC is a liquid-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 (ACS880-104LC) that is connected and controlled in a particular way: the input of the module is connected to the DC bus – like in inverter use – but each output phase connects to a resistor of its own.

Operation principle

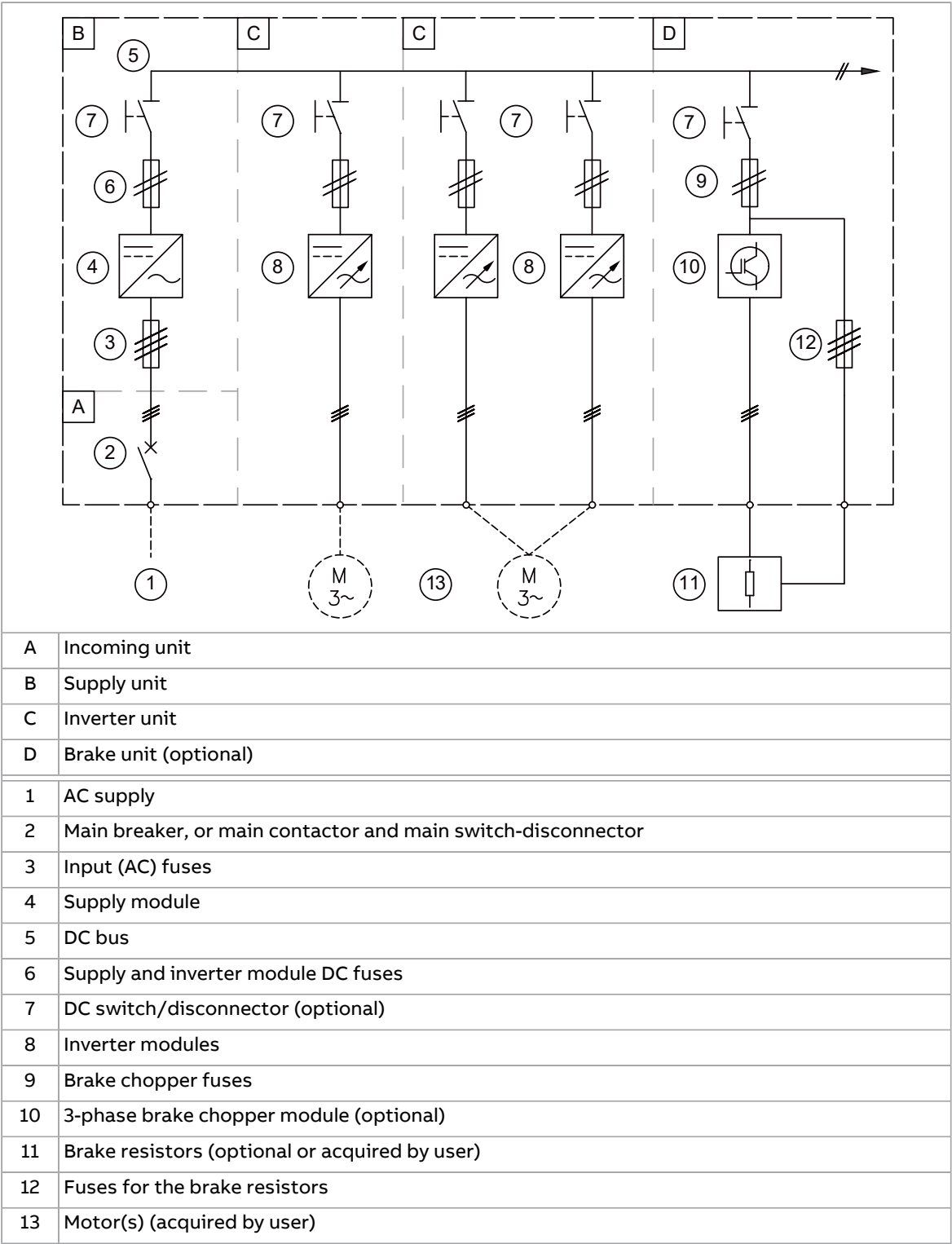
The brake chopper handles the extra energy generated by motor during a quick deceleration. The extra energy increases the drive DC link voltage. The chopper connects the brake resistor to the DC link whenever the voltage is greater than the limit defined by the control program. Energy consumption by the resistor losses lowers the voltage until the resistor can be disconnected.

When is resistor braking necessary?

Resistor braking is necessary for high capacity braking of the motor and machinery if a regenerative drive cannot be used.

Overview diagram of the drive system

This diagram shows an example of a multidrive. The supply unit connects the drive to the AC supply network. It converts the AC voltage into DC. The DC voltage is distributed through the DC bus to all inverter units and optional brake units. The inverter unit converts the DC back to AC that rotates the motor. The brake unit (optional) conveys energy to brake resistors whenever needed.



Cooling system

The brake module has an internal air-to-liquid heat exchanger. Another heat exchanger is mounted below the module. A cooling fan forces air through the external heat exchanger and the module, circulating the air inside the cubicle.

See [Internal cooling circuit \(Page 101\)](#).

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 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.

Internal du/dt 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 the 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.

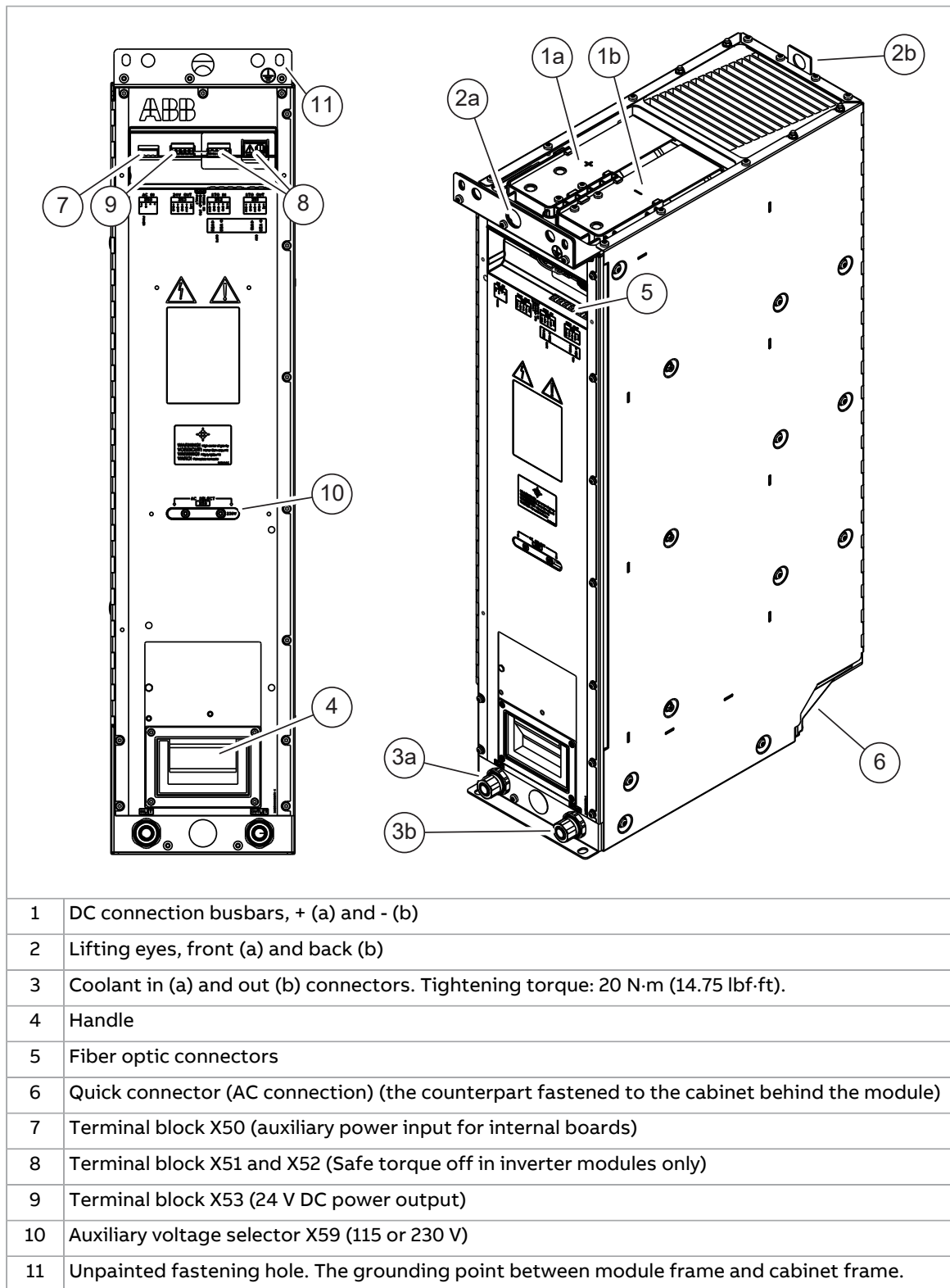
A capacitor charging circuit must be fitted if:

- 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.

■ Frame R8i hardware

Module layout



Coolant connectors

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

Connectors X50...X59

R8i modules contain a power supply (BDPS) that provides 24 V DC for the circuit boards of the module. The 24 V DC voltage provided by the BDPS is also available on X53, and can be used to power the BCU control unit of a single R8i module.

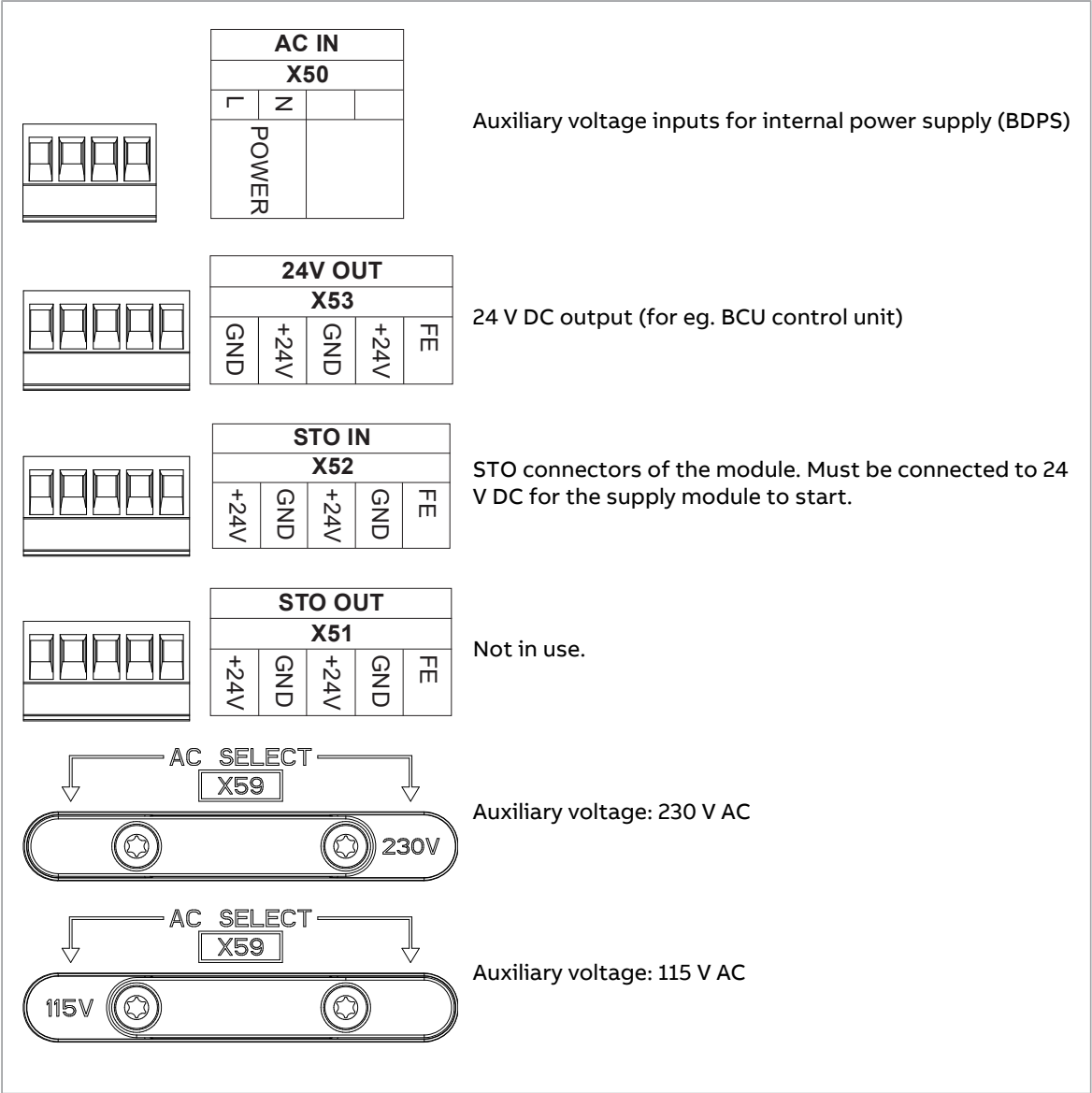
Note: With parallel-connected modules, it is strongly recommended to use an external 24 V DC supply to power the control unit.

An auxiliary voltage of 230 V AC or 115 V AC (selectable) must be fed to terminal block X50 to power the BDPS even when the DC link is not live. The selection between 115 V and 230 V is made with selector plug X59. The setting can be changed by removing the two screws, turning the plug 180 degrees, and reinstalling the screws.

Note: The Safe torque off (STO) safety function is only implemented in inverter units. Therefore, the STO function can not be used in supply, brake and converter units. In supply, brake and converter units, de-energizing any connection of STO IN (X52) connector stops the unit. Note that this stop in supply or brake module is not safety related and must not be used for safety function purposes.

The “24V” inputs on X52 must be connected to +24 V (on connector X53, for example) on each module. On a new module, a jumper wire set installed at the factory makes this connection.

20 Operation principle and hardware description



Fiber optic connectors

BSFC	V50		Name	Description
	V60		BSFC	Charging controller connection. Must be connected by the installer.
BCU	V10		BCU	Control unit connection. Must be connected by the installer.
	V20			

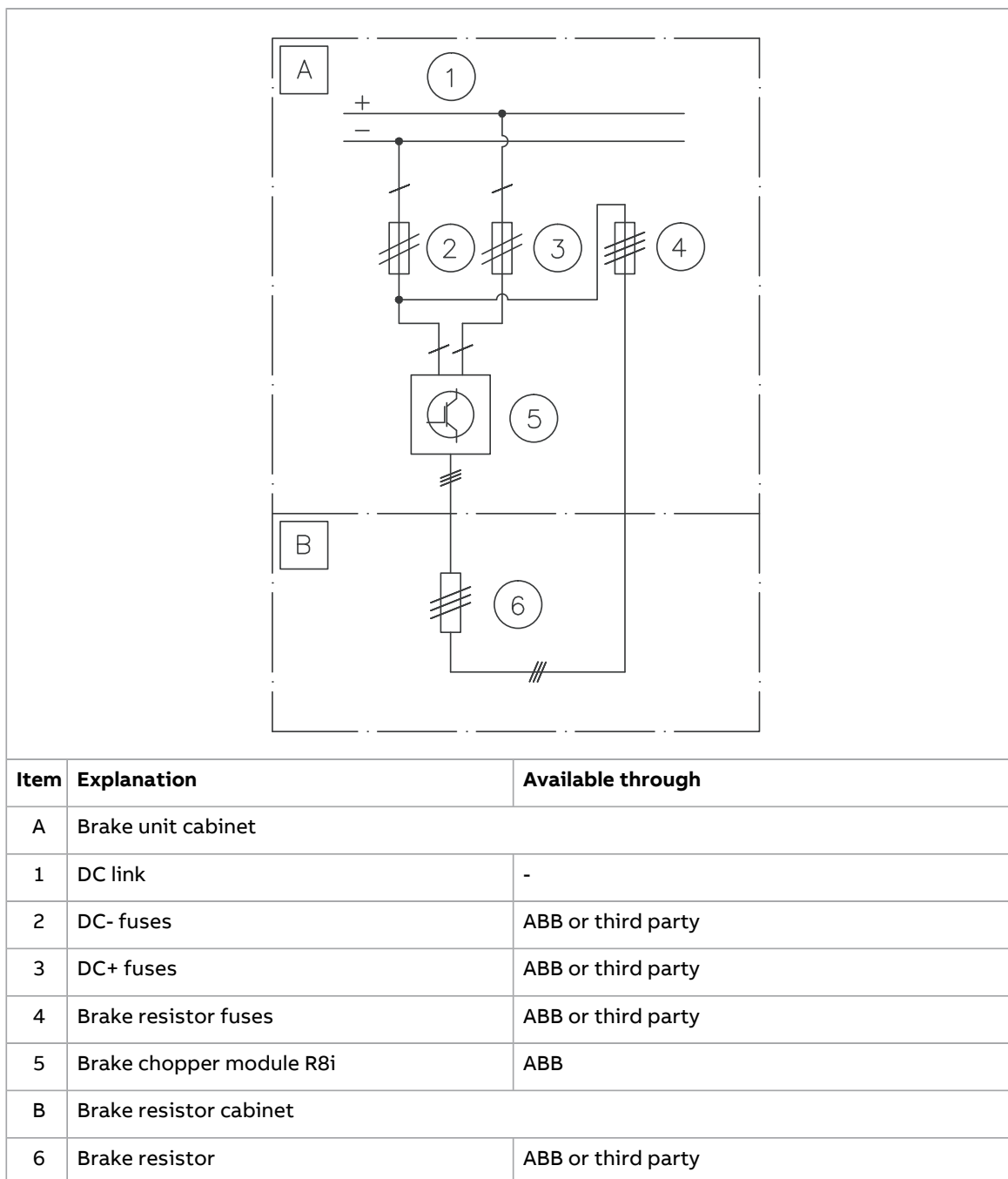
LEDs

LED	Color	Indication
FAULT	Continuous red	There is an active fault in the module.
ENABLE / STO	Continuous green	The module is ready for use.

LED	Color	Indication
ENABLE / STO	Continuous yellow	XSTO connectors are de-energized.
POWER OK	Continuous green	Supply voltage of the internal circuit boards is OK (> 21 V).

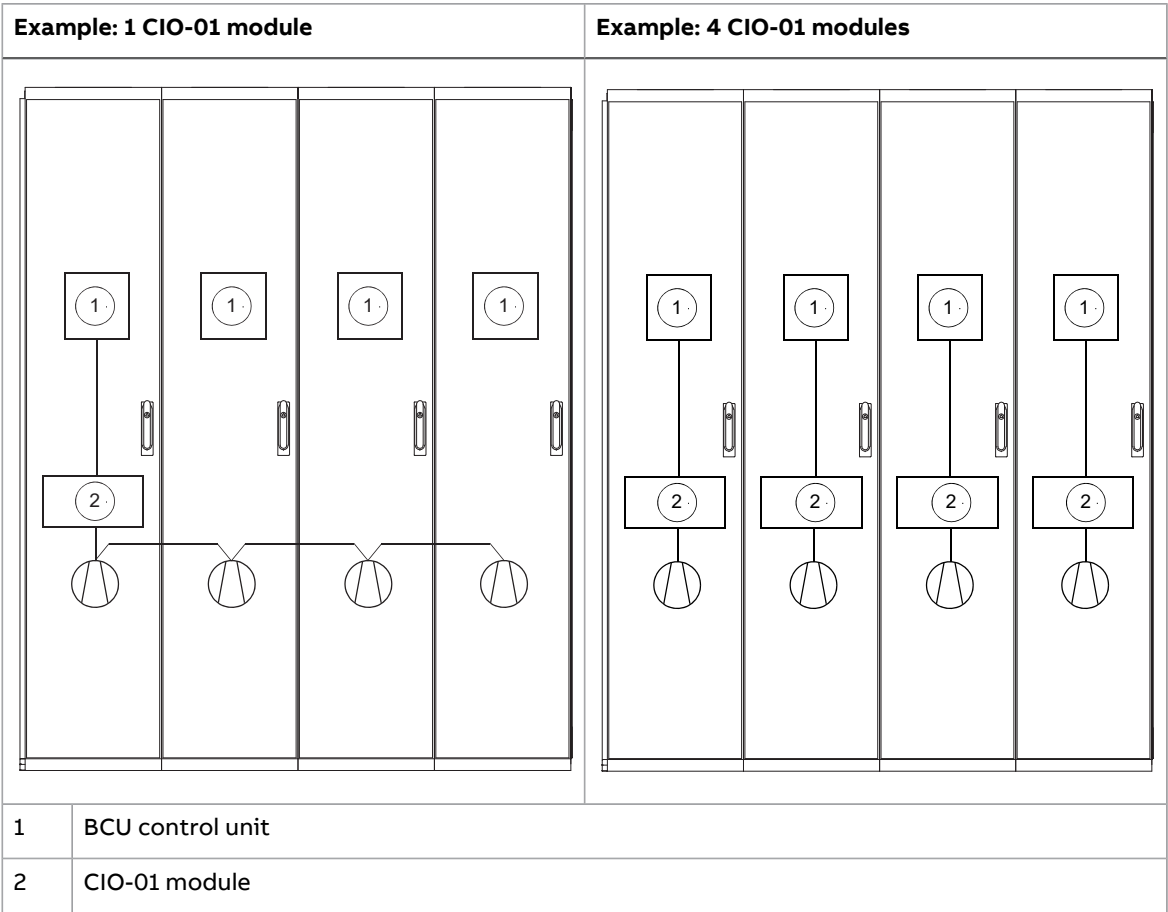
Overview circuit diagram of the brake unit

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



■ **Parallel connected units connection diagram**

The example diagram shows the connections between 4 brake units, CIO-01 modules and fans.



Parallel connected brake units have a dedicated control unit (BCU). CIO-01 modules control and monitor fan speed. A CIO-01 module can operate up to 16 fans, but the module is controlled by one control unit and all fans are considered identical. Parameter *197.10 DC Voltage offset* needs to be set in case there are multiple brake units connected to the DC bus. See [ACS880 brake control program firmware manual \(3AXD50000020967 \[English\]\)](#).

■ **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 control panel mounting platform (available separately).

For details on the control panel, see [ACS-AP-I, -S, -W and ACH-AP-H, -W Assistant control panels user's manual \(3AUA0000085685 \[English\]\)](#).

■ **Control by PC tools**

There is a USB connector on the front of the control 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 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

Brake units equipped with a DC switch/disconnector also have a DC link precharging circuit including a BSFC-12C charging control unit and a charging switch.

Type designation label

Each brake 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 unit. The first digits express the basic construction of the unit, for example “ACS880-104LC-0850A-7”. Any optional selections are given thereafter, separated by plus signs.

Quote the complete type designation and serial number when contacting technical support on the subject of individual brake modules. An example of the label is shown below.

 <p>Origin Finland Made in Finland ABB Oy Himontie 13 00380 Helsinki Finland</p> <p>FRAME R8i</p> <p>Liquid cooling</p> <p>IP00 UL open type UL/CSA: max. 849 VDC/690 VAC</p> <p>ACS880-104LC-0850A-7+C132+C207+E205</p> <p>INVERTER</p> <p>Input U1 742/849/976 VDC I1 596 A I1 -</p> <p>Output U2 3~ 0...525/600/690 VAC I2 530 A I2 0...500 Hz Sn 633 kVA</p> <p>LINE CONVERTER</p> <p>3~ 525/600/690 VAC 480 A 50/60 Hz 742/849/976 VDC 582 A - 574 kVA</p> <p>CE EAC UK CA</p> <p>UL LISTED IND. CONT. EQ. PPB</p> <p>20</p> <p>S/N: 1203804872</p>	
 <p>ACS880-104LC-0850A-7+C132+C207+E205</p> <p>BRAKE CHOPPER</p> <p>Input U1 742/849/976 VDC I1 781 A I1 -</p> <p>Output U2 3x 0...742/849/976 VDC I2 3x 310 A I2 - Sn 870 kVA</p> <p>DC/DC CONVERTER</p> <p>742/849/976 VDC 500 A - 50...660/764/878 VDC 500 A - 439 kVA</p> <p>S/N: 1203804872</p>	
1	Type designation
2	Frame size
3	Cooling method
4	Degree of protection
5	UL/CSA data
6	Ratings
7	Valid markings. See Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules (3AXD50000048634 [English]).
8	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit's manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.

Type designation key

Type designation describes the composition of the module in short. Note that in the type designation label of a brake module (ACS880-604LC), the type of the module is ACS880-104LC. The complete designation code is divided in subcodes:

- The first 1...20 digits form the basic code. It describes the basic construction of the unit. 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.

Code	Description
Basic codes	
ACS880	Product series
104LC	Construction: liquid-cooled brake module.
Size	
xxxxx	See the ratings table.
Voltage range	
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 (plus) codes	
E205	Internal du/dt filtering. Included in the module delivery as standard.

3

Moving and unpacking the module

Contents of this chapter

This chapter gives basic information on unpacking and moving the module.



WARNING!

For the safety instructions, see ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633 [English]).

Moving and unpacking the module

The modules are 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.

If you need to pack the modules, see the package information in the technical data.

4

Cabinet construction



Contents of this chapter

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

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

Limitation of liability

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

General

See the technical data for module-specific cooling requirements and mounting orientations.

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 \(Page 51\)](#) for the electrical installation.

Cabinet configuration overview

This figure shows the configuration of 1×R8i dynamic brake unit (DBU) installed in 600 mm wide Rittal VX25 or generic enclosure.

drawings. The tightening torques are listed in the kit-specific assembly drawings. See the hardware manual for the tightening torques of drive module input and output terminals.

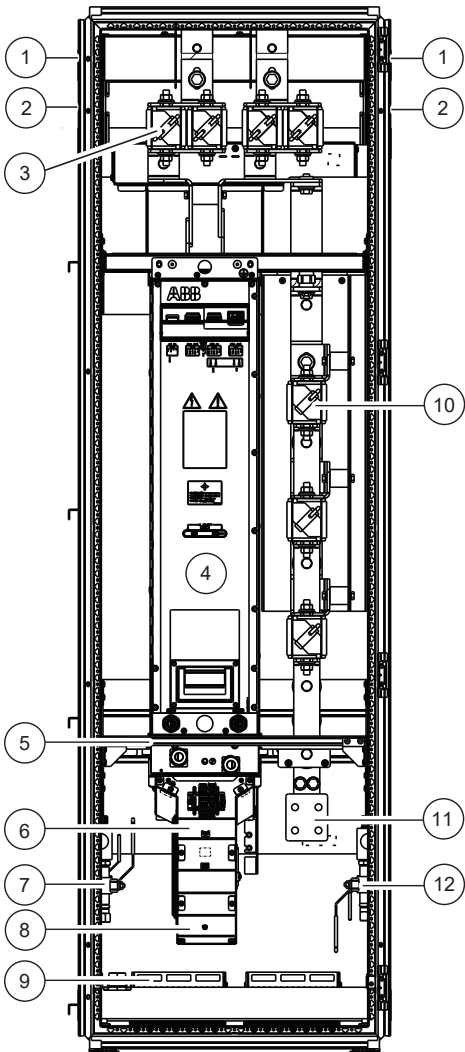
For general instructions, see [Drive modules cabinet design and construction instructions \(3AUA0000107668 \[English\]\)](#).



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

■ **R8i module in a 600 mm wide Rittal VX25 enclosure**

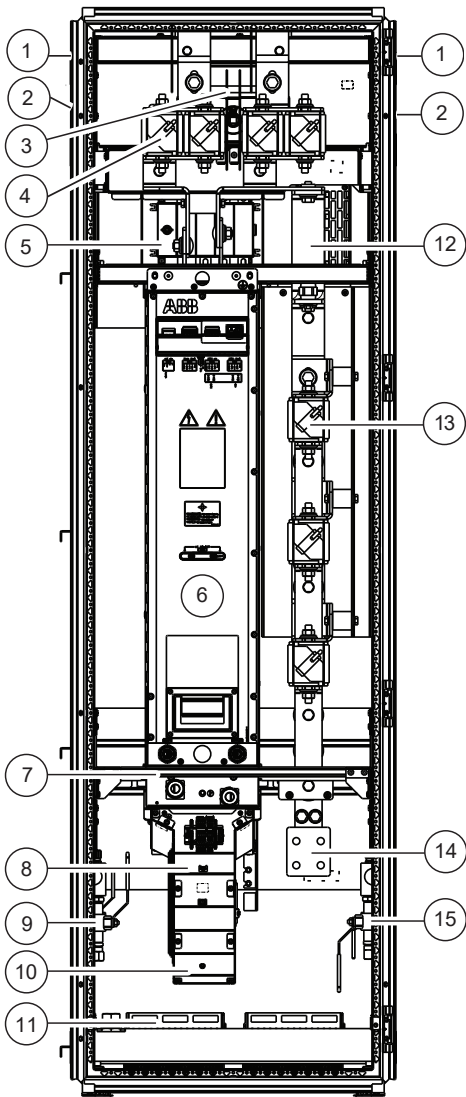
Layout without DC switch/disconnector



No.	Description
1	DC+
2	DC-
3	DC fuses
4	Brake module
5	Heat exchanger (between module and cooling fan)
6	Outgoing resistor connection busbars (behind cooling fan)
7	Coolant inlet manifold with stop and drain valves
8	Cooling fan
9	Cable entries
10	Resistor fuses
11	Incoming resistor connection busbars
12	Coolant outlet manifold with stop and drain valves



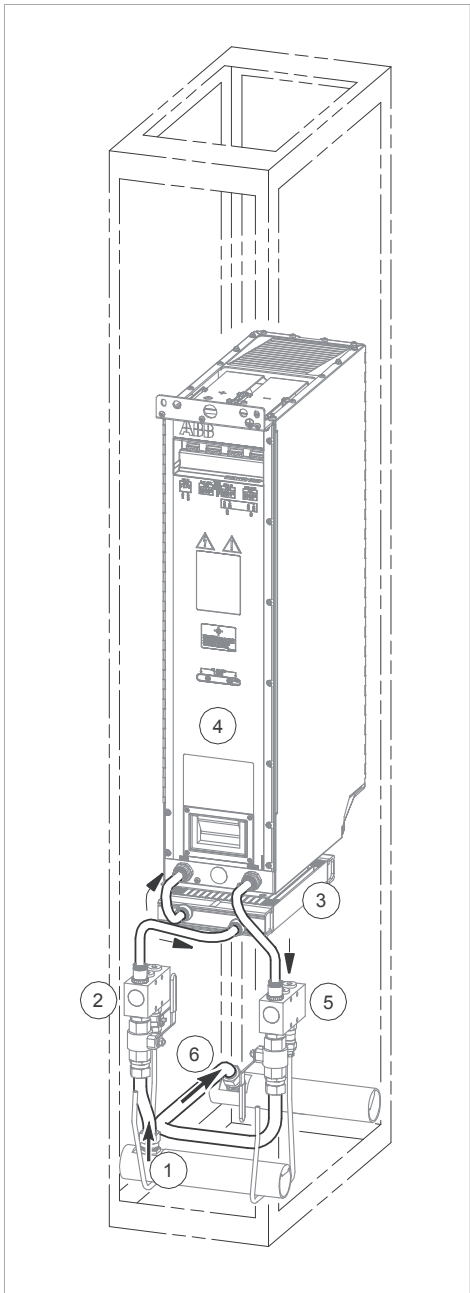
Layout with DC switch/disconnector



No.	Description
1	DC+
2	DC-
3	DC switch/disconnector behind the fuses
4	DC fuses
5	Charging mechanics
6	Brake module
7	Heat exchanger (between module and cooling fan)
8	Outgoing resistor connection busbars (behind cooling fan)
9	Coolant inlet manifold with stop and drain valves
10	Cooling fan
11	Cable entries
12	Charging resistors (obscured)
13	Resistor fuses
14	Incoming resistor connection busbars
15	Coolant outlet manifold with stop and drain valves



Pipe routing example



No.	Description
1	Coolant in
2	Inlet manifold with stop and drain valves
3	Heat exchanger
4	Brake chopper module
5	Outlet manifold with stop and drain valves
6	Coolant out



Installation stages

No.	Installation stage	Instruction code	Kit code	Kit ordering code
1	Baying parts	3AXD50000336340	-	-
	DC bus support kit	3AXD50000333639	A-468-X-001-VX	3AXD50000333387
2	Side plates	3AXD50000327591	L-468-8-020-VX	3AXD50000360543
	Module mounting mechanics	3AXD50000536733	L-6-8-315-VX	3AXD50000536634
	Quick connector	3AUA0000118667	A-468-8-100	3AUA0000119227
3	AC output terminals (for cabling)	3AXD50000330874	L-468-8-131-VX	3AXD50000360550
	Cable entry	3AXD50000004817	A-468-8-441	3AXD50000004385
4A	DC busbars (for configuration without DC switch/disconnector)	3AXD50000541010	L-6-8-262-VX	3AXD50000545810
		3AXD50000545506	L-6-8-263-VX	3AXD50000545827
		3AXD50000562671	L-6-8-266-VX	3AXD50000545858
4B	DC switch/disconnector and bus-bars	3AXD50000543205	L-6-8-264-VX	3AXD50000545834
		3AXD50000343614	L-46-8-207-VX	3AXD50000360567
		3AXD50000562671	L-6-8-266-VX	3AXD50000545858
5	Incoming resistor connection busbars	3AXD50000545087	L-6-8-265-VX	3AXD50000545841
6	Cooling fan	-	-	3AXD50000043886 / 3AXD50000045414
	Heat exchanger	-	L-468-8-440	3AXD50000041265
	Coolant distribution manifolds	3AXD50000048217	L-468-8-441	3AXD50000044084
	PE busbar	-	-	-
7	Module installation	-	-	-
8	Swing-out frame	3AXD50000345069	L-6-X-052-VX	3AXD50000361250
	Shrouds	3AXD50000353521	L-6-8-023-VX	3AXD50000361267



Overview of kits

KITS FOR ACS880-604LC IN RITTAL VX25 CABINET
NOTE! Only parts included in ABU kits are shown here
 See kit assembly drawings for additional Rittal and/or other standard parts

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

Legend:
 A Initial Approval
 B Approved
 C Approved
 D Approved
 E Approved
 F Approved

Table 1: Project Information

Based on	Customer	Project name	Weight kg
ACS880-604LC STAGE	ACS880-604LC STAGE	ACS880-604LC STAGE	360.550

Table 2: Revision History

Rev.	Desc.	By	Date
1	Initial Approval	M. Michelsson	31-Dec-19

Table 3: Assembly Drawing Information

Doc. No.	Doc. Title	Scale	Form
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	1:25	A3

Table 4: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 5: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 6: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 7: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 8: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 9: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 10: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 11: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 12: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 13: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 14: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 15: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 16: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 17: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 18: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 19: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 20: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 21: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 22: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 23: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 24: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 25: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 26: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 27: Drawing Details

Part No.	Part Name	Ordering code
31-Dec-19	ACS880-604LC STAGE INSTRUCTION	360.550

Table 28: Drawing Details

Part No.	Part Name	Ordering code
----------	-----------	---------------

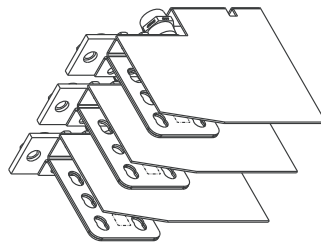


Note! See Cabinet design and construction instructions for ACS880 multidrive modules (3AU4000107668 [English]) STAGE 1: Common assembly installations (Baying parts, Common DC). See assembly drawings for details

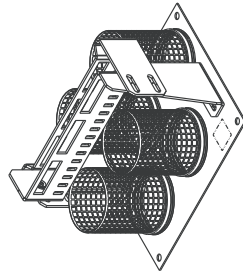
Stage 2: Installation of side plates, module mounting mechanics and quick connector



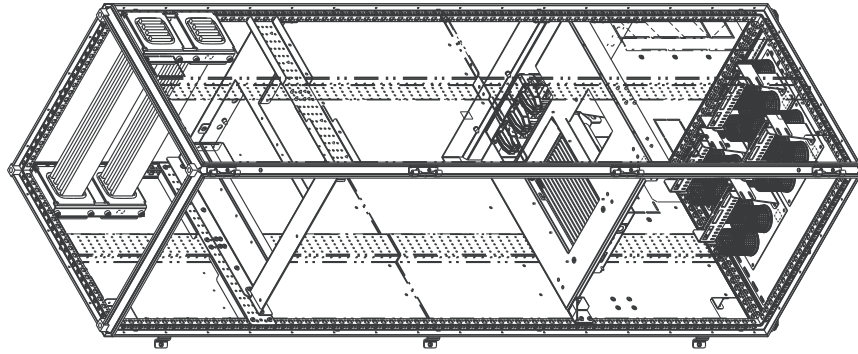
STAGE3: R81 AC OUTPUT BUSBARS KIT AND LEAD-THROUGH KIT FOR BOTTOM PLATE INSTALLATION
See assembly drawings for details and required additional Rittal and standard parts.



R81 AC OUTPUT BUSBARS KIT
KIT L-468-8-131-VX
Ordering code: 3AXD50000360550
See drawing: 3AXD50000330874



LEAD-THROUGH KIT
FOR BOTTOM PLATE
KIT A-468-8-441
Ordering code: 3AXD50000004385
See drawing: 3AXD500000004817



Based on	Prepared	31-Dec-19	Title	ASSEMBLY DRAWING	Doc. des.	Scale	Form
Customer	Check.	31-Dec-19		AC9880-604LC STAGE	Res. des.	1:25	A3
	Appr.	31-Dec-19			Res. ind.	-	DR
	Project name				Assembly		
DWG. Number	Weight kg				Dec. No.		
3AXD0001037833					3AXD50000550012		
					Sheet		
					4		
					Total		10

Stage 4A: Installation of DC busbars (without DC switch/disconnector or charging)

1

2

3

4

5

6

7

8

ACS880-60ALC STAGE
ACS880-60ALC-VX25-W600 (ASSEM) - 8+

1:0+

Initial Approval

We reserve all rights in this document and in the information contained herein. Reproduction, use or disclosure to third parties without express authority is strictly forbidden.

31-Dec-19 M. Michelsson

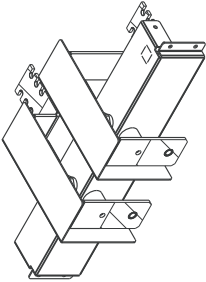
First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.

DBU DC CONNECTION BUSBARS
KIT L-6-8-262-VX
Ordering code: 3AXD50000545810
See drawing: 3AXD50000541010

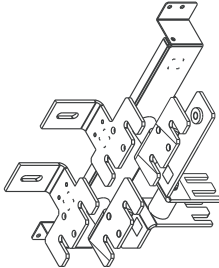
DBU DC BUSBARS
KIT L-6-8-263-VX
Ordering code: 3AXD50000545827
See drawing: 3AXD50000545506

DBU CONNECTION FLANGES
KIT L-6-8-266-VX
Ordering code: 3AXD50000545858
See drawing: 3AXD50000562671

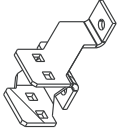
STAGE4A: DBU DC CONN BUSBAR KIT, DBU DC BUSBARS KIT AND DBU CONNECTION FLANGES KIT, FOR FUSE ONLY DESIGN.
See assembly drawings for details and required additional Rittal and standard parts.



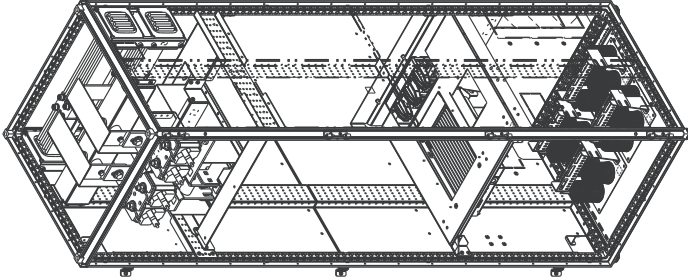
DBU DC CONNECTION BUSBARS
KIT L-6-8-262-VX
Ordering code: 3AXD50000545810
See drawing: 3AXD50000541010



DBU DC BUSBARS
KIT L-6-8-263-VX
Ordering code: 3AXD50000545827
See drawing: 3AXD50000545506



DBU CONNECTION FLANGES
KIT L-6-8-266-VX
Ordering code: 3AXD50000545858
See drawing: 3AXD50000562671



DBU DC CONNECTION BUSBARS
KIT L-6-8-262-VX
Ordering code: 3AXD50000545810
See drawing: 3AXD50000541010

DBU DC BUSBARS
KIT L-6-8-263-VX
Ordering code: 3AXD50000545827
See drawing: 3AXD50000545506

DBU CONNECTION FLANGES
KIT L-6-8-266-VX
Ordering code: 3AXD50000545858
See drawing: 3AXD50000562671

Based on:
Customer:
Cust. Doc. No.
DMS Number

Prepared:
Check:
Appr. by:
Project name

M. Michelsson
M. Rosklinen
M. Astikainen
3AXD10001037833

Title: ASSEMBLY DRAWING
AC5880-60ALC STAGE INSTRUCTION
3AXD50000550012

Doc. des.:
Asp. app.:
Doc. No.

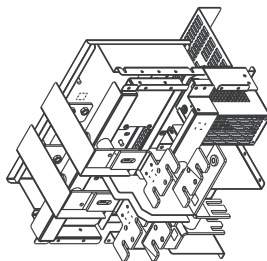
Scale:
1:25
A3

Form:
A3

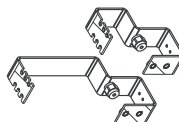
Drawn:
Checked:
Total

EW
5
10

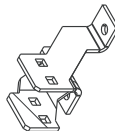
STAGE4B: DBU CHARGING MECH KIT, DC CONNECTION KIT AND DC CONNECTION FLANGES KIT. FOR DC-SWITCH DESIGN
See assembly drawings for details and required additional Rittal and standard parts



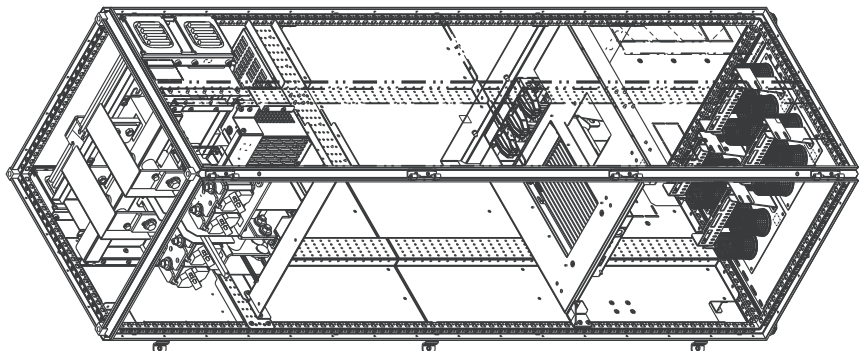
DBU CHARGING MECH
KIT L-6-8-264-VX
Ordering code: 3AXD50000545834
See drawing: 3AXD50000543205



DC CONNECTION W400/W600
KIT L-46-8-207-VX
Ordering code: 3AXD50000360567
See drawing: 3AXD50000343614



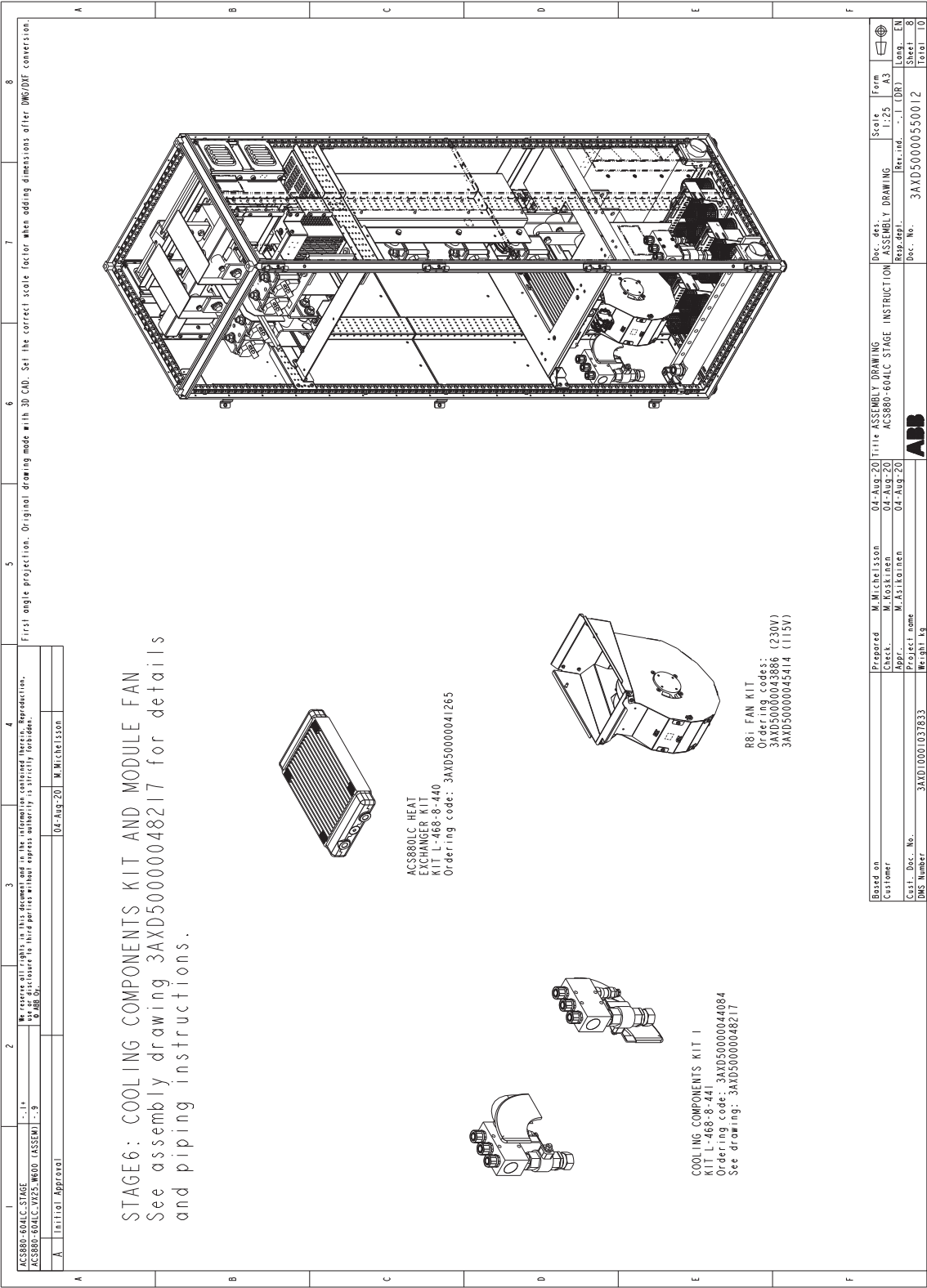
DBU CONNECTION FLANGES
KIT L-6-8-266-VX
Ordering code: 3AXD50000545858
See drawing: 3axd50000562671

[illegible]

Stage 5: Installation of incoming resistor connection busbars

[illegible]

Stage 6: Installation of cooling components



Stage 7: Installation of module

[illegible]

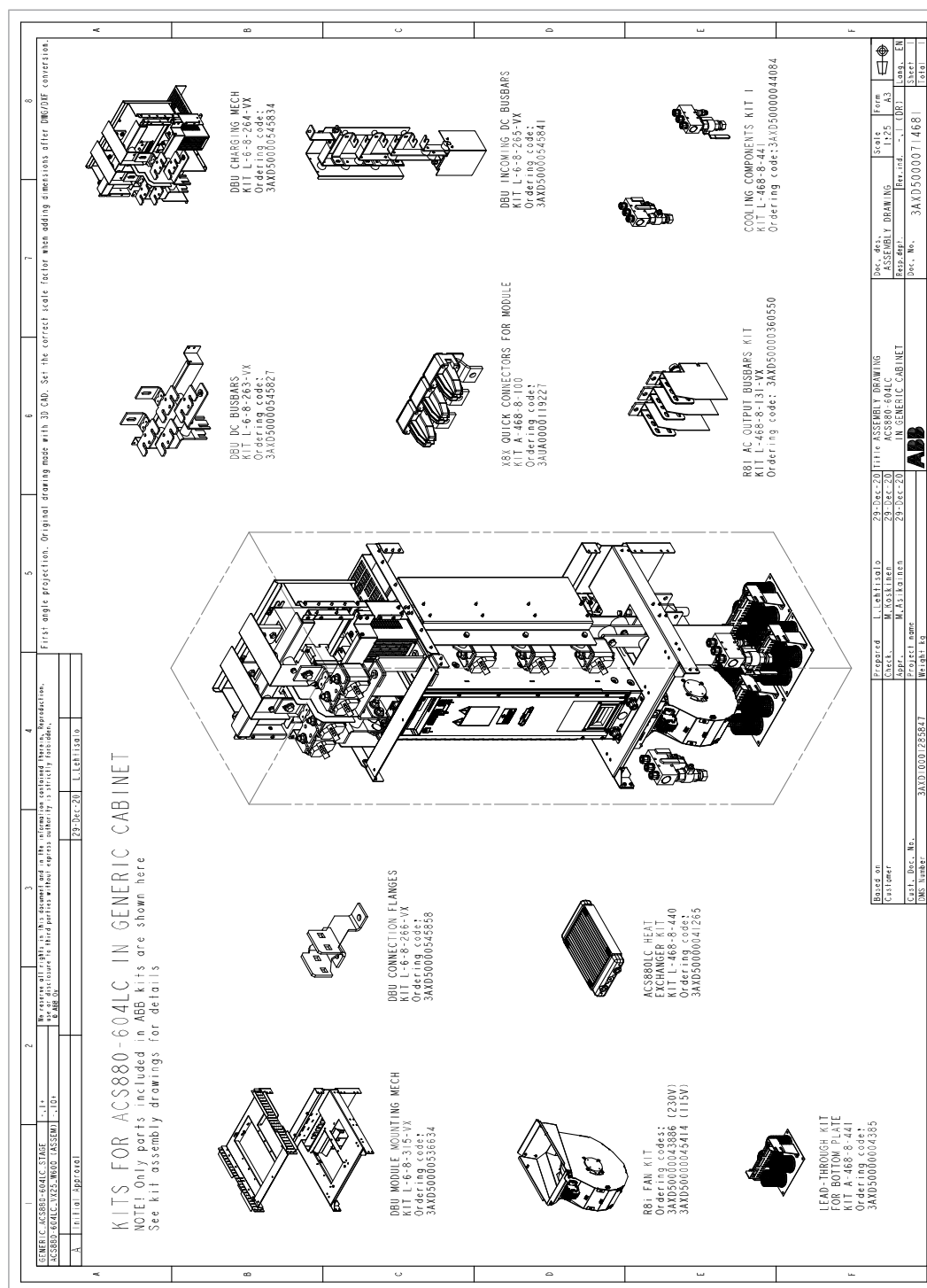
ACSR80-60ALC-STAGE
KIT L-6-X-052-VX
Ordering code: 3AXD50000361250
See drawing: 3AXD50000345069

SWING FRAME KIT W600
KIT L-6-X-052-VX
Ordering code: 3AXD50000361250
See drawing: 3AXD50000345069

SHROUD KIT W600
KIT L-6-X-023-VX
Ordering code: 3AXD50000361267
See drawing: 3AXD50000353521

STAGE8: SWING FRAME KIT AND SHROUDS INSTALLATION
See assembly drawings for details and required additional Rittal and standard parts

- **Generic enclosures**



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 liquid-cooled multidrive cabinets and modules electrical planning instructions (3AXD50000048634 [English]) for the generic guidelines for planning the electrical installation (selecting cables, routing cables, etc.).

Selecting the brake resistor



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 output of the brake chopper module must feed a resistor of its own. There are 3 outputs in the 3-phase brake chopper module.
- The resistance (R) of the brake resistor must be equal to or above the value specified. Never use resistance values below the specified value.
- The brake resistor must withstand the specified brake cycles.
- The ventilation of the space/room in which the brake resistor is located must meet the air flow amounts specified.
- The resistor 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

■ Resistor cable sizes and length

See [Typical resistor cable sizes](#).

■ Minimizing electromagnetic interference

Make sure that the installation is compliant with the EMC requirements. Obey these rules in order to minimize electromagnetic interference caused by the rapid voltage and current changes in the resistor cables:

- Shield the brake resistor cable. Use shielded cable or a metallic enclosure. If you use unshielded single-core cables, route them inside a cabinet that efficiently suppresses the 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 90° angles.
- Keep the cable as short as possible in order to minimize the radiated emissions and stress on the brake chopper. The longer the cable the greater the radiated emissions, inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Selecting the location for the brake resistors

Protect the open (IP00) brake resistors against contact. Install the brake resistor in a place where it cools effectively. Arrange the cooling of the resistor so that:

- no danger of overheating is caused to the resistor or nearby materials, and
 - the temperature of the space that the resistor is in does not go above the allowed maximum value.
-

**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 wired to disable the chopper (and/or switch off the supply to the drive) in case of overtemperature.

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

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 resistor and the brake circuit cables in a short-circuit situation.

6

Electrical installation

Contents of this chapter

This chapter describes the electrical installation of the modules.

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

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

For more information on electrical installation, see [ACS880 liquid-cooled multidrive cabinets and modules electrical planning \(3AXD50000048634 \[English\]\)](#).

Safety and liability



WARNING!

Only qualified electrical professionals are allowed to do the work described in this chapter. Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in [ACS880 liquid-cooled multidrive cabinets and modules safety instructions \(3AXD50000048633 \[English\]\)](#).

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

Electrical safety precautions

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



**WARNING!**

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

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

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

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

Important! Repeat the measurement also with the DC voltage setting of the tester. Measure between each phase and ground. There is a risk of dangerous DC voltage charging due to leakage capacitances of the motor circuit. This voltage can remain charged for a long time after the drive power-off. The measurement discharges the voltage.

 - Make sure that the voltage between the drive DC terminals (UDC+ and UDC-) and the grounding (PE) terminal is zero. In cabinet-built drives, measure between the drive DC busbars (+ and -) and the grounding (PE) busbar.

6. Install temporary grounding as required by the local regulations.
7. Ask for a permit to work from the person in control of the electrical installation work.

General notes

■ Printed circuit boards



WARNING!

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

■ Optical components



WARNING!

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

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



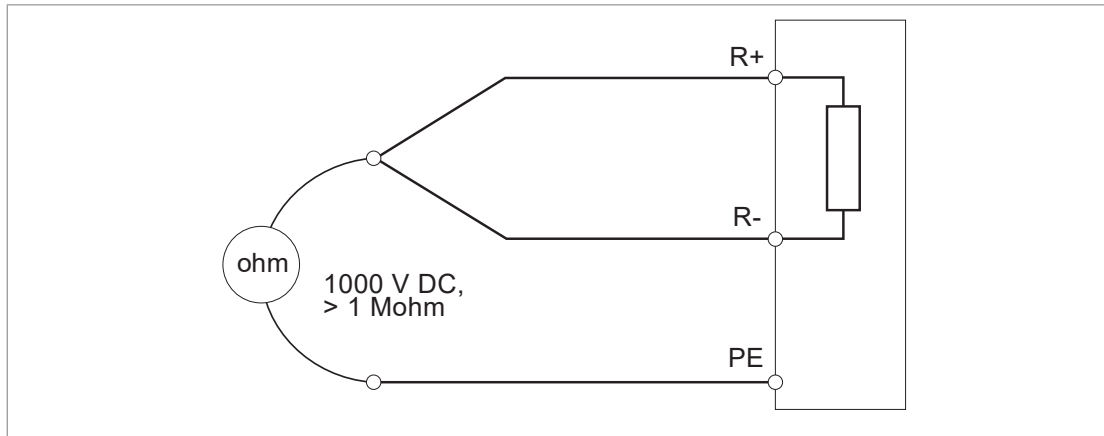
Measuring the insulation resistance of the brake resistor circuit



WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) 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 more than 1 Mohm.



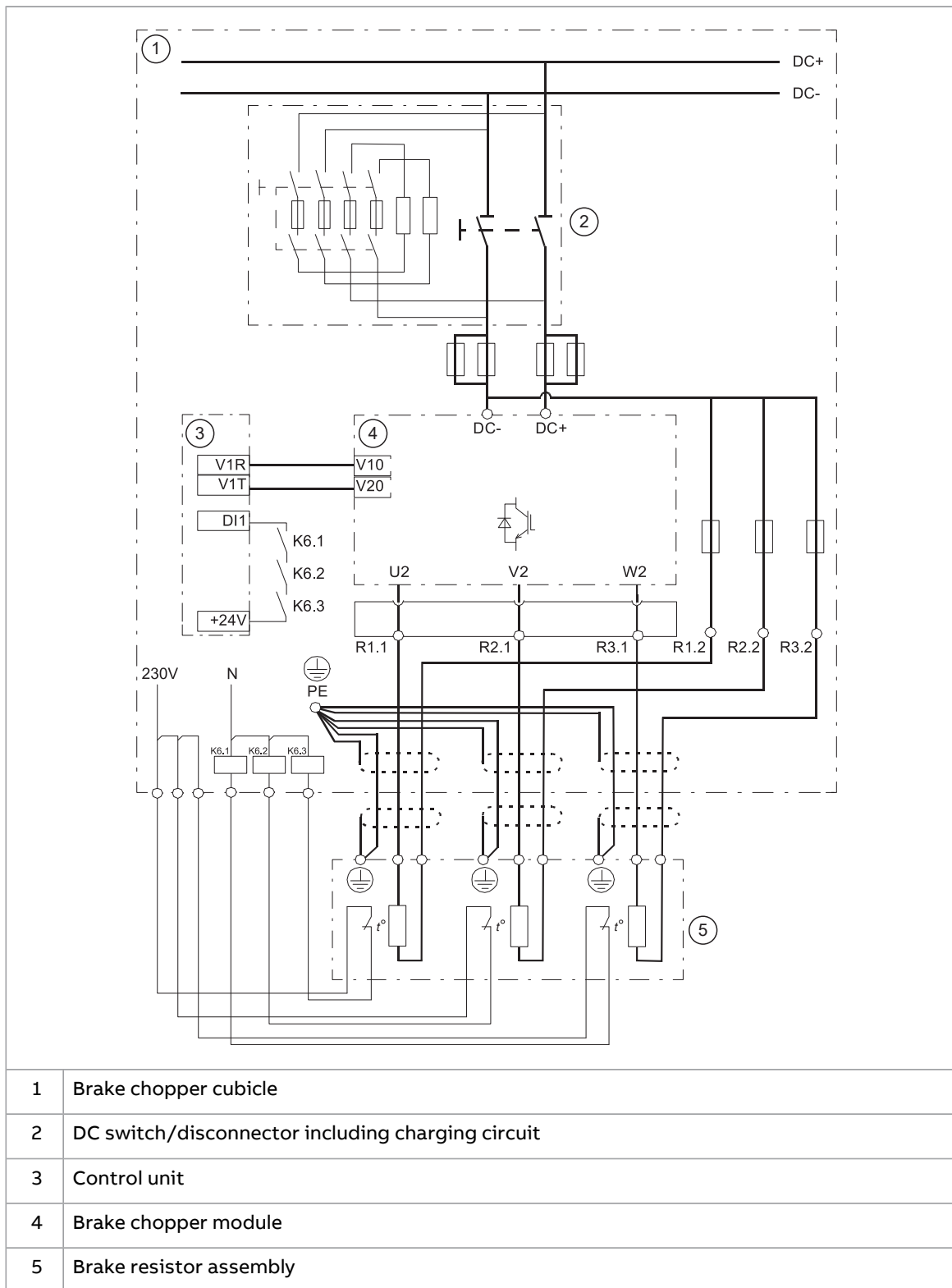
Connecting the brake resistor cables and thermal switch

■ 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.





■ 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, commissioning or maintenance work.

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) before you start the work.
2. Make the internal connections of the brake chopper cubicle. See the diagram above.

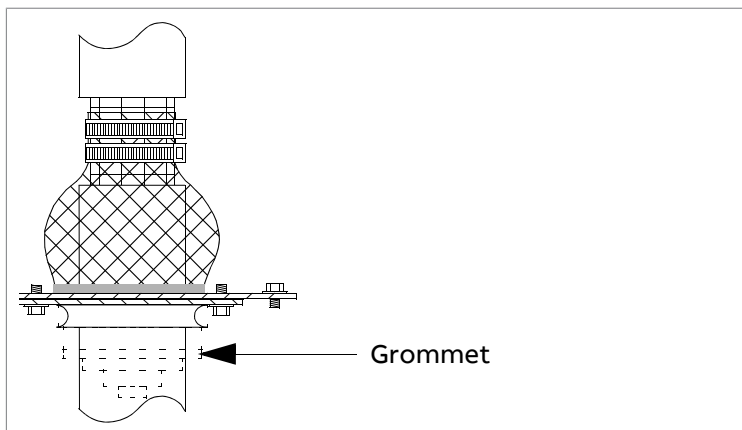
■ Connection procedure of the resistor cables



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, commissioning or maintenance work.

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) 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, commissioning or maintenance work.

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) 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 control cables

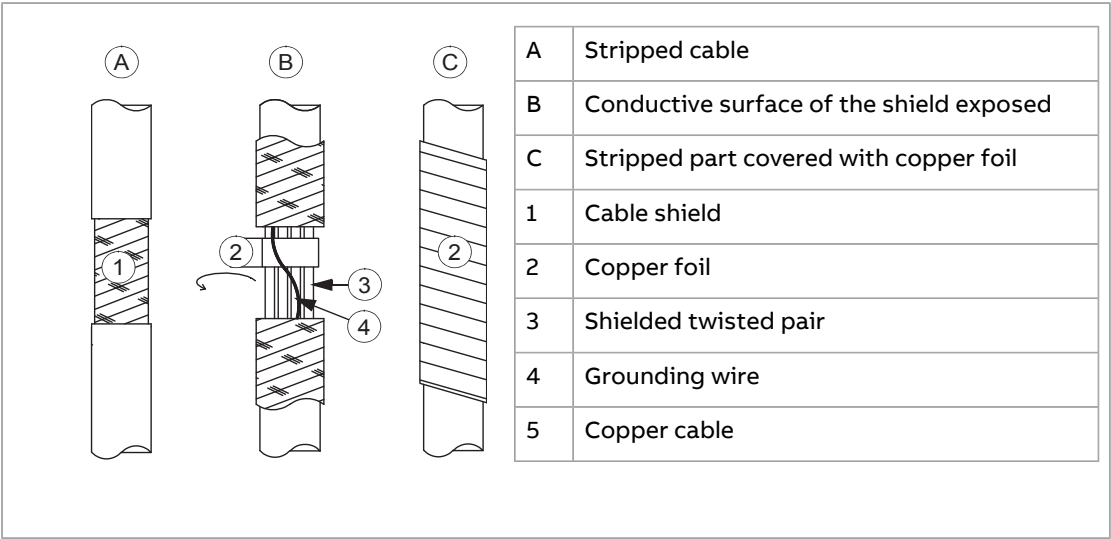
For technical data and default I/O connections of the control unit, see [The control unit \(Page 123\)](#).



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

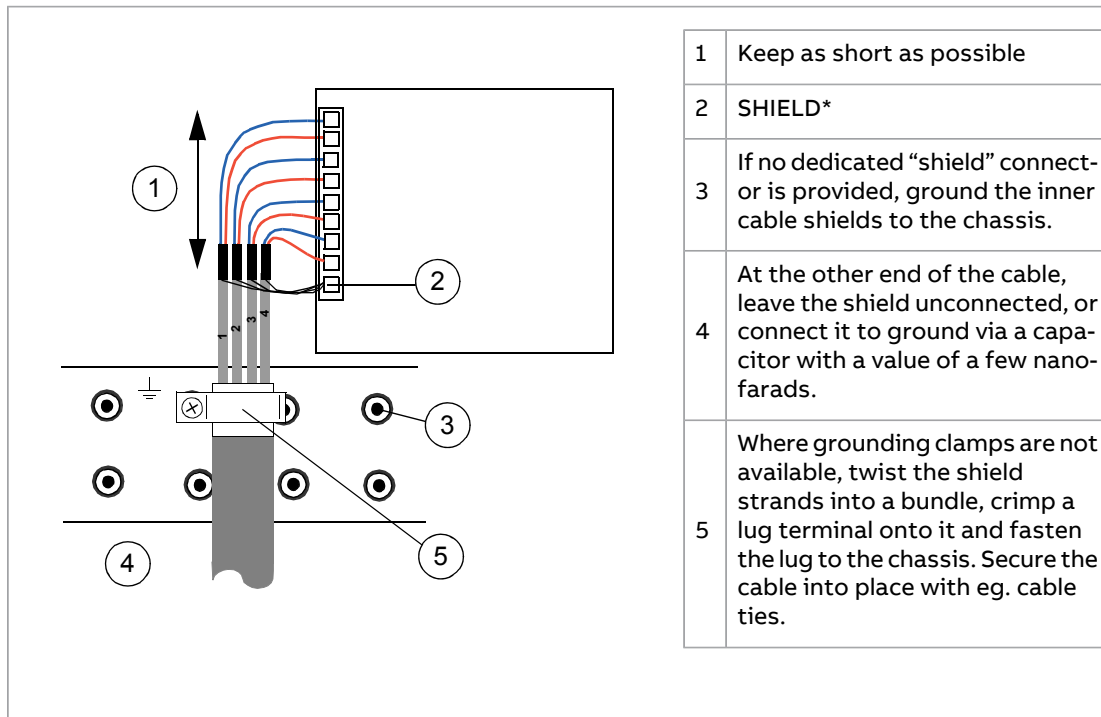
If you are not a qualified electrical professional, do not do installation or maintenance work.

- 1. Remove shrouding to access the cable entries and trunking inside the cubicle.
 - 2. Run the control cables into the cubicle. If possible, arrange for a 360° grounding of the cable shield at the cable entry.
- If the outer surface of the shield is non-conductive, turn the shield inside out as shown below and wrap copper foil around the cable to keep the shielding continuous. Do not cut the grounding wire (if present).



- 3. Run the cables to the control unit (or other connection point). Use the existing trunking wherever possible.
- 4. Cut the cables to suitable length.

5. Strip the cable ends and conductors. When connecting to the drive I/O, also remove the shield along with the outer sheathing, and use electrical tape or shrink tubing to contain the strands. Elsewhere, twist the outer shield strands into a bundle, crimp a lug onto it and connect it to the nearest chassis grounding point.



6. Connect the conductors to appropriate terminals.
7. Refit any shrouds removed earlier.

Installing option modules



WARNING!

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

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

1. Repeat the steps described in [Electrical safety precautions \(Page 51\)](#).
2. Pull out the lock (a).

Note: The location of the lock depends on the module type.

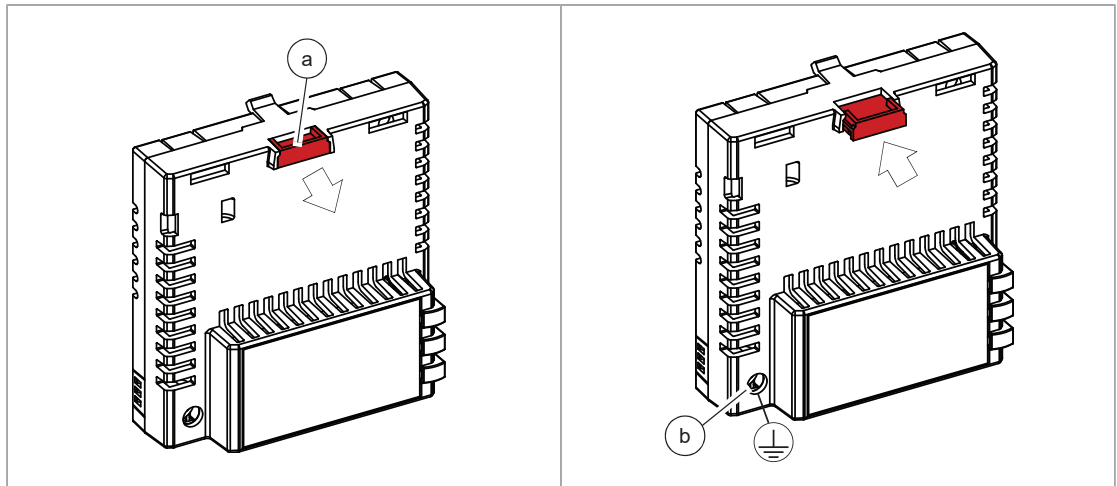
3. Install the module to a free option module slot on the control unit.
4. Push in the lock (a).
5. Tighten the grounding screw (b) to a torque of 0.8 N·m (7 lbf·in).

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



WARNING!

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



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



Connecting a PC

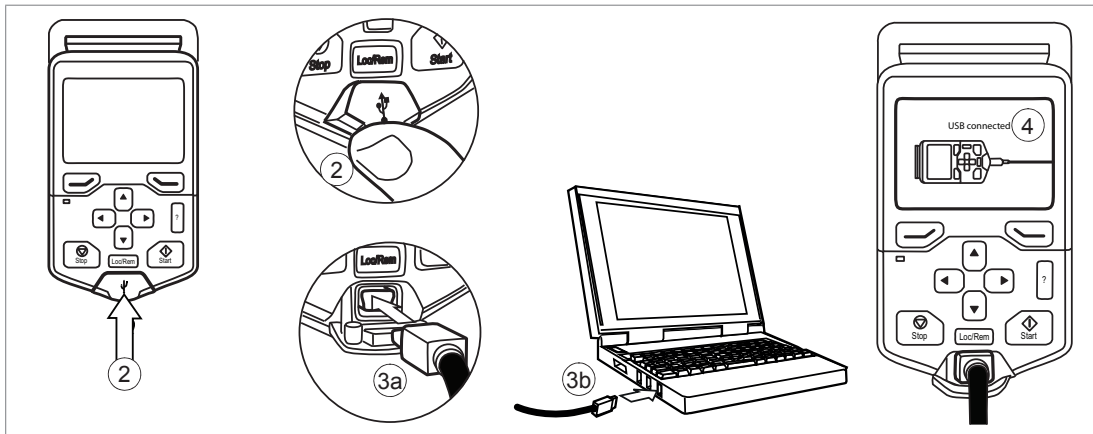


WARNING!

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

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

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



7

Installation checklist

Contents of this chapter

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

Checklist

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



WARNING!

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



WARNING!

Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) before you start the work.

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

62 Installation checklist

Make sure that ...	<input checked="" type="checkbox"/>
The drive module is fastened properly to the enclosure.	<input type="checkbox"/>
<u>If the drive is connected to a network other than a symmetrically grounded TN-S system:</u> You have done all the required modifications (for example, you may need to disconnect the EMC filter or ground-to-phase varistor). See the electrical installation instructions in the supply unit manual.	<input type="checkbox"/>
The enclosures of the equipment in the cabinet have proper galvanic connection to the cabinet protective earth (ground) busbar; The connection surfaces at the fastening points are bare (unpainted) and the connections are tight, or separate grounding conductors have been installed.	<input type="checkbox"/>
The main circuit connections inside the drive cabinet correspond to the circuit diagrams.	<input type="checkbox"/>
The control unit has been connected. See the circuit diagrams.	<input type="checkbox"/>
Appropriate AC fuses and main disconnecting device are installed.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor(s) between the drive and the switchboard, the conductor is connected to correct terminal, and the terminal is tightened to the correct torque. Grounding has also been measured according to the regulations.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> There is an adequately sized protective earth (ground) conductor between the energy storage and the DC/DC converter, the conductor has been connected to appropriate terminal, and the terminal has been tightened to the proper torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> The energy storage cable has been connected to the correct terminals of the DC/DC converter and energy storage, and the terminals have been tightened to the proper torque.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> The energy storage has been equipped with fuses for protecting energy storage cable in a cable short-circuit situation.	<input type="checkbox"/>
<u>If the drive is equipped with a DC/DC converter unit:</u> The energy storage has been equipped with a disconnecting device.	<input type="checkbox"/>
The input power cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor between the motor and the drive. The conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Grounding has also been measured according to the regulations.	<input type="checkbox"/>
The motor cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
The motor cable is routed away from other cables.	<input type="checkbox"/>
No power factor compensation capacitors are connected to the motor cable.	<input type="checkbox"/>
<u>If an external brake resistor is connected to the drive:</u> There is an adequately sized protective earth (ground) conductor between the brake resistor and the drive, and the conductor is connected to the correct terminal, and the terminals are tightened to the correct torque. Grounding has also been measured according to the regulations.	<input type="checkbox"/>
<u>If an external brake resistor is connected to the drive:</u> The brake resistor cable is connected to the correct terminals, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
<u>If an external brake resistor is connected to the drive:</u> The brake resistor cable is routed away from other cables.	<input type="checkbox"/>
The control cables are connected to the correct terminals, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
<u>If a drive bypass connection will be used:</u> The Direct On Line contactor of the motor and the drive output contactor are either mechanically and/or electrically interlocked, that is, they cannot be closed at the same time. A thermal overload device must be used for protection when bypassing the drive. Refer to local codes and regulations.	<input type="checkbox"/>
There are no tools, foreign objects or dust from drilling inside the drive.	<input type="checkbox"/>

Make sure that ...	<input checked="" type="checkbox"/>
The terminal box cover of the motor is in place. Cabinet shrouds are in place and doors are closed.	<input type="checkbox"/>
The motor and the driven equipment are ready for power-up.	<input type="checkbox"/>
The coolant connections between cubicles (if any) and to the cooling circuit are tight.	<input type="checkbox"/>
<u>If the drive is equipped with a cooling unit:</u> Make sure that the mechanical and electrical installation of the cooling unit is completed. Refer to the cooling unit documentation.	<input type="checkbox"/>

8

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.

ABB recommends that you connect a commissioning PC tool (DriveComposer) to the brake unit for the start up. By using the tool, you can set up parameters and monitor the drive during the test.

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	<input checked="" type="checkbox"/>
Safety <div>  WARNING! Obey the safety instructions during the start-up procedure. See ACS880 liquid-cooled multidrive cabinets and modules safety instructions (3AXD50000048633 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur. If you are not a qualified electrical professional, do not do installation or maintenance work. </div> <div>  WARNING! Make sure that the disconnecter of the supply transformer is locked to open position, ie, no voltage is, or can be, connected to drive inadvertently. Check also by measuring that there is no voltage connected. </div> <p>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.</p>	
Starting and checking the cooling system	
Fill up and bleed the internal cooling circuit. Start the cooling unit up. See Filling up and bleeding the internal cooling circuit (Page 104) . <u>If the drive is equipped with a cooling unit (ACS880-1007LC):</u> Start up and power up the cooling unit. See ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English]) and the delivery-specific circuit diagrams.	<input type="checkbox"/>
Check the cooling system for leaks. Make sure that cooling circuit joints at the shipping split joining cubicles are tight and that all drain valves have been closed.	<input type="checkbox"/>
Make sure that the coolant can flow freely in all cubicles. Make sure that drive system cools down. See ACS880-1007LC liquid cooling unit user's manual (3AXD50000129607 [English]) .	<input type="checkbox"/>
Install all shrouds (if removed) and close the cabinet doors.	<input type="checkbox"/>
Powering up the DC bus and starting up the inverters	
Make sure that all cabinet doors are closed.	<input type="checkbox"/>
Close the disconnecter of the supply transformer.	<input type="checkbox"/>
Close the drive auxiliary voltage switch (if present) to power up the control units.	<input type="checkbox"/>
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.	<input type="checkbox"/>
Start up the inverter units. See the procedure in the inverter unit hardware manual.	<input type="checkbox"/>
Brake units with DC switch/disconnector: Connecting the brake unit to the DC bus	
Switch on the auxiliary voltage to the brake unit.	<input type="checkbox"/>
To charge the brake unit capacitors, close the charging switch [Q10.1].	<input type="checkbox"/>
When the green light [P11.1] on the cabinet door illuminates, close the DC switch/disconnector [Q11.1] of the brake unit.	<input type="checkbox"/>
Open the charging switch [Q10.1].	<input type="checkbox"/>
Note: The brake unit can start only after the charging switch is open.	
Setting up the brake and inverter unit parameters	



Tasks	<input checked="" type="checkbox"/>
Check the brake control program parameter settings. See ACS880 brake control program firmware manual (3AXD50000020967 [English]).	<input type="checkbox"/>
Operational tests	
Test the operation of the braking. See ACS880 brake control program firmware manual (3AXD50000020967 [English]).	<input type="checkbox"/>
Switching off the brake unit	<input type="checkbox"/>



9

Maintenance

Contents of this chapter

This chapter instructs how to maintain the brake module and how to interpret its fault conditions. The information is valid for ACS880-604LC modules and the cabinet construction examples presented in this manual.

**WARNING!**

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

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

Maintenance task/object	Years from start-up														
	0	1	2	3	4	5	6	7	8	9	10	11	12	...	
Checking tightness of cable and busbar terminals. Tightening if needed.		I	I	I	I	I	I	I	I	I	I	I	I	I	
Checking ambient conditions (dustiness, corrosion, temperature)		I	I	I	I	I	I	I	I	I	I	I	I	I	
Checking coolant pipe connections		I	I	I	I	I	I	I	I	I	I	I	I	I	
Symbols															
I	Inspection (visual inspection and maintenance action if needed)														
P	Performance of on/off-site work (commissioning, tests, measurements or other work)														
R	Replacement														
3AXD10000578918 K															

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

Note:

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

Cooling system

For instructions on coolant replacement and checking the cooling system, see chapter [Internal cooling circuit](#).

Power connections

■ Retightening the power connections



WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions](#) (Page 51) before you start the work.
2. Examine the tightness of the cable connections. Use the tightening torques given in the technical data.

Cooling fans

■ Replacing cooling fans

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

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

■ Fan replacement

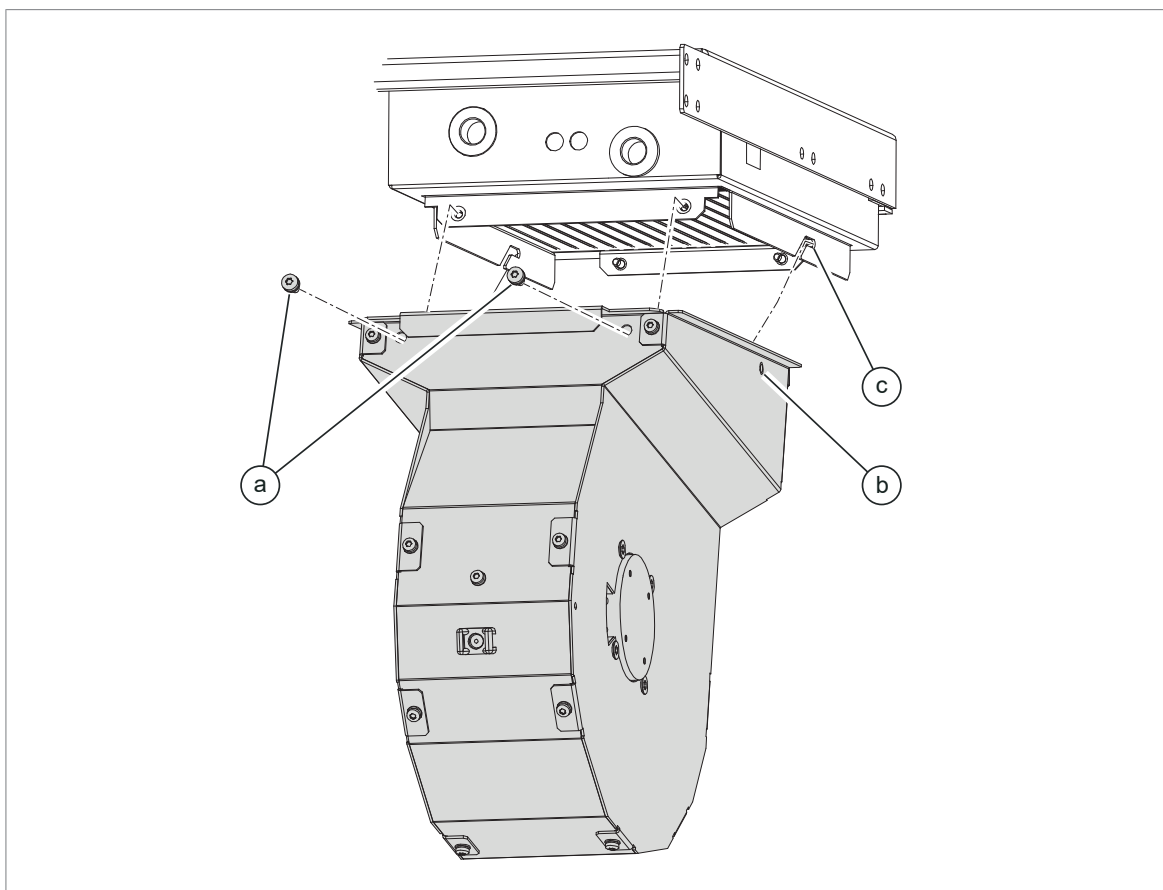
**WARNING!**

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

**WARNING!**

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) before you start the work.
 2. Remove any shrouding in front of the cooling fan in case of marine construction.
 3. Disconnect the fan wiring. Remove the CIO module.
 4. Undo the two retaining screws (a).
 5. Pull the fan outwards to separate it from the heat exchanger housing.
 6. Install new fan in reverse order. Align the guide pins (b) at the rear of the fan cowling with the slots (c) in the module bottom guide, then reinstall the retaining screws (a).
-



Brake module

■ Replacing the brake module



WARNING!

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

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



WARNING!

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



WARNING!

Beware of hot coolant. Do not work on the liquid cooling system until the pressure is lowered down by stopping the pumps and draining the coolant. High-pressure warm coolant (6 bar, max. 50 °C) is present in the internal cooling circuit when it is in operation.

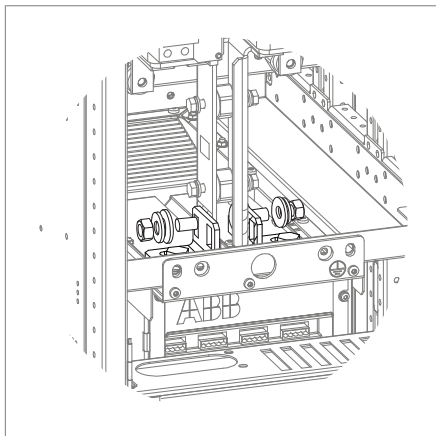


WARNING!

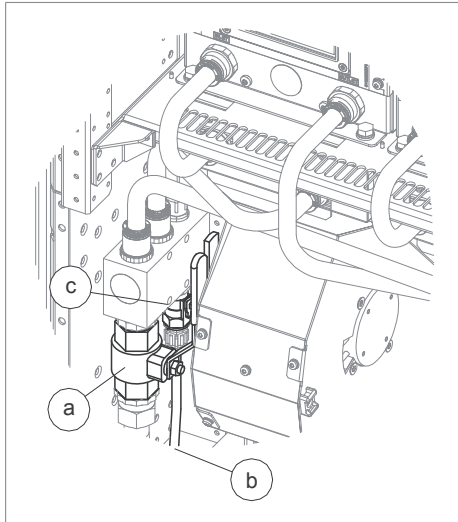
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

Removing the module

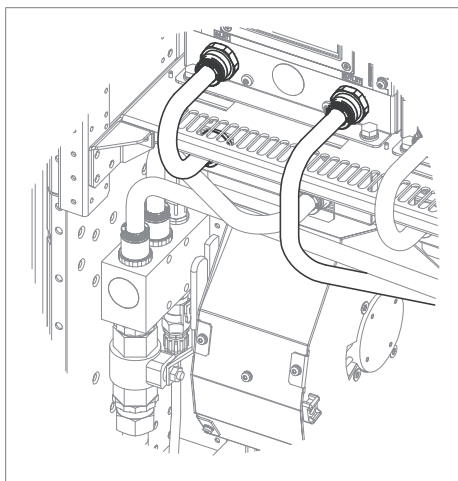
1. Do the steps in section [Electrical safety precautions](#) (Page 51).
2. Remove the shrouding in front of the module.
3. Remove the locking screws of the swing-out frame (if present) and open it.
4. Disconnect the wiring from the module and move it aside. Use cable ties to keep the wiring out of the way.
5. Remove the L-shaped DC busbars at the top of the module. Make note of the orientation of the screws as well as the order of the washers.



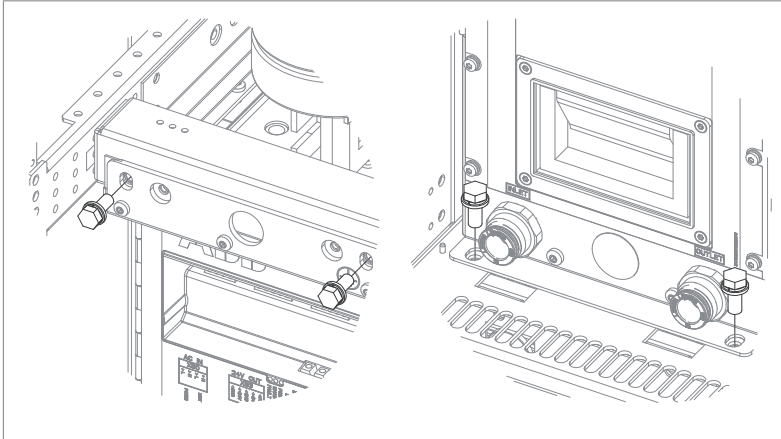
6. Close the inlet valve (a) and outlet valve (located on the right-hand side of the cubicle). Lead the drain hoses (b, on both sides of the cubicle) into a suitable container. Open the drain valves (c, on both sides of the cubicle). This will drain all modules in the cubicle.



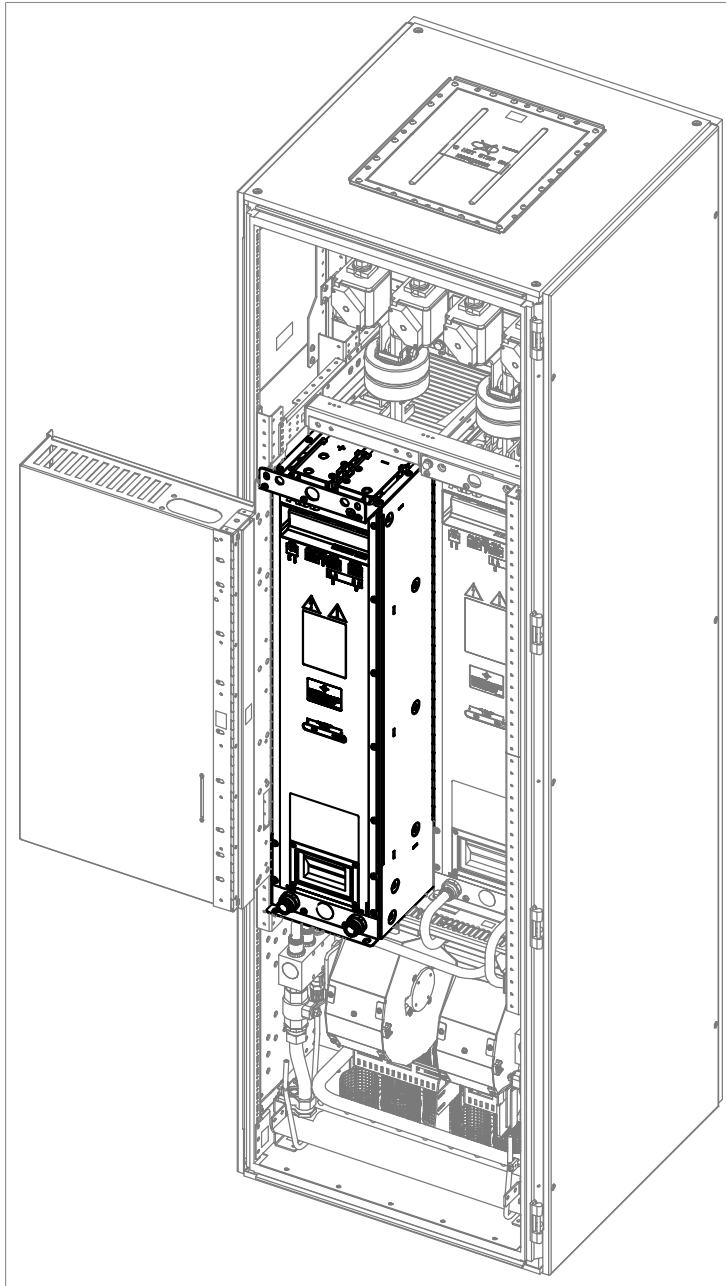
7. After the module has drained, disconnect the piping from the module.



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



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



Reinstalling the module

1. Push the module carefully into its bay.
 2. Fasten the retaining screws at the top and the bottom of the module.
 3. Reinstall the DC busbars at the top of the module.
 4. Reconnect the coolant pipes to the module. Tighten to 20 N·m (14.75 lbf·ft).
 5. Reconnect the control wiring to the module.
-

6. Fill up the cooling system. For instructions, see section [Filling up and bleeding the internal cooling circuit](#).
7. Close the swing-out frame (if present). Reinstall all shrouds removed earlier.

Control unit

■ Replacing the memory unit

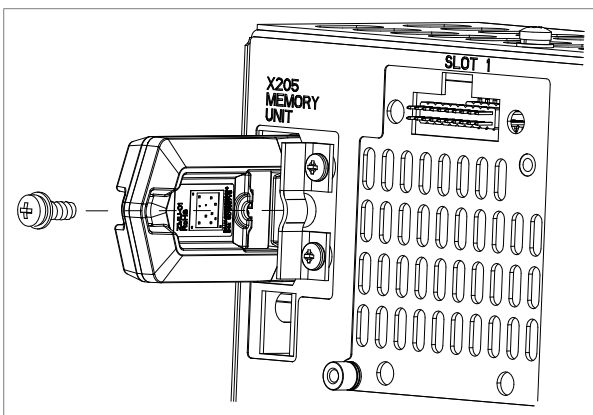
After replacing a control unit, you can keep the existing parameter settings by transferring the memory unit from the defective control unit to the new control unit.



WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) before you start the work.
2. Make sure that the control unit is not powered.
3. Remove the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.

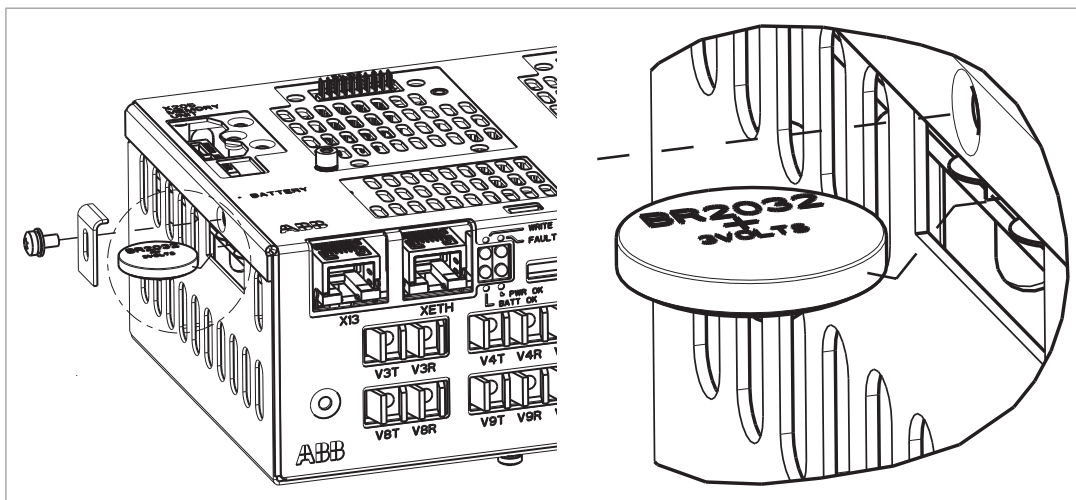


■ Replacing the BCU control unit battery

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(Page 51\)](#) before you start the work.
2. Undo the fastening screw and remove the battery.
3. Replace the battery with a new BR2032 battery.

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



Capacitors

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

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

■ Reforming the capacitors

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

LED indications

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

■ Control panel and panel platform/holder LEDs

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

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

■ R8i module LEDs

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

Functional safety components

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

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

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

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

Contact your local ABB service representative for more information.

10

Ordering information

Contents of this chapter

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

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

Note:

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

Kit code key

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

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

- x = cooling method
-

84 Ordering information

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

Brake module type	Frame size	Ordering code (for options, see below)	Qty
$U_N = 690\text{ V}$ (Range 525 ... 690 V):			
ACS880-604LC-0870-7	R8i	ACS880-104LC-0530A-7+E205	1
ACS880-604LC-1300-7	R8i	ACS880-104LC-0850A-7+E205	1
ACS880-604LC-1730-7	2×R8i	ACS880-104LC-0530A-7+E205	2
ACS880-604LC-2600-7	2×R8i	ACS880-104LC-0850A-7+E205	2
ACS880-604LC-3900-7	3×R8i	ACS880-104LC-0850A-7+E205	3
ACS880-604LC-5200-7	4×R8i	ACS880-104LC-0850A-7+E205	4

Ordering code format	Option codes
[Module type] + code [+code]... For example, ACS880-104LC-0530A-7 +E205	+E205: Internal du/dt filtering. Included in the module delivery as standard.

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).


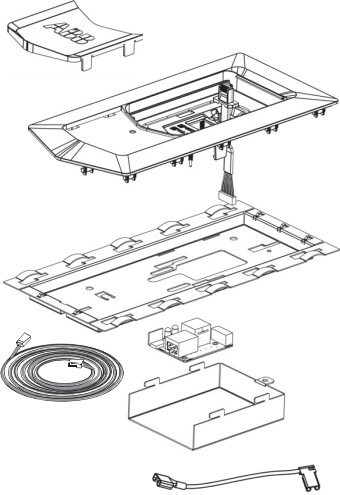
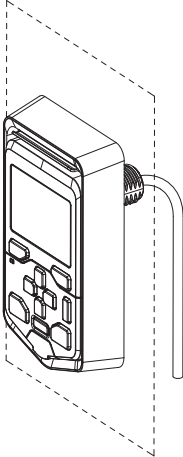
The other parts listed

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

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

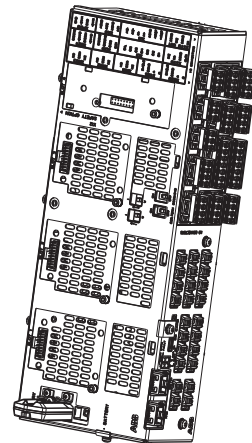
For more information on the door mounting kits, such as the contents of the kit, see the installation manuals:

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

Control electronics

■ 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
$U_N = 690\text{ V}$ (Range 525... 690 V):					
ACS880-604LC-0870-7	R8i	Control unit BCU-02 kit	1	3AXD50000020676	
ACS880-604LC-1300-7					
ACS880-604LC-1730-7	2				
ACS880-604LC-2600-7	2×R8i				
ACS880-604LC-3900-7	3×R8i		3		
ACS880-604LC-5200-7	4×R8i	4			

The BCU-02 control unit kit contains:

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

Connect the control unit to each brake chopper module with a pair of fiber optic cables (available 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:

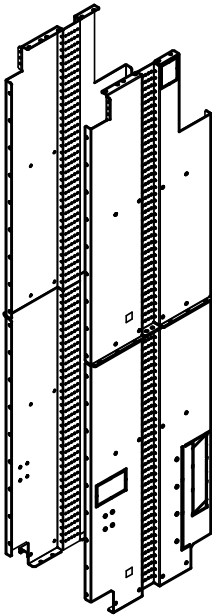
Length	Kit type designation	Ordering code
2 m	NLWC-02	58988821
3 m	NLWC-03	58948233
5 m	NLWC-05	58948250
7 m	NLWC-07	58948268
10 m	NLWC-10	58948276

Mechanical installation accessories

These kits include parts that are used for installing the module in the enclosure.

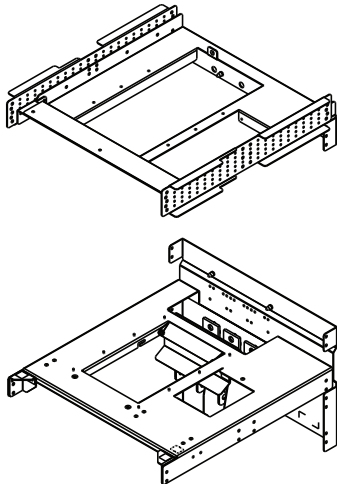
■ Side plate kit

These parts attach to the left-hand and right-hand sides of the VX25 enclosure frame and act as a mounting base for the module guides.

Used with...	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure	1	3AXD50000360543	L-468-8-020-VX	 <p>Instruction code: 3AXD50000327591</p>

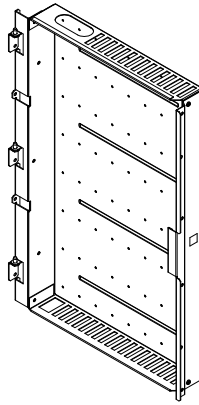
■ Module top/bottom guides

This kit contains the frames that support the module at the top and the bottom.

Used with...	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure	1	3AXD50000536634	L-6-8-315-VX	 <p>Instruction code: 3AXD50000536733</p>

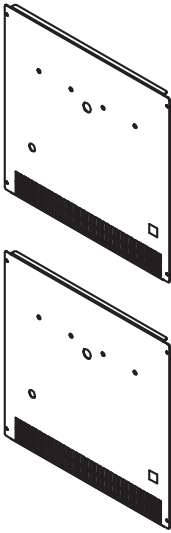
■ Swing-out frame

The swing-out frame is a hinged compartment that can be used as a mounting base for eg. control electronics and auxiliary voltage circuit components.

Used with...	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure	1	3AXD50000361250	L-6-X-052-VX	 <p>Instruction code: 3AXD50000345069</p>

■ **Shrouds**

This kit contains the shrouds, as well as the necessary brackets and screws, to cover the top and bottom parts of the cubicle.

Frame size	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure	1	3AXD50000361267	L-6-8-023-VX	 Instruction code: 3AXD50000353521

■ Lifting device

Use the lifting device when replacing a module in the Rittal VX25 enclosure.

Frame	Enclosure	Qty	Ordering code	Illustration
R8i	Rittal VX25	1	3AXD50000439997	 <p>Instruction code: 3AXD50000210268, 3AXD50000439409</p>

DC-side components

Frame R8i modules are connected to the DC bus through fuses.

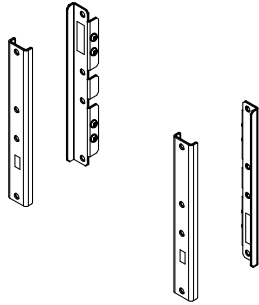
A DC switch/disconnector can be installed if quick isolation of the module from the DC bus is required. One of the auxiliary contacts of the switch is used for monitoring the open/closed state of the switch. A capacitor charging circuit is to be installed with the DC switch/disconnector.

Note: A separate capacitor charging circuit must be designed and installed by the customer if the inverter unit is directly connected to the DC bus and the supply unit of the system does not have a charging capability.

■ Common DC Flat-PLS assembly

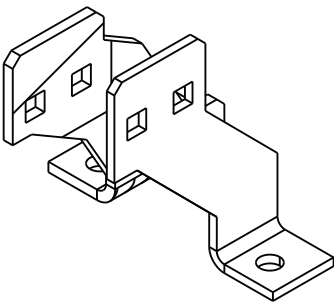
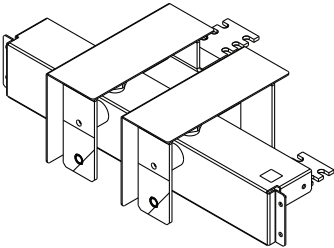
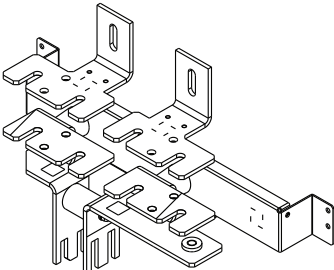
The brackets in this kit act as a mounting base for the busbar supports of the Rittal Flat-PLS DC bus and ensure its correct placement and alignment inside the cabinet line-up.

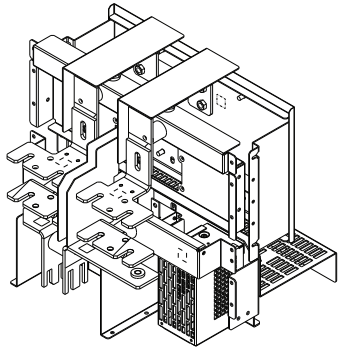
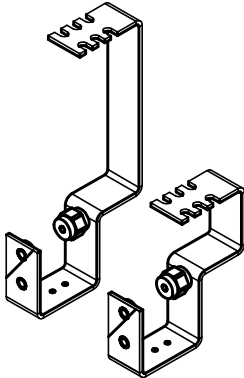
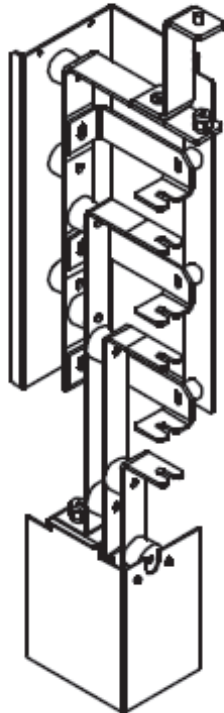
The designs shown in this manual for Rittal VX25 enclosures use the Rittal Flat-PLS busbar system. Make sure that the current in the drive system does not exceed the current-carrying capacity of the busbars.

Used with ...	Qty	Ordering code	Kit code	Illustration
VX25 enclosure	1 kit per cubicle	3AXD50000333387	A-468-X-001-VX	 <p>Instruction code: 3AXD50000333639</p>

■ **DC connection flanges and busbars**

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

Used with...	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure	1	3AXD50000545858	L-6-8-266-VX	 Instruction code: 3AXD50000562671
600 mm VX25 enclosure without DC switch/disconnector	1	3AXD50000545810	L-6-8-262-VX	 Instruction code: 3AXD50000541010
	1	3AXD50000545827	L-6-8-263-VX	 Instruction code: 3AXD50000545506

Used with...	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure with DC switch/disconnector	1	3AXD50000545834	L-6-8-264-VX	 <p>Instruction code: 3AXD50000543205</p>
	2	3AXD50000360567	L-46-8-207-VX	 <p>Instruction code: 3AXD50000343614</p>
Incoming resistor con- nection busbars kit	1	3AXD50000545841	L-6-8-265-VX	 <p>Instruction code: 3AXD50000545087</p>

■ DC fuses

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

DC fuses (IEC)

Unit type ACS880- 604LC-...	Qty (per module)	Qty (total)	Ordering code	Fuse		
				Type	Data	Size
0870-7	2	2	63919462	170M6500	1250 A, 1250 V	3 (BKN/90)
1300-7	2×2	2×2	63916749	2 x 170M6548	2×1000 A, 1100 V	3 (BKN/80)
1730-7	2	4	63919462	170M6500	1250 A, 1250 V	3 (BKN/90)
2600-7	2×2	2×2×2	63916749	2 x 170M6548	2×1000 A, 1100 V	3 (BKN/80)
3900-7	2×2	3×2×2	63916749	2 x 170M6548	2×1000 A, 1100 V	3 (BKN/80)
5200-7	2×2	4×2×2	63916749	2 x 170M6548	2×1000 A, 1100 V	3 (BKN/80)

DC fuses (UL)

Unit type ACS880- 604LC-...	Qty (per module)	Qty (total)	Ordering code	Fuse		
				Type	Data	Size
0870-7	2	2	63919462	170M6500	1250 A, 1250 V	3 (BKN/90)
1300-7	2	2	3AXD50000343485	170M6794	2000 A, 1250 V	23 (BKN/80)
1730-7	2	4	63919462	170M6500	1250 A, 1250 V	3 (BKN/90)
2600-7	2	4	3AXD50000343485	170M6794	2000 A, 1250 V	23 (BKN/80)
3900-7	2	6	3AXD50000343485	170M6794	2000 A, 1250 V	23 (BKN/80)
5200-7	2	8	3AXD50000343485	170M6794	2000 A, 1250 V	23 (BKN/80)

■ DC switch/disconnector kits

Used with...	Qty	Ordering code	Instruction code
Frame R8i with DC switch/disconnector	1	3AXD50000227037 (IEC) 3AXD50000227068 (UL)	3AXD50000330720
Frame 2×R8i with DC switch/disconnector	2		
Frame 3×R8i with DC switch/disconnector	3		
Frame 4×R8i with DC switch/disconnector	4		

The kit contains the following components:

- OT1600E11 (IEC) or OT1200U11 (UL) DC switch
- OHB150J12P operating handle
- OXP12X395 operating shaft
- 2 pcs of OA1G10 and 2 pcs of OA3G01 auxiliary contacts
- OTZT4A and PDAL2/24DC interlocks
- OHZX10 alignment ring.

■ DC charging kits (for units with DC switch/disconnector)

Used with...	Qty	Ordering code	Instruction code
Frame R8i with DC switch/disconnector	1	3AXD50000226801 (IEC) 3AXD50000227013 (UL)	3AXD50000450978
Frame 2×R8i with DC switch/disconnector	2		
Frame 3×R8i with DC switch/disconnector	3		
Frame 4×R8i with DC switch/disconnector	4		

The kit contains the following components:

- OS160GD04F (IEC) or OS100GJ04FP (UL) charging switch with terminal shrouds
- OHB65J6 operating handle
- OXP6X290 operating shaft
- 2 pcs of OA3G01 auxiliary contacts
- BSFC-12C charging controller
- 170M2676 fuses (kit 3AXD50000227013 contains FWJ-30A fuses and conversion parts)
- OHZX10 alignment ring.

Note: Charging resistors are not included in the kit and must be ordered separately.

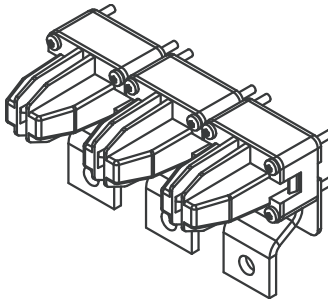
■ Charging resistors (for units with DC switch/disconnector)

Used with...	Qty	Ordering code	Data
Frame R8i with DC switch/disconnector	4	10028531	33 ohm
Frame 2×R8i with DC switch/disconnector	8		
Frame 3×R8i with DC switch/disconnector	12		
Frame 4×R8i with DC switch/disconnector	16		

Resistor-side components

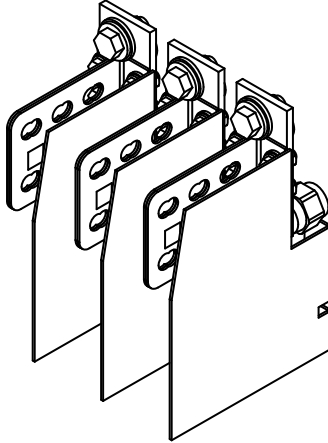
■ Quick connector

The power input is connected to the module through a quick connector.

Used with	Qty	Ordering code	Kit code	Illustration
All enclosure types	1 per module	3AUA0000119227	A-468-8-100	 <p>Instruction code: 3AUA0000118667</p>

■ Outgoing resistor connection busbars

This kit contains busbars that attach to the quick connector, and the terminals for the resistor cables.

Used with	Qty	Ordering code	Kit code	Illustration
400/600/800 mm VX25 enclosure	1 per module	3AXD50000360550	L-468-8-131-VX	 <p>Instruction code: 3AXD50000330874</p>

■ Resistor fuses

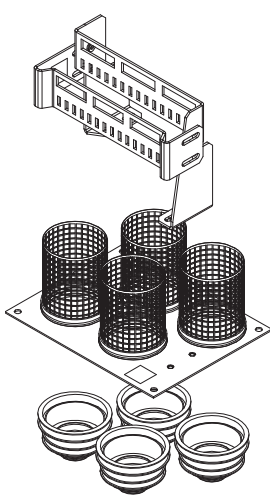
The resistor fuses protect the resistor cables against short-circuits.

Unit type ACS880-604LC-...	Fuse				
	Type	Qty	Data	Size	Ordering code
$U_N = 690 \text{ V}$					
0870-7	170M6542	3	500 A, 1250 V	3 (BKN/80)	3AXD50000021111
1300-7	170M6546	3	800 A, 1250 V	3 (BKN/80)	63919128
1730-7	170M6542	2×3	500 A, 1250 V	3 (BKN/80)	3AXD50000021111
2600-7	170M6546	2×3	800 A, 1250 V	3 (BKN/80)	63919128
3900-7	170M6546	3×3	800 A, 1250 V	3 (BKN/80)	63919128
5200-7	170M6546	4×3	800 A, 1250 V	3 (BKN/80)	63919128

Note: All fuses listed are UL Recognized.

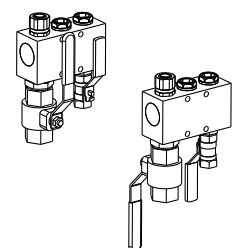
■ Cable entry kit

Cable entry kit, to be installed on the bottom plate of the enclosure, contains four 60 mm diameter inlets for cables with grommets, wire meshing for 360° grounding, and a strain relief bracket.

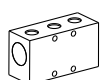
Used with ...	Qty	Ordering code	Kit code	Illustration
All enclosure types	1 per module (minimum)	3AXD50000004385	A-468-8-441	 <p>Instruction code: 3AXD50000004817</p>

Cooling system parts

■ Coolant distribution manifold kits

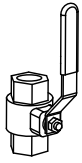
Enclosure	Qty	Ordering code	Kit code	Illustration
400/600/800mm VX25 enclosure	1	3AXD50000044084	L-468-8-441	 <p>Instruction code: 3AXD50000048217</p>

The manifold kits contain:

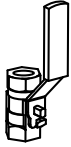


Inlet and outlet manifolds

98 Ordering information



Inlet and outlet valves



Drain valves



Nipples for connecting the valves to manifolds



Connectors for PA piping



Plugs for unused piping connectors



Chokes for flow limitation – not used with the ACS880-604LC.

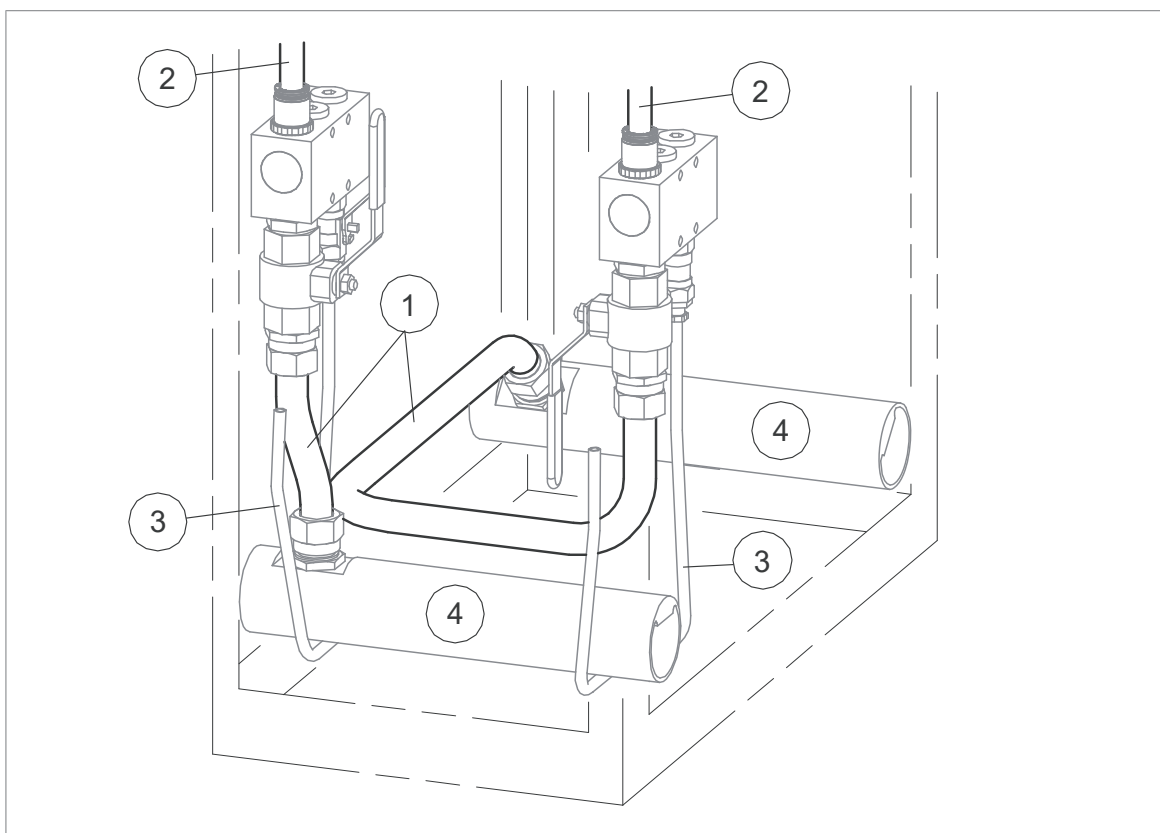
You must order the following parts separately as they are not included in the manifold kits:

- Connectors to attach to inlet, outlet and drain valves
- Connectors to attach to main pipes
- Pipes between main pipe and inlet/outlet valves
- Main pipes
- Drain pipes.

Note: The inlet and outlet valves have an R3/4" internal thread. The drain valves have an R3/8" internal thread.

■ Piping

PA (polyamide) pipe is available in various diameters on 50-meter reels. Refer to the image for application.



Item	Data	Ordering code
1	PA12P40, 22/18 mm, 50 m	3AXD50000441419
2	PA12P40, 16/13 mm, 50 m	3AXD50000047488
3	PA11P40, 8/6 mm, 50 m	3AXD50000419302
4	Not part of standard product offering	

■ Heat exchanger

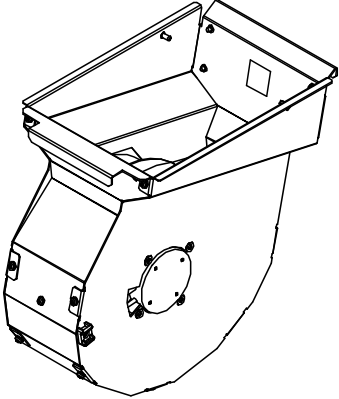
The kits include the heat exchanger and the connectors for piping.

Used with ...	Qty	Ordering code	Kit code	Illustration
All enclosure types	1 per module	3AXD50000041265	L-468-8-440	

■ **Cooling fan**

The fan blows air through the heat exchanger, circulating the air inside the cabinet. The kit contains the fan installed into its cowling which mounts to the module bottom guide.

The fan is selected according to the auxiliary voltage.

Auxiliary voltage	Qty	Ordering code	Illustration
230 V AC (50/60 Hz)	1 per module	3AXD50000043886	
115 V AC (50/60 Hz)	1 per module	3AXD50000045414	

Miscellaneous

■ **CIO-01 I/O module**

CIO-01 I/O module for distributed I/O bus control is not included in the module delivery but must be ordered separately. The distributed I/O bus controls and supervises each cabinet fan separately. It indicates malfunctioning fans by warning or fault messages. One CIO-01 can monitor and control up to 4 cabinet fans.

For more information, see [CIO-01 I/O module for distributed I/O bus control \(3AXD50000126880 \[English\]\)](#).

Type	Data	Qty	Ordering code
CIO-01	CIO-01 I/O module for distributed I/O bus control	1	3AXD50000041983

11

Internal cooling circuit

Contents of this chapter

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

Applicability

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

Internal cooling system

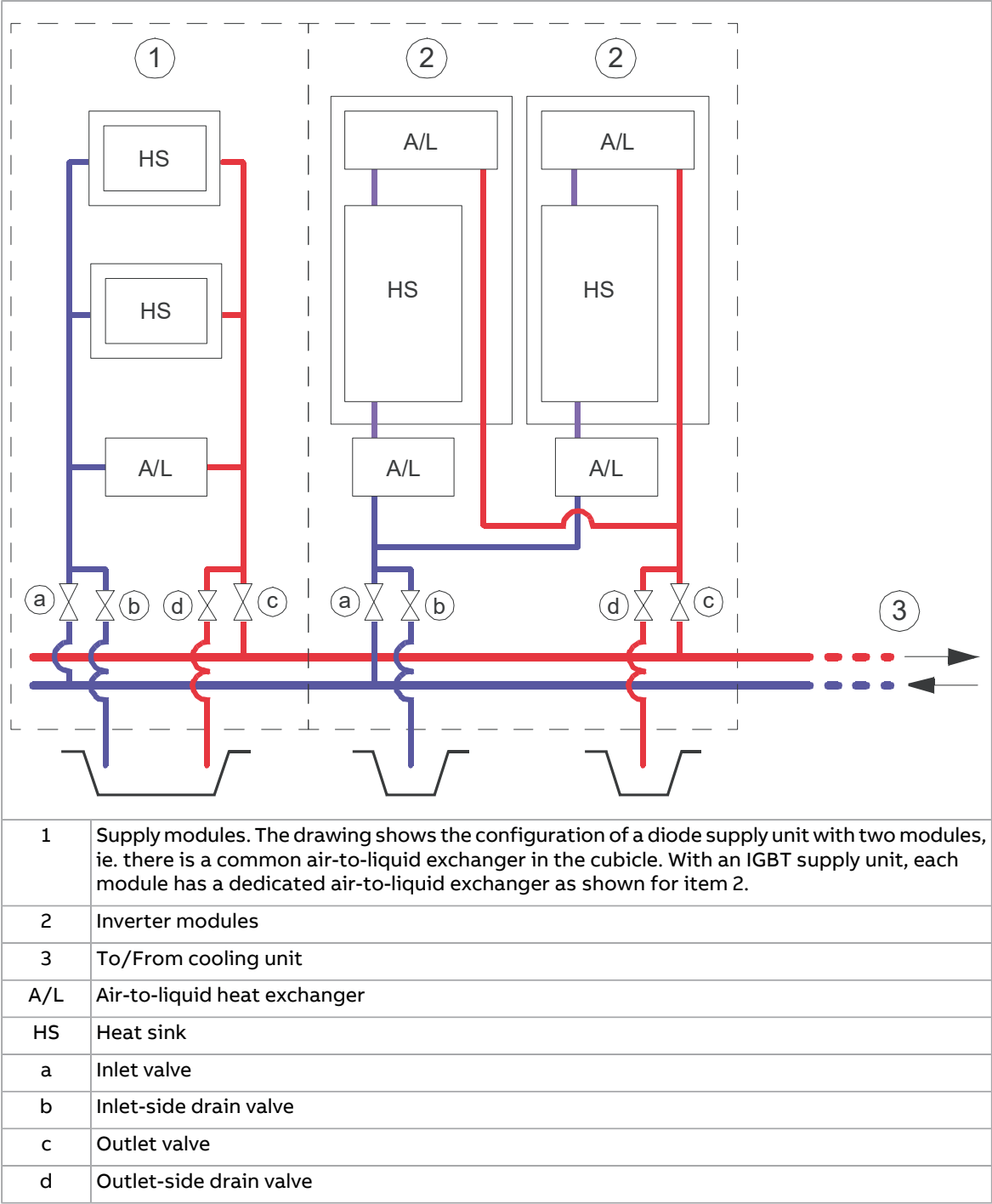
Each cubicle has an inlet and an outlet manifold, fitted with a stop valve and a drain valve. The stop valves can be closed to isolate all modules in the cubicle from the main cooling circuit.

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

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

The following diagram shows the coolant pipe connections in a drive system consisting of a supply unit and an inverter unit. Other units, such as brake units, DC/DC converter units have similar cooling arrangements. Other cubicles containing components that require cooling may also contain heat exchangers.

102 Internal cooling circuit



The coolant used with ACS880 liquid-cooled drive systems is Antifrogen® L 25% or 50% mixture. See [Coolant specification \(Page 106\)](#).

Connection to a cooling unit

■ Connection to an ACS880-1007LC cooling unit

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

■ Connection to a custom cooling unit

General requirements

Equip the system with an expansion vessel to damp pressure rise due to volume changes when the temperature varies. Equip the system with a pump that provides a nominal flow and pressure. Keep the pressure within the limits specified in [Technical data \(Page 106\)](#). Install a pressure regulator to make sure that the maximum permissible operating pressure is not exceeded.

Install a bleed valve at the highest point of the cooling circuit, and a drain valve at the lowest point.

The materials that can be used are listed in [Cooling circuit materials \(Page 108\)](#).

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in [Technical data \(Page 106\)](#). Note that the minimum temperature is dependent on ambient temperature and relative humidity.

Filling up and bleeding the internal cooling circuit

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



WARNING!

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



WARNING!

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

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

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

■ **Drive line-ups with a custom cooling unit**

Note:

- In filling up the system, the drain valves in the line-up are used only to vent the air from the circuit so that it can be displaced by the coolant. The actual bleeding of the circuit must be done via an external bleed valve installed at the highest point of the cooling circuit. The most practical location for the valve is usually near or at the cooling unit.
 - Observe the instructions given by the manufacturer of the cooling unit. Pay special attention to filling up and bleeding the pumps properly as they may be damaged if operated when dry.
 - Draining coolant into the sewer system is not allowed.
1. Open the bleed valve at the cooling unit.
 2. Open the inlet valve and the outlet-side drain valve of one cubicle. Keep the outlet valve and the inlet-side drain valve closed.
 3. Attach a hose to the outlet-side drain valve and lead it into a suitable container.
 4. Fill the circuit with coolant. For the coolant specification, refer to section [Coolant specification \(Page 106\)](#).
To minimize foaming, do not exceed the filling flow rate of 5 l/min (1.3 US gallon/min).
 5. As the piping and modules in the cubicle fills up, coolant starts to flow from the hose. Let some coolant flow out, then close the drain valve.
 6. Close the inlet valve.
 7. Repeat steps 2...6 for all cubicles in the line-up.
 8. Open the inlet and outlet valves in all cubicles. Let any air remaining in the system out through the bleed valve at the cooling unit.
-

9. Close the bleed valve at the cooling unit.
10. Continue to fill in coolant until a base pressure of approximately 250 kPa is achieved.
11. Open the bleed valve of the pump to let out any air.
12. Re-check the pressure and add coolant if necessary.
13. Start the coolant pump. Let any air remaining in the system out through the bleed valve at the cooling unit.
14. After one to two minutes, stop the pump or block the coolant flow with a valve.
15. Re-check the pressure and add coolant if necessary.
16. Repeat steps 13...15 a few times until all air is let out of the cooling circuit. Listen for a humming sound and/or feel the piping for vibration to find out if there is still air left in the circuit.

Draining the internal cooling circuit

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



WARNING!

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

1. Attach hoses to each drain valve in the cubicle to be drained. Lead the hoses into a suitable container. Make sure the ends of the hoses are not immersed in coolant at any point so that air can displace the coolant in the system.
2. Open the drain valves. Wait until all coolant has drained.
Note: Draining coolant into the sewer system is not allowed.
3. If required, dry the piping with compressed oil-free air of less than 6 bar.
4. If the drive is to be stored in temperatures below 0 °C (32 °F),
 - dry the cooling circuit with air,
 - fill the cooling circuit with coolant specified under **Coolant specification (Page 106)**.
 - drain the cooling circuit again.

Maintenance intervals

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

Technical data

■ Coolant specification

Coolant type

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

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

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

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



WARNING!

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

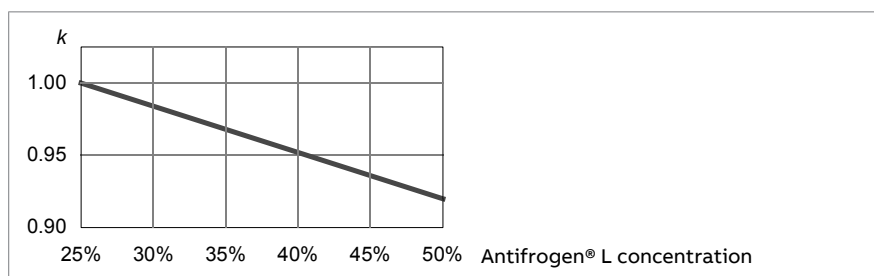
■ Temperature limits

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

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

The higher the concentration of heat transfer fluid, the higher the viscosity of the coolant. This results in a higher pressure loss in the system. See [Pressure limits \(Page 108\)](#).

The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). With the Antifrogen® L concentration between 25% and 50%, the drive output current must be derated by 1/3 percentage point per 1 p.p. increase in Antifrogen® L concentration. The drawing below shows the derating factor (k) in relation to Antifrogen® L concentration.



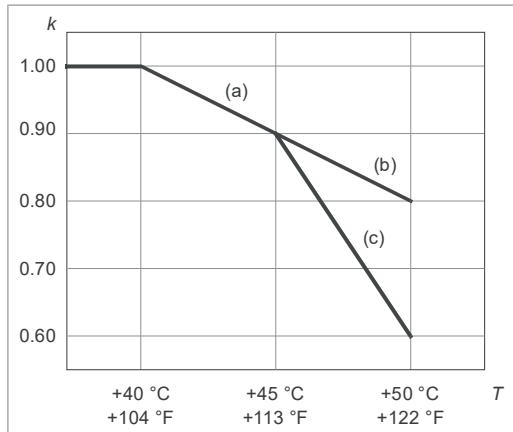
Incoming coolant temperature:

- 0...40 °C (32...104 °F): no drive output current derating required
- 40...45 °C (104...113 °F): drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (a).
- 45...50 °C (113...122 °F):
 - If components with a maximum operating temperature of 55 °C (131 °F) are installed in the same space as the drive modules, drive output current must

be derated by 6 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (c).

- If there are no components with a maximum operating temperature of 55 °C (131 °F) installed in the same space as the drive modules, drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (b).

The drawing below shows the derating factor (k) in relation to coolant temperature.



Condensation is not permitted. The minimum coolant temperature to avoid condensation (at an atmospheric pressure of 1 bar) is shown below as a function of relative humidity (RH) and ambient temperature (T_{air}).

T_{air} (°C)	Min. T_{coolant} (°C)				
	RH = 95%	RH = 80%	RH = 65%	RH = 50%	RH = 40%
5	4.3	1.9	-0.9	-4.5	-7.4
10	9.2	6.7	3.7	-0.1	-3.0
15	14.2	11.5	8.4	4.6	1.5
20	19.2	16.5	13.2	9.4	6.0
25	24.1	21.4	17.9	13.8	10.5
30	29.1	26.2	22.7	18.4	15.0
35	34.1	31.1	27.4	23.0	19.4
40	39.0	35.9	32.2	27.6	23.8
45	44.0	40.8	36.8	32.1	28.2
50	49.0	45.6	41.6	36.7	32.8
55	53.9	50.4	46.3	42.2	37.1
= Not permitted as standard but the coolant temperature must be 0 °C (32 °F) or more.					
Example:	At an air temperature of 45 °C and relative humidity of 65% the coolant temperature must not be less than +36.8 °C				

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

■ Pressure limits

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

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

Design pressure (PS): 600 kPa

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

Maximum pressure difference: 160 kPa

■ Coolant flow rate limits

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

■ Cooling circuit materials

Materials used in the internal cooling circuit are listed below.

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

Note: PVC hoses are not suitable for use with antifreeze.

- rubber gasketing NBR (nitrile rubber).



WARNING!

If you connect external piping to the internal cooling circuit, use only materials that are specified above. Other materials can cause galvanic corrosion. If the external piping contains other materials, use a cooling unit with a heat exchanger (for example, ACS880-1007LC) to keep the external piping separate from the internal cooling circuit.

12

Technical data

Contents of this chapter

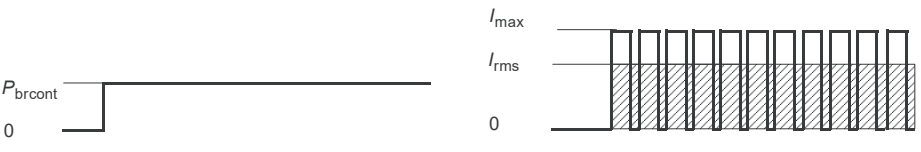
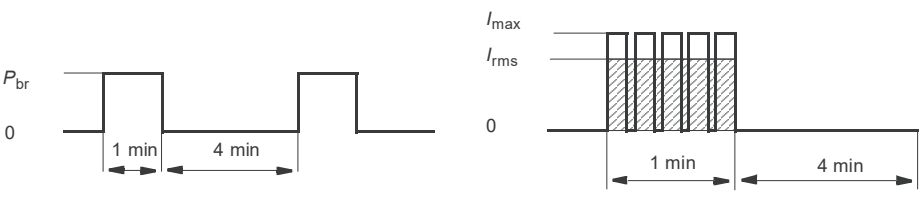
This chapter contains the technical specifications of the brake modules and related components.

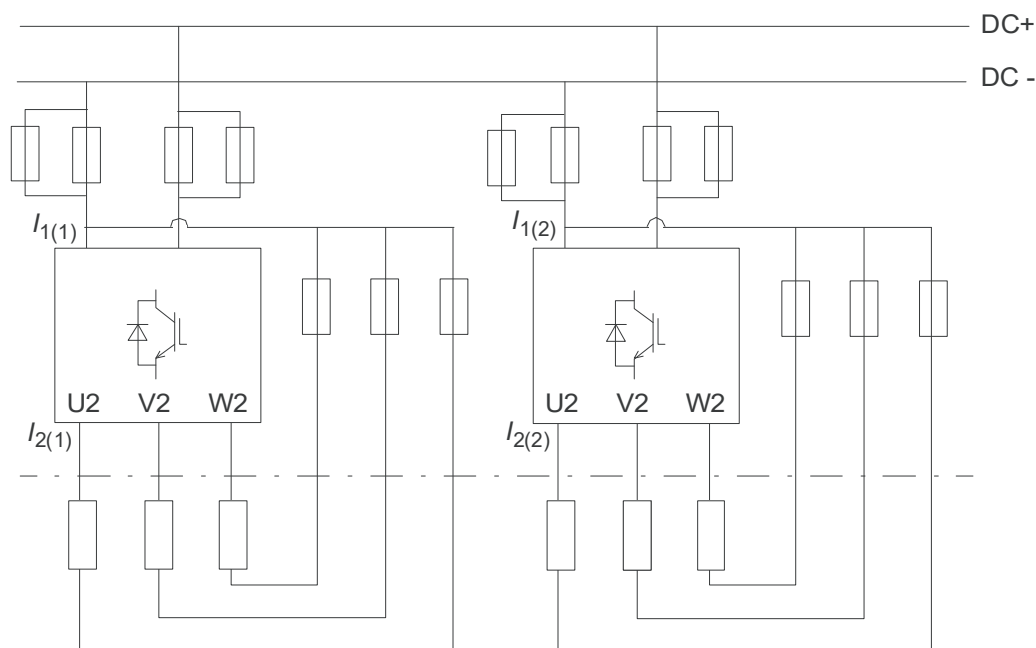
Ratings

ACS880-604LC-...	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	$P_{\text{cont-max}} (S_n)$	I_{\max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
$U_N = 690 \text{ V}$										
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

ACS880-604LC-...	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	$P_{\text{cont-max}} (S_n)$	I_{\max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
$U_N = 690 \text{ V}$										
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

■ 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.
$P_{\text{cont.max}}$	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 connected modules


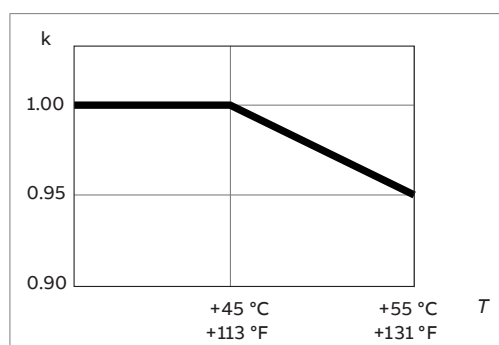
$$I_1 = I_{1(1)} + I_{1(2)}$$

$$I_2 = I_{2(1)} + I_{2(2)}$$

Derating

■ Surrounding air temperature derating

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



■ Coolant temperature derating

See section [Temperature limits](#) (Page 106).

■ Antifreeze content derating

See section [Temperature limits](#) (Page 106).

■ Altitude derating

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

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

Modules used, noise, DC capacitance

Brake unit type ACS880-604LC-	Inverter modules used		Noise level*	DC capacitance
	Qty	Type ACS880-104LC-	dB(A)	μF
$U_N = 690 \text{ V}$				
0870-7	1	0530A-7	63	6000
1300-7	1	0850A-7	63	9000
1730-7	2	0530A-7	66	12000
2600-7	2	0850A-7	66	18000
3900-7	3	0850A-7	68	27000
5200-7	4	0850A-7	69	36000
*Measured in a typical ABB (ACS880-607LC) cabinet installation.				

Fuses

See DC fuses (Page 94) and Resistor fuses (Page 96).

Dimensions and weights

The weights of the modules are shown below. For the dimensions, see chapter Dimension drawings.

Brake module type	Inverter module type	Weight	
		kg	lbs
ACS880-604LC-0870-7	ACS880-104LC-0530A-7	59	130
ACS880-604LC-1730-7			
ACS880-604LC-1300-7	ACS880-104LC-0850A-7	63	139
ACS880-604LC-2600-7			
ACS880-604LC-3900-7			
ACS880-604LC-5200-7			

Free space requirements

- Left and right sides, front and back: None
- Below: Space needed by heat exchanger and cooling fan.
- Above: The cooling air flow through the module should not be restricted.

Installation orientations

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

Losses, cooling circuit data and efficiency

ACS880-604LC-...	Power loss ¹⁾		Coolant volume		Coolant flow rate		Pressure loss	Efficiency ²⁾
	into coolant	into air surrounding cabinet	module + heat exchanger					
	kW	kW	l	US gal	l/min	US gal/min	kPa	%
U _N = 690 V								
0870-7	3.3	0.1	1.9	0.5	16	4.2	120	99%
1300-7	5.1	0.1	1.9	0.5	16	4.2	120	99%
1730-7	6.5	0.2	3.8	1.0	32	8.5	120	99%
2600-7	10.1	0.3	3.8	1.0	32	8.5	120	99%
3900-7	15.1	0.4	5.7	1.5	48	12.7	120	99%
5200-7	20.1	0.5	7.6	2.0	64	16.9	120	99%

¹⁾ These losses are not calculated according to the ecodesign standard IEC 61800-9-2.

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

Definitions

* Heat exchanger is installed in parallel and not in series with the diode supply module flows.

Power loss Total heat dissipation

Pressure loss Pressure loss with nominal liquid flow

Energy efficiency data (ecodesign)

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

Typical power cable sizes

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

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

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

Copper cable		PVC insulation Conductor temperature 70 °C		XLPE insulation Conductor temperature 90 °C	
Size	Ø [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.

ACS880-604LC-...	Frame size	I_{rms} dim	Cable data	
			Cable, T=70 °C	Cable, T=90 °C
		A	mm ²	mm ²
$U_N = 690\text{ V}$				
0870-7	R8i	372	$3 \times (2 \times (3 \times 120 + 70))$	$3 \times (3 \times 240 + 120)$
1300-7	R8i	559	$3 \times (2 \times (3 \times 240 + 120))$	$3 \times (2 \times (3 \times 150 + 70))$
1730-7	2×R8i	745	$2 \times (3 \times (2 \times (3 \times 120 + 70)))$	$2 \times (3 \times (3 \times 240 + 120))$
2600-7	2×R8i	1117	$2 \times (3 \times (2 \times (3 \times 240 + 120)))$	$2 \times (3 \times (2 \times (3 \times 150 + 70)))$
3900-7	3×R8i	1676	$3 \times (3 \times (2 \times (3 \times 240 + 120)))$	$3 \times (3 \times (2 \times (3 \times 150 + 70)))$
5200-7	4×R8i	2234	$4 \times (3 \times (2 \times (3 \times 240 + 120)))$	$4 \times (3 \times (2 \times (3 \times 150 + 70)))$

■ 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.

Input power (DC) connection

Voltage (U_1)	ACS880-104LC-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"). Torque: 70 N·m (52 lbf·ft).

Resistor connection

Voltage (U_2)	0... U_1 3-phase symmetrical.
	For ACS880-104LC-xxxx-7 modules: This is indicated in the type designation label as typical output voltage levels 3×0...742 / 849 / 976 V DC.
Maximum resistor cable length	300 m (984 ft)

Control connections

See chapter The control unit (Page 123).

Coolant connections

See Coolant connectors (Page 18).

Auxiliary power consumption

■ Control equipment

Device	U_N	f Hz	I_{cont} A	I_{start} A	P_{cont} W	S_{cont} VA
BCU control unit	24 V DC ($\pm 10\%$)	-	2.0	-	48	-
BSFC-12C charging controller	24 V DC ($\pm 10\%$)	-	0.15	-	-	-
CIO-01 I/O module	24 V DC ($+20\%/-15\%$)	-	0.1	-	-	-
PDAL2 switch/disconnector inter-lock coil	24 V DC ($+10\%/-30\%$)	-	-	-	-	9
R8i module: internal electronics	230 V AC ($+15\%/-20\%$)	50	0.45	-	105	-
	115 V AC ($+15\%/-20\%$)	60	0.9	-	105	-

■ Cooling fans

Type	Frame size	U_N V AC	f Hz	I_{cont} A
Cooling fan 230 VAC	R8i	200...240	50/60	1.4
Cooling fan 115 VAC	R8i	100...130	50/60	2.4

■ Definitions

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

Protection classes for module

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

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 ... 2000 m (0 ... 6561.7 ft) no derating. For altitudes over 2000 m (6561.7 ft), contact ABB.	-	-
Air temperature	0 ... +55 °C (+32 ... +131 °F), no condensation allowed.	-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 60721-3-1:1997	IEC 60721-3-2:1997
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

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

Color

PMS 1C Cool Gray and PMS Process Black.

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. See ACS880 cabinet-installed drives and multidrives modules recycling instructions and environmental information (3AXD50000153909 [English]).

Standards

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

Markings

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

Tightening torques

For Rittal components, use the torques given in the Rittal assembly documentation. Unless a tightening torque is specified in the text, the following torques can be used.

■ Electrical connections

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

■ Mechanical connections

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

■ Insulation supports

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

■ Cable lugs

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

Disclaimers

■ Generic disclaimer

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

■ **Cybersecurity disclaimer**

This product can be connected to and communicate information and data via a network interface. The HTTP protocol, which is used between the commissioning tool (Drive Composer) and the product, is an unsecured protocol. For independent and continuous operation of product such connection via network to commissioning tool is not necessary. However it is Customer's sole responsibility to provide and continuously ensure a secure connection between the product and Customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as but not limited to the installation of firewalls, prevention of physical access, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

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

13

The control unit

Contents of this chapter

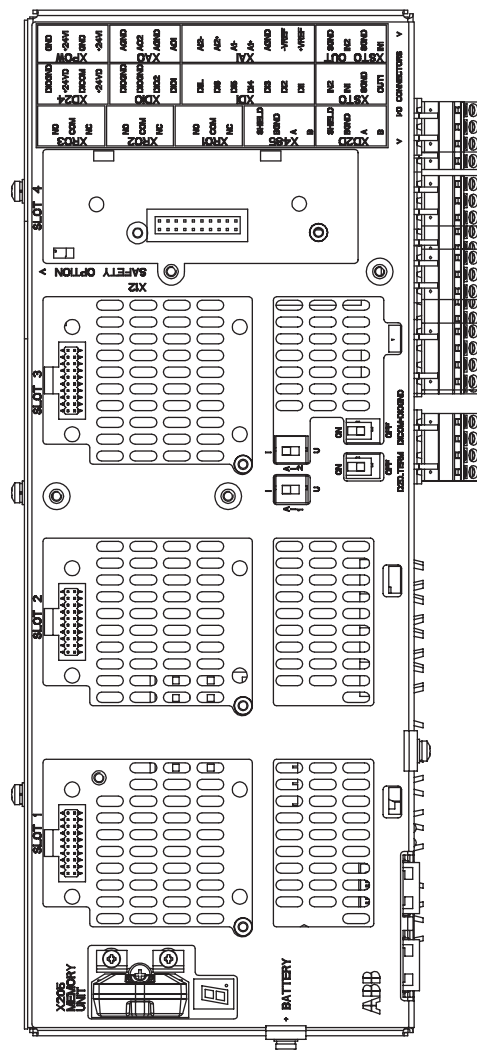
This chapter

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

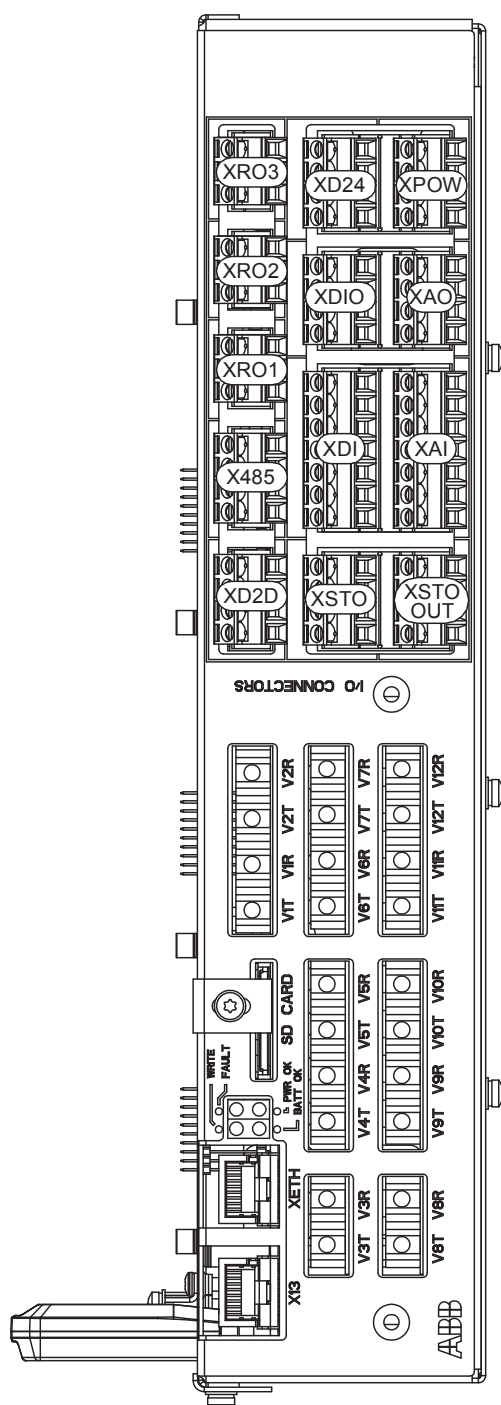
General

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 layout



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




	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XSTO	Safe torque off connection (input signals)
XSTO OUT	Safe torque off connection (to inverter modules)
X12	(On the opposite side) Not in use
X13	Control panel / PC connection
X485	Connection to CIO-01 (optional)
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 mm² (24...12 AWG). The torque is 0.5 N·m (5 lbf·in).

Terminal			Description	
XD2D			Drive-to-drive link	
<div>1</div>	1	B	Not in use by default	
<div>2</div>	2	A		
<div>3</div>	3	BGND		
<div>4</div>	4	Shield		
X485			RS485 connection	
<div>5</div>	5	B	Cooling fan monitoring (CIO module)	
<div>6</div>	6	A		
<div>7</div>	7	BGND		
<div>8</div>	8	Shield		
XRO1, XRO2, XRO3			Relay outputs	
<div>11</div> <div>12</div> <div>13</div>	11	NC	Norm. closed	XRO1: Running ¹⁾ (Energized = running) 250 V AC / 30 V DC, 2 A
	12	COM	Common	
	13	NO	Norm. open	
<div>21</div> <div>22</div> <div>23</div>	21	NC	Norm. closed	XRO2: Fault (-1) ¹⁾ (Energized = no fault) 250 V AC / 30 V DC, 2 A
	22	COM	Common	
	23	NO	Norm. open	
<div>31</div> <div>32</div> <div>33</div>	31	NC	Norm. closed	XRO3: Running ¹⁾ (Energized = running) 250 V AC / 30 V DC, 2 A
	32	COM	Common	
	33	NO	Norm. open	
XSTO, XSTO OUT			XSTO connector	
<div>1</div> <div>2</div> <div>3</div> <div>4</div>	1	OUT	XSTO: Factory connection. Both circuits (power module, control unit) must be closed for the brake unit to start (IN1 and IN2 must be connected to OUT). ²⁾	
	2	SGND		
	3	IN1		
	4	IN2		
<div>5</div> <div>6</div> <div>7</div> <div>8</div>	5	IN1	XSTO OUT: Not in use.	
	6	SGND		
	7	IN2		
	8	SGND		
XDI			Digital inputs	

Terminal			Description
<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div>	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
<div>1</div> <div>2</div> <div>3</div> <div>4</div>	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
<div>5</div> <div>6</div> <div>7</div> <div>8</div>	1	+24VD	+24 V DC 200 mA ³⁾
	2	DICOM	Digital input ground
	3	+24VD	+24 V DC 200 mA ³⁾
	4	DIOGND	Digital input/output ground
			DICOM=DIOGND
			Ground selection switch ⁴⁾
XAI			Analog inputs, reference voltage output
<div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div>	1	+VREF	10 V DC, R_L 1...10 kohm
	2	-VREF	-10 V DC, R_L 1...10 kohm
	3	AGND	Ground
	4	AI1+	Not in use by default. 0(4)...20 mA, R_{in} = 100 ohm ⁵⁾
	5	AI1-	
	6	AI2+	Not in use by default. 0(2)...10 V, R_{in} > 200 kohm ⁶⁾
	7	AI2-	
XAO			Analog outputs
<div>1</div> <div>2</div> <div>3</div> <div>4</div>	1	AO1	Zero (no signal indicated) ¹⁾ 0...20 mA, R_L < 500 ohm
	2	AGND	
	3	AO2	Zero (no signal indicated) ¹⁾ 0...20 mA, R_L < 500 ohm
	4	AGND	
XPOW			External power input
<div>1</div> <div>2</div> <div>3</div> <div>4</div>	1	+24VI	24 V DC, 2.05 A
	2	GND	
	3	+24VI	
	4	GND	
X12			Not in use in brake units
X13			Control panel connection
X205			Memory unit connection

¹⁾ Default use of the signal in the control program. The use can be changed by a parameter. See also the delivery-specific circuit diagrams.

- 2) 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.
- 3) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
- 4) Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats). ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.
- 5) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI2. Change of setting requires reboot of control unit.
- 6) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI1. Change of setting requires reboot of control unit.

Connecting motor temperature sensors to the drive

IEC/EN 60664 requires double or reinforced insulation between the control unit and the live parts of the motor. To achieve this, use an FPTC-01 or FPTC-02 protection module or an FAIO-01 extension module. See [ACS880 liquid-cooled multidrives cabinets and modules electrical planning instructions \(3AXD50000048634\)](#) and the module manual.

External power supply for the control unit (XPOW)

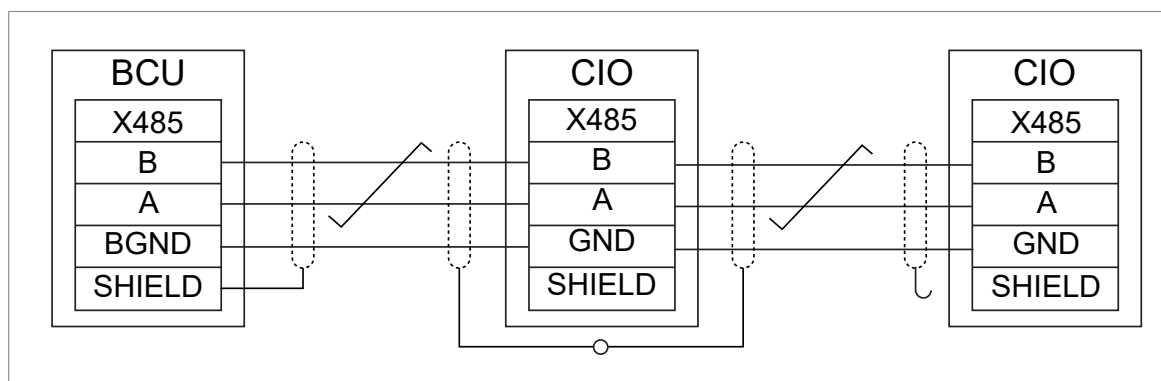
The control unit is powered from a 24 V DC, 2 A supply through terminal block XPOW. With a type BCU control unit, a second supply can be connected to the same terminal block for redundancy.

Using an external supply is recommended, if:

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

The X485 connector

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



Safe torque off (XSTO, XSTO OUT)

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

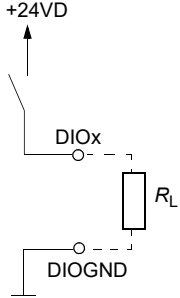
FSO safety functions module connection (X12)

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

SDHC memory card slot

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

Connector data

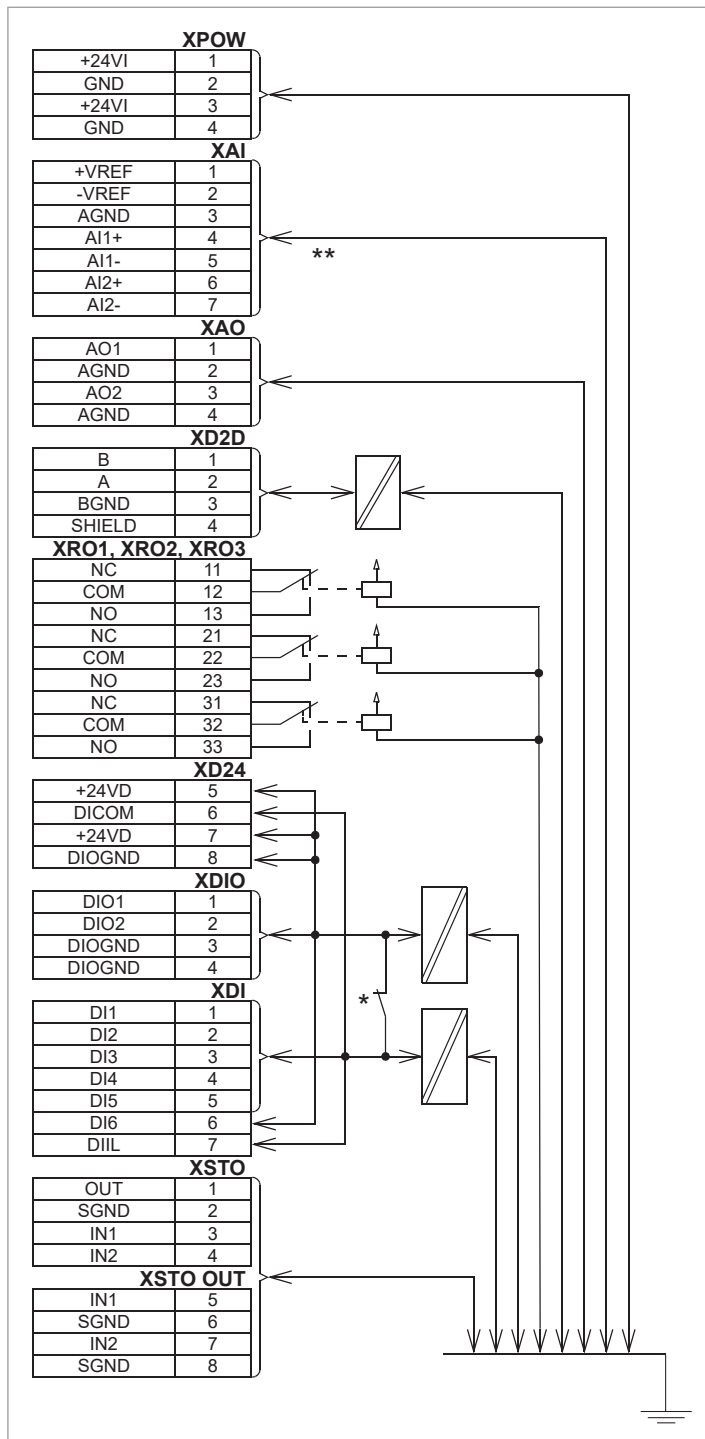
Power supply (XPOW)	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p>24 V (±10%) DC, 2 A</p> <p>External power input.</p> <p>Two supplies can be connected to the BCU-x2 for redundancy.</p>
Relay outputs RO1...RO3 (XRO1...XRO3)	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p>250 V AC / 30 V DC, 2 A</p> <p>Protected by varistors</p>
+24 V output (XD24:2 and XD24:4)	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p>Total load capacity of these outputs is 4.8 W (200 mA / 24 V) minus the power taken by DIO1 and DIO2.</p>
Digital inputs DI1...DI6 (XDI:1...XDI:6)	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p>24 V logic levels: "0" < 5 V, "1" > 15 V</p> <p>R_{in}: 2.0 kohm</p> <p>Input type: NPN/PNP (DI1...DI5), PNP (DI6)</p> <p>Hardware filtering: 0.04 ms, digital filtering up to 8 ms</p> <p>DI6 (XDI:6) can alternatively be used as an input for a PTC sensor. "0" > 4 kohm, "1" < 1.5 kohm.</p> <p>I_{max}: 15 mA (DI1...DI5), 5 mA (DI6)</p>
Start interlock input DIIL (XDI:7)	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p>24 V logic levels: "0" < 5 V, "1" > 15 V</p> <p>R_{in}: 2.0 kohm</p> <p>Input type: NPN/PNP</p> <p>Hardware filtering: 0.04 ms, digital filtering up to 8 ms</p>
<p>Digital inputs/outputs DIO1 and DIO2 (XDIO:1 and XDIO:2)</p> <p>Input/output mode selection by parameters.</p> <p>DIO1 can be configured as a frequency input (0...16 kHz with hardware filtering of 4 microseconds) for 24 V level square wave signal (sinusoidal or other wave form cannot be used). DIO2 can be configured as a 24 V level square wave frequency output. See the firmware manual, parameter group 111/11.</p>	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p><u>As inputs:</u> 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in}: 2.0 kohm. Filtering: 1 ms.</p> <p><u>As outputs:</u> Total output current from +24VD is limited to 200 mA</p> 
Reference voltage for analog inputs +VREF and -VREF (XAI:1 and XAI:2)	<p>Connector pitch 5 mm, wire size 0.5 ... 2.5 mm² (22...12 AWG)</p> <p>Maximum tightening torque 0.45 N·m (4 lbf·in)</p> <p>10 V ±1% and -10 V ±1%, R_{load} 1...10 kohm</p> <p>Maximum output current: 10 mA</p>

Analog inputs AI1 and AI2 (XAI:4 ... XAI:7). Current/voltage input mode selection by switches	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Current input: -20...20 mA, $R_{in} = 100 \text{ ohm}$ Voltage input: -10...10 V, $R_{in} > 200 \text{ kohm}$ Differential inputs, common mode range $\pm 30 \text{ V}$ Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) 0...20 mA, $R_{load} < 500 \text{ ohm}$ Frequency range: 0...500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Physical layer: RS-485 Transmission rate: 8 Mbit/s Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 ... 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft) Termination by switch
RS-485 connection (X485)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Physical layer: RS-485 Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 ... 165 ohm, for example Belden 9842) Maximum length of link: 50 m (164 ft)
Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) Input voltage range: -3...30 V DC Logic levels: "0" < 5 V, "1" > 17 V. Note: For the unit to start, both connections must be "1". This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but 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 and IEC 61800-5-2
Safe torque off output (XSTO OUT)	Connector pitch 5 mm, wire size 0.5 ... 2.5 mm ² (22...12 AWG) Maximum tightening torque 0.45 N·m (4 lbf·in) To STO connector of inverter module.
Control panel connection (X13)	Connector: RJ-45 Cable length < 100 m (328 ft)
Ethernet connection (XETH)	Connector: RJ-45 This connection is not supported by the firmware
SDHC memory card slot (SD CARD)	Memory card type: SDHC Maximum memory size: 4 GB

132 The control unit

Battery	Real-time clock battery type: BR2032
The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.	

■ BCU-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.

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

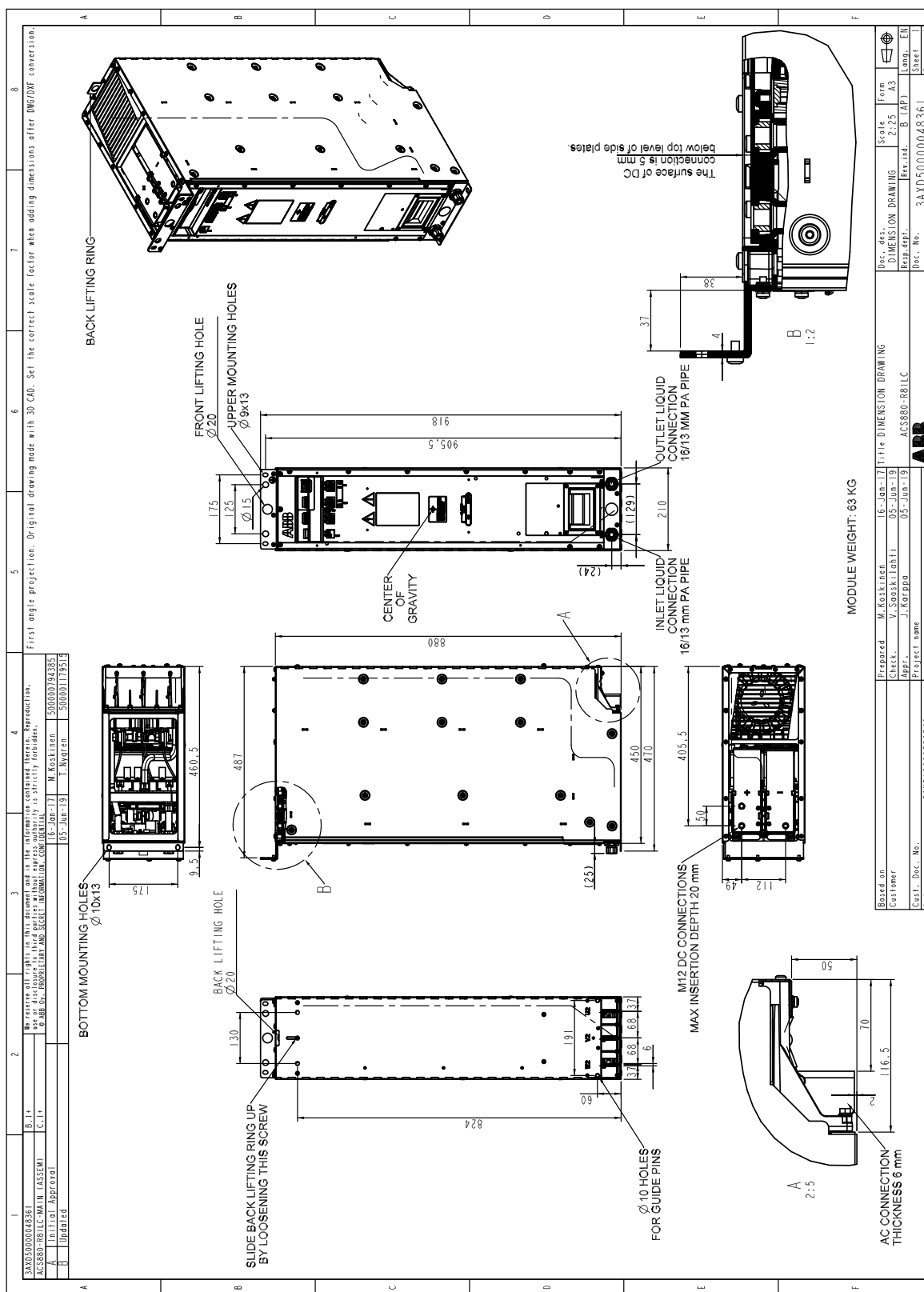
14

Dimension drawings

Contents of this chapter

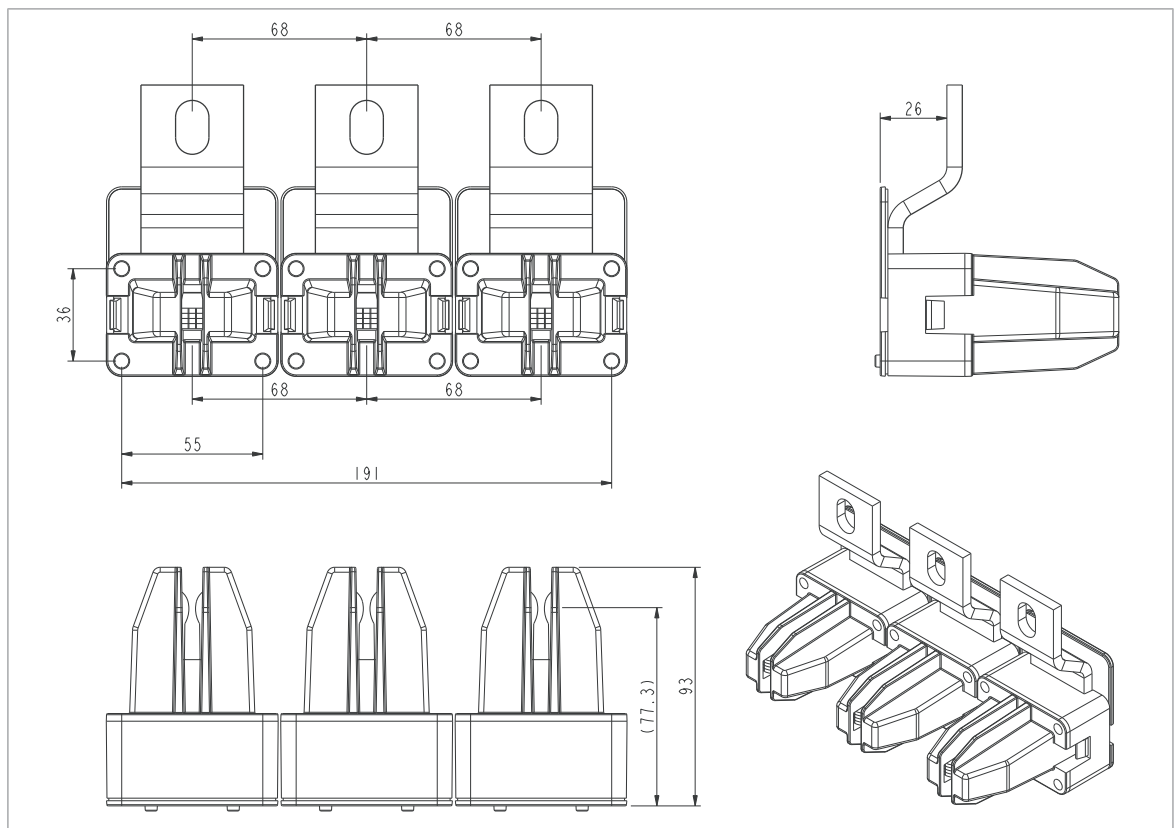
This chapter contains dimension drawings of the brake module and related components. Dimensional drawings of most installation accessories are available from ABB on request.

Brake module



MODULE WEIGHT: 63 KG

■ Quick connector

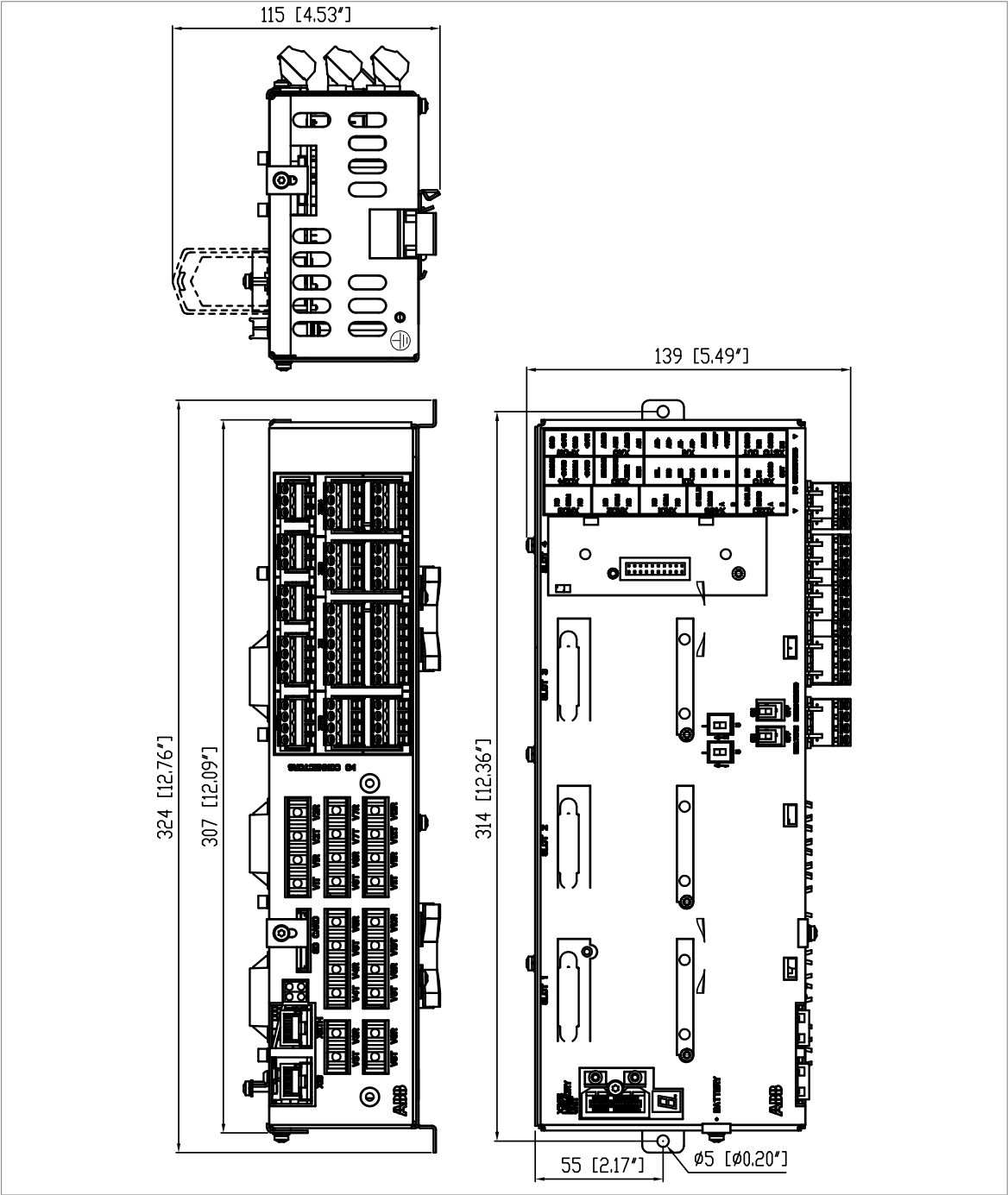


Dimensions in mm

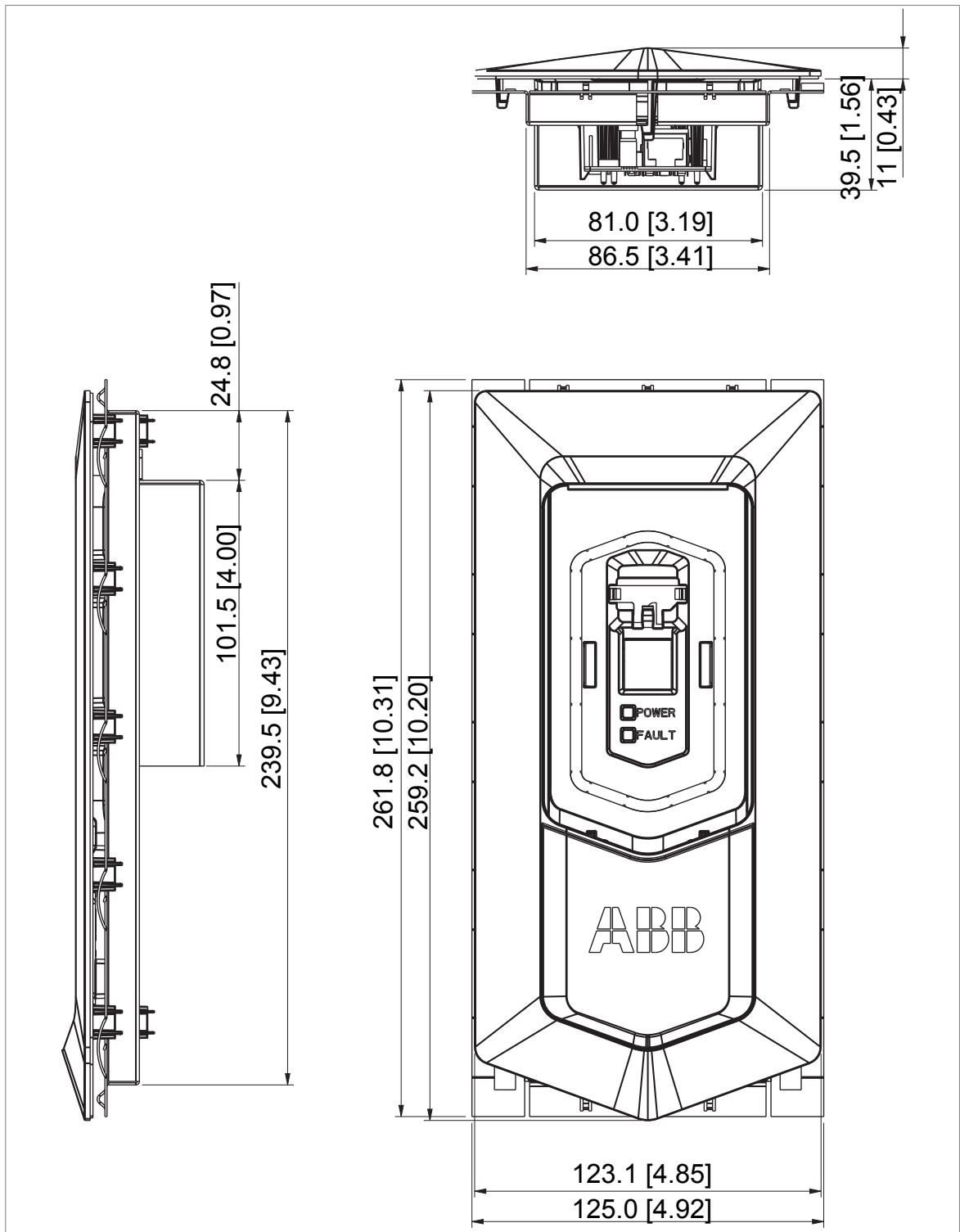
1 mm = 0.0394 in

Control electronics

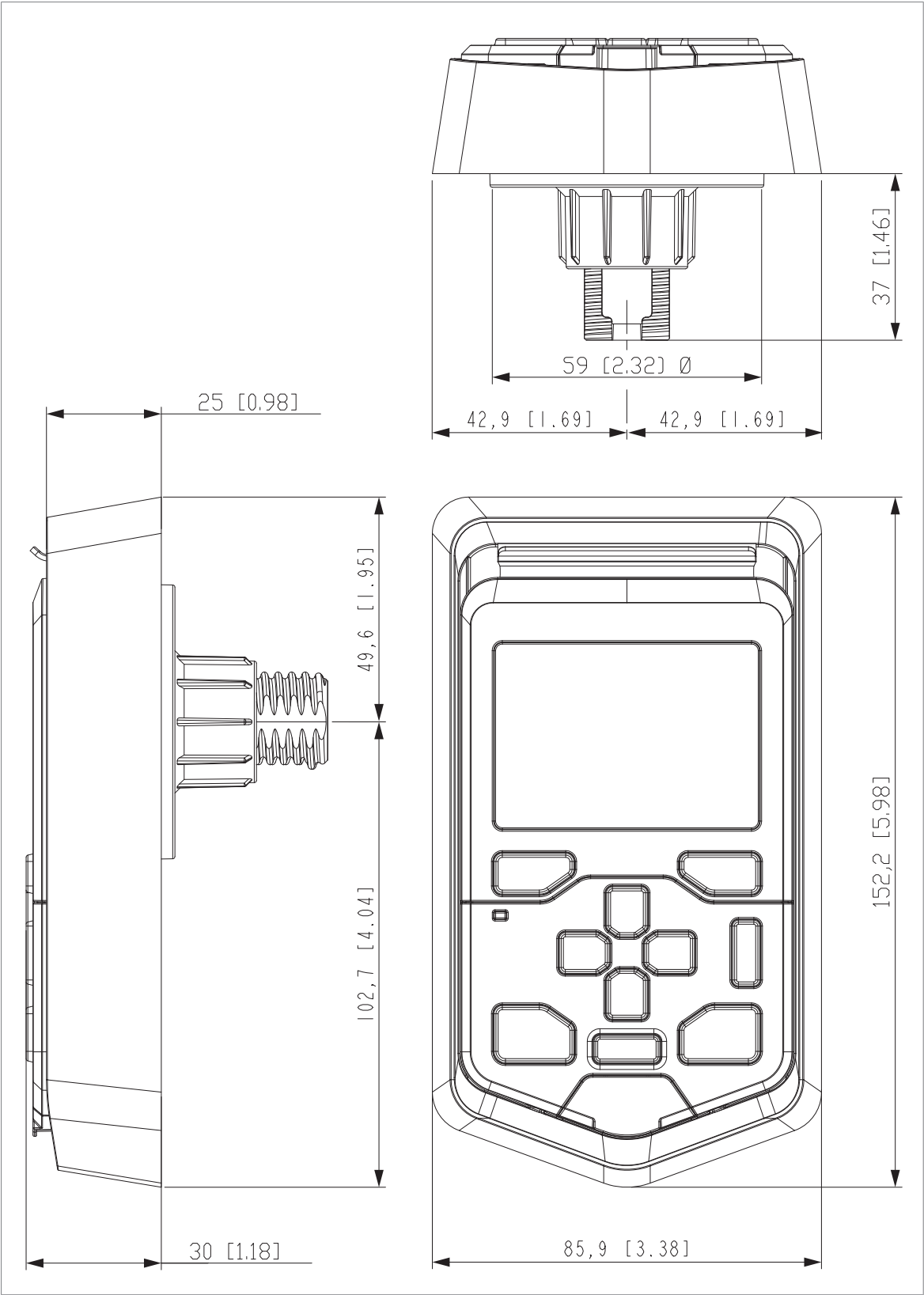
■ BCU control unit



■ DPMP-01 control panel mounting platform

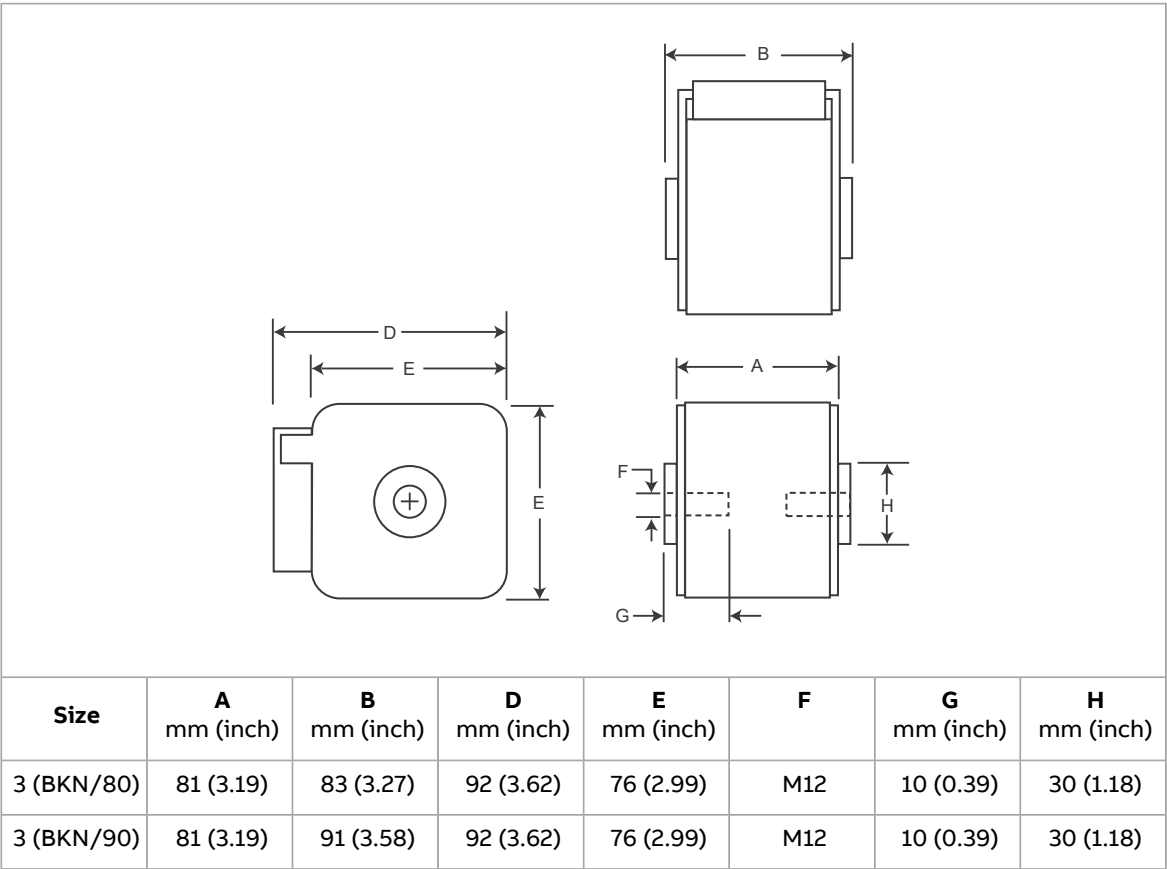


■ DPMP-02 control panel mounting platform

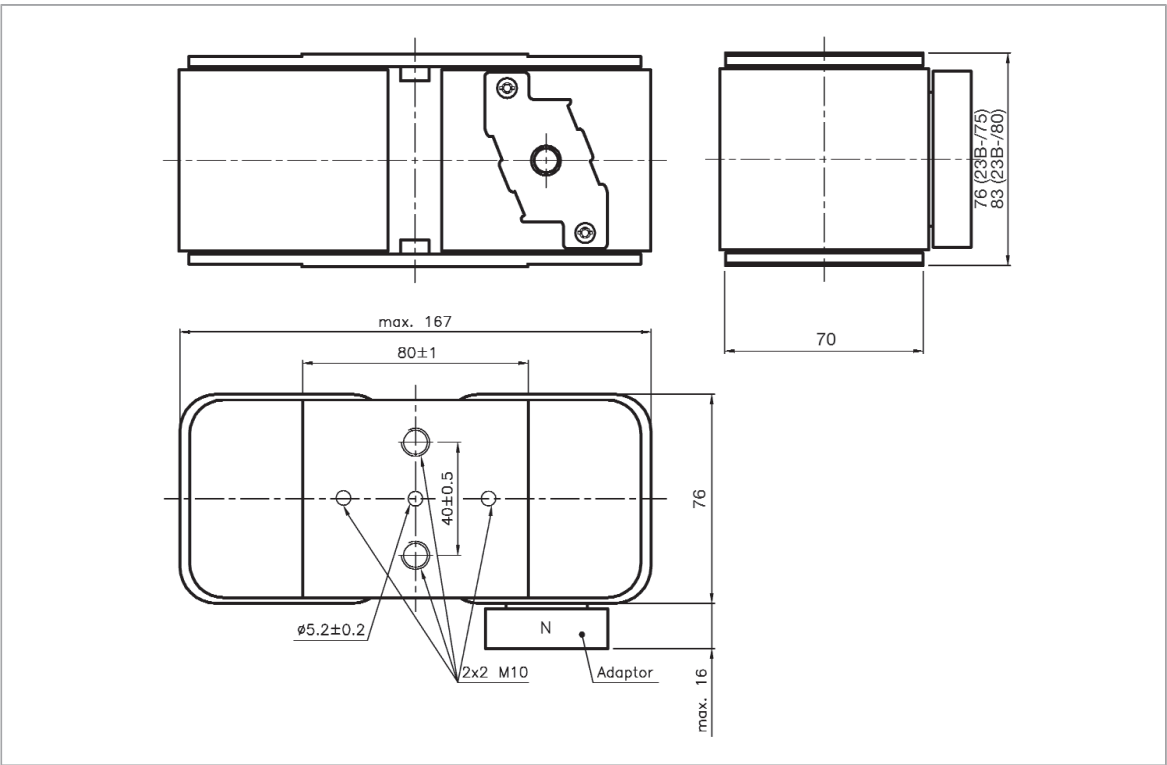


DC fuse blocks (Bussmann)

■ Size 3



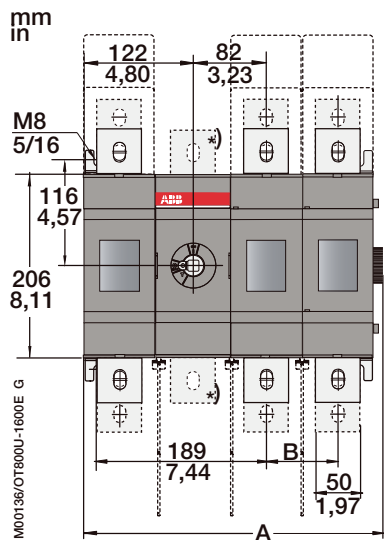
■ Size 23



Switchgear and charging components

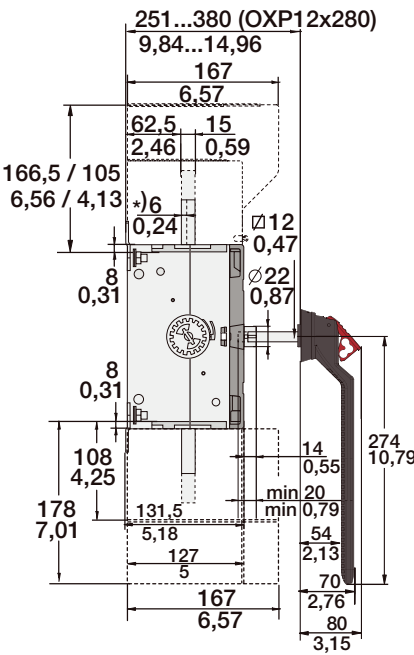
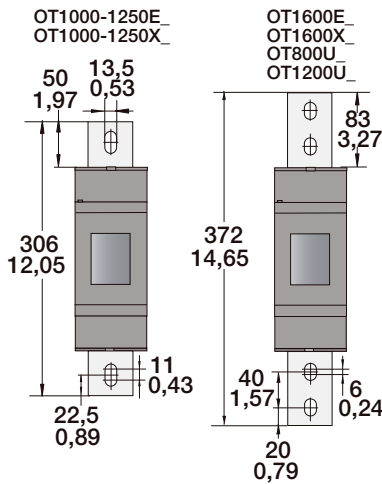
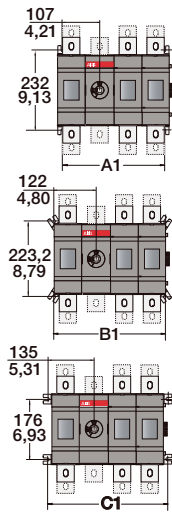
■ DC switch/disconnector

OT1200U11, OT1600E11



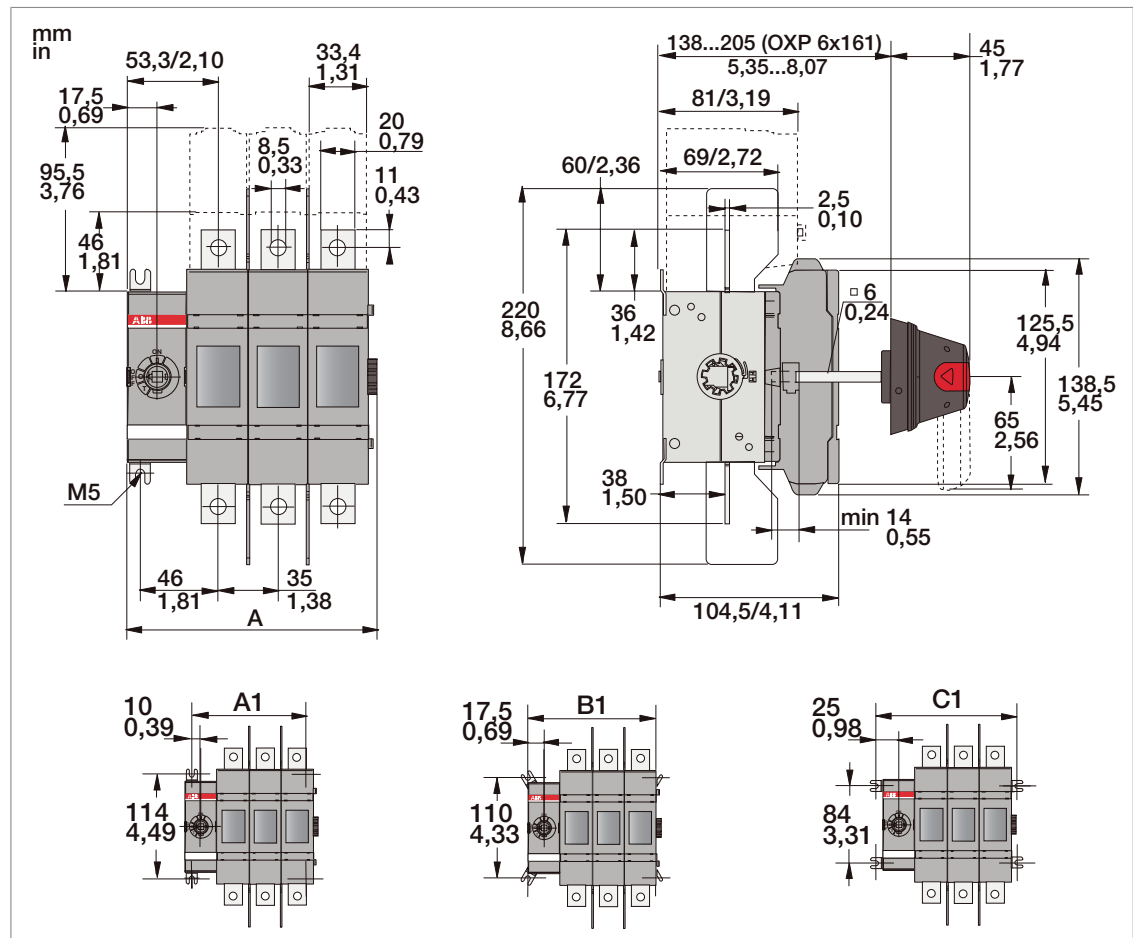
*) N3 types

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

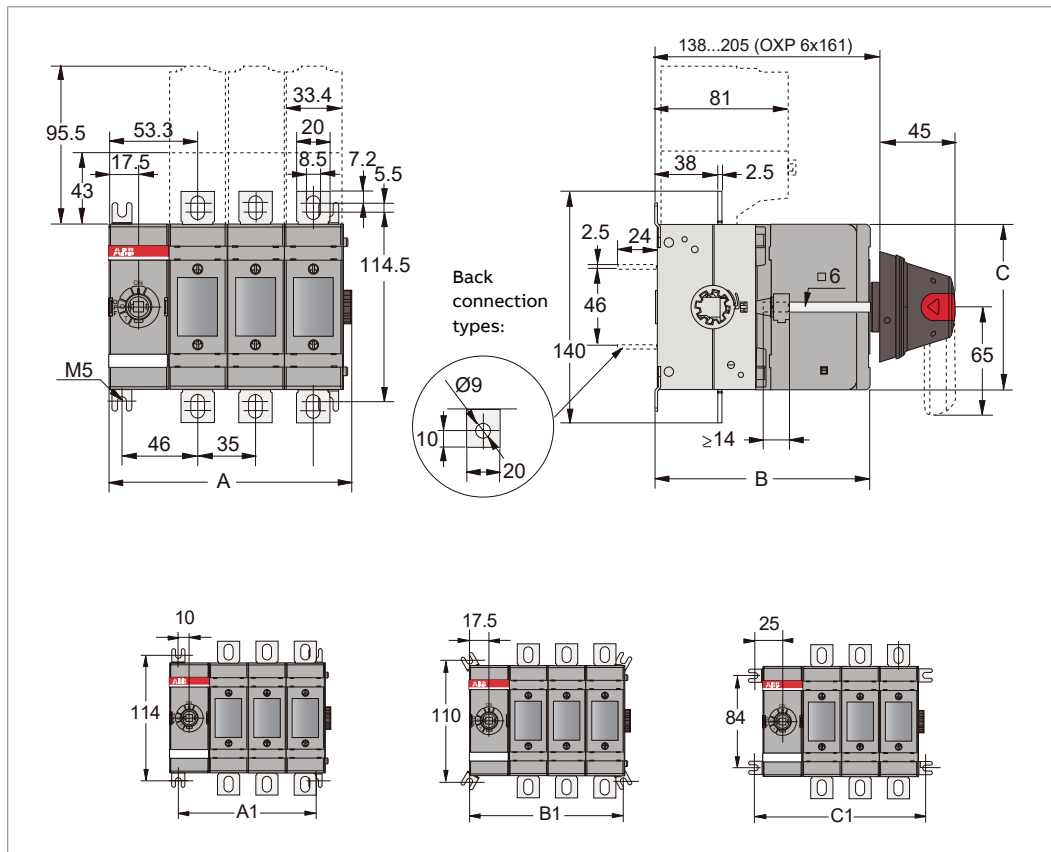


■ Charging switch

OS100GJ04FP

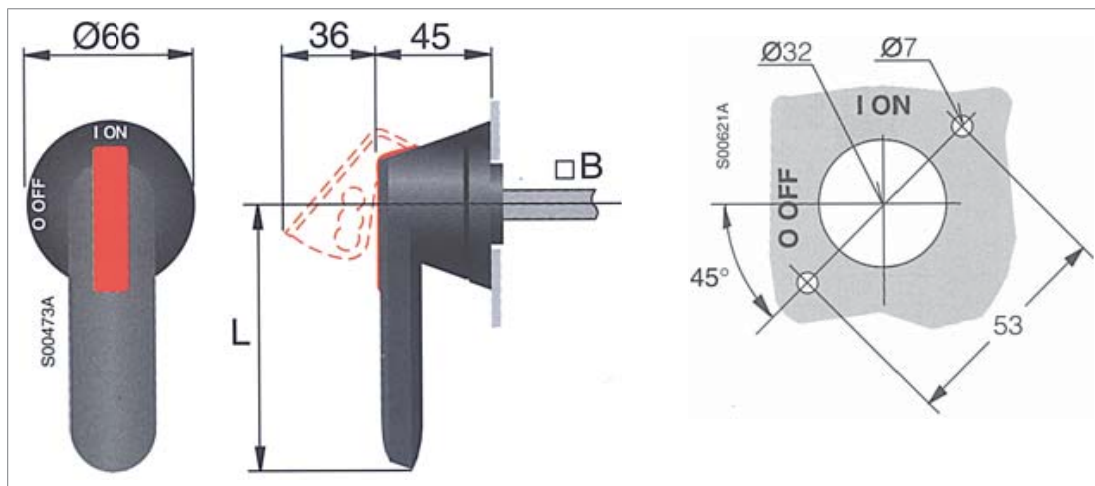


OS160GD04F



- **Switch handles**

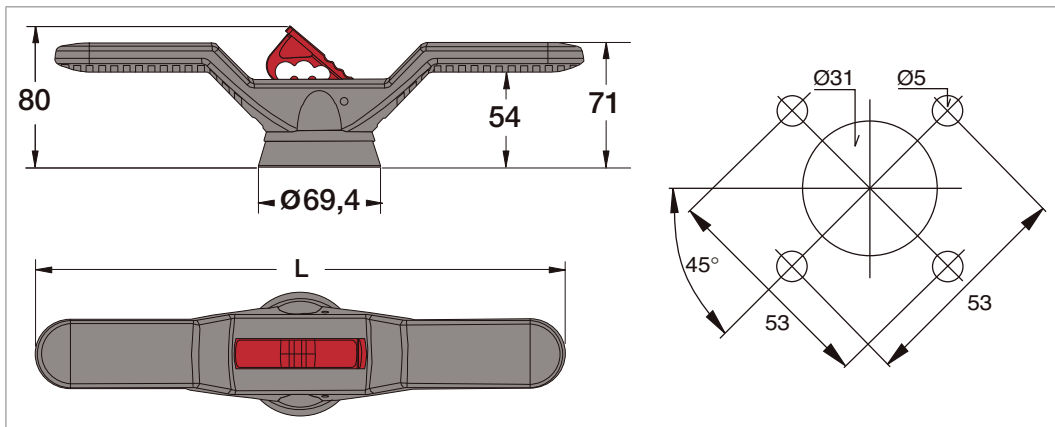
OHB65J6



$L = 65 \text{ mm}$

B = 6 × 6 mm

OHB150J12P

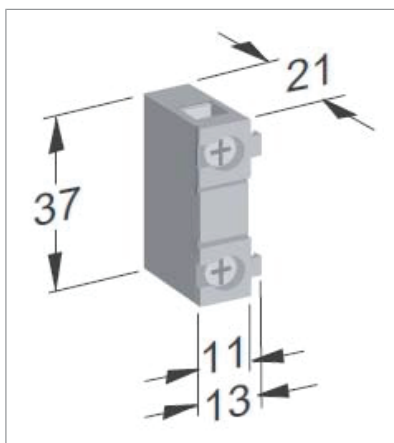


L = 300 mm

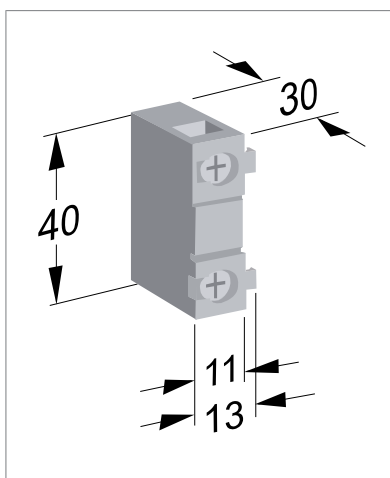
Shaft: 12 × 12 mm

■ **Auxiliary contacts**

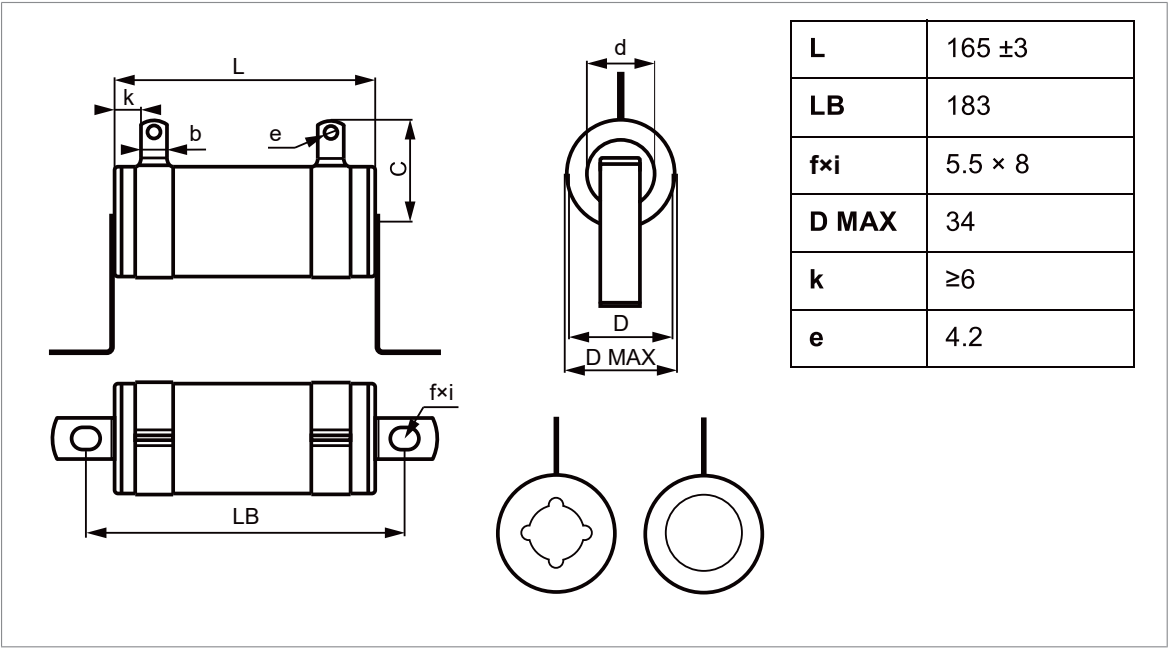
OA1G10



OA3G01



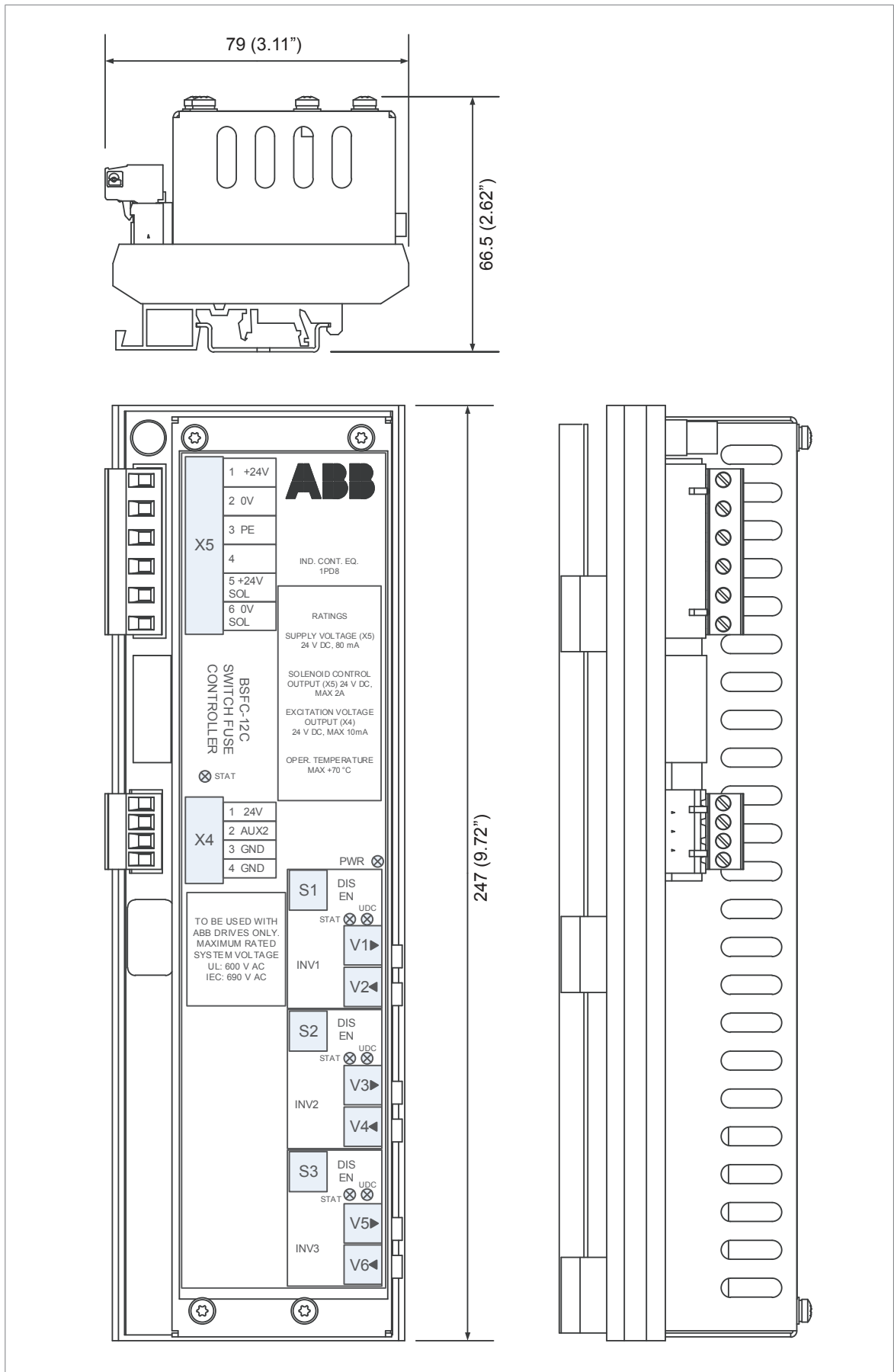
■ Charging resistor



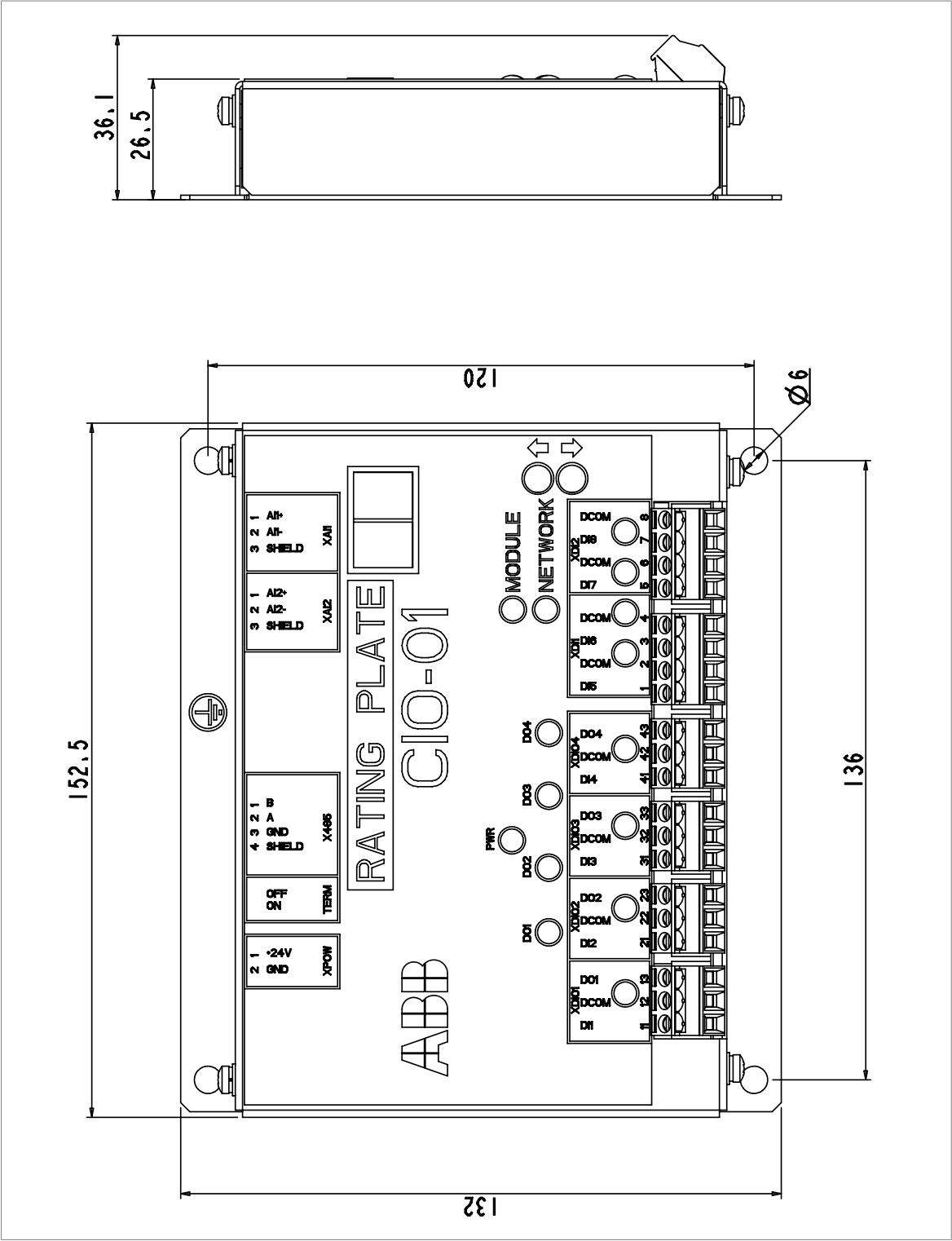
Dimensions in mm

1 mm = 0.0394 in

■ **BSFC-12C charging controller**



CIO-01 I/O module



Dimensions in mm

1 mm = 0.0394 in

15

Example circuit diagrams

Contents of this chapter

This chapter contains connection diagram examples for brake units.

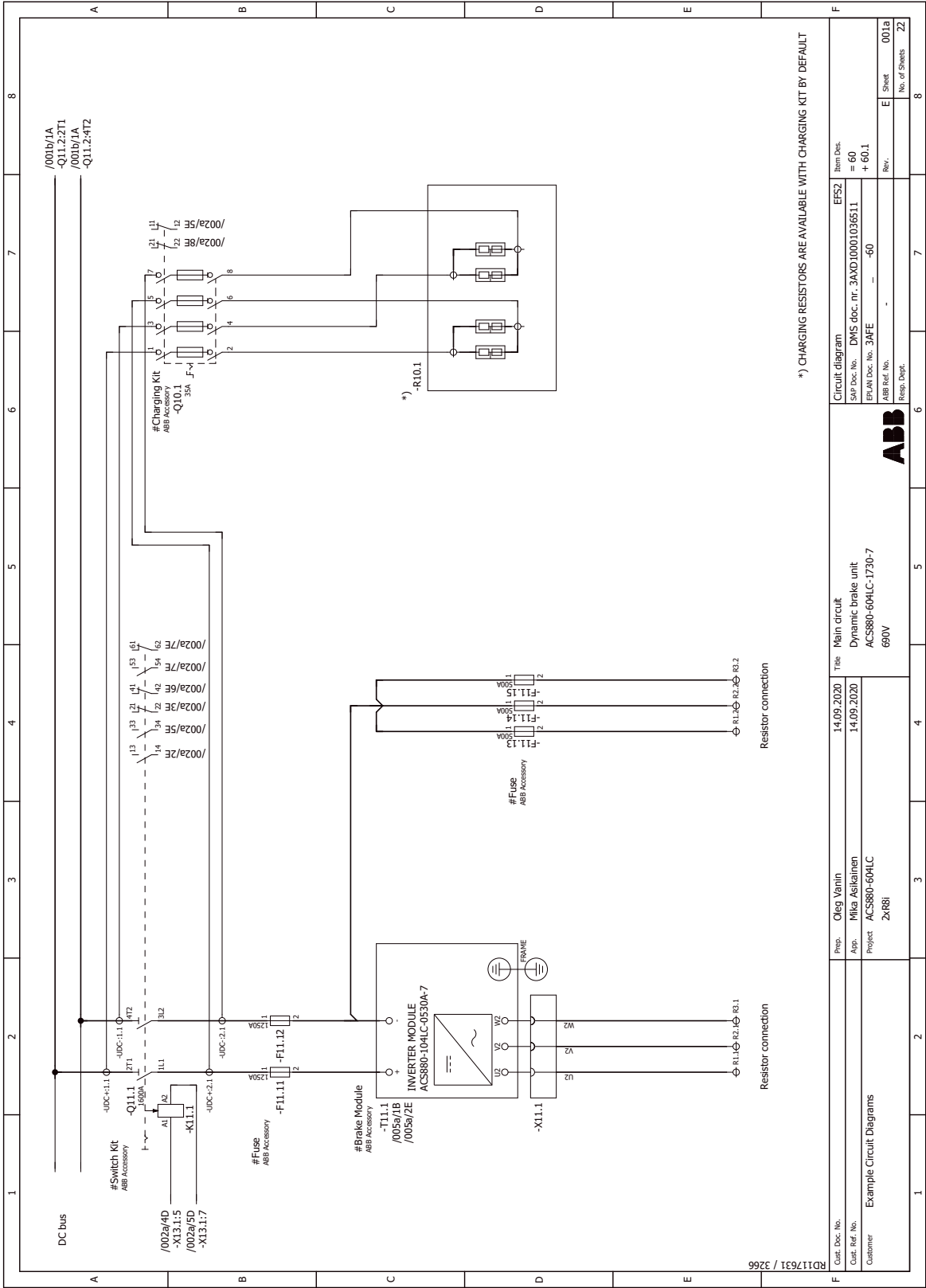
Note: The Safe torque off (STO) function is not in use, and has been bridged at the factory.

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

Component designations used in the diagrams

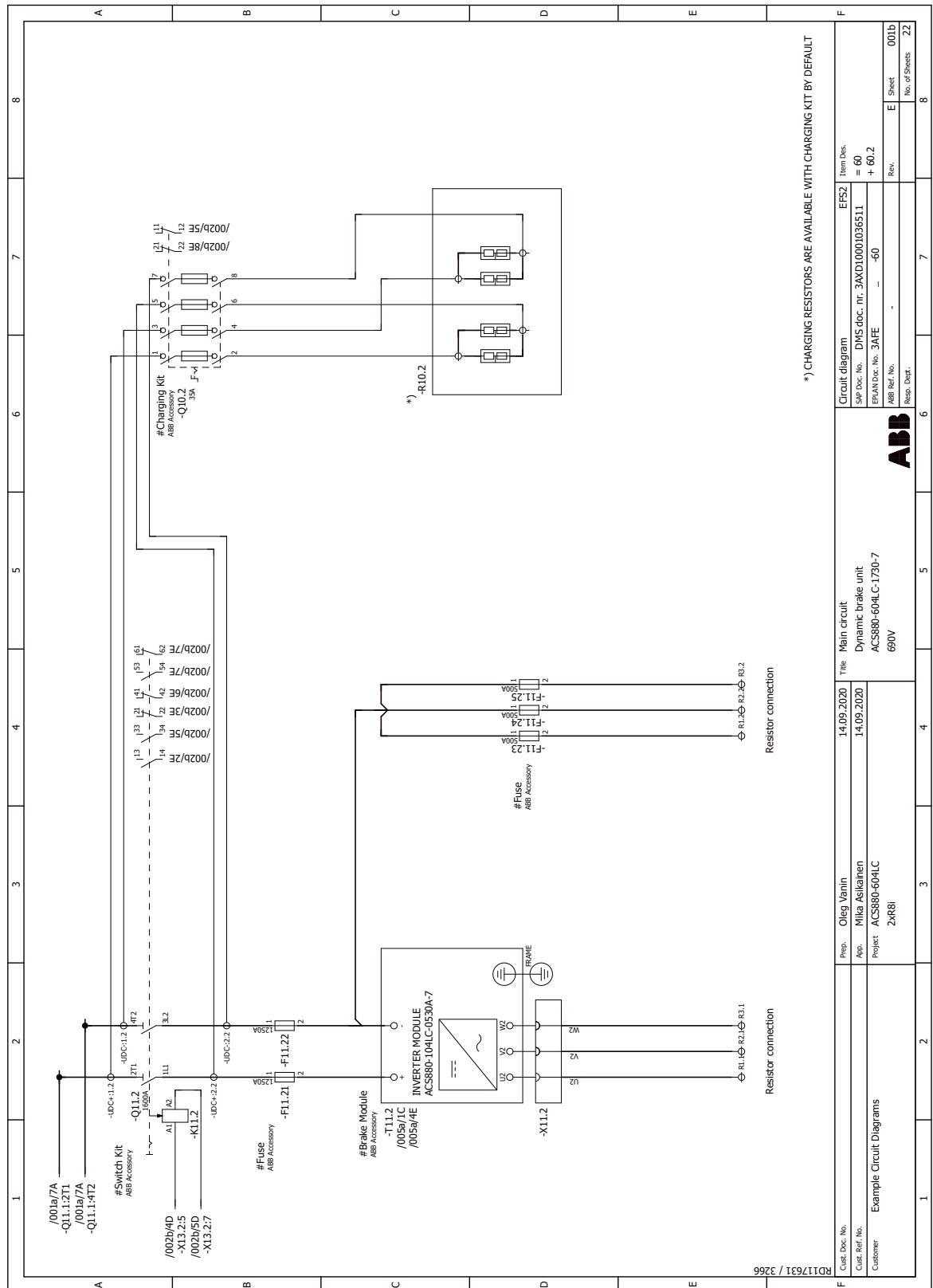
Designation	Component
A11.x	Charging controller
A41	BCU control unit
A47	FDPI diagnostics and control panel interface
A48	DPMP-01 panel mounting platform kit (to be ordered separately)
A49	ACS-AP-W control panel
A115	CIO-01 module for fan monitoring
F11.xx	Fuses
G115	Cooling fan
Q10.x	Charging switch
Q11.x	Main switch/disconnector
R10.x	Charging resistors
T11.x	Brake module
T22	External 24 V DC power supply

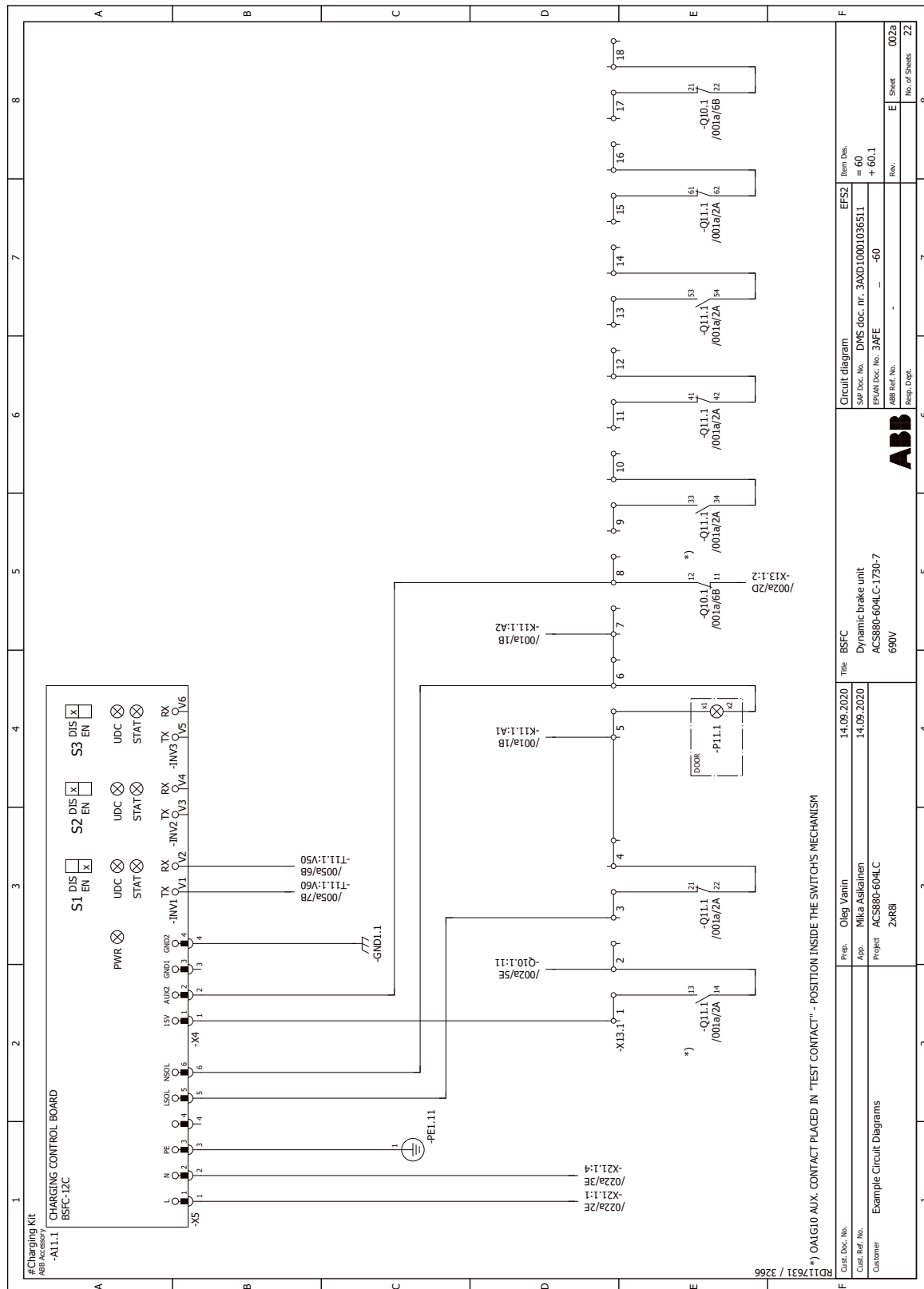
Frame 2xR8i - Main circuit (sheet 001a)



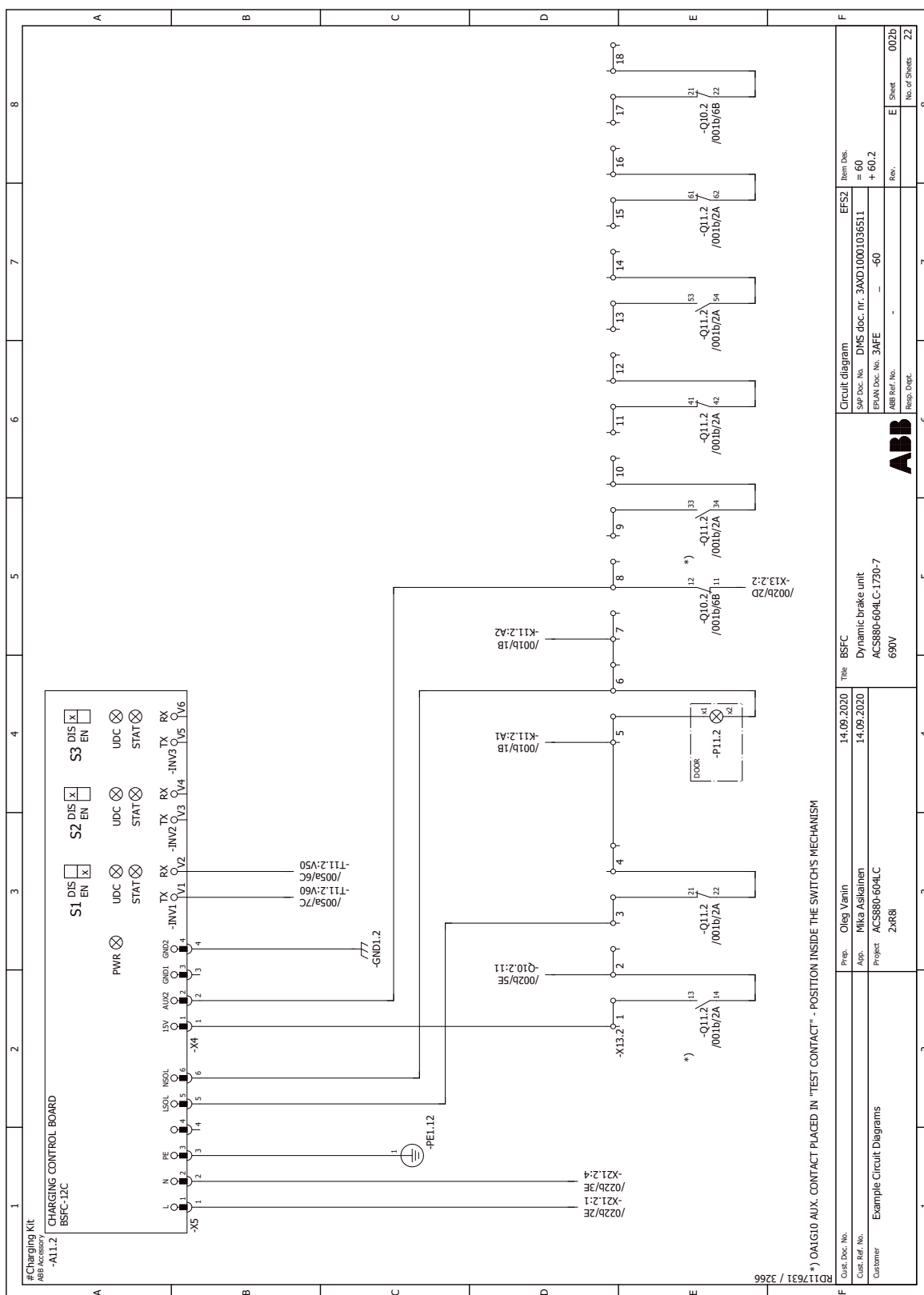
*) CHARGING RESISTORS ARE AVAILABLE WITH CHARGING KIT BY DEFAULT

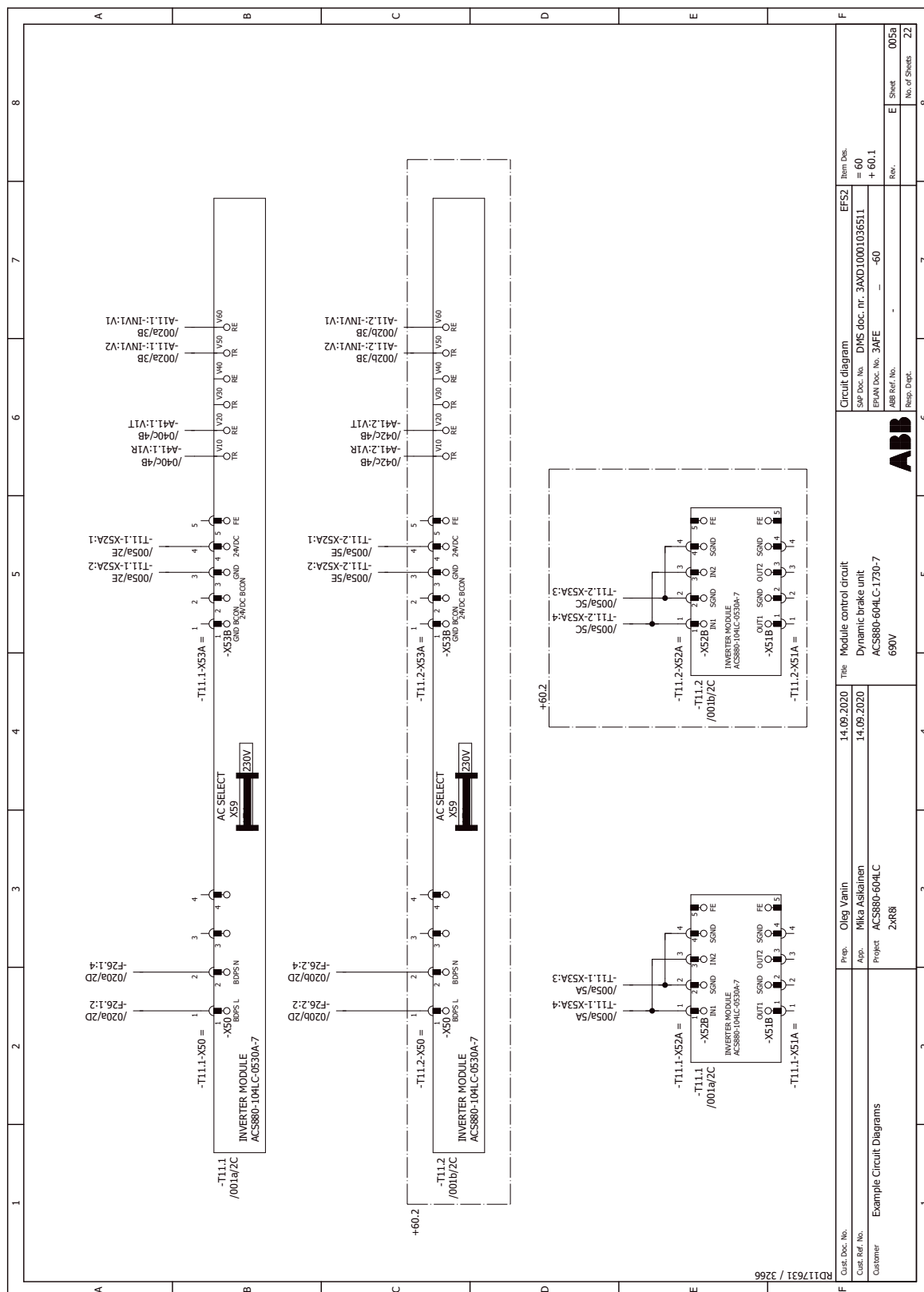
Frame 2×R8i - Main circuit (sheet 001b)



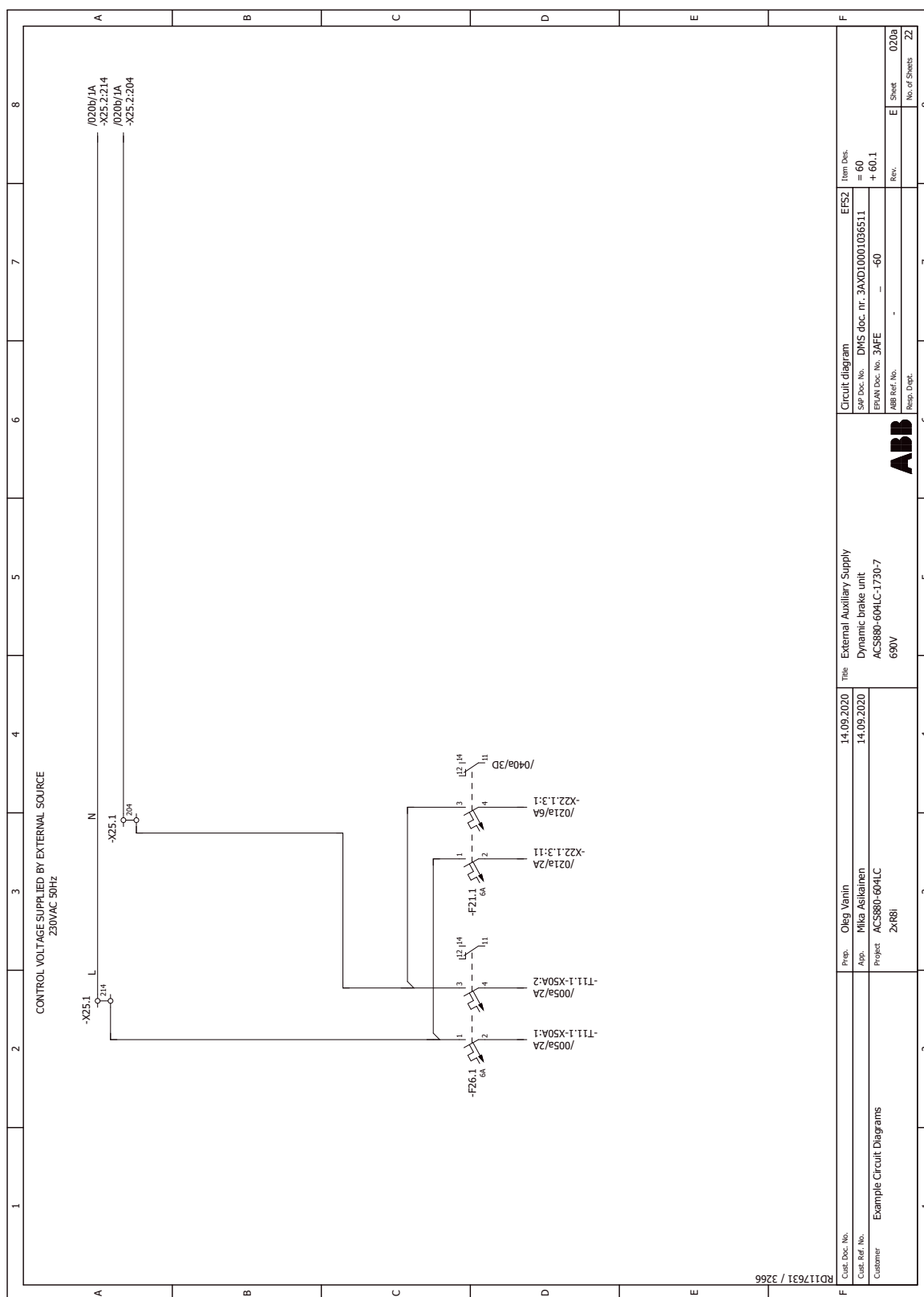


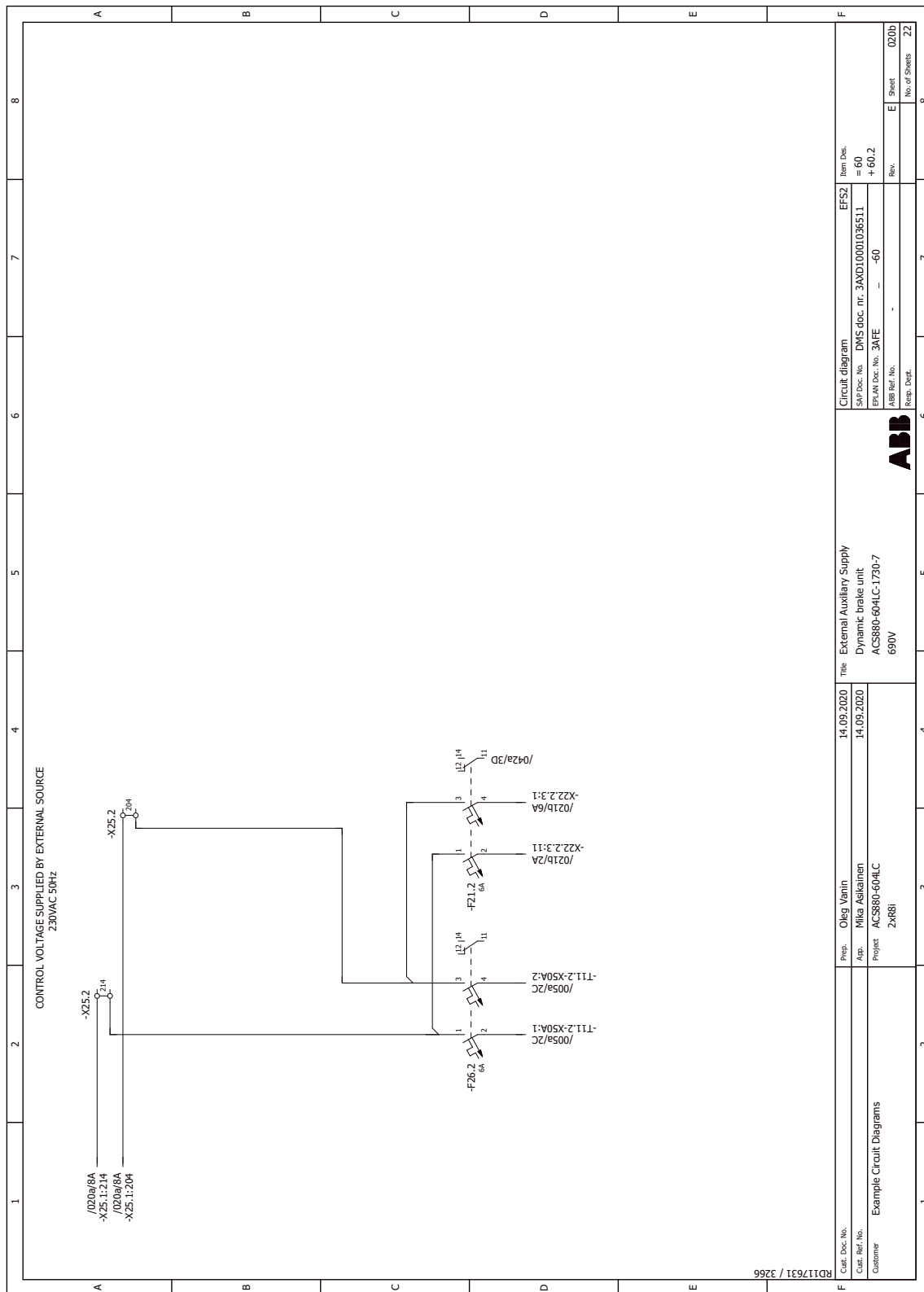
Frame 2×R8i - Charging circuit (sheet 002b)



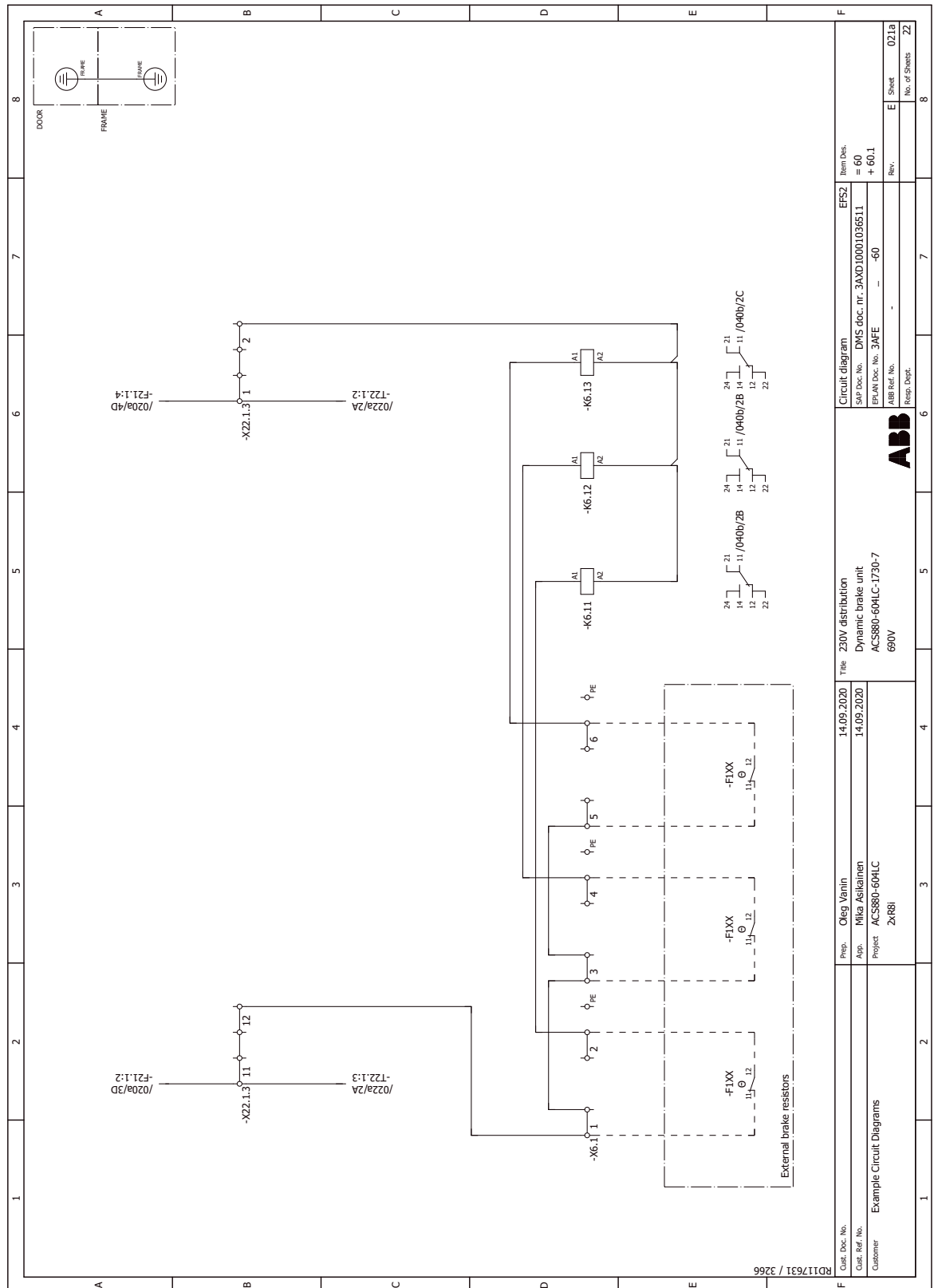


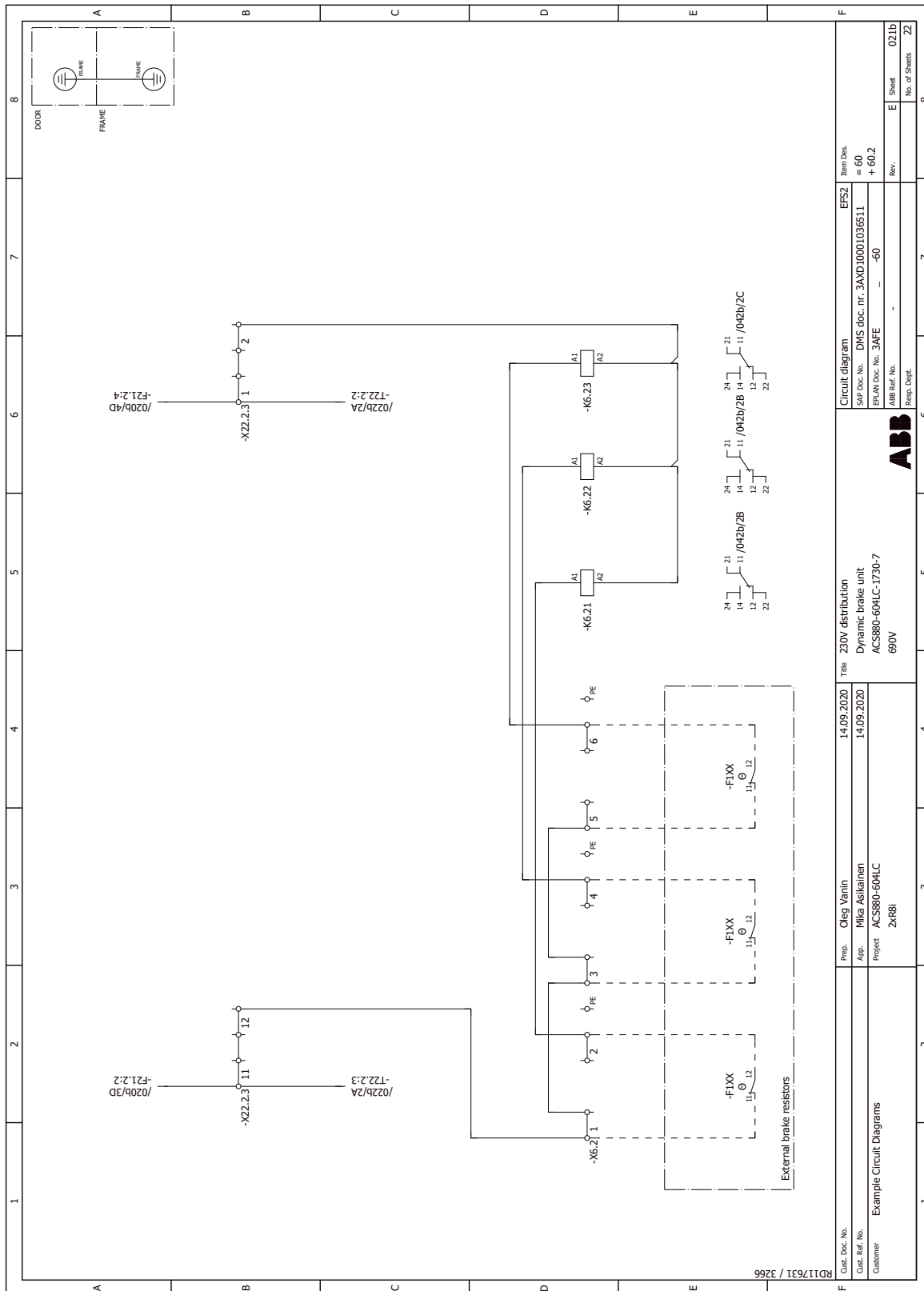
Frame 2×R8i - Auxiliary voltage supply (sheet 020a)



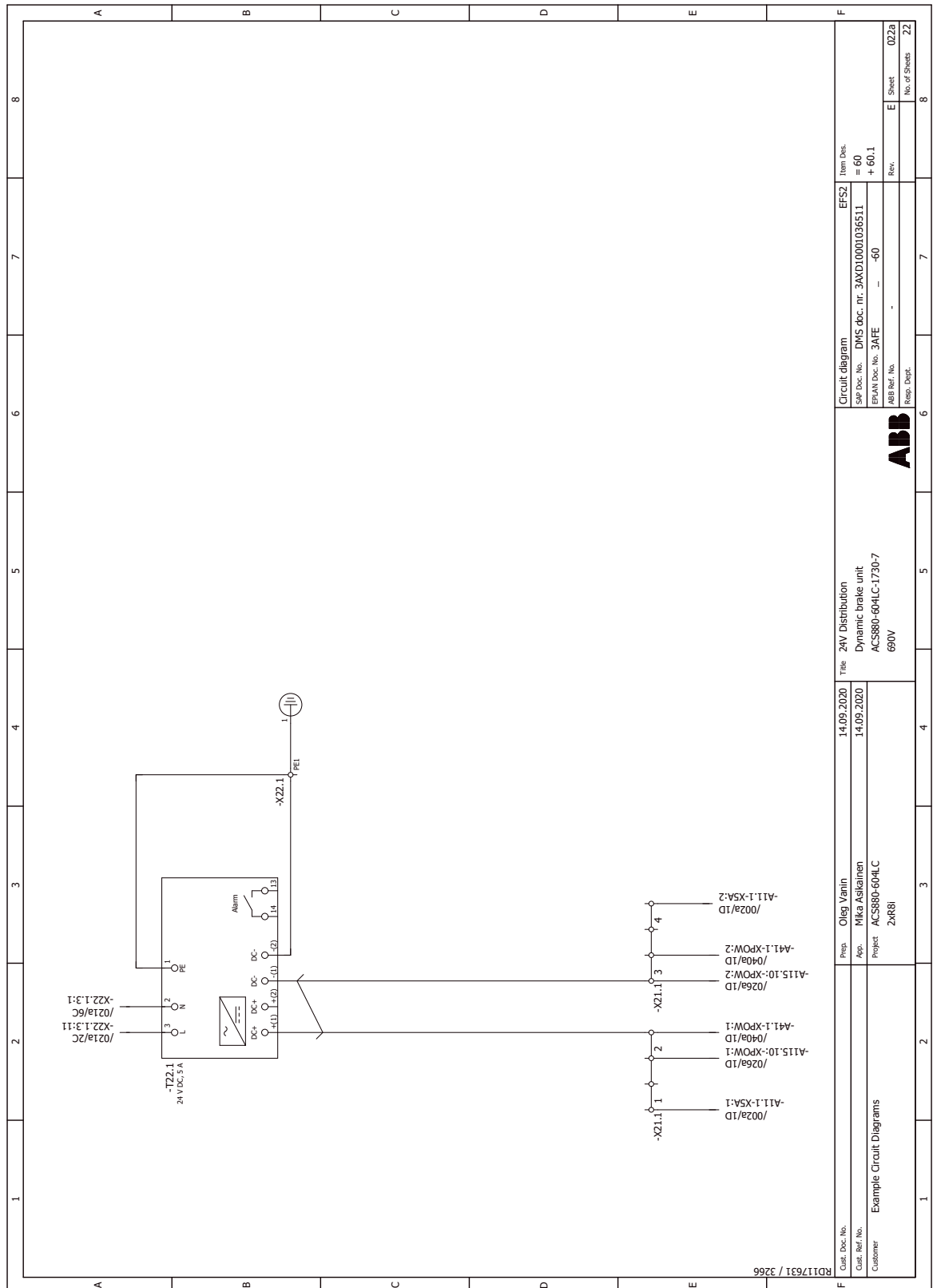


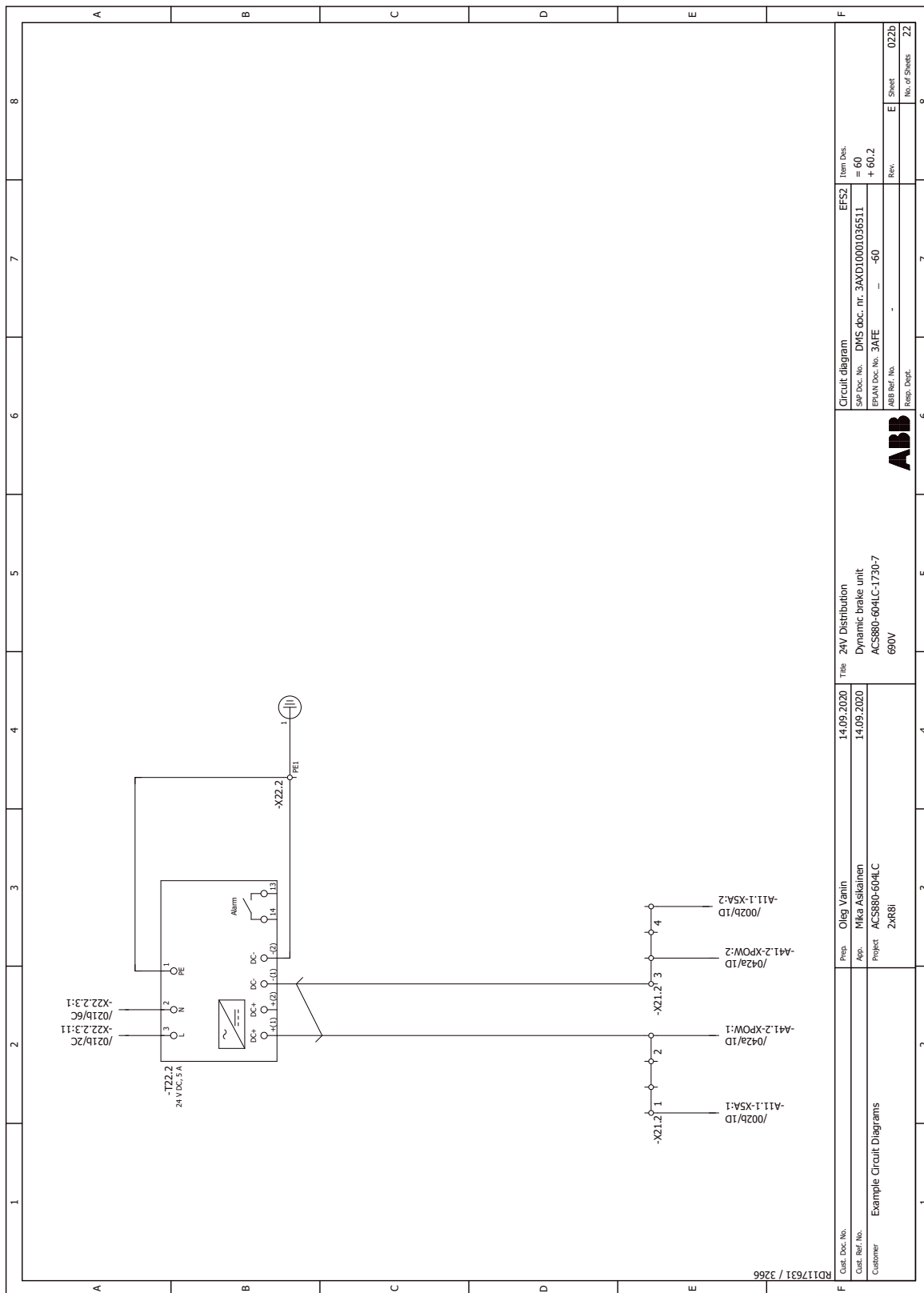
Frame 2xR8i - 230/115 V distribution (sheet 021a)



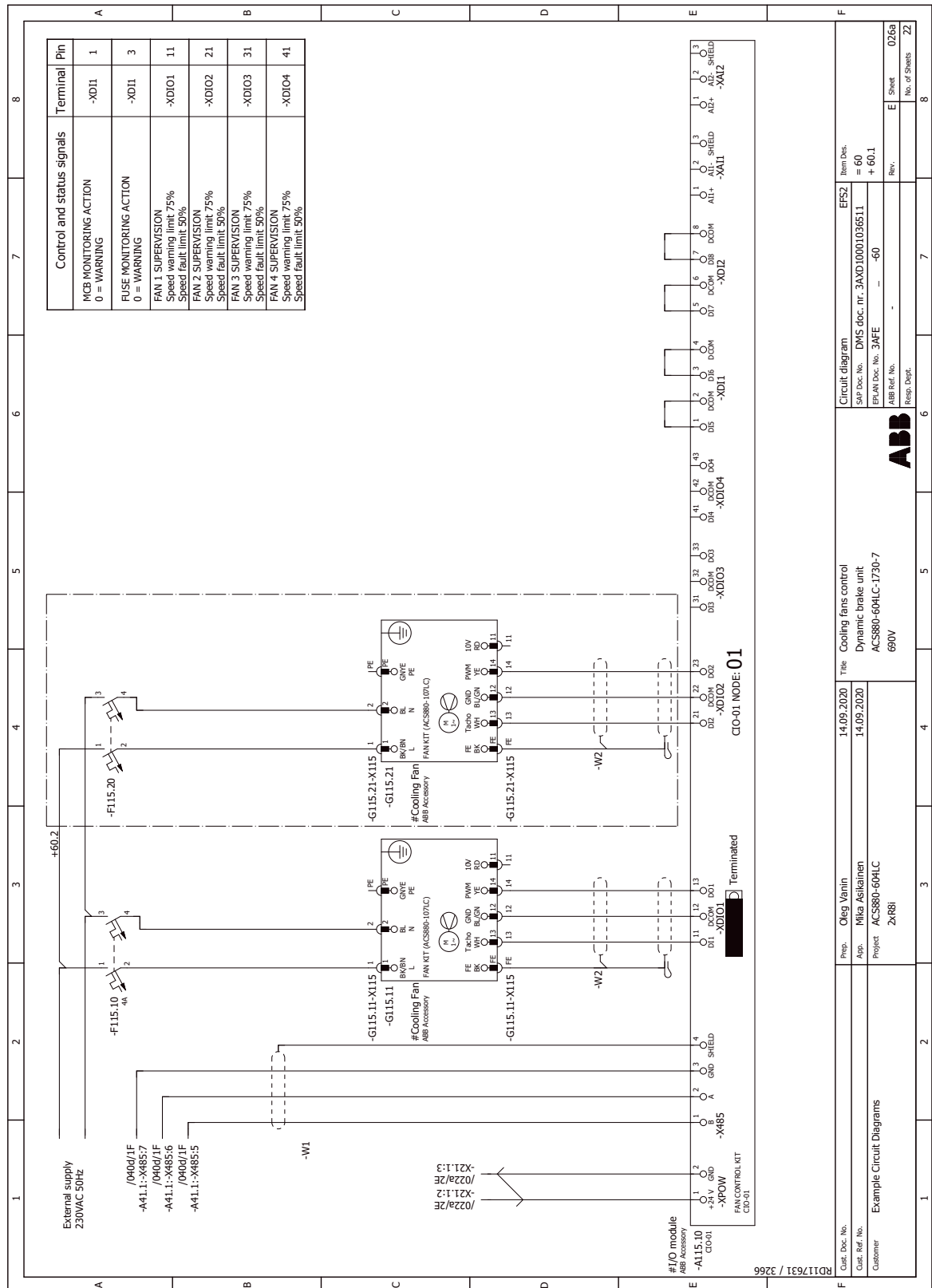


Frame 2xR8i - 24 V distribution (sheet 022a)

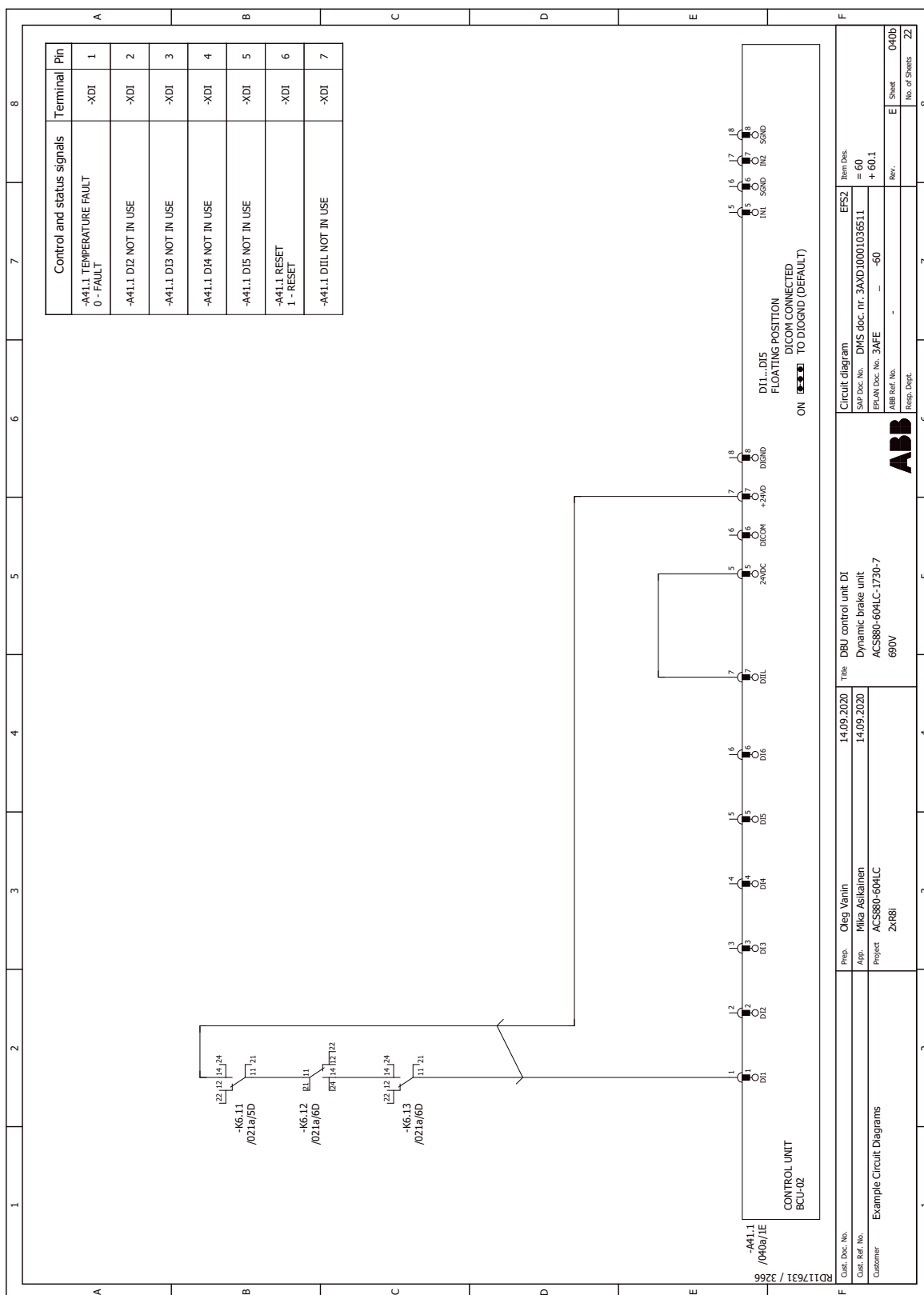


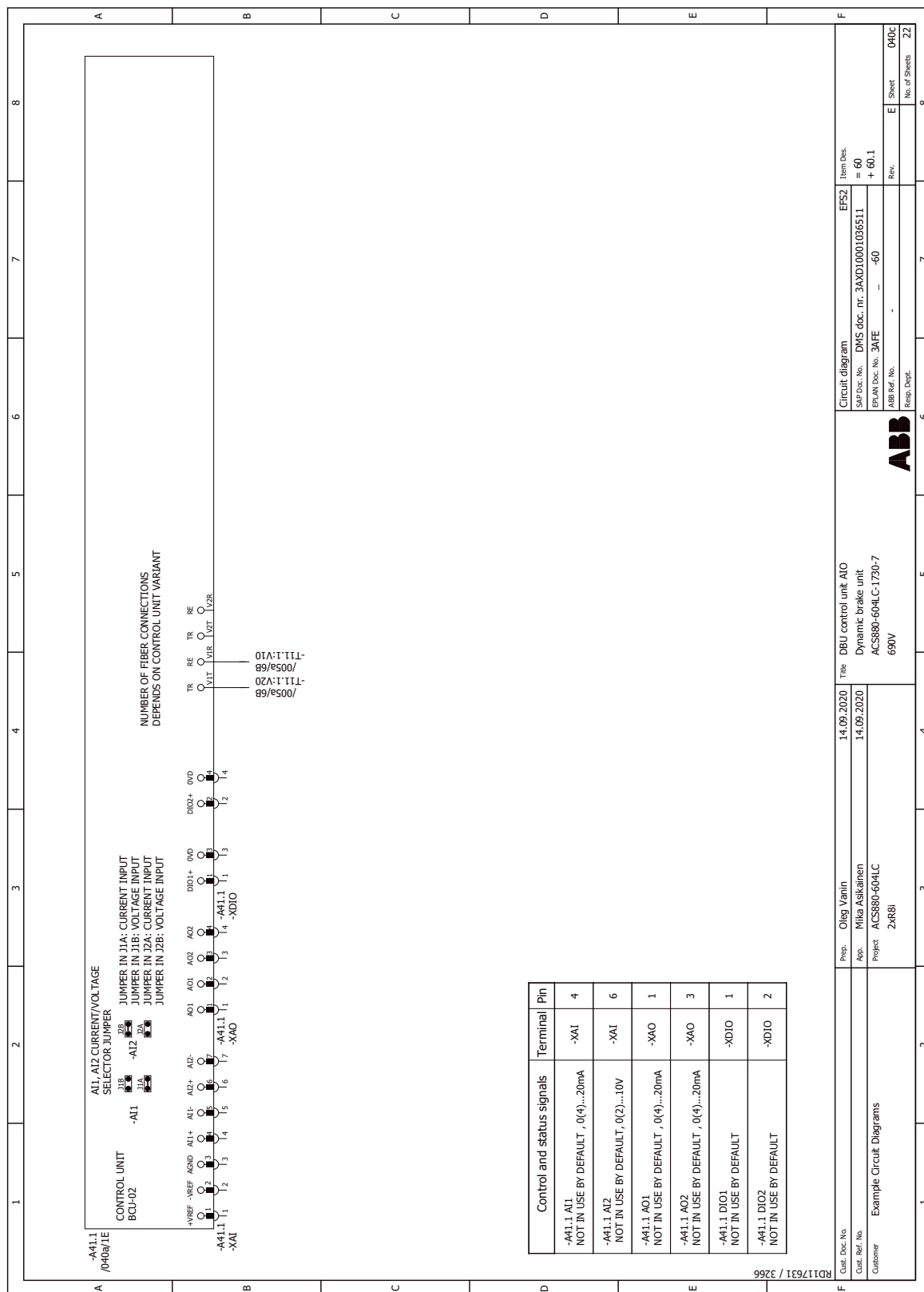


Frame 2xR8i - Fan control (sheet 026a)

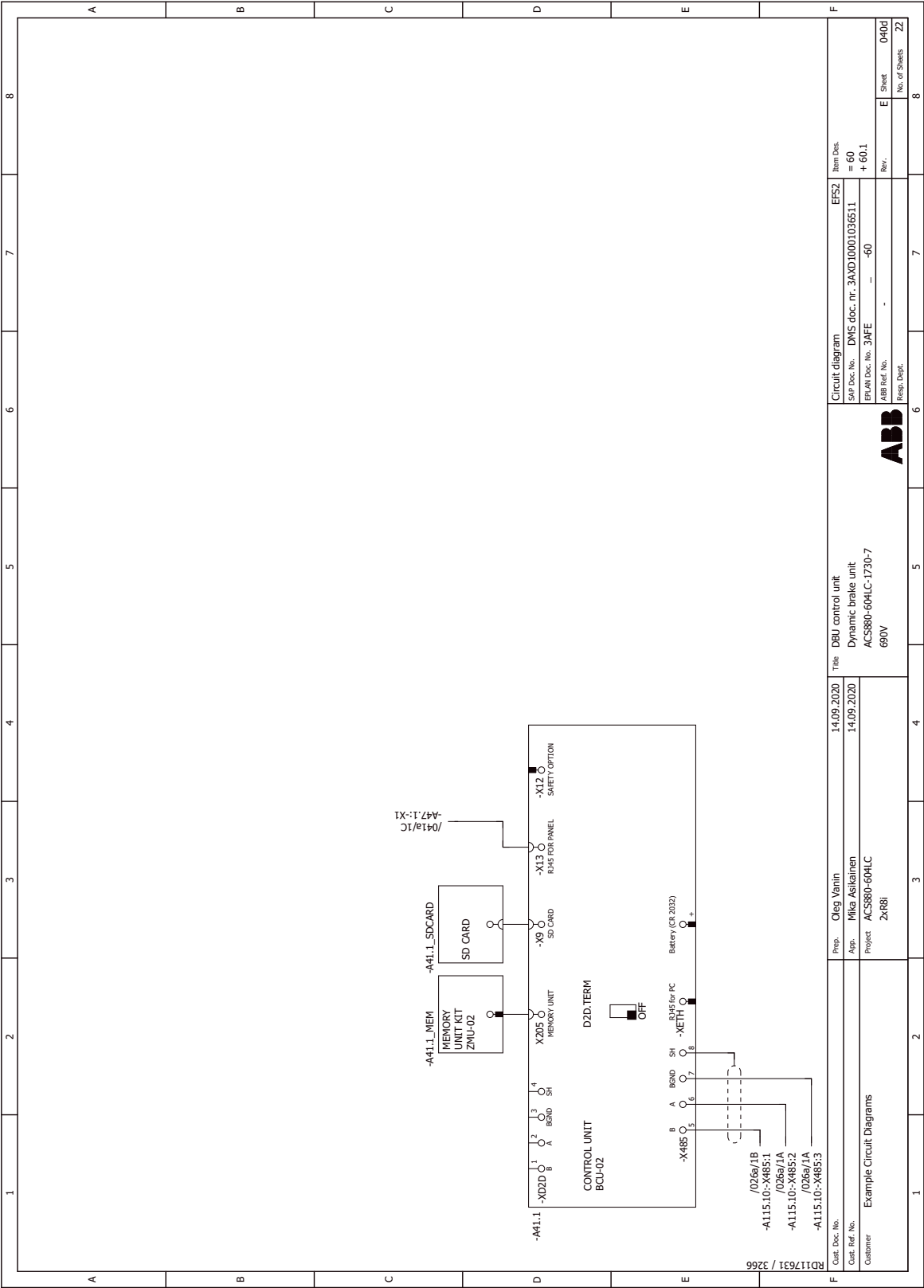


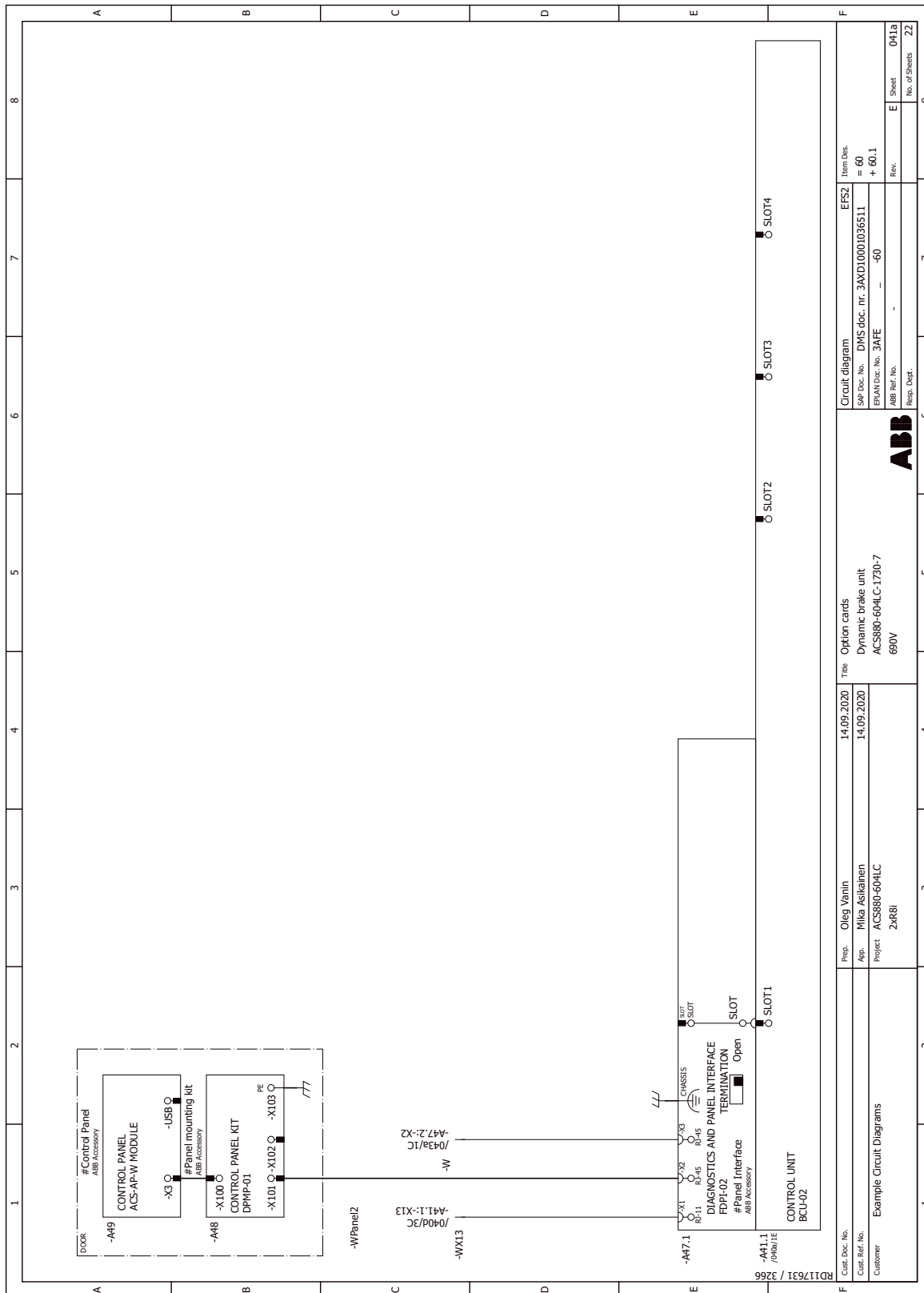
Frame 2×R8i - Control unit 1 / DI (sheet 040b)



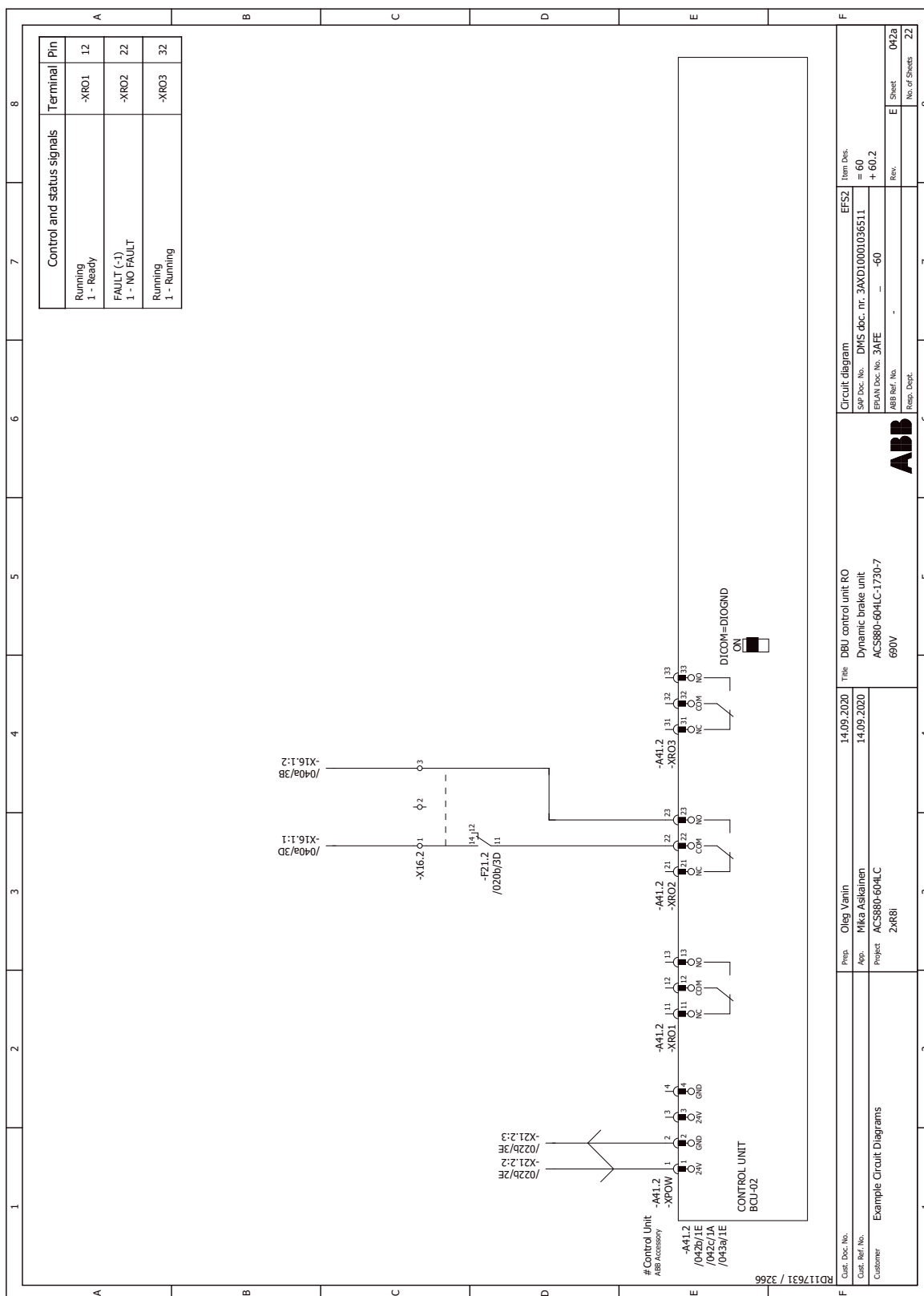


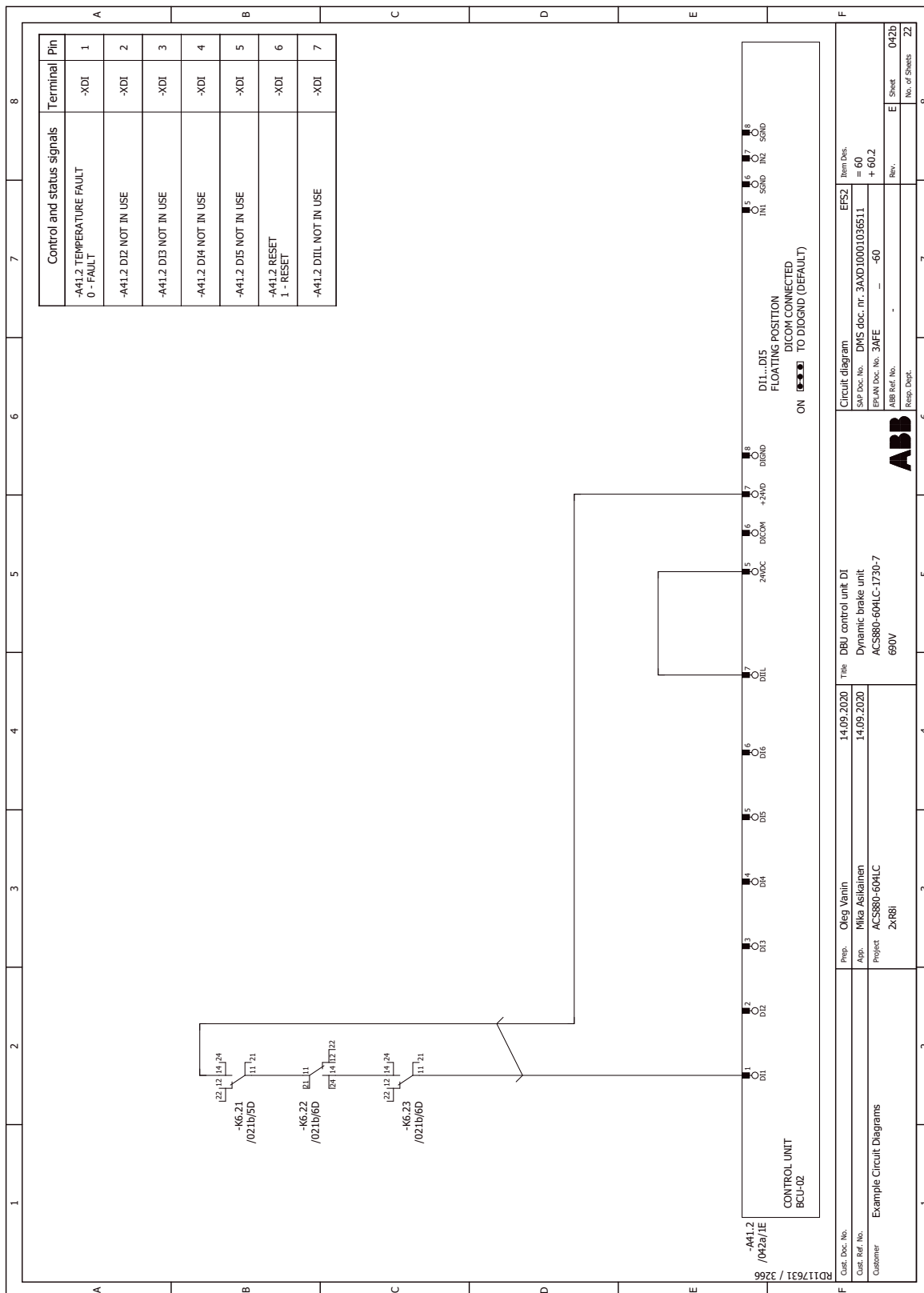
Frame 2×R8i - Control unit 1 (sheet 040d)



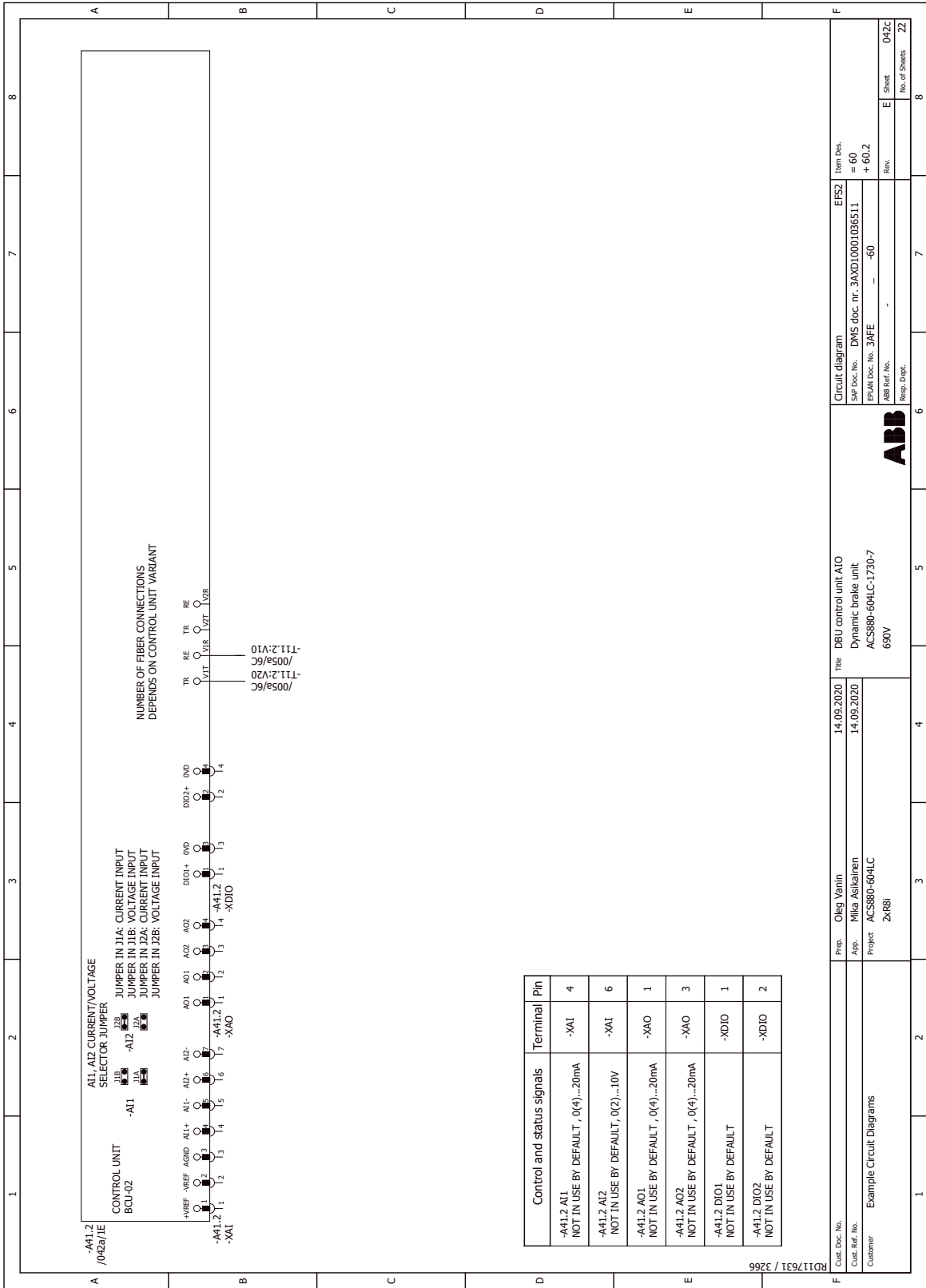


Frame 2xR8i - Control unit 2 / RO (sheet 042a)

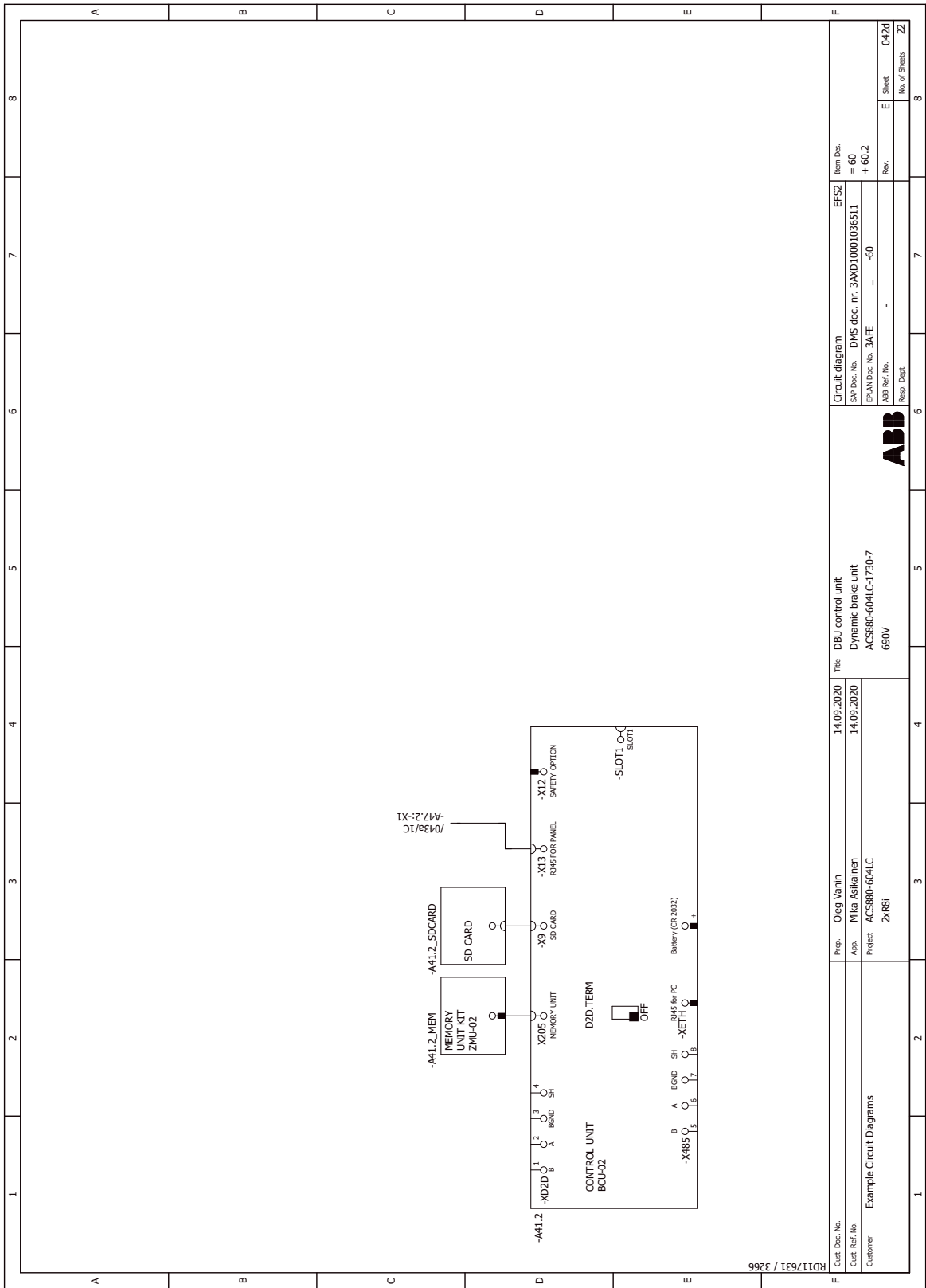




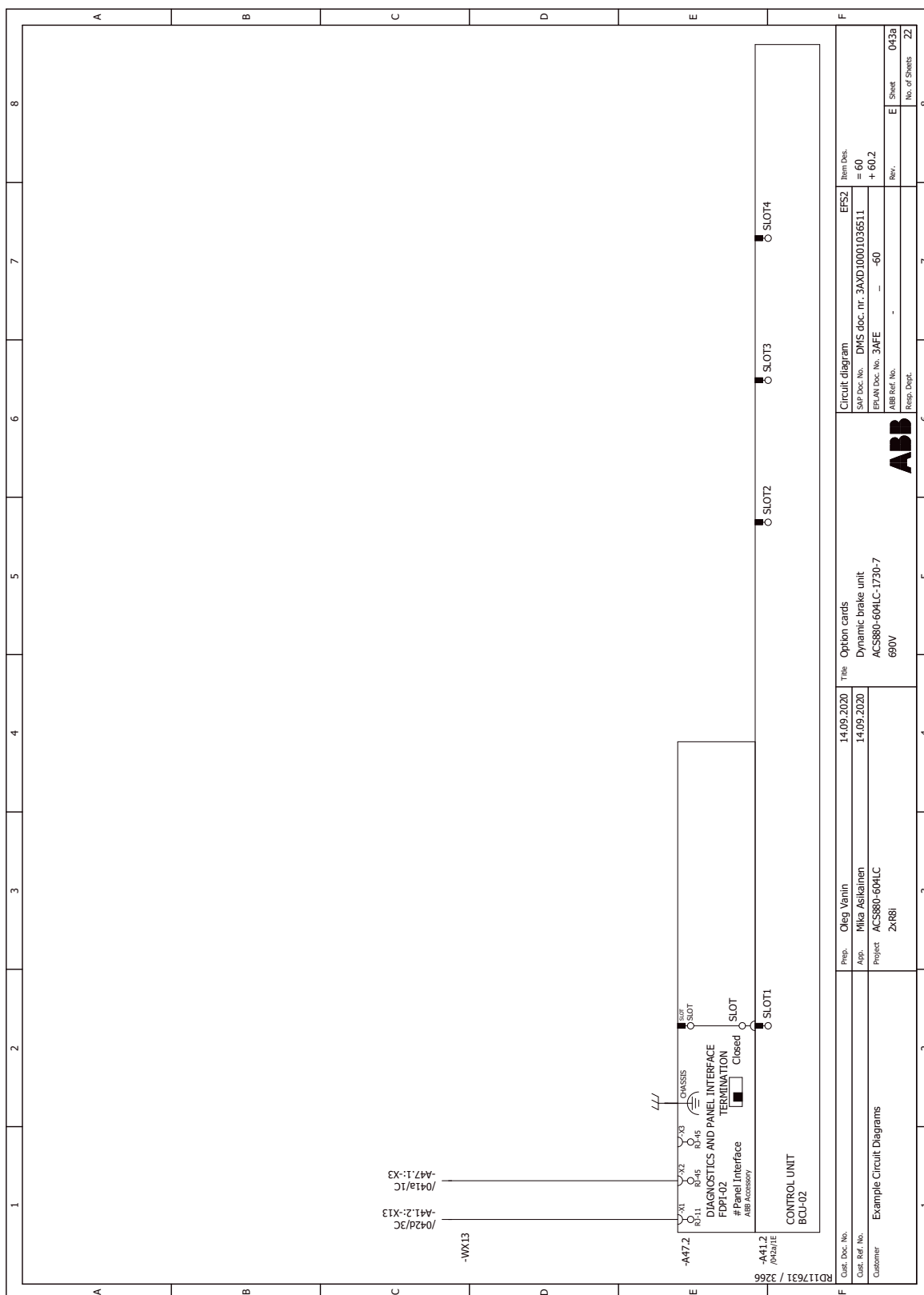
Frame 2×R8i - Control unit 2 / AI, AO, DIO (sheet 042c)



Frame 2×R8i - Control unit 2 (sheet 042d)



Frame 2×R8i - Option modules (sheet 043a)





Further information

Product and service inquiries

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

Product training

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

Providing feedback on ABB manuals

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

Document library on the Internet

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



www.abb.com/drives



3AXD50000581641B