ABB INDUSTRIAL DRIVES

ACS880-607 3-phase brake units

Hardware manual

ACS880-607 3-phase brake units

Hardware manual

3AXD50000022034 Rev D
EN
EFFECTIVE: 2019-04-29

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Introduction to the manual

Contents of this chapter

This chapter gives basic information on the manual.

Applicability

The manual is applicable to ACS880-607 3-phase brake units that form a part of an ACS880 multidrive system.

Safety instructions

Follow all safety instructions delivered with the drive.

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

Target audience

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

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

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

Related manuals

Manual	Code
General manuals	
ACS880 multidrive cabinets and modules safety instructions	3AUA0000102301
ACS880 multidrive cabinets and modules electrical planning instructions	3AUA0000102324
ACS880 multidrive cabinets mechanical installation instructions	3AUA0000101764
Supply unit manuals	
ACS880-207 IGBT supply units hardware manual	3AUA0000130644
ACS880 IGBT supply control program firmware manual	3AUA0000131562
ACS880-307 +A003 diode supply units hardware manual	3AUA0000102453
ACS880-307 +A018 diode supply units hardware manual	3AXD50000011408
ACS880 diode supply control program firmware manual	3AUA0000103295
ACS880-907 regenerative rectifier units hardware manual	3AXD50000020546
ACS880 regenerative rectifier control program firmware manual	3AXD50000020827
Inverter unit manuals	
ACS880-107 inverter units hardware manual	3AUA0000102519
ACS880 primary control program firmware manual	3AUA0000085967
ACS880 primary control program quick start-up guide	3AUA0000098062
Manuals for application programs (Crane, Winder, etc.)	
Brake unit and DC/DC converter unit manuals	
ACS880-607 1-phase brake units hardware manual	3AUA0000102559
ACS880-607 3-phase brake units hardware manual	3AXD50000022034
ACS880 (3-phase) brake control program firmware manual	3AXD50000020967
ACS880-1607 DC/DC converter units hardware manual	3AXD50000023644
ACS880 DC/DC converter control program firmware manual	3AXD50000024671
Option manuals	
ACS-AP-x assistant control panels user’s manual	3AUA0000085685
Drive composer start-up and maintenance PC tool user’s manual	3AUA0000094606
Manuals for I/O extension modules, fieldbus adapters, safety options etc.	

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

Categorization by frame size and option code

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

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

The instructions and technical data which concern only certain optional selections are marked with option codes (such as +E210). The options included in the drive can be identified from the option codes visible on the type designation label.

Use of component designations

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

Terms and abbreviations

Term/ Abbreviation	**Description**
BCON	Type of control board
BCU	Type of control unit
BDFC	Control board for direct-on-line cooling fan
BDPS	Internal power supply board in frame R8i modules
BFPS	Control and power supply board for speed-controlled cooling fan
Brake chopper	Conducts the surplus energy from the intermediate circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor.
Brake chopper module	Brake chopper enclosed in a metal frame or housing. Intended for cabinet installation.
Brake resistor	Dissipates the drive surplus braking energy conducted by the brake chopper to heat
Brake unit	Brake chopper modules under control of one control board, and related accessories
Control board	Circuit board in which the control program runs
Control unit	Control board built in a housing (often rail-mountable)
Cubicle	One section of a cabinet-installed drive. A cubicle is typically behind a door of its own.
DC link	DC circuit between rectifier and inverter
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
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object, eg, variable, constant, or signal.
Single drive	Drive for controlling one motor
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 the brake unit.

Product overview

ACS880-607 is an air-cooled cabinet-installed brake unit, which forms a part of an ACS880 multidrive system. As standard, it includes brake chopper(s). Brake resistors are external.

Operation principle

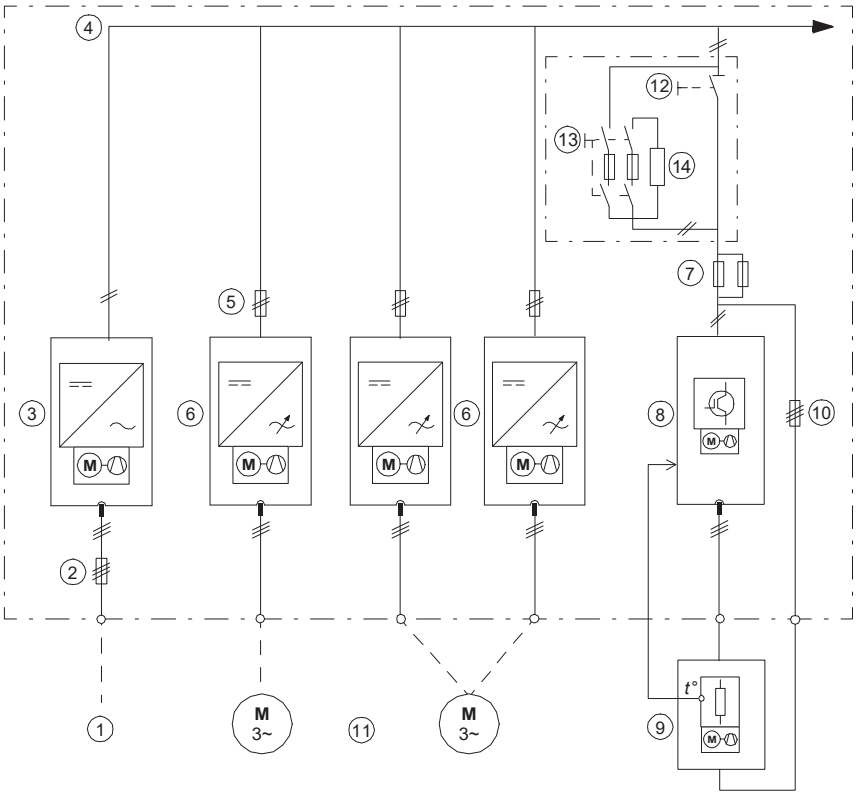
The brake chopper handles the energy generated by a decelerating motor. The extra energy increase the DC link voltage. The chopper connects the brake resistor to the DC link of the drive whenever the voltage exceeds an activation limit. The energy consumption by the resistor losses lowers the voltage until the resistor can again be disconnected.

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

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

Simplified main circuit diagram of the drive system

This diagram shows a typical common DC bus drive system.

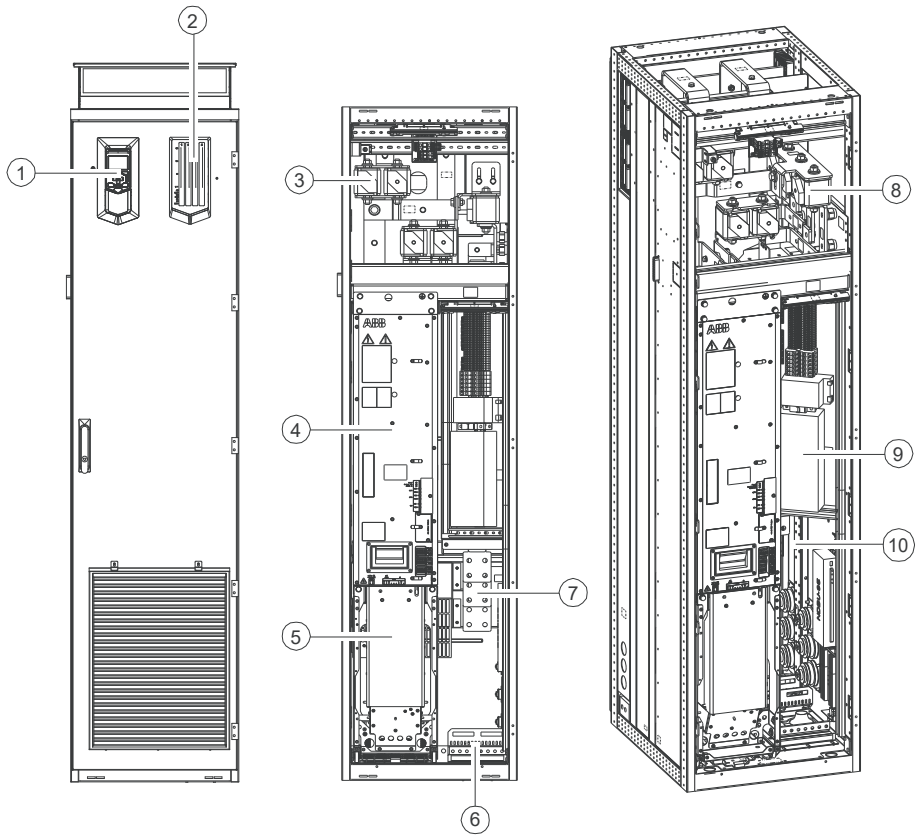


1	AC supply
2	Input (AC) fuses
3	Supply unit
4	DC bus
5	Inverter DC fuses (with or without a DC switch/disconnector)
6	Inverter units (in this example, one of the two units consists of two inverter modules connected in parallel)
7	Brake chopper fuses
8	Brake unit
9	Brake resistors (user-defined or option +D151)
10	Brake resistor fuses
11	Motor(s)
12	DC switch/disconnector (part of option +F286)
13	Charging circuit switch with fuses (part of option +F286)
14	Charging resistors (part of option +F286)

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

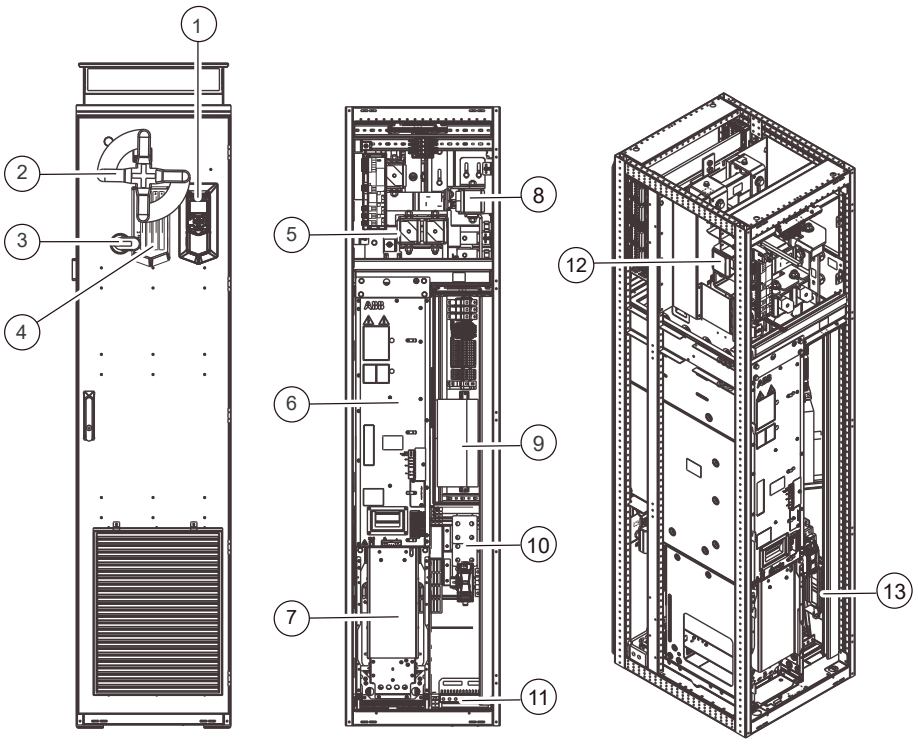
Layout drawings

The figure below shows the components of the brake chopper cubicle with bottom entry and exit of cables and shrouds removed.



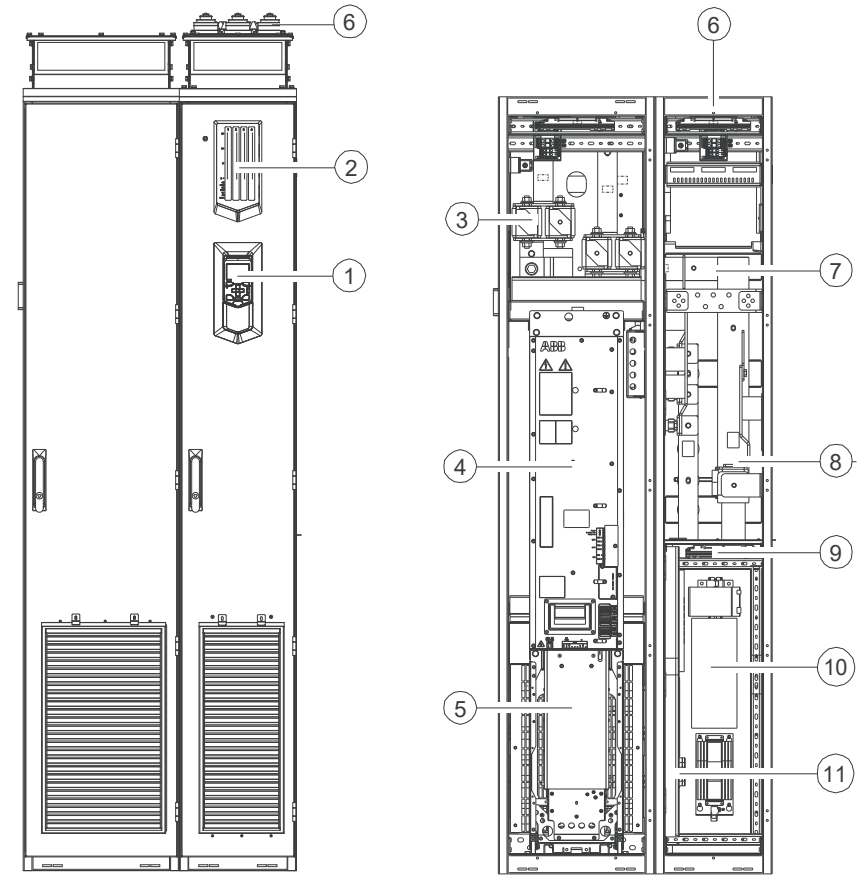
1	Control panel (option +J400)	6	Cable entries for brake resistor and control cables
2	Drive monitoring display (option +J401)	7	Terminals for brake resistor cable connection
3	Brake chopper fuses	8	Brake resistor fuses
4	Brake chopper module	9	BCU-x2 control unit
5	Brake chopper cooling fan	10	Cabinet heater (option +G300)

The figure below shows the components of the brake chopper cubicle with bottom entry and exit of cables and shrouds removed – option +F286 included.



1	Control panel (option +J400)	8	Brake resistor fuses
2	DC switch/disconnector handle (part of option +F286)	9	BCU-x2 control unit
3	Charging circuit switch fuse handle (part of option +F286)	10	Terminals for brake resistor cable connection
4	Drive monitoring display (option +J401)	11	Cable entries for brake resistor and control cables.
5	Charging circuit fuses	12	Brake chopper fuses
6	Brake chopper module	13	Cabinet heater (option +G300)
7	Brake chopper cooling fan		

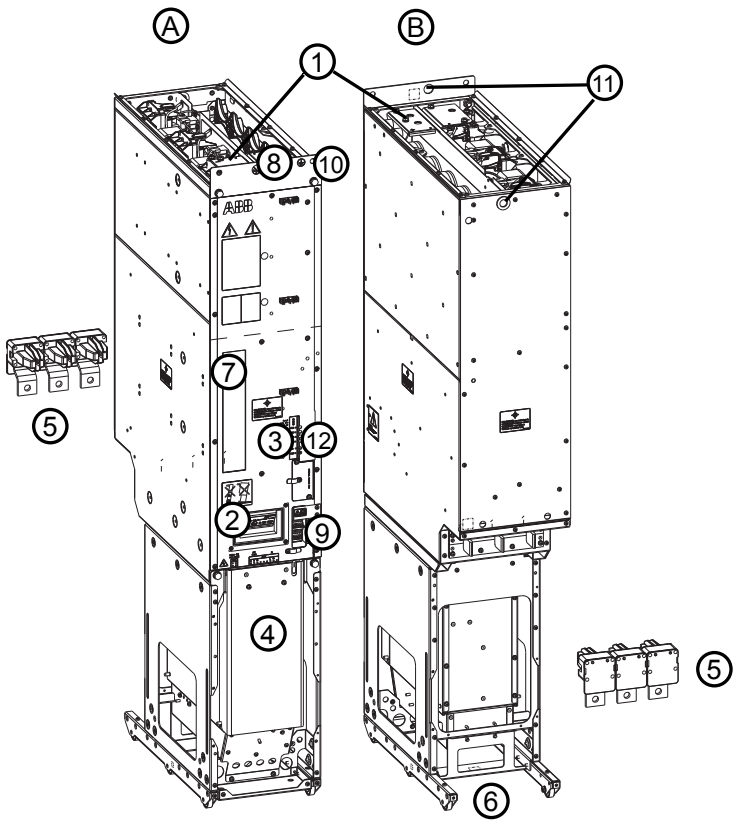
The figure below shows the components of the brake chopper cubicles with top entry and exit of cables and shrouds removed.



1	Control panel (option +J400)	7	Terminals for brake resistor cable connection
2	Drive monitoring display (option +J401)	8	Brake resistor fuses
3	Brake chopper fuses	9	Cabinet fans
4	Brake chopper module	10	BCU-x2 control unit
5	Brake chopper cooling fan	11	Cabinet heater (option +G300)
6	Cable entries for brake resistor and control cables		

Frame R8i layout

This figure shows the layout of the R8i module.

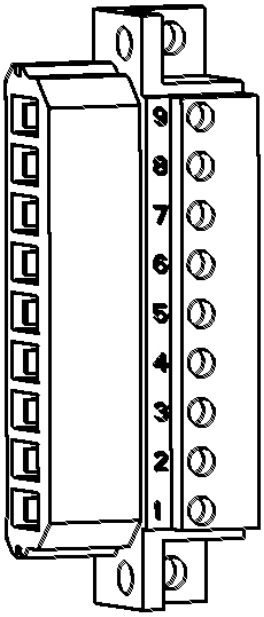


A	R8i module, front
B	R8i module, back
1	DC busbars
2	Handle
3	LEDs and fiber optic connectors
4	Fan (standard speed-controlled fan shown; a direct-on-line fan is available as option +C188)
5	Quick connector (three phases). The counterpart is fastened to the cabinet behind the module.
6	Wheels
7	Type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

Brake chopper module connectors

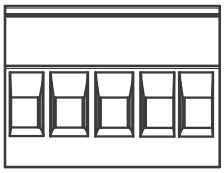
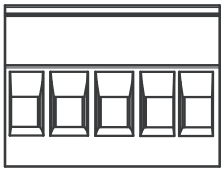
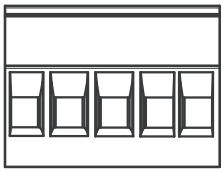
Connectors X50…X53

Connector X50



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

Connectors X51, X52, X53

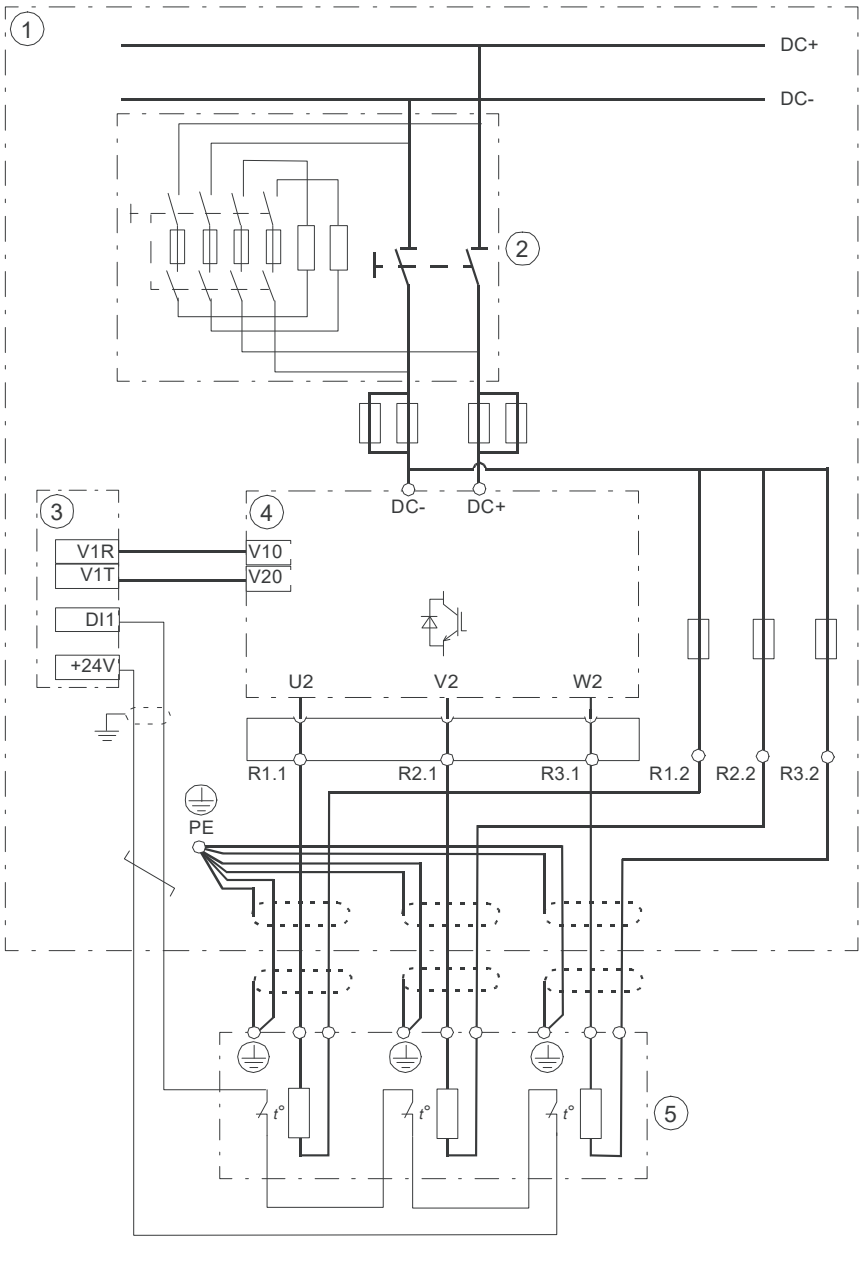
	**STO OUT** **X51** FE / GND / 24V / GND / 24V	X51	STO OUT	Not in use.
	**STO IN** **X52** FE / GND / 24V / GND / 24V	X52	STO IN	STO connectors of the module. Must be connected to 24 V DC for the module to start.
	**24V OUT** **X53** FE / 24V / GND / 24V / GND	X53	24V OUT	24 V DC for BCU and for STO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

Fibre optic connectors

BSFC	V50 V60	**Name**	**Description**
BFPS	V30 V40	BSFC	Charging controller connection (option +F286).
BCU	V10 V20	BFPS	Fan control connection (to fan control box).
		BCU	Control unit connection.

Overview of power and control connections

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



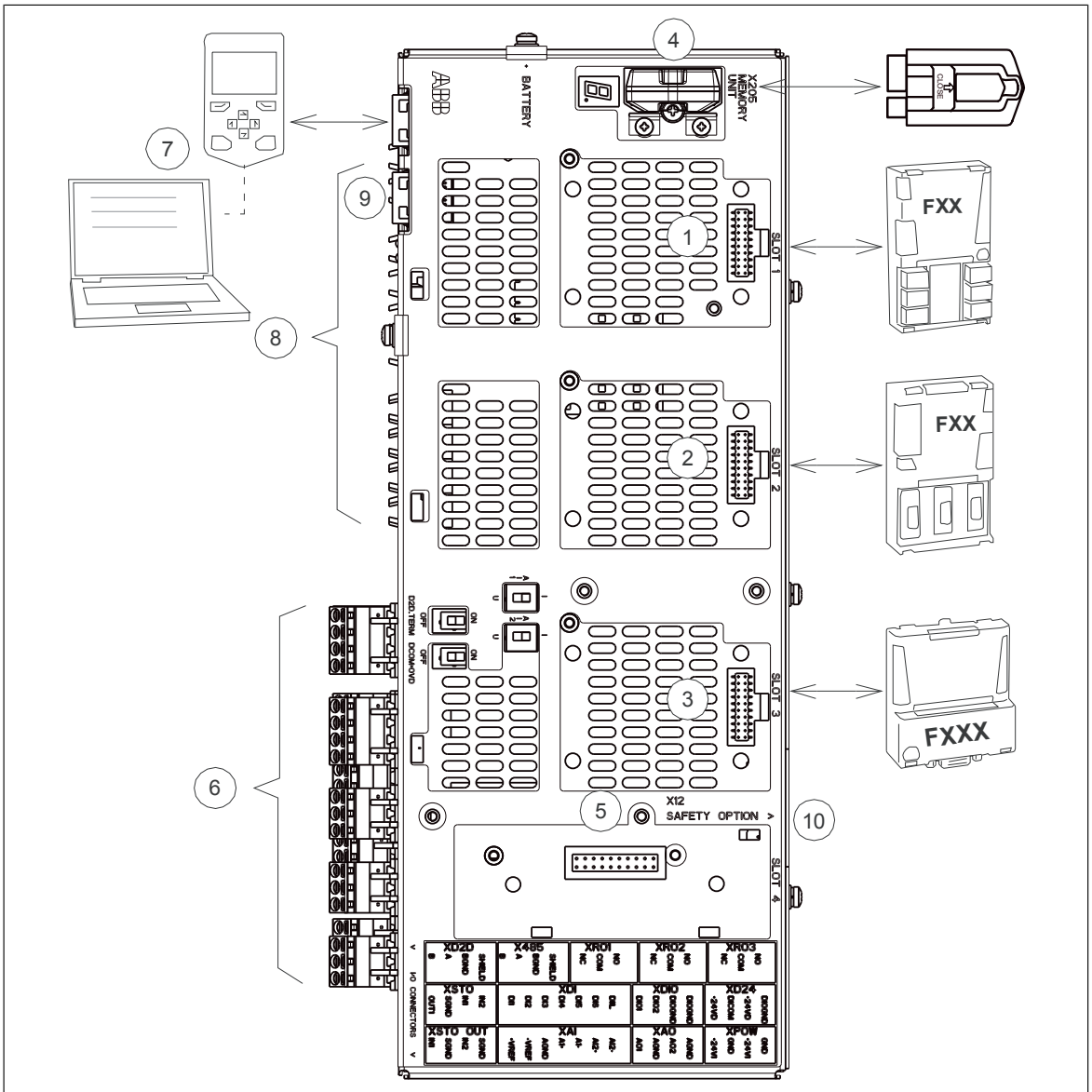
1	Brake chopper cubicle
2	DC switch/disconnector with charging circuit (option +F286)
3	Control unit
4	Brake chopper module
5	Brake resistors (user-defined or option +D151)

Brake unit control devices

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

Overview of the control connections of the BCU control unit

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



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

The control panel

The control panel (option +J400) 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 is mounted on a platform on the brake chopper cubicle door.

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

Control by PC tools

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

Fieldbus control

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

DC switch and charging switch

DC switch/disconnector (option +F286)

The brake unit can optionally be equipped with DC switch/disconnectors which allow the isolation of the brake chopper modules from the DC bus. When a brake chopper module is reconnected to the DC bus, its DC capacitors are automatically charged through a charging circuit.

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

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

Charging switch

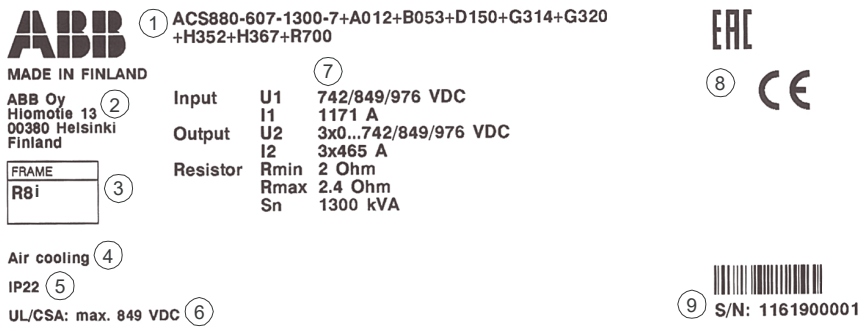
The brake chopper modules equipped with a DC switch/disconnector have a DC link precharging circuit including an xSFC-02 charging control unit and a charging switch on the cubicle door.

Type designation labels

Each brake unit and brake chopper module is equipped with type designation labels.

Brake unit type designation label

An example label of the brake unit is shown below.

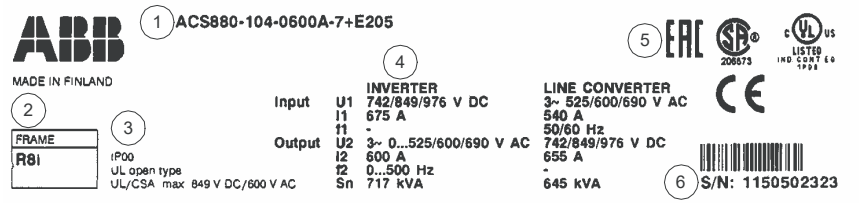


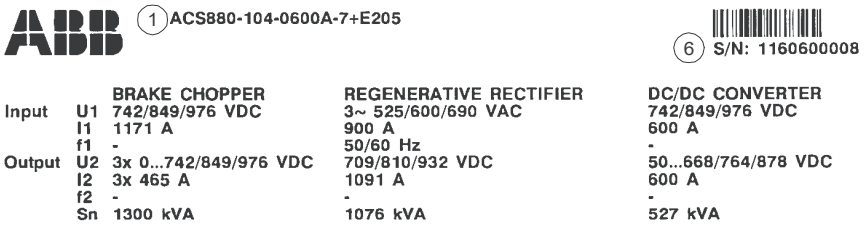
1	Type designation.
2	Manufacturer’s address.
3	Frame size.
4	Cooling method.
5	Degree of protection.
6	Maximum input voltage (UL/CSA).
7	Ratings.
8	Valid markings.
9	Serial number. The first digit refers to the manufacturing plant. The next four digits indicate manufacturing year and week respectively (yyww). The remaining digits complete the serial number so that there are no two units with the same number.

Brake chopper module type designation label

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

Examples of the label are shown below.





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

Brake unit type designation key

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

- The first 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.

The subcodes are described below.

CODE	DESCRIPTION
Basic codes	
ACS880	Product series
607	Brake unit: Supply frequency 50 Hz, control (auxiliary) voltage 230 V AC, IEC industrial cabinet construction, degree of protection IP22 (UL Type 1), cabling through bottom of cabinet, speed-controlled module cooling fans, European-style cable entries, aluminum DC busbars (up to 3200 A), tin-plated copper DC busbars (from 3200 A up), DC fuses, ACS880 brake control program, coated circuit boards, USB memory stick containing complete documentation in English.
Ratings / size	
xxxxx	Size

CODE	DESCRIPTION
Voltage range	
3	513…566 V DC. This is indicated in the type designation label as typical input voltage level 566 V DC.
5	513…707 V DC. This is indicated in the type designation label as typical input voltage levels 566 / 679 / 707 V DC.
7	709…976 V DC. This is indicated in the type designation label as typical input voltage levels 742 / 849 / 976 (849 UL, CSA) V DC.
Option codes (plus codes)	
Supply frequency	
A012	50 Hz
A013	60 Hz
Degree of protection	
B053	IP22 (UL type 1)
B054	IP42 (UL Type 1)
B055	IP54 (UL Type 12)
Construction	
C121	Marine construction
C128	Cooling air through bottom
C129	UL approved
C130	Channeled air outlet
C134	CSA approved
C164	Plinth height 100 mm
C179	Plinth height 200 mm
C180	Seismic design
C188	Direct-on-line cooling fan
Resistor braking	
D150	Brake chopper
D151	Brake resistors
Filters	
E210	EMC filter for second environment TN and IT (grounded and ungrounded) systems, category C3.
Switchgear	
F286	DC switch/disconnector
Heaters lights and auxiliary control voltage	
G300	Cabinet heater (external supply)
G301	Cabinet lighting

CODE	DESCRIPTION
G304	115 V control voltage for relays
Materials	
G314	DC busbar material aluminum
G315	DC busbar material tin plated copper
G320	230 V AC control transformer
G330	Halogen-free wiring and materials
Cabling	
H352	Brake resistor cables through the bottom of the cabinet
H353	Brake resistor cables through the roof of the cabinet
H358	Blind 3 mm steel cable gland plates
H364	Blind 3 mm aluminum cable gland plates
H365	Blind 6 mm brass cable gland plates
H367	Control cables through the bottom of the cabinet
H368	Control cables through the roof of the cabinet
Control panel and PC options	
J400	Control panel (max. 4 per door)
J401	Drive monitoring display
J410	Control panel mounting platform (max. 4 per door)
J412	Common control panel
I/O extension and feedback interface modules	
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L509	RDCO-04 DDCS communication module
L525	FAIO-01 analog I/O extension module
L526	FDIO-01 digital I/O extension module
Z2016	Ring topology for fiber optic link without NDCU-95 DDCS branching unit
Fieldbus adapter modules	
K450	Panel bus selected
K451	FDNA-01 DeviceNet™ adapter module
K454	FPBA-01 PROFIBUS DP adapter module
K457	FCAN-01 CANopen adapter module
K458	FSCA-01 Modbus/RTU adapter module
K462	FCNA-01 ControlNet™ adapter module
K469	FECA-01 EtherCAT adapter module

CODE	DESCRIPTION
K470	FEPL-01 Ethernet POWERLINK adapter module
K473	FENA-11 Ethernet/IP™, Modbus/TCP and PROFINET adapter module
K475	FENA-21 high performance Ethernet/IP™, Modbus/TCP and PROFINET adapter module
K480	Ethernet switch with optical link for PC tool and control network
Documentation	
Note: English-language manuals are included if a translation in the specified language is not available.	
R700	English
R701	German
R702	Italian
R705	Swedish
R706	Finnish
R707	French
R708	Spanish
R711	Russian
R716	Hard copies of documentation

Brake chopper module type designation key

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

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

The subcodes are described below.

CODE	DESCRIPTION
Basic codes	
ACS880	Product series
104	Construction: inverter, supply, converter or brake module. The module includes internal d*u*/d*t* filters and a speed-controlled cooling fan supplied from the DC bus as standard.
Ratings / size	
xxxxx	Size
Voltage range	
3	513…566 V DC. This is indicated in the type designation label as typical input voltage level 566 V DC.
5	513…707 V DC. This is indicated in the type designation label as typical input voltage levels 566 / 679 / 707 V DC.

CODE	DESCRIPTION
7	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.
Option codes (plus codes)	
Construction	
C132	Marine type approval
C183	Module heater
C188	Direct-on-line cooling fan
Filter	
E205	Internal d*u*/d*t* filtering. Standard with 690 V modules
Auxiliary power supply	
G304	115 V AC auxiliary voltage supply
Specialities	
P904	Extended warranty 24/30
P909	Extended warranty 36/42
P942	Retrofit version (mechanically compatible with ACS800 R8i)

3

Mechanical installation

Contents of this chapter

This chapter describes the mechanical installation of the brake units.

Brake units

The ACS880 multidrive - the brake unit as one part of the complete drive - is transported in sections. See *ACS880 multidrive cabinets mechanical installation instructions* (3AUA0000101764 [English]).

User-defined brake resistors

Obey the brake resistor manufacturer’s instructions.

4

Guidelines for planning the electrical installation

Contents of this chapter

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

Limitation of liability

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

Generic guidelines

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

Selecting the brake resistors

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

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

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

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

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

Selecting and routing the brake resistor cables

Typical resistor cable sizes

See the technical data.

Minimizing electromagnetic interference

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

- Shield the braking power line completely, either by using shielded cable or a metallic enclosure. Unshielded single-core cable can only be used if it is routed inside a cabinet that efficiently suppresses radiated emissions.
- Install the cables away from other cable routes.
- Avoid long parallel runs with other cables. The minimum parallel cabling separation distance should be 0.3 meters (1 ft).
- Cross the other cables at right angles.
- Keep the cable as short as possible in order to minimize the radiated emissions and stress on chopper IGBTs. The longer the cable, the higher the radiated emissions, inductive load and voltage peaks over the IGBT semiconductors of the brake chopper.

Maximum cable length

See the technical data.

Placing the brake resistors

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

Arrange the cooling of the resistor in a way that:

- no danger of overheating is caused to the resistor or nearby materials
- the temperature of the room the resistor is located in does not exceed the allowed maximum.

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

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

Selecting the resistor thermal switch cable

Make sure that the cable connecting the resistor thermal switch to chopper control unit meets the following requirements:

- shielded cable
- rated operating voltage 0.6 kV / 1 kV (U_0/U)
- 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 following conditions are met:

- The resistor assembly is equipped with a thermal switch, which is connected to chopper control unit input.
- The cables are dimensioned according to the nominal current of the drive.

Operation principle

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

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

Protecting the system against short-circuits

The brake unit is equipped with fuses as standard.

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

5

Electrical installation

Contents of this chapter

This chapter contains instructions on wiring the brake units.

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 electrician, do not do installation or maintenance work.

Electrical safety precautions

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

WARNING!
Obey these instructions. If you ignore them, injury or death, or damage to the equipment can occur. If you are not a qualified electrician, do not do installation or maintenance work. Go through these steps before you begin any installation or maintenance work.

1. Keep the cabinet doors closed when the drive is powered. With the doors open, a risk of a potentially fatal electric shock, arc flash or high-energy arc blast exists.
2. Clearly identify the work location and equipment.
3. Disconnect all possible voltage sources. Lock and tag.
   - Open the main disconnecting device of the drive.
   - Open the charging switch if present.
   - Open the disconnector of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Make sure that re-connection is not possible. Lock the disconnectors to open position and attach a warning notice to them.
   - Disconnect any external power sources from the control circuits.
   - After you disconnect the drive, always wait 5 minutes to let the intermediate circuit capacitors discharge before you continue.
4. Protect any other energized parts in the work location against contact.
5. Take special precautions when close to bare conductors.
6. Measure that the installation is de-energized. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
   - Use a multimeter with an impedance of at least 1 Mohm.
   - Make sure that the voltage between the drive input power terminals and the grounding (PE) busbar is close to 0 V.
   - Make sure that the voltage between the drive DC busbars (+ and -) and the grounding (PE) busbar is close to 0 V.
   - If you have a permanent magnet motor connected to the drive, make sure that the voltage between the drive output terminals and the grounding (PE) busbar is close to 0 V.
7. Install temporary grounding as required by the local regulations.
8. Ask the person in control of the electrical installation work for a permit to work.

General notes

Static electricity

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

Optical components

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

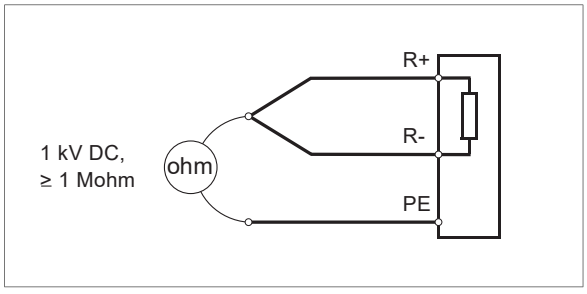
- Handle the fiber optic cables with care.
- When you unplug the fibre optic cables, always hold the connector, not the cable itself.
- Do not touch the ends of the fibers with bare hands as the ends are extremely sensitive to dirt.
- Do not bend the fiber optic cables too tightly. The minimum allowed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

Checking the insulation of brake resistor and resistor cable

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

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 38)* before you start the work.
2. Check that the resistor cable is connected to the resistor and disconnected from the drive output terminals.
3. At the drive end, connect the R+ and R- conductors of the resistor cable together. Measure the insulation resistance between the conductors and the PE conductor with a measuring voltage of 1000 V DC. The insulation resistance must be higher than 1 Mohm.

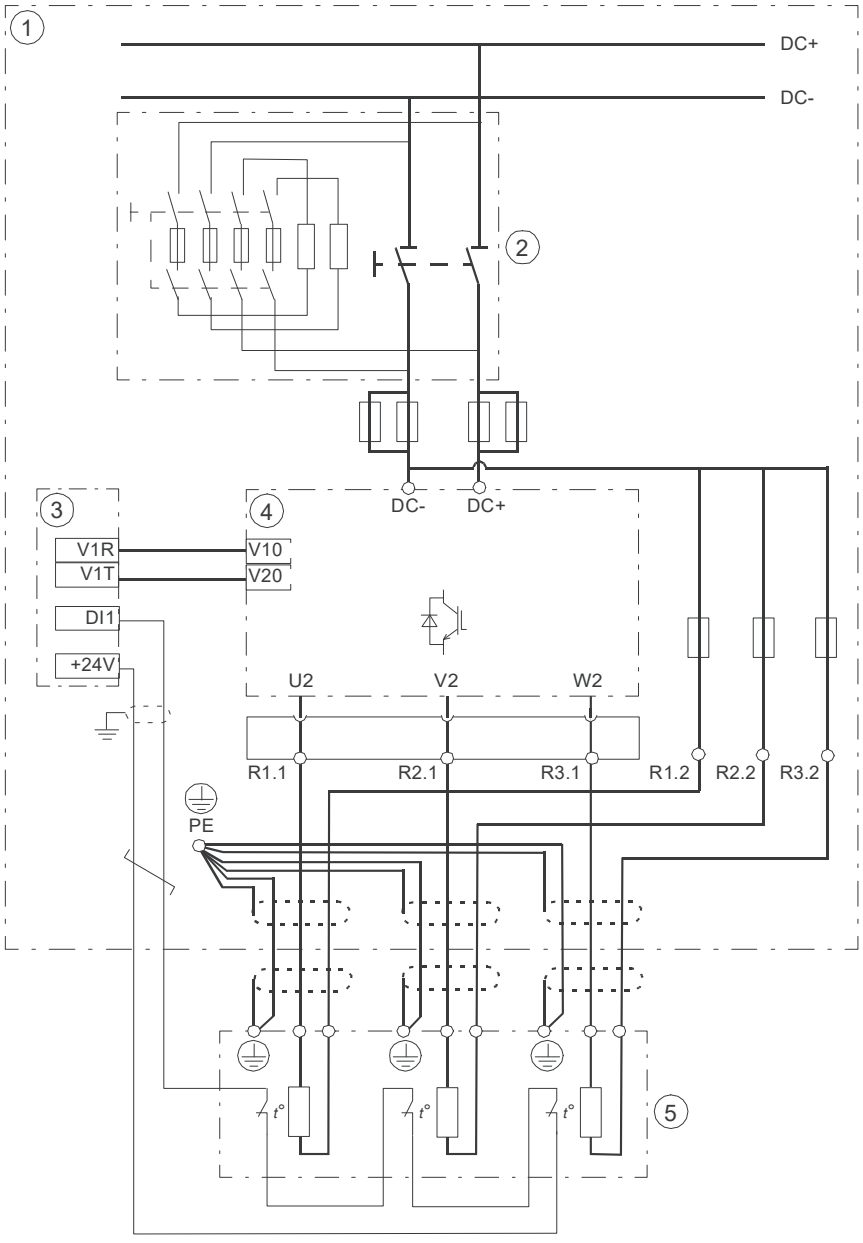


Connecting the brake resistor cables and thermal switch

Connection diagram

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

The diagram also shows the internal connections of the brake unit done by ABB.



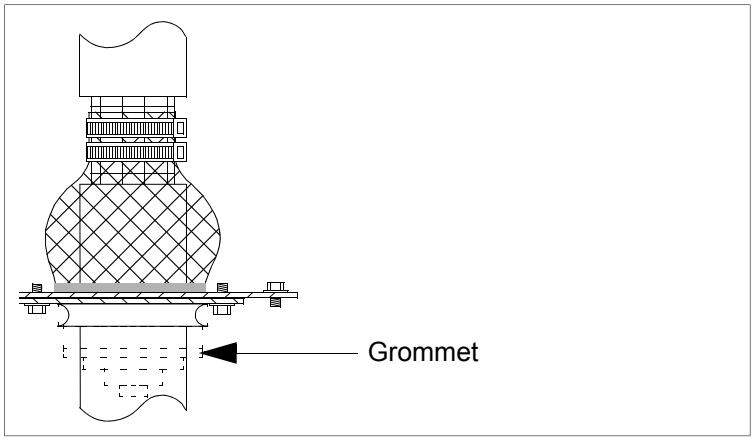
1	Brake chopper cubicle
2	DC switch/disconnector including charging circuit (+F286)
3	Control unit
4	Brake chopper module
5	Brake resistors

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 electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 38)* 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 *Technical data* for tightening torques.

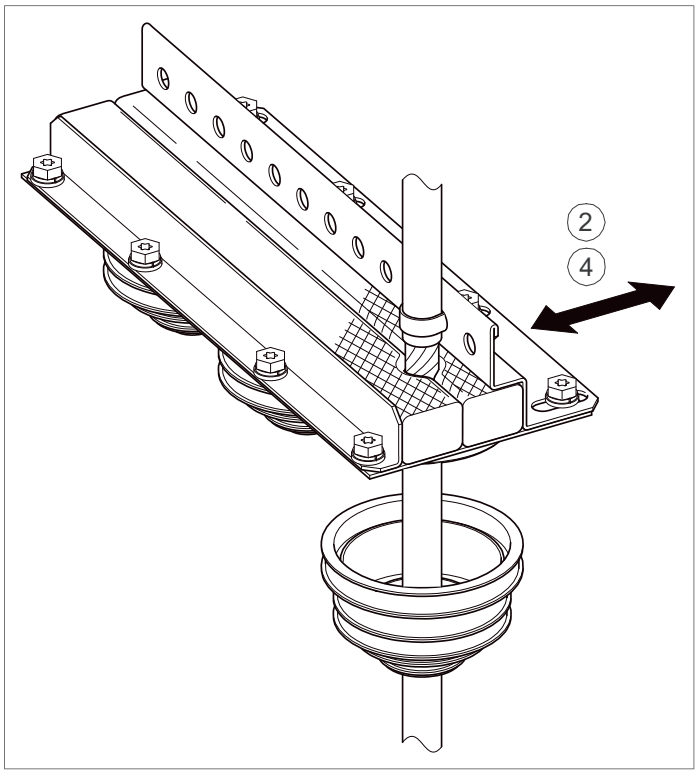
Connection procedure of the thermal switch cable

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

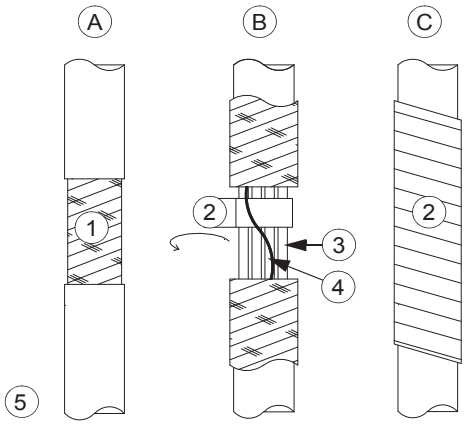
If you are not a qualified electrician, do not do installation or maintenance work.

Ground the outer shield of the cable 360 degrees at the cabinet lead-through, for example, as follows:

1. Stop the drive and do the steps in section *Electrical safety precautions (page 38)* before you start the work.
2. Slacken the locking screws of the entry and open it wide. Thread the cables through the grommets below the cable entry, then into the cubicle between the cushions.
3. Remove the outer jacket at the entry so that the cushions can press on the bare shield.



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



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

4. Push the cushions firmly together so that they press on the exposed cable shields. Tighten the locking screws.
5. Run the cables to their eventual connection points using existing trunking wherever possible. Protect the cables against any sharp edges or hot surfaces.
6. Strip the ends of the conductors. Try to keep the unshielded portion of the conductors as short as possible. Use tape or shrink tubing to contain any stray strands. Connect the conductors to the appropriate terminals. Twist the shields into a bundle, crimp a ring terminal onto it and connect it to the nearest chassis grounding point.
7. Refit any shrouds removed earlier.

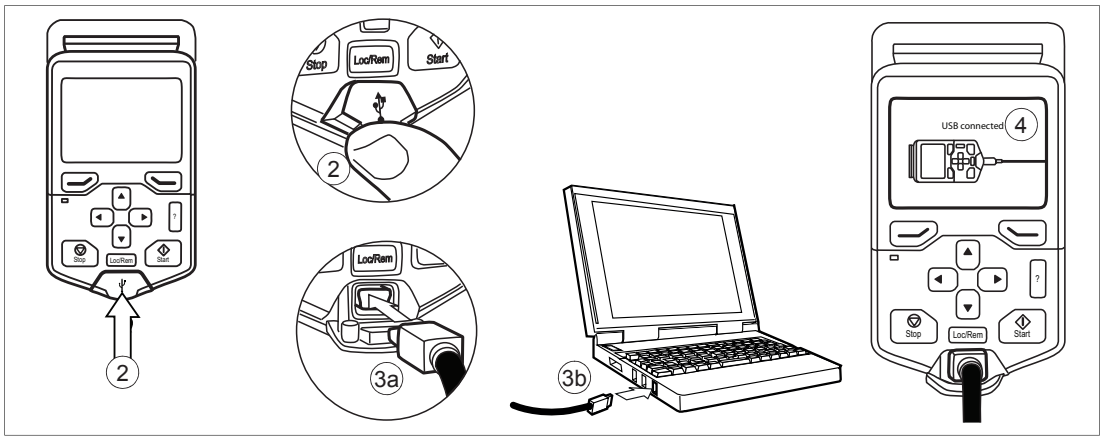
8. At the other end of the cables, leave the shields unconnected or ground them via a capacitor (eg. 3.3 nF / 630 V).

WARNING!
IEC 60664 and IEC 61800-5-1 require double or reinforced insulation between resistor live parts and the sensor. If the 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.

Connecting a PC

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

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



5. See the documentation of the PC tool for setup instructions.

6

Control units of the drive

Contents of this chapter

This chapter

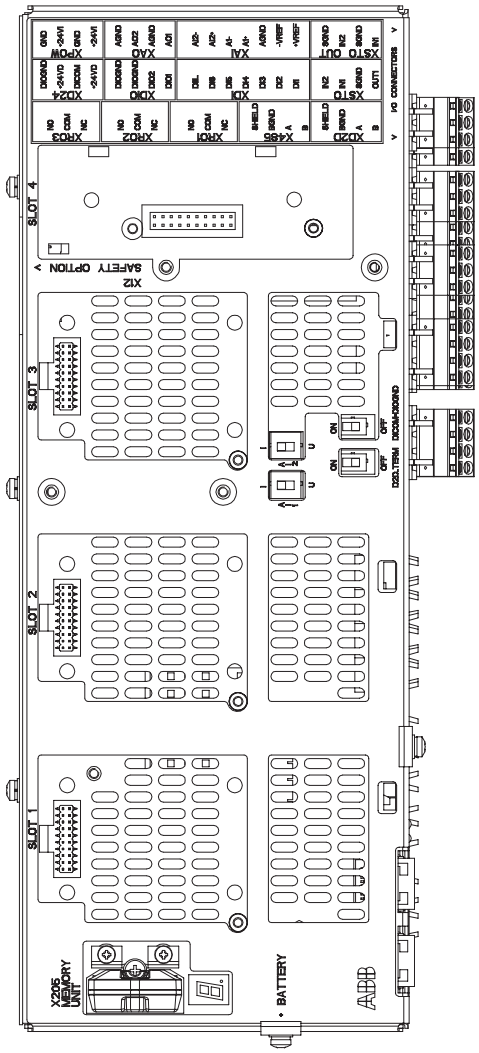
- describes the connections of the control unit,
- contains the specifications of the inputs and outputs of the control unit.

General

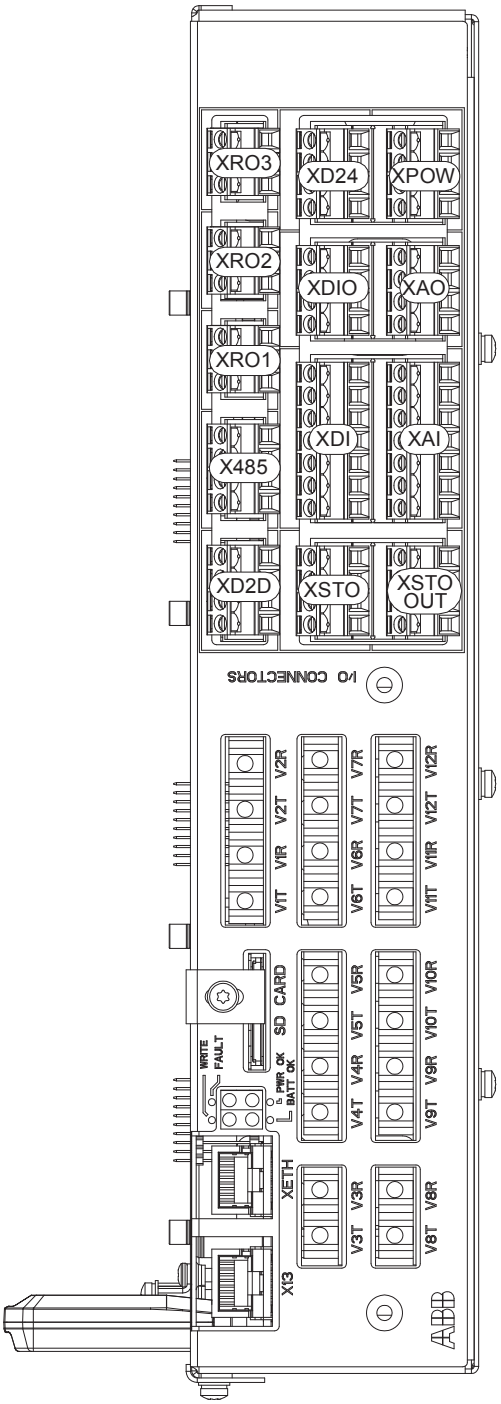
The brake unit is controlled by a BCU-x2 control unit. The BCU-x2 consists of a BCON-12 control board (and a BIOC-01 I/O connector board and power supply board) built in a metal housing. The control unit is connected to the brake module(s) by fiber optic cables.

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

BCU-x2 control unit layout and connections



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



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

Default I/O diagram of the brake control unit

The diagram below shows the default I/O connections on the brake control unit, and describes the use of the signals/connections. Under normal circumstances, the factory-made wiring should not be changed.

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

XD2D		**Drive-to-drive link**
1	B	Drive-to-drive link (not in use by default)
2	A	
3	BGND	
4	Shield	
X485		**RS485 connection**
5	B	Not in use (not in use by default)
6	A	
7	BGND	
8	Shield	
XRO1…XRO3		**Relay outputs**
11	NC	XRO1: **Running** 1) (energized = running) 250 V AC / 30 V DC / 2 A
12	COM	
13	NO	
21	NC	XRO2: **Fault (-1)** 1) (energized = no fault) 250 V AC / 30 V DC / 2 A
22	COM	
23	NO	
31	NC	XRO3: **Running** 1) (energized = running) 250 V AC / 30 V DC / 2 A
32	COM	
33	NO	
XSTO		**XSTO connector**
1	OUT	XSTO connector. Both circuits (power module, control unit) must be closed for the brake unit to start. (IN1 and IN2 must be connected to OUT.) 6)
2	SGND	
3	IN1	
4	IN2	
5	IN1	Not in use
6	SGND	
7	IN2	
8	SGND	
XDI		**Digital inputs**
1	DI1	Temp fault 1) (0 = overtemperature)
2	DI2	Not in use by default
3	DI3	Not in use by default
4	DI4	Not in use by default
5	DI5	Not in use by default
6	DI6	Reset 1) (0⟶1 = fault reset)
7	DIIL	Not in use by default
XDIO		**Digital input/outputs**
1	DIO1	Not in use by default
2	DIO2	Not in use by default
3	DIOGND	Digital input/output ground
4	DIOGND	Digital input/output ground
XD24		**Auxiliary voltage output**
5	+24VD	+24 V DC 200 mA 4)
6	DICOM	Digital input ground
7	+24VD	+24 V DC 200 mA 4)
8	DIOGND	Digital input/output ground
DICOM=DIOGND		**Ground selection switch** 5)
XAI		**Analog inputs, reference voltage output**
1	+VREF	10 V DC, R_L 1…10 kohm
2	-VREF	-10 V DC, R_L 1…10 kohm
3	AGND	Ground
4	AI1+	Not in use by default.
5	AI1-	0(4)…20 mA, R_{in} = 100 ohm 3)
6	AI2+	Not in use by default.
7	AI2-	0(2)…10 V, R_{in} > 200 kohm 2)
XAO		**Analog outputs**
1	AO1	**Zero** 1) 0…20 mA, R_L < 500 ohm
2	AGND	
3	AO2	**Zero** 1) 0…20 mA, R_L < 500 ohm
4	AGND	
XPOW		**External power input**
1	+24VI	24 V DC, 2.05 A
2	GND	
3	+24VI	
4	GND	
X12		**Safety functions module connection**
X13		**Control panel connection**
X205		**Memory unit connection**

Notes:

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

2) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI1. Change of setting requires reboot of control unit.

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

4) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.

5) Determines whether DICOM is separated from DIOGND (ie, common reference for digital inputs floats).
DICOM=DIOGND ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.

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

External power supply for the control unit (XPOW)

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

The XD2D connector

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

- basic master/follower communication with one master drive and multiple followers,
- fieldbus control through the embedded fieldbus interface (EFB), or
- drive-to-drive (D2D) communication implemented by application programming.

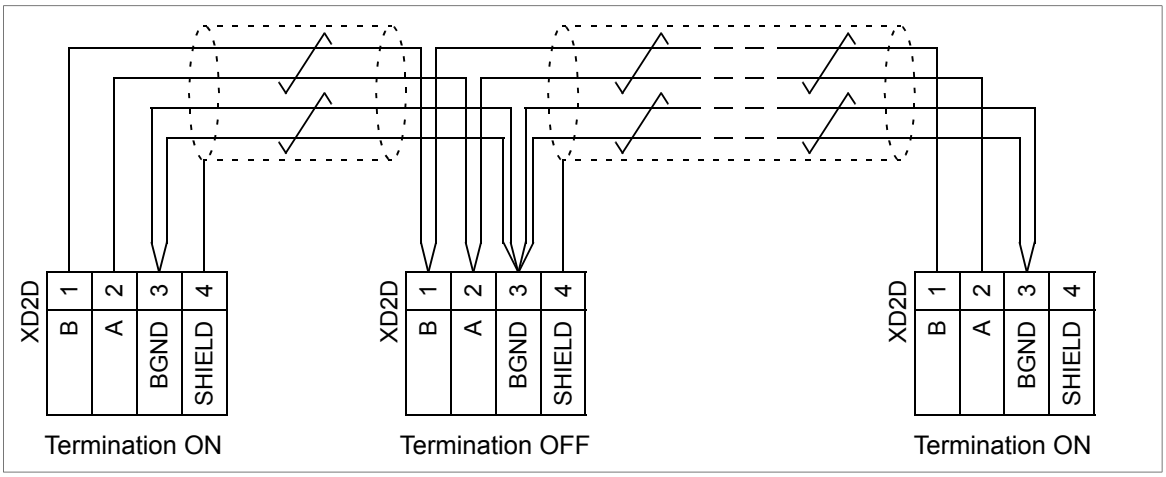
See the firmware manual of the drive for the related parameter settings.

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

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

The following diagram shows the wiring between control units.

BCU-x2



Safe torque off (XSTO, XSTO OUT)

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

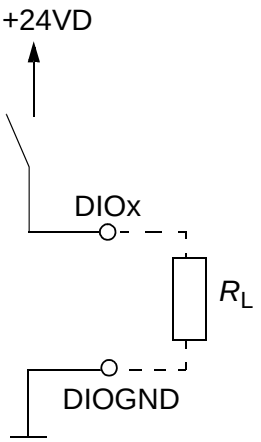
FSO-xx safety functions module connection (X12)

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

SDHC memory card slot

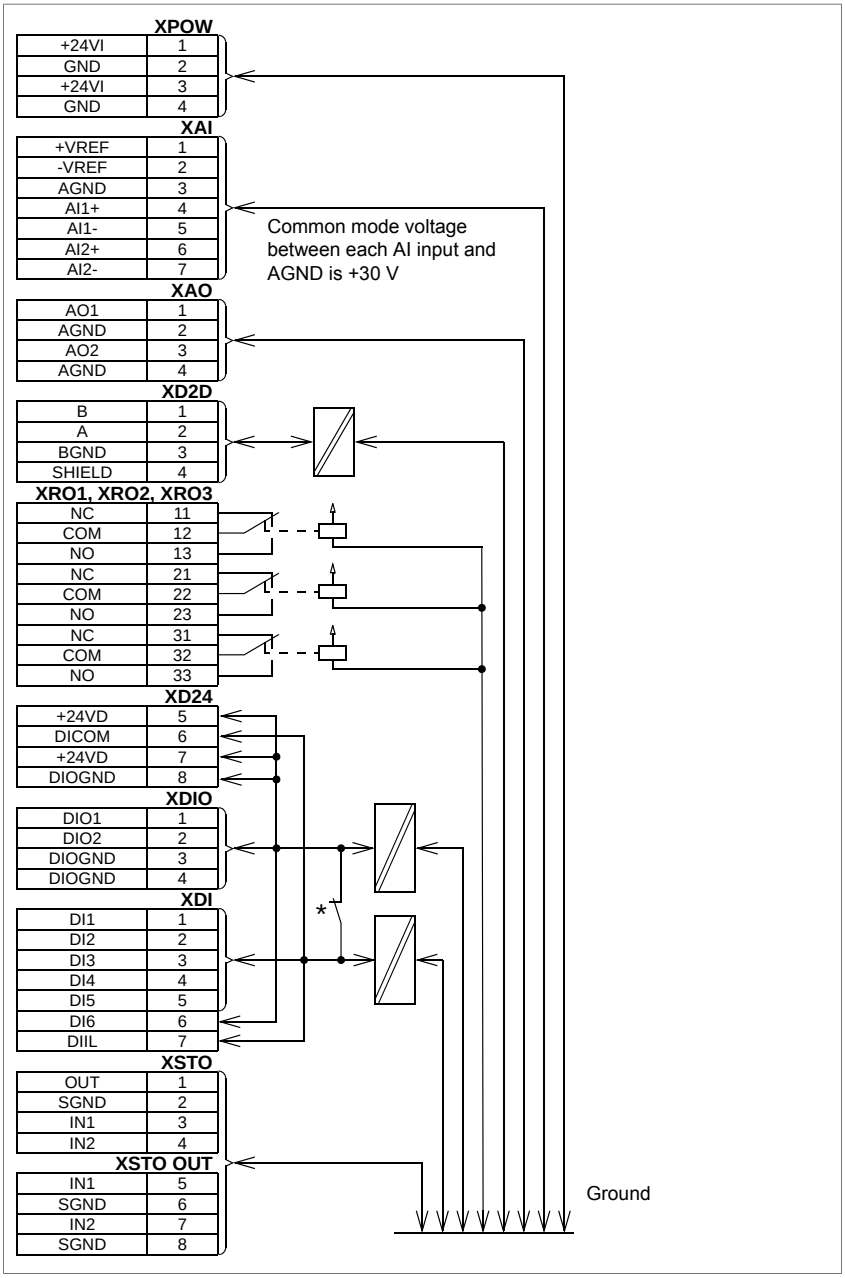
The BCU-x2 has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

Connector data

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

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

BCU-x2 ground isolation diagram



*Ground selector (DICOM=DIOGND) settings

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

7

Installation checklist of the drive

Contents of this chapter

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

Checklist

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

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

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

WARNING!
Stop the drive and do the steps in section *Electrical safety precautions (page 38)* before you start the work.

Make sure that …	☑
The ambient operating conditions (including free space around the drive) meet the specifications.	☐
The drive cabinet has been attached to floor, and if necessary due to vibration etc, also by its top to the wall or roof.	☐
The cooling air flows freely in and out of the drive.	☐
If the drive is connected to a network other than a symetrically grounded TN-S system: Check the compatibility. See the electrical installation instructions in the supply unit manual.	
There is an adequately sized protective earth (ground) conductor between the drive and the switchboard, the conductor has been connected to appropriate terminal, and the terminal has been tightened. (Pull on the conductor to check.) Proper grounding has also been measured according to the regulations.	☐

Make sure that …	☑
The input power cable has been connected to the appropriate terminals, the phase order is right, and the terminals have been tightened. (Pull on the conductors to check.)	☐
There is an adequately sized protective earth (ground) conductor between the motor and the drive, and the conductor has been connected to appropriate terminal, and the terminal has been tightened. (Pull on the conductors to check.). Proper grounding has also been measured according to the regulations.	☐
The motor cable has been connected to the appropriate terminals, the phase order is right, and the terminals have been tightened. (Pull on the conductors to check.)	☐
The motor cable has been routed away from other cables.	☐
No power factor compensation capacitors have been connected to the motor cable.	☐
If an external brake resistor has been connected to the drive: There is an adequately sized protective earth (ground) conductor between the brake resistor and the drive, and the conductor has been connected to appropriate terminal. Proper grounding has also been measured according to the regulations.	☐
If an external brake resistor has been connected to the drive: The brake resistor has been connected to the appropriate terminals, and the terminals have been tightened. (Pull on the conductors to check.)	☐
If an external brake resistor has been connected to the drive: The brake resistor cable has been routed away from other cables.	☐
The control cables have been connected to the appropriate terminals, and the terminals have been tightened. (Pull on the conductors to check.)	☐
The supply voltage matches the nominal input voltage of the drive. Check the type designation label.	☐
The voltage setting of the auxiliary voltage transformers (if any) is correct. See the electrical installation instructions.	☐
If a drive bypass connection will be used: The direct-on-line contactor of the motor and the drive output contactor are either mechanically or electrically interlocked, ie, cannot be closed simultaneously.	☐
There are no tools, foreign objects or dust from drilling inside the drive.	☐
The area in front of the drive is clean: the drive cooling fan cannot draw any dust or dirt inside.	☐
Cover(s) of the motor connection box are in place. Cabinet shrouds are in place and doors are closed.	☐
The motor and the driven equipment are ready for start.	☐

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.

If a task is valid only for a certain option device or feature, the option code is given in brackets, for example, (option +F286).

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

Start-up procedure

Tasks	☑
Safety	
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 electrician, do not do installation or maintenance work. **Note:** Some brake resistors are coated with oil film for protection. The protective oil will burn off when the brake resistor is used for the first time. Make sure that the airflow is sufficient.	☐
Installation checklist	
Make sure that the installation has been inspected. See the installation checklist.	☐
Supply and inverter units start-up	

Tasks	☑
Make sure that the supply unit of the drive system has been started up according to the instructions in its hardware manual.	☐
Make sure that the inverter units of the drive system have been started up according to the instructions in their hardware manual.	☐
Make sure that the supply unit is stopped, and the drive system has been isolated from the supply network.	☐
Powering up the DC bus	
Make sure that all cabinet doors are closed.	☐
WARNING! Before you close the drive main contactor / air circuit breaker (Q1) , make sure that sufficient inverter power is connected to the intermediate DC bus. A rule of thumb: The sum capacitance of the inverters connected must be at least 50% of the sum capacitance of all inverters. If there is not enough capacitive load at start, the DC voltage can overshoot the overvoltage limit causing immediate start of the brake unit and continuous supply for it by the supply unit. Constant braking will overload brake choppers and resistors and cause overheating.	☐
Close the disconnector of the supply transformer.	☐
Close the drive auxiliary voltage switch (Q21) to power up the control unit of the unit.	☐
Start the supply unit. See the supply unit hardware manual. When started, the supply unit charges the capacitors of all inverters and brake units connected to the DC bus.	☐
Brake units with DC switch/disconnector (option +F286): Connecting the brake unit to the DC bus	
To charge the brake unit capacitors, close the charging switch (Q10).	☐
When the green light on the cabinet door illuminates, close the DC switch/disconnector (Q11) of the brake unit.	☐
Open the charging switch (Q10). **Note:** The brake unit can start only after the charging switch is open.	☐
Setting up the brake unit parameters	
Check the brake control program parameter settings. See *ACS880 brake control program firmware manual* (3AXD50000020967 [English]).	☐
Operational tests	
Test the operation of the braking. See *ACS880 brake control program firmware manual* (3AXD50000020967 [English]).	☐

9

Fault tracing

Contents of this chapter

This chapter describes the fault tracing possibilities and maintenance instructions of the brake units.

Fault indications

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

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

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

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

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

LEDs

Control panel and panel platform/holder LEDs

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

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

Control unit LEDs

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

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

R8i module LEDs

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

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

Warning and fault messages

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

7-segment display of the brake control unit

See the control unit description.

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Maintenance

Contents of this chapter

This chapter refers to maintenance instructions of the brake unit.

Reference to maintenance instructions

See the *ACS880-107 inverter units hardware manual* (3AUA0000102519 [English]) for

- preventive maintenance intervals of cooling fans and converter modules
- instructions on how to replace the cooling fans and converter modules.

Replacing brake chopper and brake resistor fuses – bottom exit

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

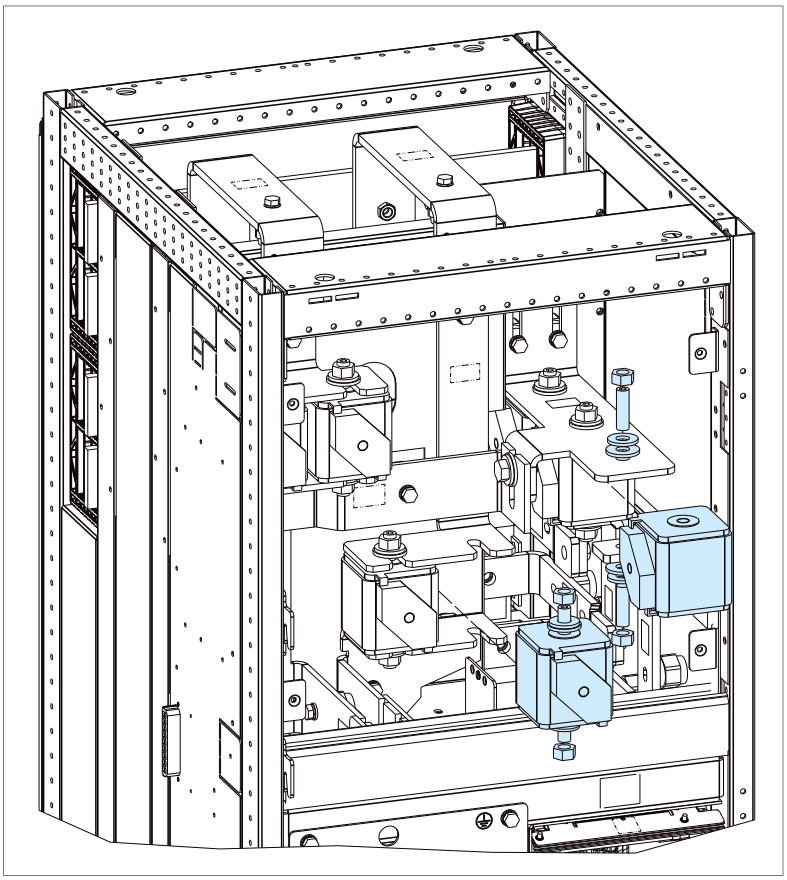
If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 38)* before you start the work.

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

2. Brake units without option +F286:
   - Open the cubicle door.
   - Remove the shroud in front of the fuses.
   - Replace the fuses as shown below.

   Brake units with DC switch/disconnector (option +F286):
   - Open the DC switch.
   - Open the cubicle door.
   - Remove the shroud in front of the fuses
   - Remove the BSFC board in front of the brake chopper fuses
   - Replace the fuses as shown below.



Replacing brake chopper and brake resistor fuses – top exit

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

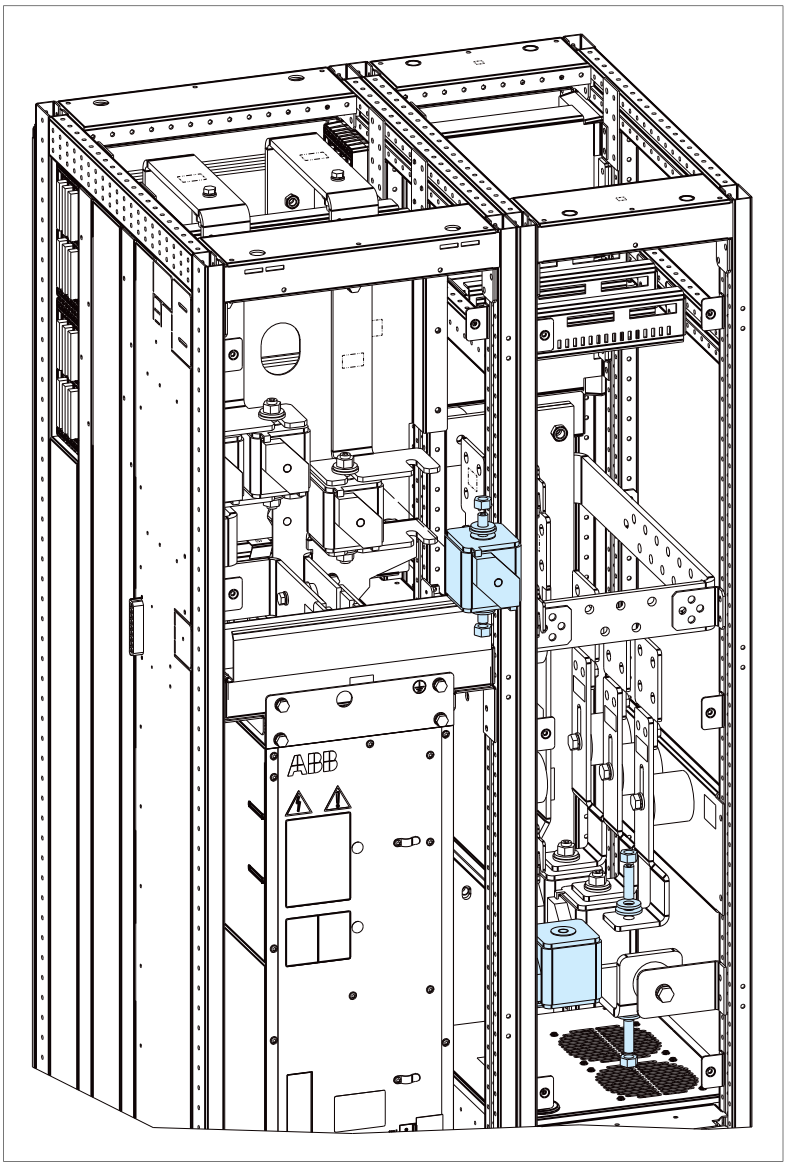
If you are not a qualified electrician, do not do installation or maintenance work.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 38)* before you start the work.

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

2. Brake units without option +F286:
   - Open the cubicle door.
   - Remove the shrouds in front of the fuses.
   - Replace the fuses as shown below.

   Brake units with DC switch/disconnector (option +F286):
   - Open the DC switch.
   - Open the cubicle door.
   - Remove the shrouds in front of the fuses.
   - Replace the fuses as shown below.



ABB

11

Technical data

Contents of this chapter

This chapter contains the technical data for the brake units.

Ratings

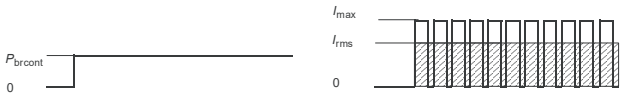
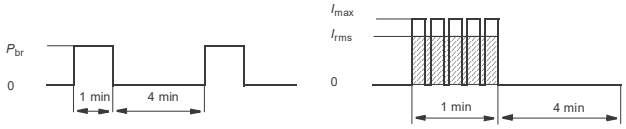
ACS880-607-…	Frame size	Resistor values		Ratings with R_{min}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
U_N = 400 V										
0500-3	R8i	1.7	2.1	781	310	500	370	999	351	640
0750-3	R8i	1.2	1.4	1171	465	750	555	1499	527	960
1000-3	2×R8i	1.7	2.1	1562	621	1000	740	1998	702	1290
1510-3	2×R8i	1.2	1.4	2342	931	1510	1110	2997	1053	1930
2260-3	3×R8i	1.2	1.4	3514	1396	2260	1665	4496	1580	2890
3010-3	4×R8i	1.2	1.4	4685	1862	3010	2220	5994	2106	3860
3770-3	5×R8i	1.2	1.4	5856	2327	3770	2775	7493	2633	4820
U_N = 500 V										
0630-5	R8i	2.2	2.6	781	310	630	370	999	351	800
0940-5	R8i	1.4	1.7	1171	465	940	555	1499	527	1210
1260-5	2×R8i	2.2	2.6	1562	621	1260	740	1998	702	1610
1880-5	2×R8i	1.4	1.7	2342	931	1880	1110	2997	1053	2410
2830-5	3×R8i	1.4	1.7	3514	1396	2830	1665	4496	1580	3620

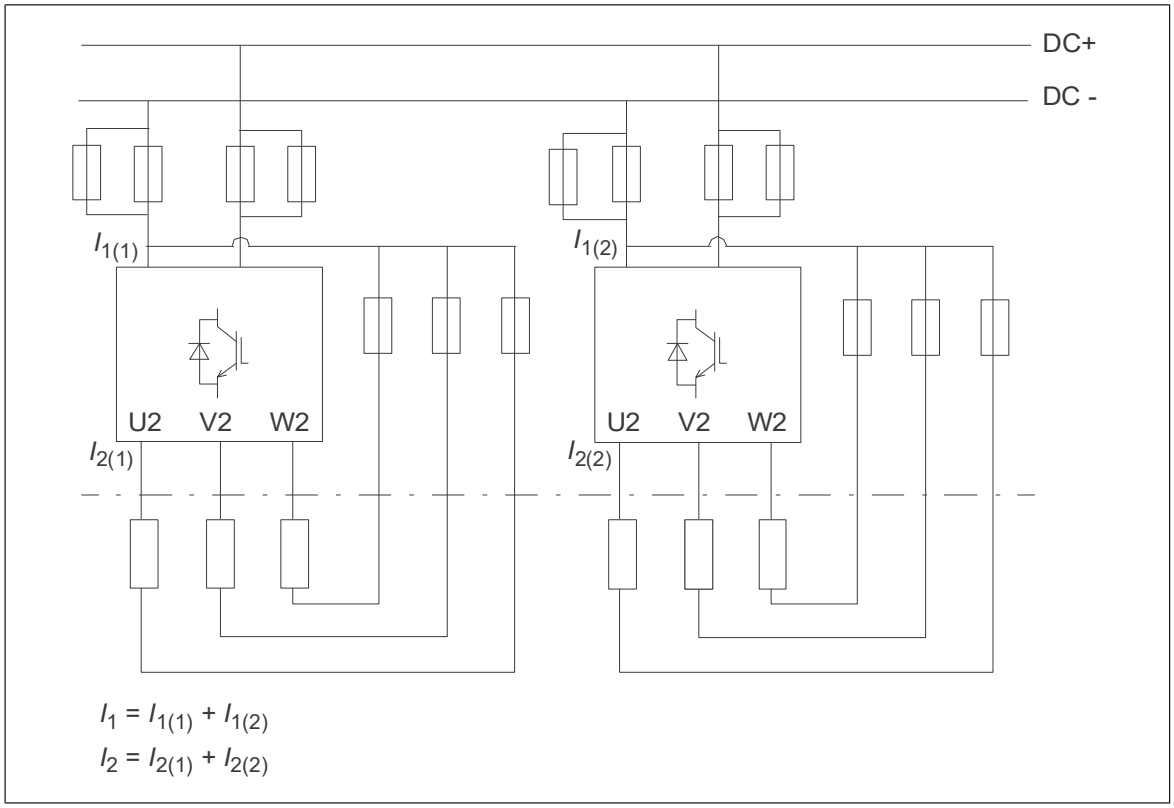
ACS880-607-…	Frame size	Resistor values		Ratings with R_{min}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
3770-5	4×R8i	1.4	1.7	4685	1862	3770	2220	5994	2106	4820
4710-5	5×R8i	1.4	1.7	5856	2327	4710	2775	7493	2633	6030
U_N = 690 V										
0870-7	R8i	3.0	3.6	781	310	870	370	999	351	1110
1300-7	R8i	2.0	2.4	1171	465	1300	555	1499	527	1660
1730-7	2×R8i	3.0	3.6	1562	621	1730	740	1998	702	2220
2600-7	2×R8i	2.0	2.4	2342	931	2600	1110	2997	1053	3330
3900-7	3×R8i	2.0	2.4	3514	1396	3900	1665	4496	1580	4990
5200-7	4×R8i	2.0	2.4	4685	1862	5200	2220	5994	2106	6650
6500-7	5×R8i	2.0	2.4	5856	2327	6500	2775	7493	2633	8320

ACS880-607-…	Frame size	Resistor values		Ratings with R_{max}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
U_N = 400 V										
0500-3	R8i	1.7	2.1	781	282	500	312	827	291	530
0750-3	R8i	1.2	1.4	1171	424	750	468	1241	436	800
1000-3	2×R8i	1.7	2.1	1562	565	1000	625	1655	581	1060
1510-3	2×R8i	1.2	1.4	2342	847	1510	937	2482	872	1600
2260-3	3×R8i	1.2	1.4	3514	1271	2260	1405	3723	1308	2400
3010-3	4×R8i	1.2	1.4	4685	1694	3010	1874	4964	1744	3190
3770-3	5×R8i	1.2	1.4	5856	2118	3770	2342	6205	2180	3990
U_N = 500 V										
0630-5	R8i	2.2	2.6	781	284	630	312	835	293	670
0940-5	R8i	1.4	1.7	1171	430	940	468	1277	449	1030
1260-5	2×R8i	2.2	2.6	1562	568	1260	625	1671	587	1340
1880-5	2×R8i	1.4	1.7	2342	860	1880	937	2555	898	2060
2830-5	3×R8i	1.4	1.7	3514	1289	2830	1405	3832	1347	3080
3770-5	4×R8i	1.4	1.7	4685	1719	3770	1874	5110	1795	4110
4710-5	5×R8i	1.4	1.7	5856	2149	4710	2342	6387	2244	5140
U_N = 690 V										
0870-7	R8i	3.0	3.6	781	283	870	312	833	293	920
1300-7	R8i	2.0	2.4	1171	425	1300	468	1249	439	1390
1730-7	2×R8i	3.0	3.6	1562	567	1730	625	1665	585	1850
2600-7	2×R8i	2.0	2.4	2342	850	2600	937	2498	878	2770

ACS880-607-…	Frame size	Resistor values		Ratings with R_{max}						
				No overload use			Cyclic load (1 min / 5 min)			
		R_{min}	R_{max}	I_1	I_2	$P_{contmax}$ (S_n)	I_{max}	I_{dc}	I_{rms}	P_{br}
		Ohm	Ohm	A DC	A DC	kW (kVA)	A DC	A DC	A DC	kW
3900-7	3×R8i	2.0	2.4	3514	1275	3900	1405	3746	1316	4160
5200-7	4×R8i	2.0	2.4	4685	1700	5200	1874	4995	1755	5540
6500-7	5×R8i	2.0	2.4	5856	2125	6500	2342	6244	2194	6930

Definitions

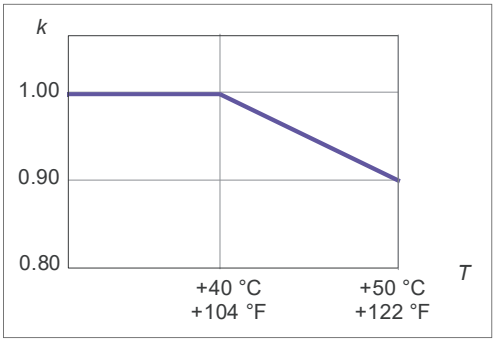
U_N	Nominal voltage.
R_{min}	Minimum allowed resistance value of the brake resistor per one phase of the brake module.
R_{max}	Maximum resistance value of the brake resistor per one phase of the brake module.
Note:	Connect one resistor per brake chopper module phase. For example, a brake unit of frame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



Derating

Temperature derating

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



Altitude derating

At altitudes from 1000 to 2000 m (3300 to 6561 ft) above sea level, the continuous output currents given above must be derated 1% for every 100 m (328 ft). For a more accurate derating, use the DriveSize PC tool.

Input and output voltages

Typical input and output voltages are listed below.

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

Type equivalence table

ACS880-607-...	Brake module type*	Basic module type	Frame size
U_N = 400 V			
0500-3	ACS880-104-0640A-3	ACS880-104-0640A-3	R8i
0750-3	ACS880-104-0900A-3	ACS880-104-0900A-3	R8i
1000-3	ACS880-104-1250A-3	ACS880-104-0640A-3	2×R8i
1510-3	ACS880-104-1760A-3	ACS880-104-0900A-3	2×R8i
2260-3	ACS880-104-2610A-3	ACS880-104-0900A-3	3×R8i
3010-3	ACS880-104-3450A-3	ACS880-104-0900A-3	4×R8i
3770-3	ACS880-104-4290A-3	ACS880-104-0900A-3	5×R8i
U_N = 500 V			
0630-5	ACS880-104-0590A-5	ACS880-104-0590A-5	R8i
0940-5	ACS880-104-0810A-5	ACS880-104-0810A-5	R8i
1260-5	ACS880-104-1150A-5	ACS880-104-0590A-5	2×R8i
1880-5	ACS880-104-1580A-5	ACS880-104-0810A-5	2×R8i
2830-5	ACS880-104-2350A-5	ACS880-104-0810A-5	3×R8i
3770-5	ACS880-104-3110A-5	ACS880-104-0810A-5	4×R8i
4710-5	ACS880-104-3860A-5	ACS880-104-0810A-5	5×R8i
U_N = 690 V			
0870-7	ACS880-104-0410A-7	ACS880-104-0410A-7	R8i
1300-7	ACS880-104-0600A-7	ACS880-104-0600A-7	R8i
1730-7	ACS880-104-0800A-7	ACS880-104-0410A-7	2×R8i
* Type of brake module(s) to be installed into a user-defined cabinet.			

ACS880-607-...	Brake module type*	Basic module type	Frame size
2600-7	ACS880-104-1170A-7	ACS880-104-0600A-7	2×R8i
3900-7	ACS880-104-1740A-7	ACS880-104-0600A-7	3×R8i
5200-7	ACS880-104-2300A-7	ACS880-104-0600A-7	4×R8i
6500-7	ACS880-104-2860A-7	ACS880-104-0600A-7	5×R8i
* Type of brake module(s) to be installed into a user-defined cabinet.			

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. $\boldsymbol{I_{\text{rms dim}}}$ is the dimensioning current.

ACS880-607-...	Frame size	$I_{\text{rms dim}}$	Cable data	
			Cable, T=70 °C	Cable, T=90 °C
		A	mm²	mm²
U_N = 400 V				
0500-3	R8i	372	3×(2×(3×120+70))	3×(3×240+120)
0750-3	R8i	559	3×(2×(3×240+120))	3×(2×(3×150+70))
1000-3	2×R8i	745	2×(3×(2×(3×120+70)))	2×(3×(3×240+120))
1510-3	2×R8i	1117	2×(3×(2×(3×240+120)))	2×(3×(2×(3×150+70)))
2260-3	3×R8i	1676	3×(3×(2×(3×240+120)))	3×(3×(2×(3×150+70)))
3010-3	4×R8i	2234	4×(3×(2×(3×240+120)))	4×(3×(2×(3×150+70)))
3770-3	5×R8i	2793	5×(3×(2×(3×240+120)))	5×(3×(2×(3×150+70)))
U_N = 500 V				
0630-5	R8i	372	3×(2×(3×120+70))	3×(3×240+120)
0940-5	R8i	559	3×(2×(3×240+120))	3×(2×(3×150+70))
1260-5	2×R8i	745	2×(3×(2×(3×120+70)))	2×(3×(3×240+120))
1880-5	2×R8i	1117	2×(3×(2×(3×240+120)))	2×(3×(2×(3×150+70)))
2830-5	3×R8i	1676	3×(3×(2×(3×240+120)))	3×(3×(2×(3×150+70)))
3770-5	4×R8i	2234	4×(3×(2×(3×240+120)))	4×(3×(2×(3×150+70)))
4710-5	5×R8i	2793	5×(3×(2×(3×240+120)))	5×(3×(2×(3×150+70)))
U_N = 690 V				
0870-7	R8i	372	3×(2×(3×120+70))	3×(3×240+120)
1300-7	R8i	559	3×(2×(3×240+120))	3×(2×(3×150+70))

ACS880-607-...	Frame size	$I_{rms\ dim}$	Cable data	
			Cable, T=70 °C	Cable, T=90 °C
		A	mm²	mm²
1730-7	2×R8i	745	2×(3×(2×(3×120+70)))	2×(3×(3×240+120))
2600-7	2×R8i	1117	2×(3×(2×(3×240+120)))	2×(3×(2×(3×150+70)))
3900-7	3×R8i	1676	3×(3×(2×(3×240+120)))	3×(3×(2×(3×150+70)))
5200-7	4×R8i	2234	4×(3×(2×(3×240+120)))	4×(3×(2×(3×150+70)))
6500-7	5×R8i	2793	5×(3×(2×(3×240+120)))	5×(3×(2×(3×150+70)))

Maximum cable length

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

Fuses

ACS880-607-…	DC fuses (IEC and UL)			Brake resistor fuses (IEC and UL)		
	Type	Data	Qty	Type	Data	Qty
U_N = 400 V						
0500-3	170M6410	630 A; 690 V	2	170M6408	500 A; 690 V	3
0750-3	170M6414	1000 A; 690 V	2	170M6412	800 A; 690 V	3
1000-3	170M6410	630 A; 690 V	4	170M6408	500 A; 690 V	6
1510-3	170M6414	1000 A; 690 V	4	170M6412	800 A; 690 V	6
2260-3	170M6414	1000 A; 690 V	6	170M6412	800 A; 690 V	9
3010-3	170M6414	1000 A; 690 V	8	170M6412	800 A; 690 V	12
3770-3	170M6414	1000 A; 690 V	10	170M6412	800 A; 690 V	15
U_N = 500 V						
0630-5	170M6410	630 A; 690 V	2	170M6408	500 A; 690 V	3
0940-5	170M6414	1000 A; 690 V	2	170M6412	800 A; 690 V	3
1260-5	170M6410	630 A; 690 V	4	170M6408	500 A; 690 V	6
1880-5	170M6414	1000 A; 690 V	4	170M6412	800 A; 690 V	6
2830-5	170M6414	1000 A; 690 V	6	170M6412	800 A; 690 V	9
3770-5	170M6414	1000 A; 690 V	8	170M6412	800 A; 690 V	12
4710-5	170M6414	1000 A; 690 V	10	170M6412	800 A; 690 V	15
U_N = 690 V						
0870-7	170M6544	630 A; 1250 V	2	170M6542	500 A; 1250 V	3

1300-7	170M6548	1000 A; 1100 V	2	170M6546	800 A; 1250 V	3
1730-7	170M6544	630 A; 1250 V	4	170M6542	500 A; 1250 V	6
2600-7	170M6548	1000 A; 1100 V	4	170M6546	800 A; 1250 V	6
3900-7	170M6548	1000 A; 1100 V	6	170M6546	800 A; 1250 V	9
5200-7	170M6548	1000 A; 1100 V	8	170M6546	800 A; 1250 V	12
6500-7	170M6548	1000 A; 1100 V	10	170M6546	800 A; 1250 V	15

Dimensions, weights and free space requirements

ACS880-607-…	Height 1	Height 2	Space above	Width 1	Width 2	Depth 1	Depth 2	Weight 1	Weight 2
	mm	mm	mm	mm	mm	mm	mm	kg	kg
U_N = 400 V									
0500-3	2145	2315	400	500	700	636	756	400	500
0750-3	2145	2315	400	500	700	636	756	400	500
1000-3	2145	2315	400	1000	1400	636	756	800	1000
1510-3	2145	2315	400	1000	1400	636	756	800	1000
2260-3	2145	2315	400	1500	2100	636	756	1200	1500
3010-3	2145	2315	400	2000	2800	636	756	1600	2000
3770-3	2145	2315	400	2500	3500	636	756	2000	2500
U_N = 500 V									
0630-5	2145	2145	400	500	700	636	756	400	500
0940-5	2145	2145	400	500	700	636	756	400	500
1260-5	2145	2145	400	1000	1400	636	756	800	1000
1880-5	2145	2145	400	1000	1400	636	756	800	1000
2830-5	2145	2145	400	1500	2100	636	756	1200	1500
3770-5	2145	2145	400	2000	2800	636	756	1600	2000
4710-5	2145	2145	400	2500	3500	636	756	2000	2500
U_N = 690 V									
0870-7	2145	2315	400	500	700	636	756	400	500
1300-7	2145	2315	400	500	700	636	756	400	500
1730-7	2145	2315	400	1000	1400	636	756	800	1000
2600-7	2145	2315	400	1000	1400	636	756	800	1000
3900-7	2145	2315	400	1500	2100	636	756	1200	1500
5200-7	2145	2315	400	2000	2800	636	756	1600	2000
6500-7	2145	2315	400	2500	3500	636	756	2000	2500

Height 1	Height of IP22 and IP42 units
Height 2	Height of IP54 units
Width 1	Standard width with bottom exit of cables
Width 2	Standard width with top exit of cables
Depth 1	Depth of standard units
Depth 2	Depth of units with air inlet through bottom
Weight 1	Weight of units with bottom exit of cables
Weight 2	Weight of units with top exit of cables

Losses, cooling data and noise

ACS880-607-...	Noise level	Losses	Cooling air flow	
	dB (A)	kW	m^3/h	ft^3/min
U_N = 400 V				
0500-3	72	3.1	1300	765
0750-3	72	4.8	1300	765
1000-3	74	6.3	2600	1530
1510-3	74	9.7	2600	1530
2260-3	76	14.5	3900	2295
3010-3	76	19.3	5200	3060
3770-3	77	24.1	6500	3825
U_N = 500 V				
0630-5	72	3.3	1300	765
0940-5	72	5.0	1300	765
1260-5	74	6.6	2600	1530
1880-5	74	10.0	2600	1530
2830-5	76	15.0	3900	2295
3770-5	76	20.0	5200	3060
4710-5	77	25.1	6500	3825
U_N = 690 V				
0870-7	72	4.2	1300	765
1300-7	72	6.3	1300	765
1730-7	74	8.4	2600	1530
2600-7	74	12.6	2600	1530
3900-7	76	18.9	3900	2295
5200-7	76	25.2	5200	3060
6500-7	77	31.5	6500	3825

Resistor connection

Voltage (U_2)	0…U_1 3-phase symmetrical.
	For ACS880-104-xxxx-3 modules: This is indicated in the type designation label as typical output voltage level 3x 0…566 VDC.
	For ACS880-104-xxxx-5 modules: This is indicated in the type designation label as typical output voltage levels 3x 0…566 / 679 / 707 VDC.
	For ACS880-104-xxxx-7 modules: This is indicated in the type designation label as typical output voltage levels 3x 0…742 / 849 / 976 (849 UL, CSA) VDC.
Maximum resistor cable length	300 m (984 ft)
Output terminals	Busbars to quick connector: M12. Torque: 50 N·m (37 lbf·ft) Busbars to support insulators: M8. Torque: 9 N·m (6.5 lbf·ft) Cables to busbars: M12. Torque: 70 N·m (52 lbf·ft)

Efficiency

Approximately 98% at nominal power level.

Protection classes

Degrees of protection (IEC/EN 60529)	IP22 (standard), IP42 (option +B054), IP54 (option +B055)
Enclosure types (UL50)	UL Type 1 (standard), UL Type 1 (option +B054), UL Type 12 (option +B055). For indoor use only.
Overvoltage category (IEC/EN 60664-1)	III, except for auxiliary power connections (fan, control, heating, lighting, cooling unit pump etc) which are category II.
Protective class (IEC/EN 61800-5-1)	I

Ambient conditions

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

	Operation installed for stationary use	**Storage in the protective package**	**Transportation in the protective package**
Installation site altitude	0…2000 m (0…6562 ft) above sea level. For altitudes over 2000 m, contact ABB. Output derated above 1000 m (3281 ft).	-	-
Air temperature	0 … +40 °C (+32 … +104 °F). No condensation allowed. Output derated in the range +40 … +50 °C (+104 … +122 °F).	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)

	Operation installed for stationary use	**Storage in the protective package**	**Transportation in the protective package**
Relative humidity	Max. 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Contamination	IEC/EN 60721-3-3:2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use of weather protected locations Chemical gases: Class 3C2 Solid particles: Class 3S2 (3S1 with IP20). No conductive dust allowed.	IEC 60721-3-1:1997 Chemical gases: Class 1C2 Solid particles: Class 1S3 (packing must support this, otherwise 1S2)	IEC 60721-3-2:1997 Chemical gases: Class 2C2 Solid particles: Class 2S2
Vibration IEC/EN 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Environmental testing Part 2: Tests –Test Fc: Vibration (sinusoidal)	IEC/EN 60721-3-3:2002 10…57 Hz: max. 0.075 mm amplitude 57…150 Hz: 1 *g* Units with marine construction (option +C121): Max. 1 mm (0.04 in.) (5 … 13.2 Hz), max. 0.7 *g* (13.2 … 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997 10…57 Hz: max. 0.075 mm amplitude 57…150 Hz: 1 *g*	IEC/EN 60721-3-2:1997 2…9 Hz: max. 3.5 mm amplitude 9…200 Hz: 10 m/s^2 (32.8 ft/s^2)
Shock IEC 60068-2-27:2008, EN 60068-2-27:2009 Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	Not allowed	With packing max. 100 m/s^2 (328 ft/s^2) 11 ms	With packing max. 100 m/s^2 (328 ft/s^2) 11 ms

Materials

Cabinet	• Hot-dip zinc coated steel sheet 1.5 mm • Polyester thermosetting powder coating on visible surfaces, color RAL 7035 and RAL 9017
Busbars	Aluminum or copper
Air filters of IP54 units (option +B055)	Inlet (door) • Camfil/airComp 300-50 • 288 mm x 521 mm • 688 mm x 521 mm Outlet (roof) • Camfil/airTex G150 • 2 pcs: 398 mm x 312 mm
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinctive
Package	Standard package: • timber, polyethylene sheet (thickness 0.15 mm), stretch film (thickness 0.023 mm), PP tape, PET strap, sheet metal (steel) • for land and air transport when planned storage time is less than 2 months or when storage can be arranged in clean and dry conditions less than 6 months • can be used when products will not be exposed to corrosive atmosphere during transport or storage Container package: • timber, VCI sheet film (PE, thickness 0.10 mm), VCI stretch film (PE, thickness 0.04 mm), VCI emitter bags, PP tape, PET strap, sheet metal (steel) • for sea transport in containers • recommended for land and air transport when storage time prior to installation exceeds 6 months or storage is arranged in partially weather-protected conditions Seaworthy package: • timber, plywood, VCI sheet film (PE, thickness 0.10 mm), VCI stretch film (PE, thickness 0.04 mm), VCI emitter bags, PP tape, PET strap, sheet metal (steel) • for sea transport with or without containerization • for long storage periods in environments where roofed and humidity-controlled storage cannot be arranged Cabinets are fastened to the pallet with screws and braced from the top end to the package walls to prevent swaying inside the package. Package elements are attached to each other with screws.
Disposal	The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated. Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.

Standards

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

Markings

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

Tightening torques

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

Electrical connections

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

Mechanical connections

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

Insulation supports

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

Cable lugs

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

Disclaimers

Generic disclaimer

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

Cybersecurity disclaimer

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

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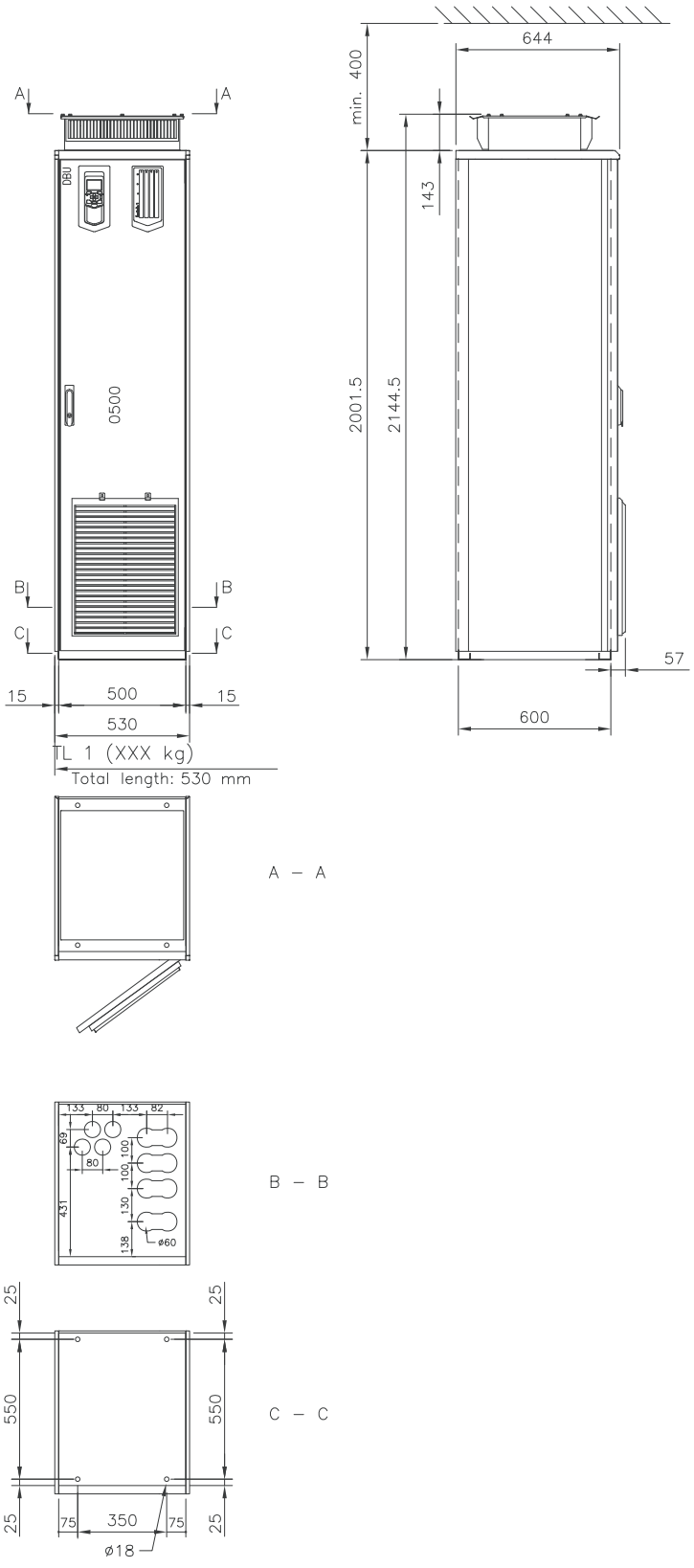
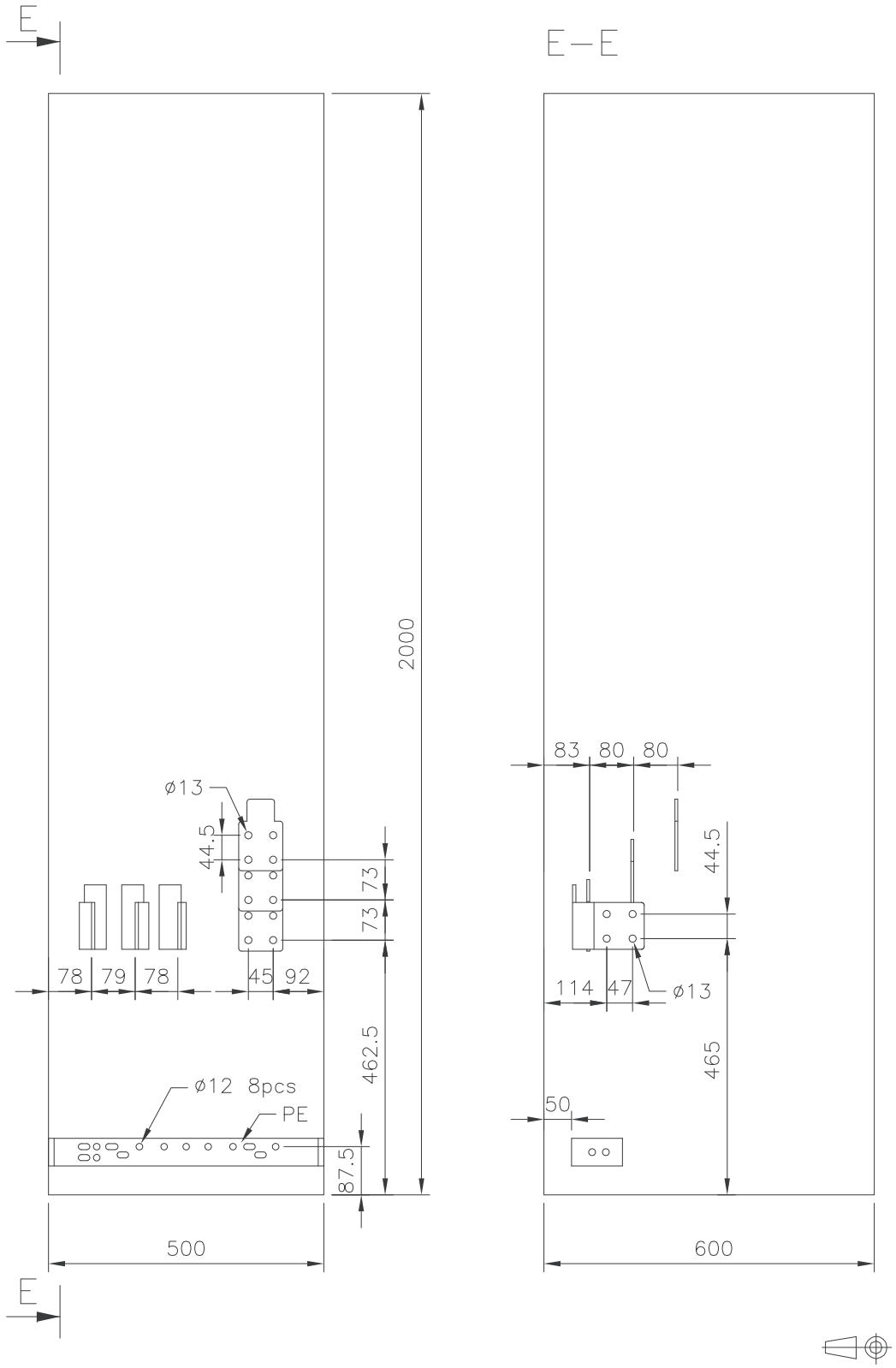
Dimension drawings

Contents of this chapter

This chapter contains example dimension drawings for the brake units.

Dimension drawing – bottom exit

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78
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83
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80
44.5
114
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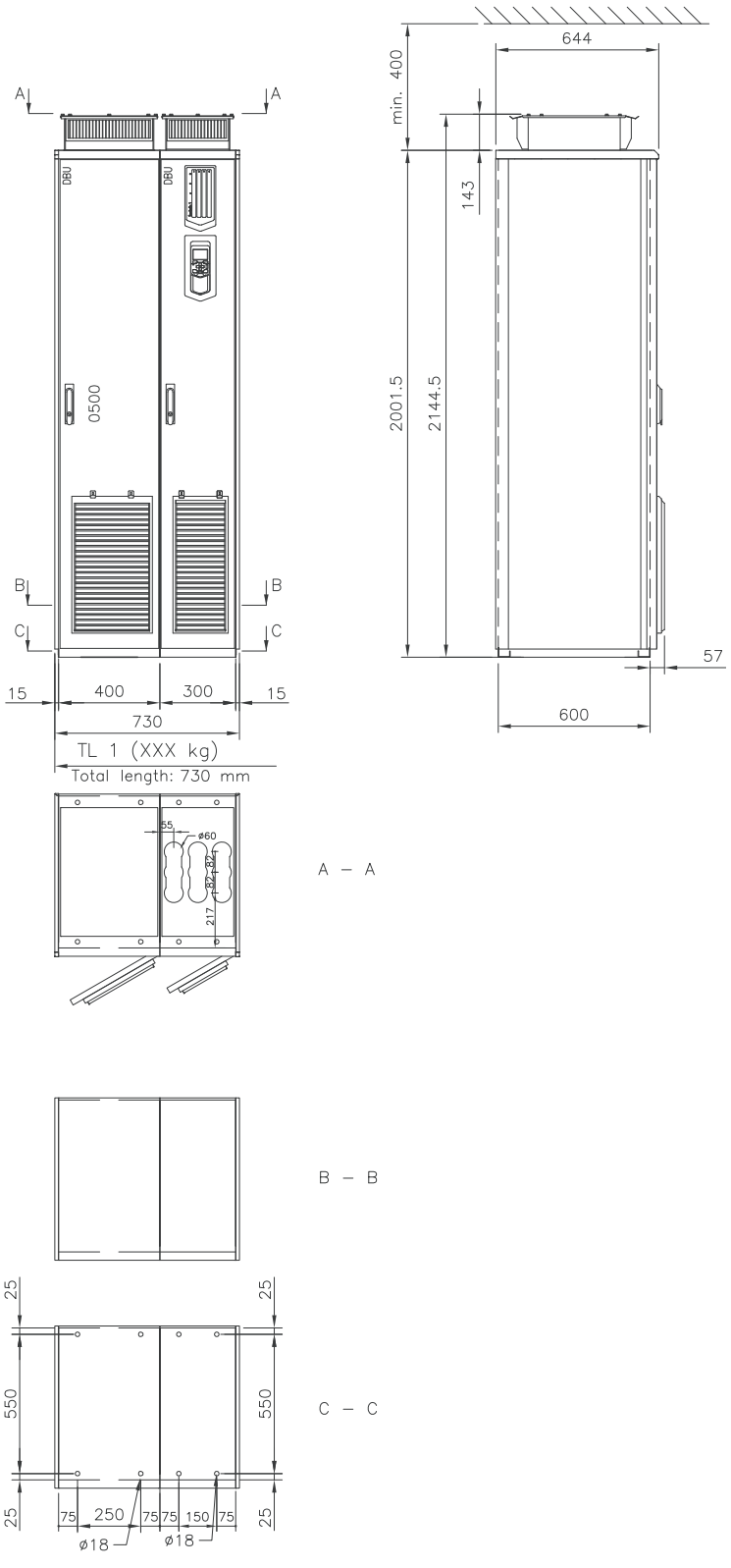
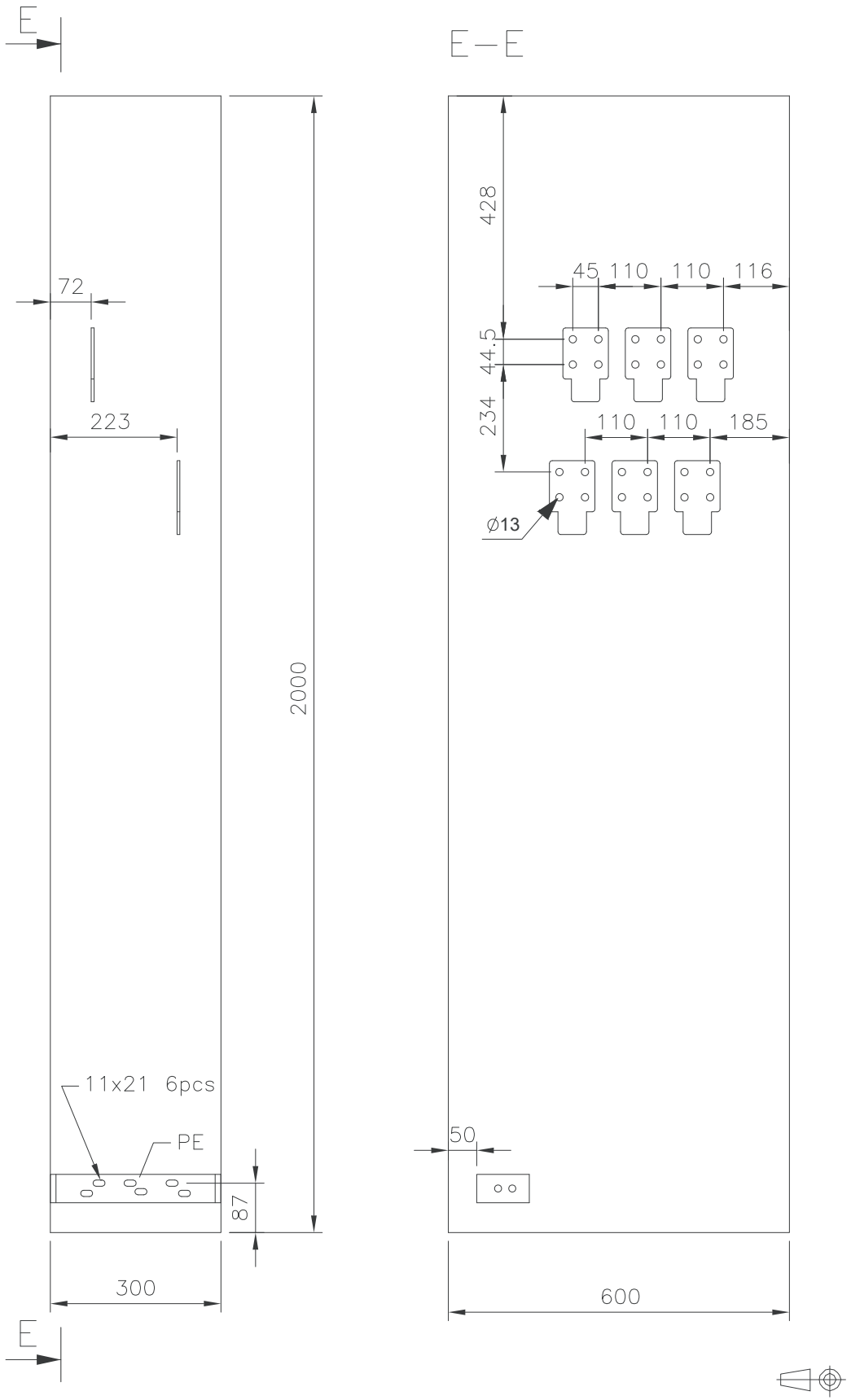
50
600

Dimension drawing – top exit




E
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72
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600

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.

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