

ABB INDUSTRIAL DRIVES

ACS880-107 inverter units

Hardware manual



ACS880-107 inverter units

Hardware manual

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4. Electrical installation



6. Start-up



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Further information



1

Introduction to the manual

Contents of this chapter

This chapter gives basic information on the manual.

Applicability

The manual is applicable to ACS880 multidrive inverter units that form a part of an ACS880 multidrive system. ACS880 multidrive inverter units have the basic type designation of ACS880-107.

Safety instructions

Obey all safety instructions delivered with the drive.

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

Target audience

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

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

Categorization by frame size, option code and item designation

Some descriptions, instructions, technical data and dimensional drawings which concern only a certain group of units may be marked with the symbol of the frame size (such as “R2i”, “4×R8i”, etc.). The marking derives from the quantity and basic construction of the inverter modules that form the inverter unit. For example, the frame size “2×R8i” indicates that the inverter unit consists of two frame size R8i inverter modules connected in parallel.

The frame size is marked on the type designation labels. The frame size of each inverter module is also shown in the rating tables. See the technical data.

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

Use of component designations

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

Terms and abbreviations

Term	Description
BCU	Type of control unit
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
FAIO-01	Optional analog I/O extension module
FCAN	Optional CANopen® adapter module
FCNA	Optional ControlNet™ adapter module
FDCO	Optical DDCS communication module
FDIO-01	Optional digital I/O extension module
FDNA	Optional DeviceNet™ adapter module
FDPI	Diagnostics and panel interface board
FECA	Optional EtherCAT adapter module
FEIP	Optional Ethernet adapter module
FEN-01	Optional TTL incremental encoder interface module
FEN-11	Optional TTL absolute encoder interface module
FEN-21	Optional resolver interface module
FEN-31	Optional HTL incremental encoder interface module
FENA	Optional Ethernet adapter module
FEPL	Optional Ethernet POWERLINK adapter module
FIO-01	Optional digital I/O extension module
FIO-11	Optional analog I/O extension module
FMBT	Optional Ethernet adapter module for Modbus TCP protocol
FPBA	Optional PROFIBUS DP adapter module
FPNO	Optional Profinet IO adapter module
FPTC-01	Optional thermistor protection module
FPTC-02	Optional ATEX-certified thermistor protection module for potentially explosive atmospheres

Term	Description
Frame, frame size	Physical size of the drive or power module
FSCA	Optional Modbus RTU adapter module
FSE-31	Optional pulse encoder interface module for safety encoder
FSO-12, FSO-21	Optional functional safety modules
IGBT	Insulated gate bipolar transistor
Intermediate circuit	DC circuit between rectifier and inverter
INU	Inverter unit
Inverter	Converts direct current and voltage to alternating current and voltage.
Inverter module	Inverter bridge, related components and drive DC link capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.
Inverter unit	Inverter module(s) under control of one control board, and related components. One inverter unit typically controls one motor.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
Parameter	In the drive control program, user-adjustable operation instruction to the drive, or signal measured or calculated by the drive. In some (for example fieldbus) contexts, a value that can be accessed as an object, eg, variable, constant, or signal.
PLC	Programmable logic controller
RDCO	Optical DDCS communication module
RFI	Radio-frequency interference
SIL	Safety integrity level (1...3) (IEC 61508)
STO	Safe torque off (IEC/EN 61800-5-2)
Supply unit	Supply module(s) under control of one control board, and related components.
UPS	Uninterruptible power supply
ZCU	Type of control unit

Related documents

Manual	Code
General manuals	
<i>ACS880 multidrive cabinets and modules safety instructions</i>	3AUA0000102301
<i>ACS880 multidrive cabinets and modules electrical planning instructions</i>	3AUA0000102324
<i>ACS880 multidrive cabinets mechanical installation instructions</i>	3AUA0000101764
Supply unit manuals	
<i>ACS880-207 IGBT supply units hardware manual</i>	3AUA0000130644
<i>ACS880 IGBT supply control program firmware manual</i>	3AUA0000131562
<i>ACS880-307 +A003 diode supply units hardware manual</i>	3AUA0000102453
<i>ACS880-307...+A018 diode supply units hardware manual</i>	3AXD50000011408
<i>ACS880 diode supply control program firmware manual</i>	3AUA0000103295
<i>ACS880-907 regenerative rectifier units hardware manual</i>	3AXD50000020546
<i>ACS880 regenerative rectifier control program firmware manual</i>	3AXD50000020827
Inverter unit manuals	
<i>ACS880-107 inverter units hardware manual</i>	3AUA0000102519
<i>ACS880 primary control program firmware manual</i>	3AUA0000085967
<i>ACS880 primary control program quick start-up guide</i>	3AUA0000098062
Manuals for application programs (Crane, Winder, etc.)	
Brake unit and DC/DC converter unit manuals	

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Manual	Code
<i>ACS880-607 1-phase brake units hardware manual</i>	3AUA0000102559
<i>ACS880-607 3-phase brake units hardware manual</i>	3AXD50000022034
<i>ACS880 (3-phase) brake control program firmware manual</i>	3AXD50000020967
<i>ACS880-1607 DC/DC converter units hardware manual</i>	3AXD50000023644
<i>ACS880 DC/DC converter control program firmware manual</i>	3AXD50000024671
Option manuals	
<i>ACS880 +C132 marine type-approved cabinet-built drives supplement</i>	3AXD50000039629
<i>ACS-AP-x assistant control panels user's manual</i>	3AUA0000085685
<i>Drive composer start-up and maintenance PC tool user's manual</i>	3AUA0000094606
<i>Converter module lifting device for drive cabinets hardware manual</i>	3AXD50000210268
<i>Lifter for air-cooled drive modules user's guide</i>	3AXD50000332588
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.

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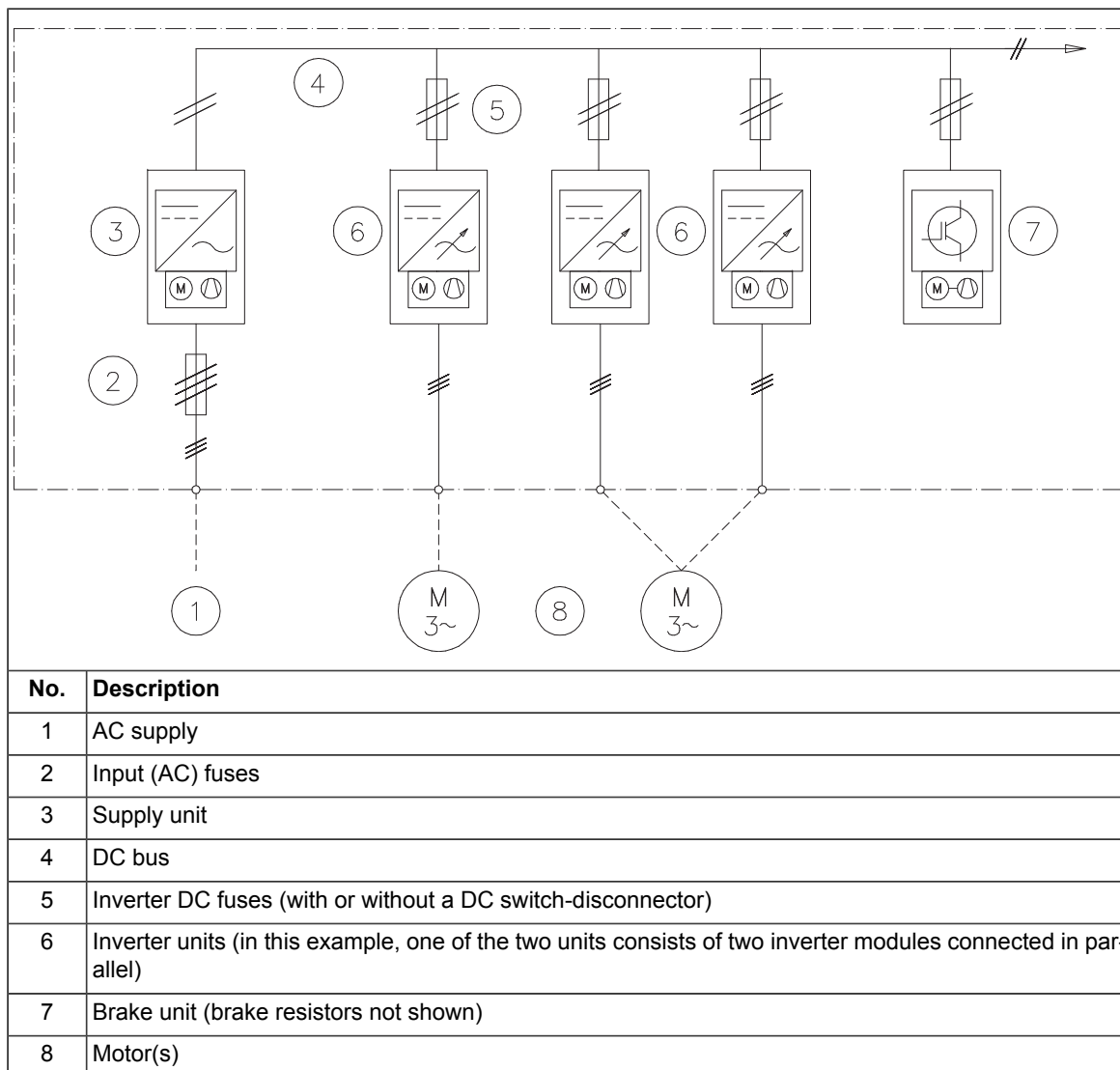
Hardware description

Contents of this chapter

This chapter describes a typical drive system and the hardware of the inverter unit. The information is valid for all ACS880-107 inverter units.

Overview diagram of the drive system

The diagram below depicts a common DC bus drive system.



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

The inverter units can be used for controlling asynchronous AC induction motors, permanent magnet synchronous motors, AC induction servomotors and ABB synchronous reluctance motors (SynRM).

Inverter unit hardware

■ General

An inverter unit contains the components required to control one motor. These include one or more inverter modules connected in parallel, together with the necessary auxiliary equipment such as control electronics, fusing, cabling and switchgear.

ACS880-107 inverter units range from 1.5 to 5600 kW in power. ACS880-107 inverter units employ inverter modules from frame size R1i to R8i. Up to approximately 500 kW, inverter units consist of one module only; higher powers are achieved by connecting multiple R8i modules in parallel.

All inverter modules have coated circuit boards as standard.

■ Cabinet system

An inverter unit is built into one or more adjoining cubicles and contains the components that are required to control one motor. At smaller inverter sizes, a single cubicle may contain several inverter units, each controlling a different motor. On the other hand, large inverter units consist of parallel-connected modules and may occupy several cubicles.

Examples of the cabinet configurations are included below as well as in the dimensions and weights chapter. The motor cabling direction is optionally up or down – see below under each module frame size for specific information.

■ Cooling

Each inverter module has its own cooling fan(s). Control cubicles may have additional cooling fans.

The inverter cubicles have the air intake at the lower part of the door. The intake can optionally be through the floor, adding 130 mm (5.12") to the standard depth of 600 mm (23.62") of the cabinet.

The cooling air outlets are on the roof of each cubicle. Some configurations have exhaust fans fitted inside the top compartment of the cubicle. A channeled air outlet is optional.

■ Inverter module frame sizes R1i to R4i

General

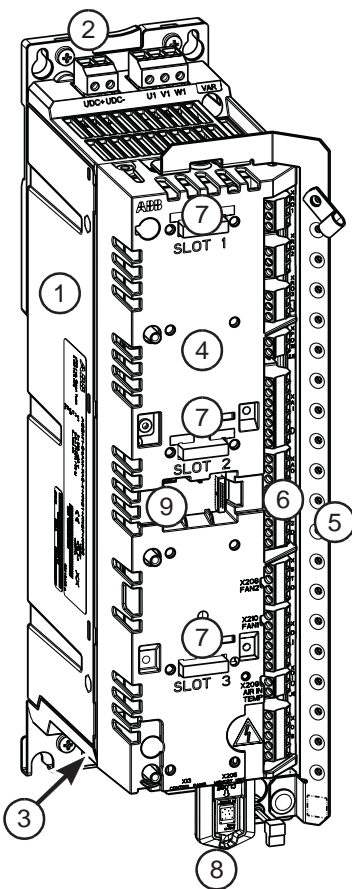
The motor (output) cables are connected to either detachable or non-detachable screw terminal blocks at the bottom of the cubicle. The modules have a built-in ZCU drive control unit, which contains the basic I/Os and slots for optional I/O modules.

The modules have an internal capacitor precharge circuit.

External optional equipment is primarily installed on mounting plates in the same cubicle.

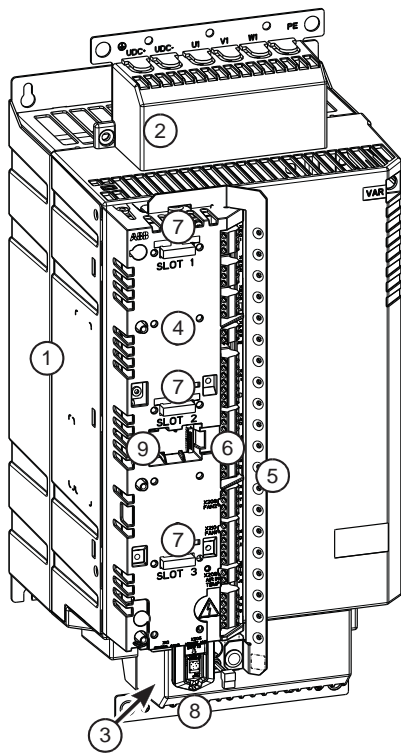
Module layout examples

Frame R1i (Frame R2i has a similar layout)



Item	Explanation
1	Power unit
2	DC (input) connections
3	Motor (output) connection (obscured). This has been wired to a separate terminal block in the lower part of the cubicle.
4	ZCU-14 control unit mounted on top of the power unit
5	Grounding/strain relief rail for control cables.
6	I/O terminal blocks
7	3 slots for optional modules
8	Memory unit
9	Connection for FSO-xx safety functions module

Frame R4i (Frame R3i has a similar layout)



Item	Explanation
1	Power unit
2	DC (input) connections (under connector cover)
3	Motor (output) connection (under connector cover). This has been wired to a separate terminal block in the lower part of the cubicle.
4	ZCU-14 control unit mounted on top of the power unit
5	Grounding/strain relief rail for control cables
6	I/O terminal blocks
7	3 slots for optional modules
8	Memory unit
9	Connection for FSO-xx safety functions module

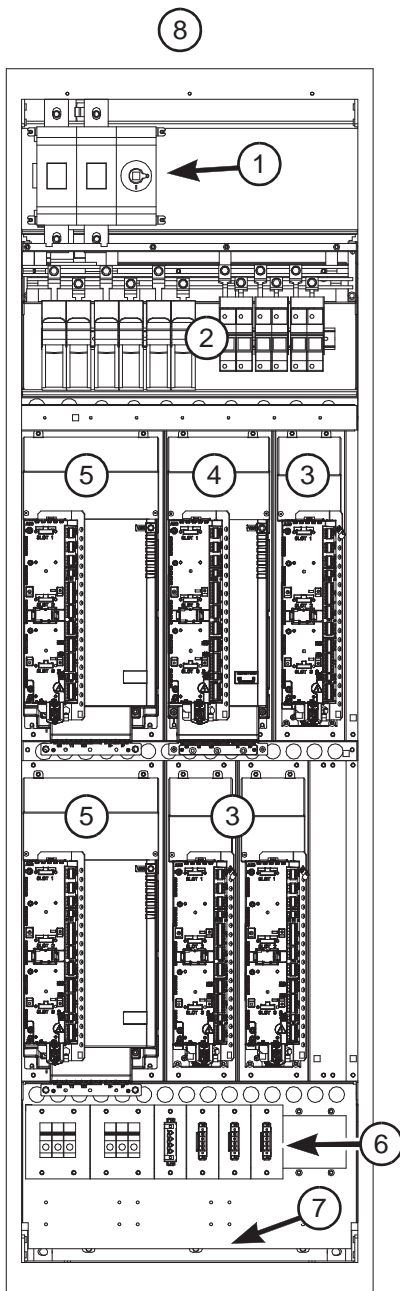
Standard cabinet layout

Several inverter modules of frame sizes R1i...R4i can be installed in one cubicle. The standard cubicle width is 400, 600, 800 or 1000 mm depending on the size and number of inverter modules installed.

Each module has dedicated DC fuse disconnectors. The motor (output) connections are located at the lower part of the cubicle; depending on the power of the inverter module, these are either detachable or non-detachable terminal blocks.

The cubicle is equipped with cable entries for the motor cables in the floor.

The picture below presents an example of a 600 mm wide cubicle with three R1i, one R3i and two R4i modules.



Item	Explanation
1	Main DC switch fuse for all units in the cubicle (optional) or main DC fuses
2	DC fuse disconnectors for each individual module
3	Three frame R1i inverter modules
4	Frame R3i inverter module
5	Two frame R4i inverter modules
6	Output connections
7	Cable entries
8	Air outlet compartment with cabinet cooling fan (not shown)

Layout of cubicle with frame R1i...R4i modules in their own compartments (option +C204)

If option +C204 is selected, each inverter module is installed into its own compartment behind a door. Up to three inverter modules of frame sizes R1i...R4i can be installed in one 400 mm wide cubicle.

At the top of the cubicle, there is another compartment which contains the common DC switch-disconnector and fuses for all the modules in the cubicle.

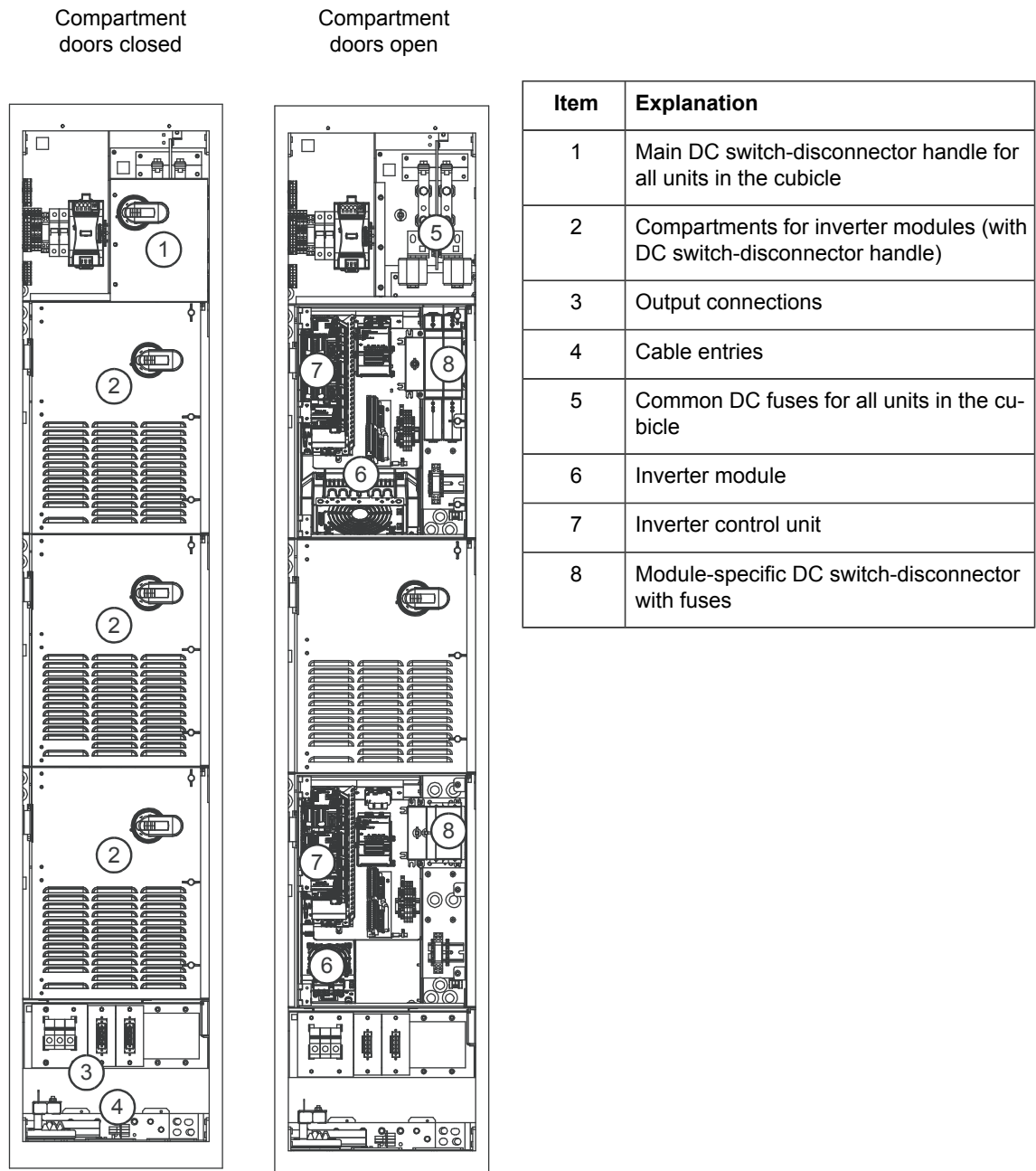
The inverter modules are installed in an inclined position so that the cooling air flows from the cool area at the front of the cubicle through the modules into the hot area at the back. The hot air is exhausted through the roof of the cubicle.

Each module has a dedicated DC switch-disconnector. When the switch-disconnector is open, the door to that particular compartment can be opened. It is also allowable to replace the module, its cooling fan, or its DC fuses.

The motor (output) connections for each module are located at the lower part of the cubicle; depending on the power of the inverter module, these are either detachable or non-detachable terminal blocks.

The cubicle is equipped with cable entries for the motor cables in the floor.

The picture below presents an example of a 400 mm wide cubicle with three R1i to R4i modules.



■ Inverter module frame size R5i

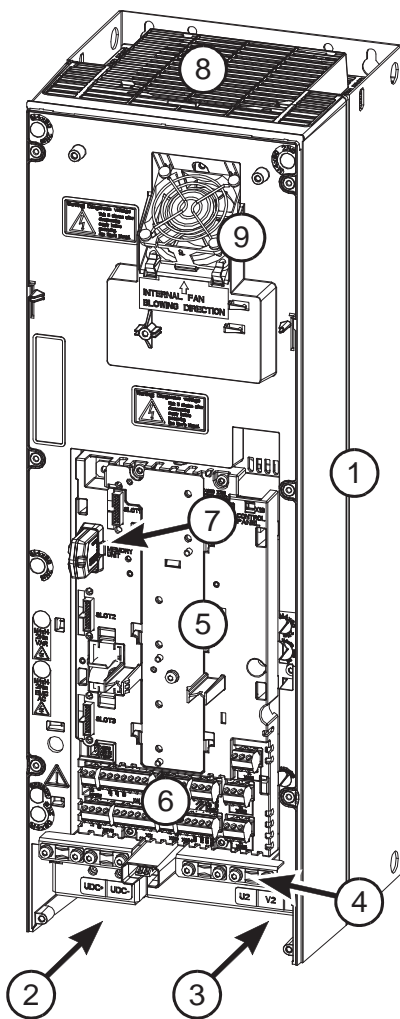
General

The motor (output) cables are connected to either detachable or non-detachable screw terminal blocks at the bottom of the cubicle. The modules have a built-in ZCU drive control unit, which contains the basic I/Os and slots for optional I/O modules.

The modules have an internal capacitor precharge circuit.

External optional equipment is primarily installed on mounting plates in the same cubicle.

Module layout



Item	Explanation
1	Power unit
2	DC (input) connection
3	Motor (output) connection. This has been wired to a separate terminal block in the lower part of the cubicle.
4	Control cable clamps
5	ZCU-12 control unit. The control unit has three slots for optional modules.
6	I/O terminal blocks
7	Memory unit
8	Main cooling fan
9	Auxiliary cooling fan

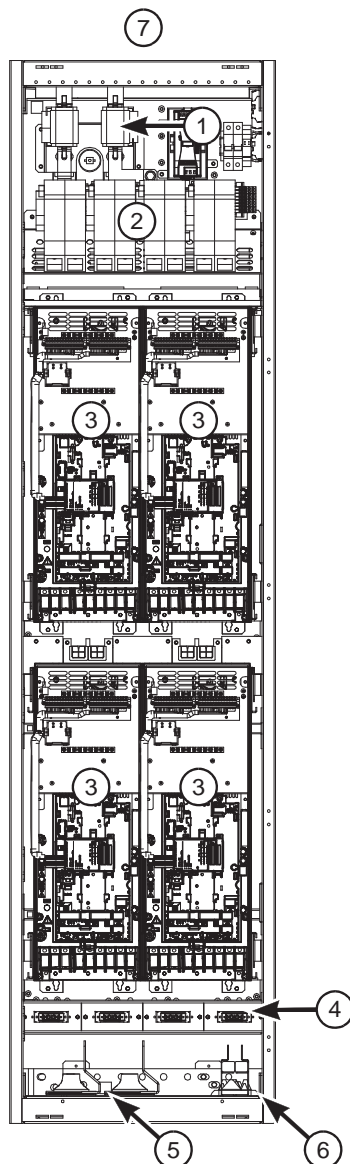
Standard cabinet layout

Several inverter modules of frame size R5i can be installed in one cubicle. The standard cubicle widths are 300 (check availability with ABB) and 500 mm. The number of modules that can be fitted into the cubicle also depends on the optional equipment selected.

Each module has dedicated DC fuse disconnectors. The motor (output) connections are detachable plug connectors located at the lower part of the cubicle.

The cubicle is equipped with cable entries at the floor.

The picture below presents an example of a 500 mm wide cubicle with four R5i modules.



Item	Explanation
1	Main DC switch for all units in the cubicle (optional) and main DC fuses
2	DC fuse disconnectors for each individual module
3	R5i inverter modules (with ZCU-12 control units)
4	Output connections
5	Output cable entries
6	Control cable entry
7	Air outlet compartment with cabinet cooling fan (not shown)

Layout of cubicle with frame R5i modules in their own compartments (option +C204)

If option +C204 is selected, two frame R5i inverter modules are installed into their own compartments in a 500 mm wide cubicle. At the top of the cubicle, there is another compartment which contains the common DC switch-disconnector and fuses for all the modules in the cubicle.

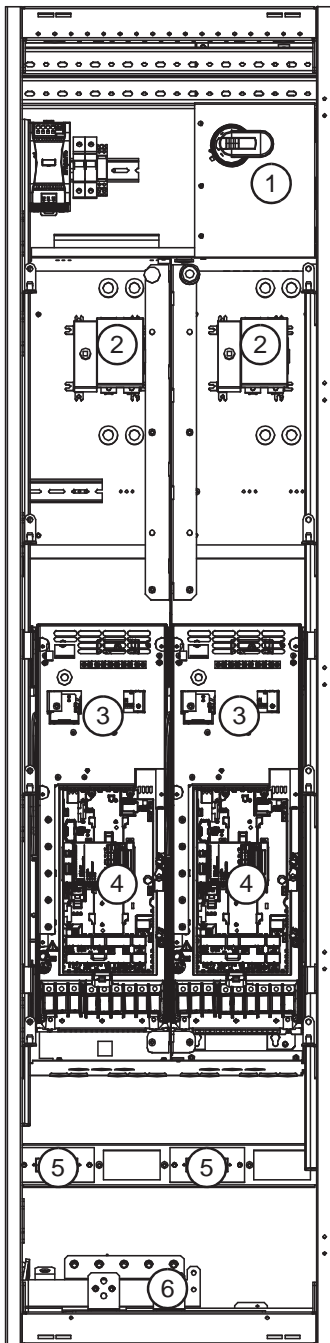
The inverter modules are installed in an upright position. The cooling air is guided from the cool area at the front of the cubicle through the modules into the hot area at the back. The hot air is exhausted through the roof of the cubicle.

Each module has a dedicated DC switch-disconnector. When the switch-disconnector is open, the door to that particular compartment can be opened. It is also allowable to replace the module, its cooling fan, or its DC fuses.

The motor (output) connections for each module are located at the lower part of the cubicle. The cubicle is equipped with cable entries at the floor.

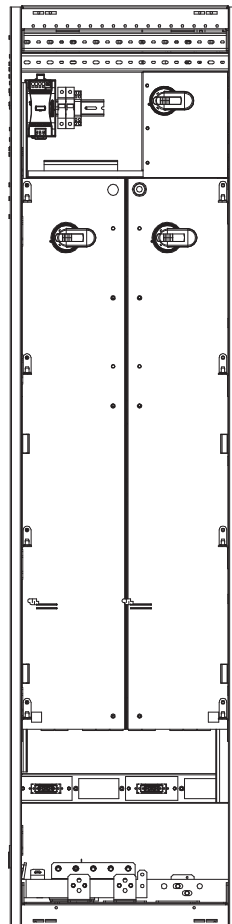
The picture below presents an example of the layout with two R5i modules.

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Item	Example
1	Main DC switch-disconnector handle for both modules in the cubicle Compartment for DC fuses
2	DC switch-disconnectors (with fuses) for each individual module
3	Inverter modules
4	Inverter control units
5	Output connections
6	Cable entries

Compartment doors closed



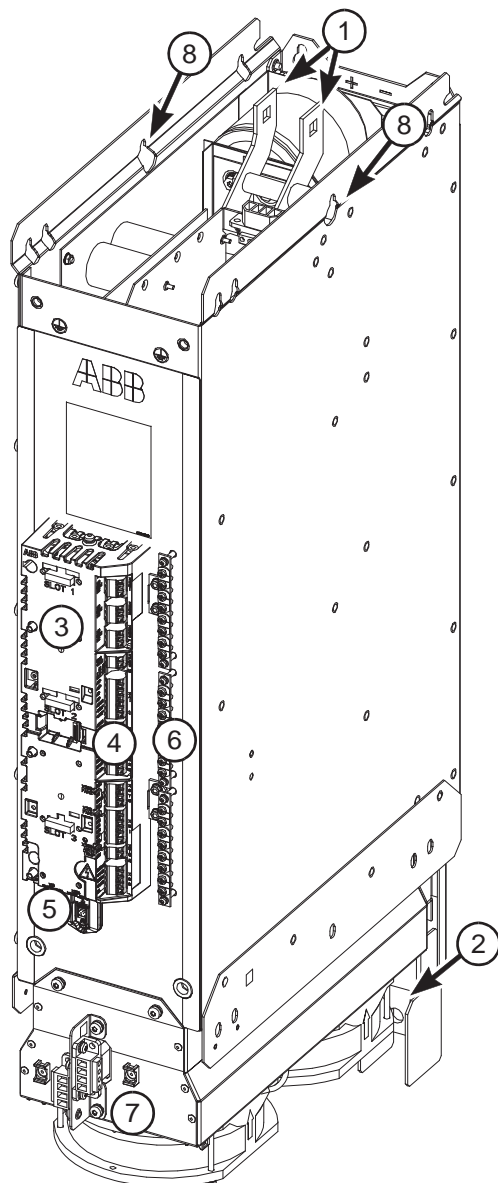
■ Inverter module frame sizes R6i and R7i

The inverter cubicle is equipped with cable entries for the motor cables in the floor of the cubicle. As standard, the output busbars are extended to the lower part of the cubicle for easy access.

The drive control unit (type ZCU-14) is mounted onto the module; the control unit contains the basic I/Os and slots for optional I/O modules. Other optional equipment is primarily installed on separate mounting plates.

The cooling fan(s) is supplied from the module and can be easily replaced.

Module layout

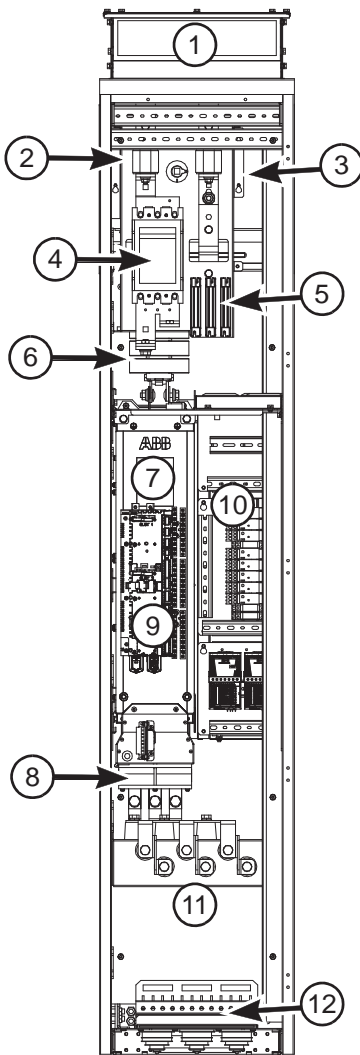


Item	Explanation
1	DC (input) connection
2	Motor (output) connection
3	ZCU-14 control unit (with slots for optional I/O modules)
4	I/O terminal blocks
5	Control panel connector, memory unit
6	Grounding/clamping plates for control cables
7	Cooling fan holder with one (R6i) or two (R7i) fans
8	Lifting eyes

Cabinet layout

Each inverter module of frame sizes R6i or R7i is installed in a 400 mm wide cubicle. The modules have a dedicated DC fuses or switch fuse. The modules have an internal capacitor pre-charge circuit apart from largest R7i types which have an external charging contactor and resistors.

The picture below presents an example of a cubicle with an R6i/R7i inverter module.



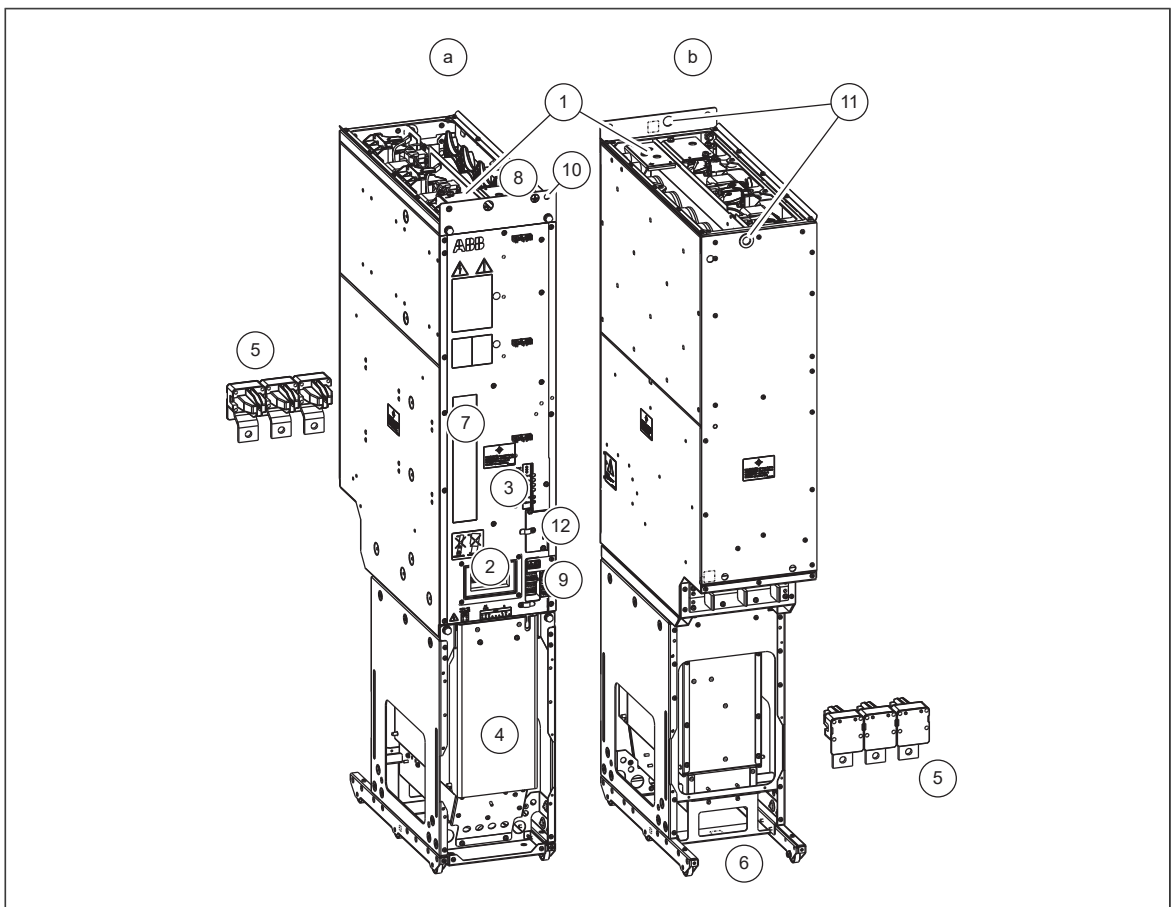
Item	Explanation
1	Air outlet
2	DC fuses
3	DC switch-disconnector (behind DC fuses and mounting plate) (optional)
4	Charging contactor (R7i only) (optional)
5	Charging resistors (R7i only) (optional)
6	Common mode filters
7	Inverter module
8	Inverter module cooling fan(s)
9	Control unit
10	Control voltage circuit components, installation space for other equipment such as relays
11	Output busbars
12	Cable entries

Motor cabling

The motor cables are connected to the output busbars at the bottom of the cubicle. For top exit, the depth of the cabinet is increased by 130 mm.

■ Inverter module frame size R8i and multiples

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

Cooling fans

The cooling fan unit at the base of the inverter module contains two DC fans. The fans are PWM-controlled according to an internal temperature measurement. The fan carriage can be easily removed for fan replacement, or to allow access to the output cable connections at the back of the cubicle.

The inverter module also has a small fan ventilating the circuit board compartment inside the module. The fan can be serviced without removing the inverter module from the cabinet.

Control electronics

Inverter units consisting of one or several R8i modules employ a separate control unit (BCU) that contains the BCON board with basic I/Os and slots for optional I/O modules. A fiber optic link connects the BCU to each inverter module. Any safety circuits utilizing the built-in Safe torque off functionality are connected to the BCU. The forwarding connector of the BCU is wired to the inverter module(s).

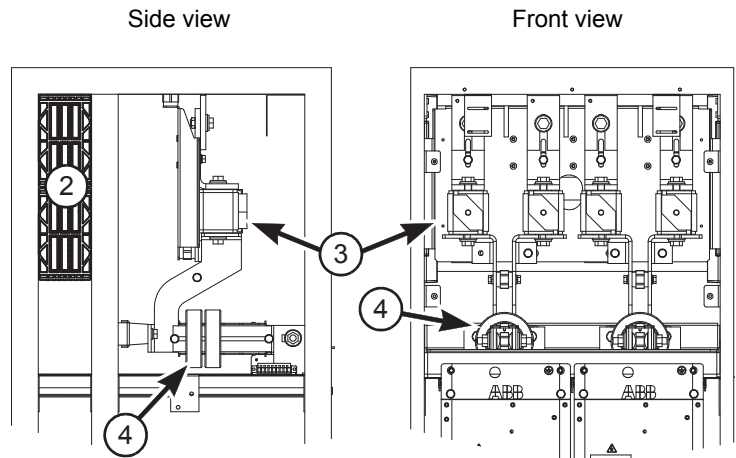
The control electronics are typically located in a 300 mm wide control cubicle (DCU), which also may contain components of the auxiliary voltage circuit and optional features such as relays and circuit breakers. The cubicle can also contain the control equipment of another inverter unit. A 400 mm wide cubicle is optionally available.

Cabinet layout

1...3 inverter modules may be installed in one cubicle. The width of the cubicle is 400, 600 or 800 mm respectively. Each module is equipped with dedicated DC fuses; a DC switch-disconnector is optional. An inverter unit with a switch-disconnector also has a precharge circuit including a charging switch on the door. When connecting the inverter unit to the DC bus, the charging switch is closed first. After the precharging completes, the DC switch-disconnector can be closed and the charging switch opened.

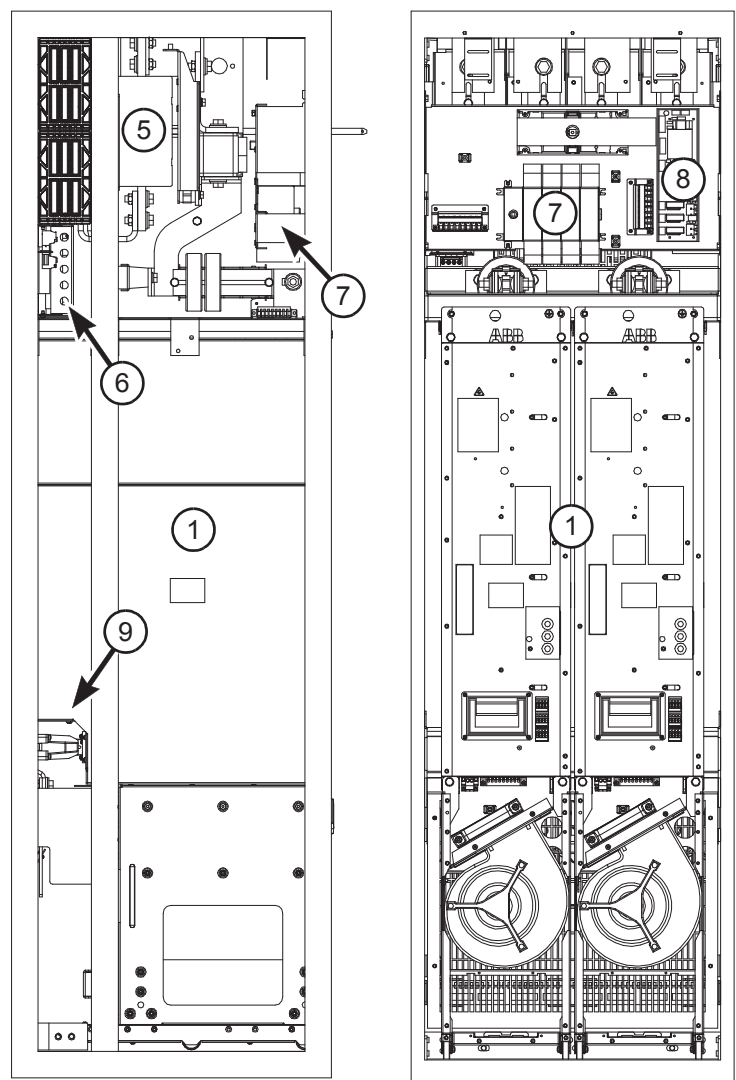
The picture below presents a cubicle with two R8i inverter modules with shrouding removed. The top compartment of the cubicle is shown with and without optional DC switch-disconnector and charging components.

Without DC switch-disconnector

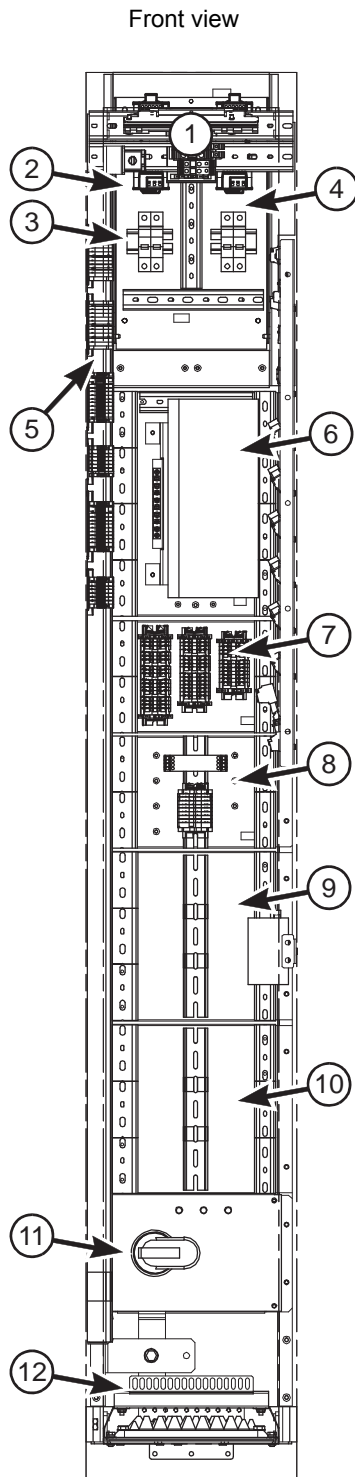


With DC switch-disconnector and charging circuit

Item	Explanation
1	Inverter modules
2	DC bus
3	DC fuses
4	Common mode filters
5	DC switch-disconnector [Q2]
6	Charging resistors
7	Charging switch [Q10]
8	Charging controller
9	AC quick connector



The drawing below shows an example of a 300 mm wide control equipment cubicle.



Item	Explanation
1	Terminal block for auxiliary voltage distribution
2	24 V DC power supply for control circuits
3	Circuit breakers for control voltages
4	Space for installation of items 2 and 3 for a second inverter unit
5	(On the left-hand side wall) Terminal blocks for control circuits and auxiliary voltage distribution
6	BCU-xx control unit
7	Terminal blocks for control unit I/O (option +L504)
8...10	Mounting space for additional or optional circuitry
11	Earthing switch of inverter unit output (optional)
12	Control cable lead-through (optionally on the roof of the cubicle)

Motor cabling

The motor cabling connects to the module via a quick connector at the back of the module. By default, each inverter module is cabled individually to the motor. With an optional common motor terminal cubicle, the outputs of the parallel-connected inverter modules are connected to a separate cubicle containing a single set of output busbars.

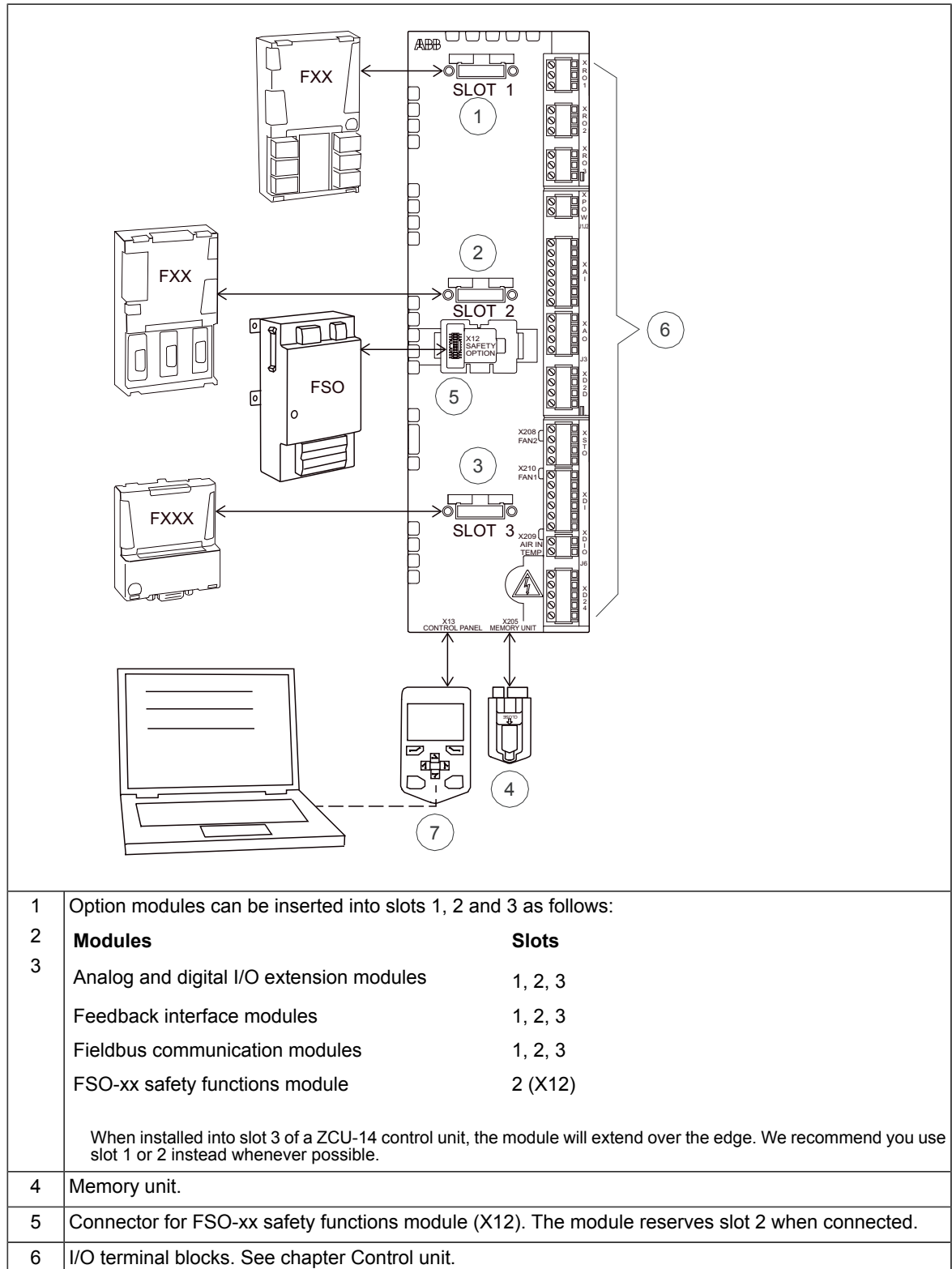
The cubicle is available in bottom-exit and top-exit variants. The standard cabling direction is down; top exit adds 200 mm to the depth of the cubicle.

Control interfaces

■ Overview of control connections of the ZCU control unit

The diagram shows the control connections and interfaces of the ZCU-14 control unit.

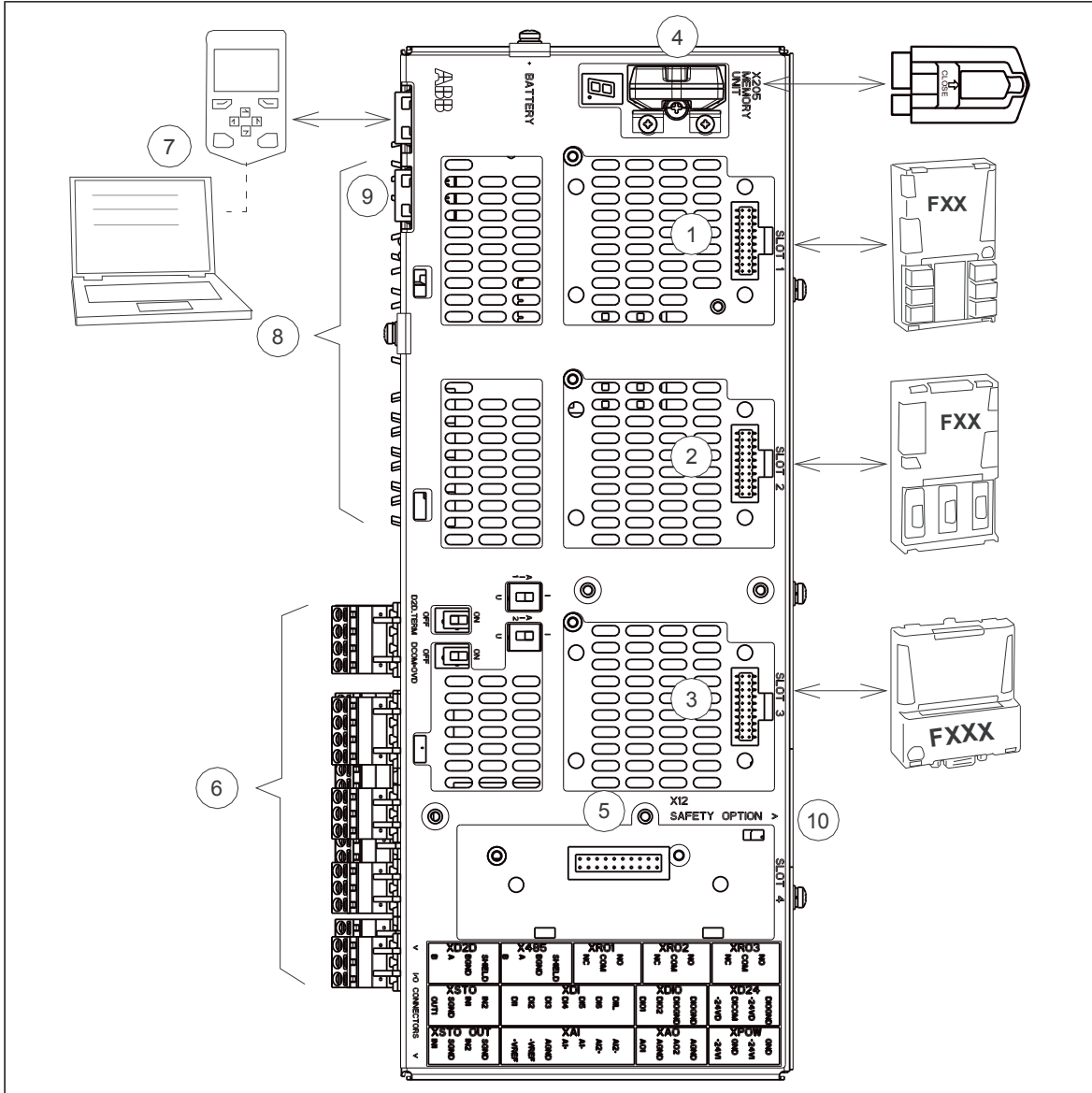
It is used with module frame sizes R1i...R7i. Frame R5i modules employ a type ZCU-12 unit which has a different layout but the same connectivity as the ZCU-14.



7	See section The ACx-AP-x control panel.
---	---

■ **Overview of the control connections of the BCU control unit**

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



1	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 ACx-AP-x control panel**

The ACS-AP-W is the user interface of the inverter unit, providing the essential controls such as Start/Stop/Direction/Reset/Reference, and the parameter settings for the control program.

The control panel can be mounted on a platform on the inverter cubicle door. The maximum number of platforms on one door is four, but one control panel can be used to control several units through a panel link.

For details on the control panel, see *ACX-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 inverter unit can be controlled through a fieldbus interface if the unit 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 appropriate firmware manual of the inverter unit.

■ Other control devices

DC switch-disconnector (option +F286)

The inverter unit can optionally be equipped with a DC switch-disconnector [Q2] which allows the isolation of the unit from the DC link. Before the unit is reconnected to the DC link, the capacitors of the inverter module(s) must be charged through a charging circuit.

With frame R1i...R5i inverter units, the DC switch-disconnector controls all of the inverter modules within that particular cubicle. Each module is additionally fitted with DC fuse disconnectors or a switch-disconnector. If R1i...R5i units are ordered in their own compartments (option +C204), the cubicle is equipped with a common DC switch-disconnector and the modules with dedicated DC switch-disconnectors as standard.

The status of the DC switch-disconnector (as well as module-specific disconnectors of R1i...R5i modules) is connected to the inverter(s). By default, the inverter is disabled when the DC switch-disconnector (or a DC fuse disconnector) is open.



WARNING!

Do not operate the DC switch-disconnectors under load.



WARNING!

Do not operate the DC fuse disconnectors under load or under voltage.



WARNING!

With frame n×R8i inverter units, both the DC switch-disconnector [Q2] and the charging switch [Q10] must be opened to disconnect the inverter unit from the DC link.

Charging switch (frame R8i and multiples only)

Frame n×R8i inverter units equipped with a DC switch-disconnector (option +F286) have a charging circuit including an xSFC-02 charging control unit and a charging switch [Q10] on the cubicle door. Before closing the DC switch-disconnector, the user closes the charging switch. After the precharging completes, a green light [H1] on the cabinet door illuminates. The DC switch-disconnector can now be closed, and the charging switch opened.

Note: The charging switch must be opened before the inverter unit can be started.

Type designation labels

■ Inverter unit type designation label

Each inverter unit has a type designation label attached onto the inside of the cubicle door. (Note that multiple small inverter units can be installed within one cubicle, and that an inverter unit may consist of several cubicles and inverter modules.)











The type designation stated on the label contains information on the specifications and configuration of the unit. The first digits express the basic construction of the unit, for example “ACS880-107-0100A-3”. The optional selections are given thereafter, separated by plus signs, for example “+E205”.

Quote the complete type designation and serial number when contacting technical support on the subject of an inverter unit.

■ Inverter module type designation label

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

Examples of the label are shown below.

	<p>ABB ① ACS880-104-0100A-3</p> <p>ASSEMBLED IN FINLAND</p> <p>② FRAME R4i</p> <p>③ IP20 UL open type</p> <p>④ INVERTER Input U1 566 V DC I1 125 A f1 - Output U2 3~ 0...400 V AC I2 104 A f2 0...500 Hz Sn 72 kVA</p> <p>⑤ EAC    206673 LISTED IND. CONTROL EQ. 1P2E CE</p> <p>⑥  S/N: 1150501480</p>																																
	<p>ABB ① ACS880-104-0600A-7+E205</p> <p>MADE IN FINLAND</p> <p>ABB Oy Hiomotie 13 00380 Helsinki Finland</p> <p>② FRAME R8i</p> <p>③ Air cooling IP00 UL open type UL/CSA: max. 849 VDC/600 VAC</p> <p>④ INVERTER Input U1 742/849/976 VDC I1 675 A f1 - Output U2 3~ 0...525/600/690 VAC I2 600 A f2 0...500 Hz Sn 717 kVA</p> <p>LINE CONVERTER 3~ 525/600/690 VAC 540 A 50/60 Hz 742/849/976 VDC 655 A 645 kVA</p> <p>⑤ EAC    206673 LISTED IND. CONTROL EQ. 1P2E CE</p> <p></p> <p>⑥  S/N: 1160600008</p>																																
	<p>ABB ① ACS880-104-0600A-7+E205</p> <p>⑥  S/N: 1160600008</p> <table border="0"> <tr> <td></td> <td>BRAKE CHOPPER</td> <td>REGENERATIVE RECTIFIER</td> <td>DC/DC CONVERTER</td> </tr> <tr> <td>Input U1</td> <td>742/849/976 VDC</td> <td>3~ 525/600/690 VAC</td> <td>742/849/976 VDC</td> </tr> <tr> <td>I1</td> <td>1171 A</td> <td>900 A</td> <td>600 A</td> </tr> <tr> <td>f1</td> <td>-</td> <td>50/60 Hz</td> <td>-</td> </tr> <tr> <td>Output U2</td> <td>3x 0...742/849/976 VDC</td> <td>709/810/932 VDC</td> <td>50...668/764/878 VDC</td> </tr> <tr> <td>I2</td> <td>3x 465 A</td> <td>1091 A</td> <td>600 A</td> </tr> <tr> <td>f2</td> <td>-</td> <td>-</td> <td>-</td> </tr> <tr> <td>Sn</td> <td>1300 kVA</td> <td>1076 kVA</td> <td>527 kVA</td> </tr> </table>		BRAKE CHOPPER	REGENERATIVE RECTIFIER	DC/DC CONVERTER	Input U1	742/849/976 VDC	3~ 525/600/690 VAC	742/849/976 VDC	I1	1171 A	900 A	600 A	f1	-	50/60 Hz	-	Output U2	3x 0...742/849/976 VDC	709/810/932 VDC	50...668/764/878 VDC	I2	3x 465 A	1091 A	600 A	f2	-	-	-	Sn	1300 kVA	1076 kVA	527 kVA
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1	Type designation.																																
2	Frame size.																																
3	Degree of protection; additional UL/CSA specifications.																																
4	Ratings. The labels show ratings for inverter module (INVERTER), IGBT supply module (LINE CONVERTER), brake chopper module (BRAKE CHOPPER), regenerative rectifier module (REGENERATIVE RECTIFIER) and DC/DC converter module (DC/DC CONVERTER).																																
5	Valid markings.																																
6	Serial number. The first digit refers to the manufacturing plant. The next four digits indicate manufacturing year and week respectively (yyww). The remaining digits complete the serial number so that there are no two units with the same number.																																

Type designation key

The type designation contains information on the specifications and configuration of the drive. The first digits from left express the basic drive type. The optional selections are given thereafter, separated by plus signs, eg, +E202. Codes preceded by a minus sign (eg. -J400) indicate the absence of the specified feature. The main selections are described below. Not all selections are available for all types. For more information, refer to the ordering instructions available separately on request.

Code	Description
Basic code	
ACS880	Product series
ACS880-107	Default configuration: Inverter unit, IEC industrial cabinet construction, plinth height 50 mm, IP22 (UL type 1), 50 Hz supply frequency, control (auxiliary) voltage 230 V AC, bottom entry and exit of cables, European-style motor cable entries, aluminum DC busbars (up to 3200 A), tin-plated copper DC busbars (from 3200 A up), speed-controlled module cooling fans, DC fuses, DC fuse/disconnectors (frames R1i□R5i only), standard wire markings, ACS880 primary control program, Safe torque off function, coated circuit boards, USB memory stick containing complete documentation in English.
Size	
xxxxx	Refer to the rating tables
Voltage range	
3	380...415 V AC. This is indicated in the type designation label as typical input voltage level (3~ 400 V AC)
5	380...500 V AC. This is indicated in the type designation label as typical input voltage levels (3~ 400/480/500 V AC)
7	525...690 V AC. This is indicated in the type designation label as typical input voltage levels (3~ 525/600/690 V AC)

■ Option codes

Code	Description
Supply connection	
A012	50 Hz supply frequency
A013	60 Hz supply frequency
Degree of protection	
B053	IP22 (UL Type 1)
B054	IP42 (UL Type 1)
B055	IP54 (UL Type 12)
Construction	
C121	Marine construction
C128	Air inlet through bottom of cabinet
C129	UL Listed (evaluated to both U.S. and Canadian safety requirements)
C130	Channeled air outlet
C132	Marine type approval. Refer to ACS880 +C132 marine type-approved cabinet-built drives supplement (3AXD50000039629 [English]).
C134	CSA approved
C164	Plinth height 100 mm
C176	Door hinges on left

Code	Description
C179	Plinth height 200 mm
C180	Seismic design
C188	Direct-on-line module cooling fans
C204	Modules in their own compartments
Filters	
E205	du/dt filtering
E206	Sine output filter
E208	Common mode filtering (standard with frames R6i, R7i, R8i and multiples)
E210	EMC/RFI filter for 2nd environment TN (grounded) or IT (ungrounded) system, category C3
Switching and grounding	
F267	Service switch at inverter output
F269	Output contactors
F270	Output grounding switch
F271	Output grounding terminals
F286	DC switch-disconnector
F287	DC fuses
F288	DC fuse-disconnector(s)
Cabinet equipment	
G300	Cabinet and module heating elements (external supply)
G301	Cabinet lighting
G304	Control (auxiliary) voltage 115 V AC
G307	Terminals for connecting external control voltage (230 V AC or 115 V AC, eg. UPS)
G313	Output for motor space heater (external supply)
G314	Aluminum busbars
G315	Tin-plated copper DC busbars
G320	Control (auxiliary) voltage 230 V AC
G330	Halogen-free wiring and materials
G338	Additional wire markings
G339	
G340	
G341	
G342	
G343	Corrosion indicator
G344	Auxiliary voltage transformer
G412	Light-duty aluminum (see also the hardware manual of the supply unit)
G453	Common mode filter temperature monitoring
Cabling	
H350	Supply cabling direction down
H351	Supply cabling direction up
H352	Motor cabling direction down
H353	Motor cabling direction up
H358	Cable conduit entry (US/UK)

38 Hardware description

Code	Description
H359	Common motor terminal cubicle
H364	Gland plate out of 3 mm thick aluminum, blind
H365	Blind 6 mm brass cable gland plates
H366	Common output terminals (for inverter modules mounted in the same cubicle)
H367	Control cable entry through floor of cabinet
H368	Control cabling through roof of cabinet
H371	Cable size 2 terminals for aluminum cables (frame R4i)
Control panel	
J400	ACS-AP-W control panel (with Bluetooth)
J401	LED monitoring display
J410	Control panel mounting platform
J412	Common control panel
J425	ACS-AP-I control panel
Fieldbus adapters, diverse communication options	
K450	Panel bus (control of several units from one control panel)
K451	FDNA-01 DeviceNet™ adapter module
K454	FPBA-01 PROFIBUS DP adapter module
K457	FCAN-01 CANopen adapter module
K458	FSCA-01 RS-485 (Modbus/RTU) adapter module
K462	FCNA-01 ControlNet™ adapter module
K469	FECA-01 EtherCat adapter module
K470	FEPL-02 EtherPOWERLINK adapter module
K473	FENA-11 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols
K475	FENA-21 Ethernet adapter module for EtherNet/IP™, Modbus TCP and PROFINET IO protocols, 2-port
K480	Ethernet switch for PC tool or control network (for max. 6 inverter units)
K483	Ethernet switch with optical link for PC tool or control network (for max. 6 inverter units)
K490	FEIP-21 Ethernet/IP adapter module, 2-port
K491	FMBT-21 Modbus/TCP adapter module, 2-port
K492	FPNO-21 PROFINET adapter module, 2-port
I/O extensions and feedback interfaces	
L500	FIO-11 analog I/O extension module
L501	FIO-01 digital I/O extension module
L502	FEN-31 HTL incremental encoder interface module
L503	FDCO-01 optical DDCS communication adapter module
L504	Additional I/O terminal block
L505	Thermal protection with PTC relays (1 or 2 pcs)
L506	Thermal protection with Pt100 relays (3, 5 or 8 pcs)
L508	FDCO-02 optical DDCS communication adapter module
L509	RDCO-04 optical DDCS communication for BCU-xx (4xTransmitter/Receiver)
L513	ATEX-certified thermal protection with PTC relays (1 or 2 pcs)
L514	ATEX-certified thermal protection with Pt100 relays (3, 5 or 8 pcs)

Code	Description
L516	FEN-21 resolver interface module
L517	FEN-01 TTL incremental encoder interface module
L518	FEN-11 TTL absolute encoder interface module
L521	FSE-31 pulse encoder interface module
L525	FAIO-01 analog I/O extension module
L526	FDIO-01 digital I/O extension module
L536	FPTC-01 thermistor protection module
L537	FPTC-02 ATEX-certified thermistor protection module
L539	Isolation relay for motor temperature switch
Starter for auxiliary motor fan	
M600	Trip limit setting range: 1 ... 1.6 A
M601	Trip limit setting range: 1.6 ... 2.5 A
M602	Trip limit setting range: 2.5 ... 4 A
M603	Trip limit setting range: 4 ... 6.3 A
M604	Trip limit setting range: 6.3 ... 10 A
M605	Trip limit setting range: 10...16 A
M606	Trip limit setting range: 16...20 A
M610	Trip limit setting range: 20...25 A
M660	Starter for electromagnetic motor brake: 24 V DC, 0.40 ... 0.63 A
M661	Starter for electromagnetic motor brake: 115 V AC, 0.40 ... 0.63 A
M662	Starter for electromagnetic motor brake: 230 V AC, 0.40 ... 0.63 A
M663	Starter for electromagnetic motor brake: 400 V AC, 3-phase, 0.40 ... 0.63 A
Control program	
N5000	Winder control program
N5050	Crane control program
N5100	Winch control program
N5200	PCP (Progressive Cavity Pump) control program
N5300	Test bench control program
N5600	ESP (Electrical Submersible Pump) control program
N5700	Position control program
N7502	Control program for synchronous reluctance motors (SynRM)
N8010	IEC 61131-3 application programmability
N8200	High speed (> 598 Hz) license
Specialties	
P913	Special RAL Classic color
P947	Safety data calculation and validation for tailored safety functions
P966	Special color (other than RAL Classic)
Safety functions	
Q950	Prevention of unexpected start-up with FSO-xx safety functions module, by activating the Safe torque off function
Q951	Emergency stop (category 0) with safety relays, by opening the main breaker/contactors
Q952	Emergency stop (category 1) with safety relays, by opening the main breaker/contactors

40 Hardware description

Code	Description
Q957	Prevention of unexpected start-up with safety relays, by activating the Safe torque off function
Q963	Emergency stop (category 0) with safety relays, by activating the Safe torque off function
Q964	Emergency stop (category 1) with safety relays, by activating the Safe torque off function
Q965	Safely-limited speed with FSO-21 and encoder
Q966	Safely-limited speed without encoder
Q972	FSO-21 safety functions module
Q973	FSO-12 safety functions module
Q979	Emergency stop (configurable for category 0 or 1) with FSO-xx safety functions module, by activating the Safe torque off function
Q982	PROFIsafe with FSO-xx safety functions module and FENA-21 Ethernet adapter module
Full set of printed manuals in the selected language	
Note: The delivery may include manuals in English if the requested language is not available.	
R700	English
R701	German
R702	Italian
R705	Swedish
R706	Finnish
R707	French
R708	Spanish
R711	Russian
R712	Chinese

3

Control units of the drive

Contents of this chapter

This chapter

- describes the connections of the control unit(s) used in the drive,
- contains the specifications of the inputs and outputs of the control unit(s).

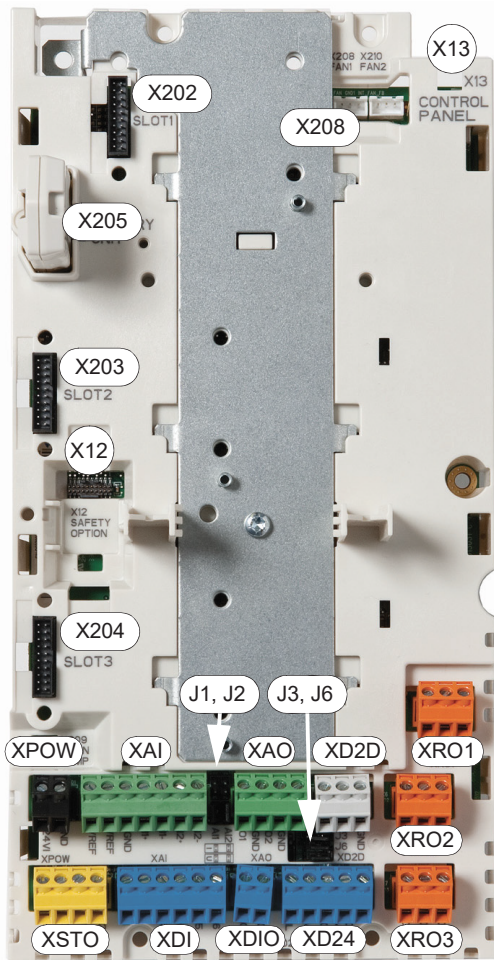
General

The ZCU-14 control unit is used with inverter module frame sizes R1i...R4i, R6i and R7i, while the ZCU-12 is used with frame size R5i. Both ZCU units consist of a ZCON control board contained in a plastic housing. The control unit is mounted on the inverter module.

The BCU-x2 control unit is used with frame size R8i and multiples. 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 inverter module(s) by fiber optic cables.

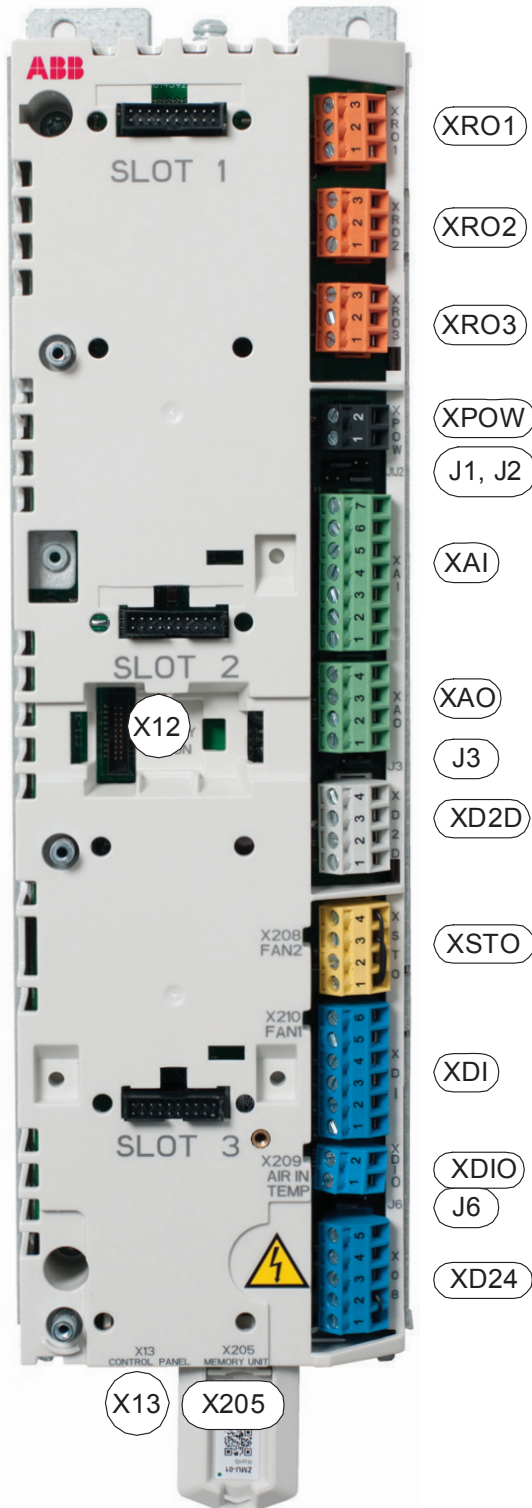
In this manual, the name "BCU-x2" represents the control unit types BCU-02, BCU-12 and BCU-22. These have a different number of power module connections (2, 7 and 12 respectively) but are otherwise similar.

ZCU-12 layout



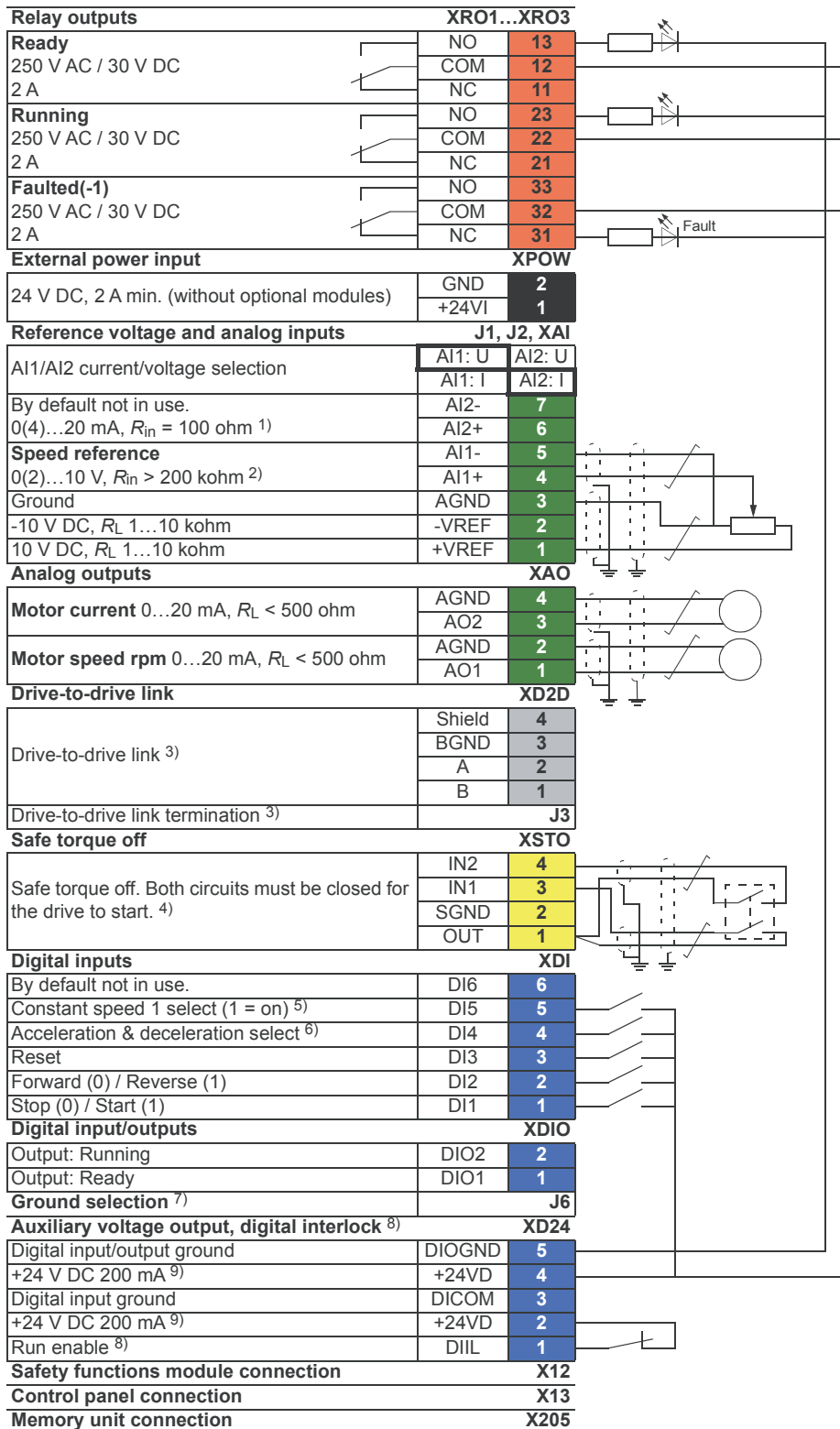
	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs
XDIO	Digital input/outputs
XD24	Digital input interlock (DIIL) and +24 V output
XD2D	Drive-to-drive link
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XSTO	Safe torque off connection
X12	Connection for FSO-xx safety functions module
X13	Control panel connection
X202	Option slot 1
X203	Option slot 2
X204	Option slot 3
X205	Memory unit connection (memory unit inserted in the picture)
J1, J2	Voltage/Current selection jumpers (J1, J2) for analog inputs
J3	Drive-to-drive link termination switch (J3)
J6	Common digital input ground selection switch (J6)

ZCU-14 layout



	Description
XPOW	External power input
XAI	Analog inputs
XAO	Analog outputs
XD2D	Drive-to-drive link
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XD24	Digital input interlock (DIIL) and +24 V output
XDIO	Digital input/outputs
XDI	Digital inputs
XSTO	Safe torque off connection (inverter unit only). Note: This connection only acts as a true Safe torque off input when the ZCU is controlling an inverter unit. When the ZCU is controlling a supply unit, de-energizing the inputs will stop the unit but will not constitute a true safety function.
X12	Connection for FSO-xx safety functions module (inverter unit only).
X13	Control panel connection
X202	Option slot 1
X203	Option slot 2
X204	Option slot 3
X205	Memory unit connection (memory unit inserted in the drawing)
J1, J2	Voltage/Current selection jumpers (J1, J2) for analog inputs
J3	Drive-to-drive link termination switch (J3)
J6	Common digital input ground selection jumper (J6).

Default I/O diagram of the inverter control unit (ZCU-1x)

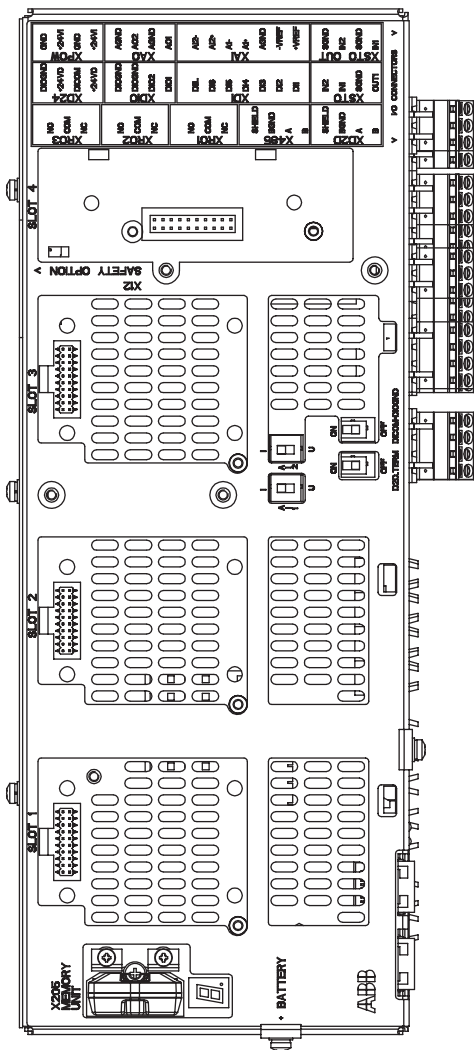


Notes:

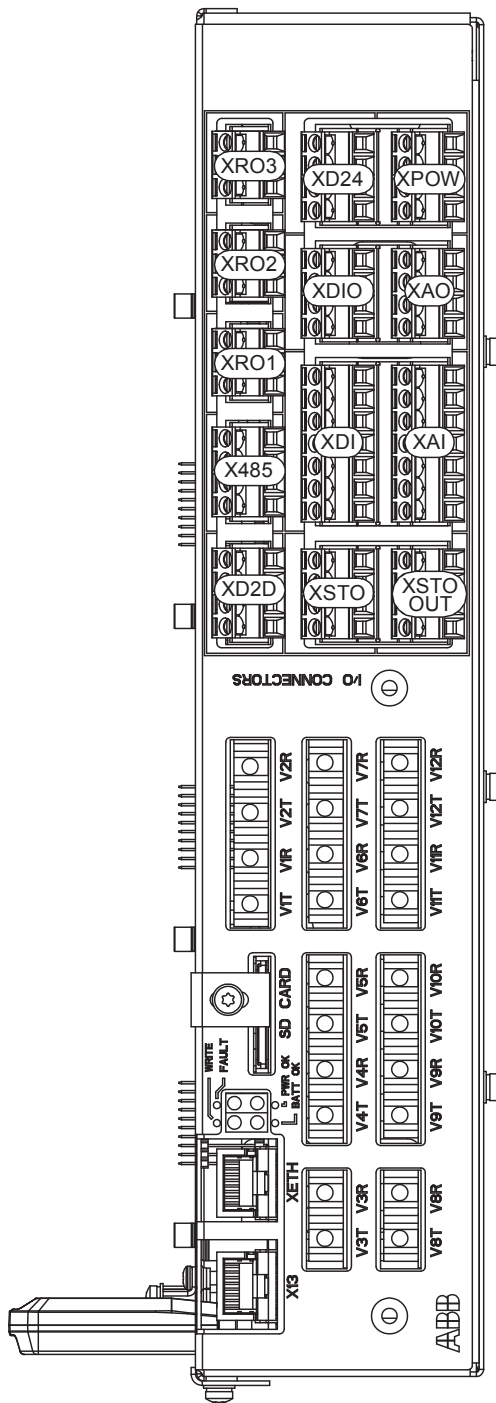
The wire size accepted by all screw terminals (for both stranded and solid wire) is 0.5 ... 2.5 mm² (24...12 AWG). The torque is 0.5 N·m (5 lbf·in).

- 1) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI2. Change of setting requires reboot of control unit.
 - 2) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI1. Change of setting requires reboot of control unit.
 - 3) See section [The XD2D connector \(page 51\)](#).
 - 4) See chapter [The Safe torque off function \(page 183\)](#).
 - 5) Constant speed 1 is defined by parameter 22.26.
 - 6) 0 = Acceleration/deceleration ramps defined by parameters 23.12/23.13 in use. 1 = Acceleration/deceleration ramps defined by parameters 23.14/23.15 in use.
 - 7) Determines whether DICOM is separated from DIOGND (ie. common reference for digital inputs floats; in practice, selects whether the digital inputs are used in current sinking or sourcing mode). See also [ZCU-1x ground isolation diagram \(page 56\)](#). DICOM=DIOGND ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.
 - 8) See section [DIIL input \(page 50\)](#).
 - 9) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
-

BCU-x2 layout



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

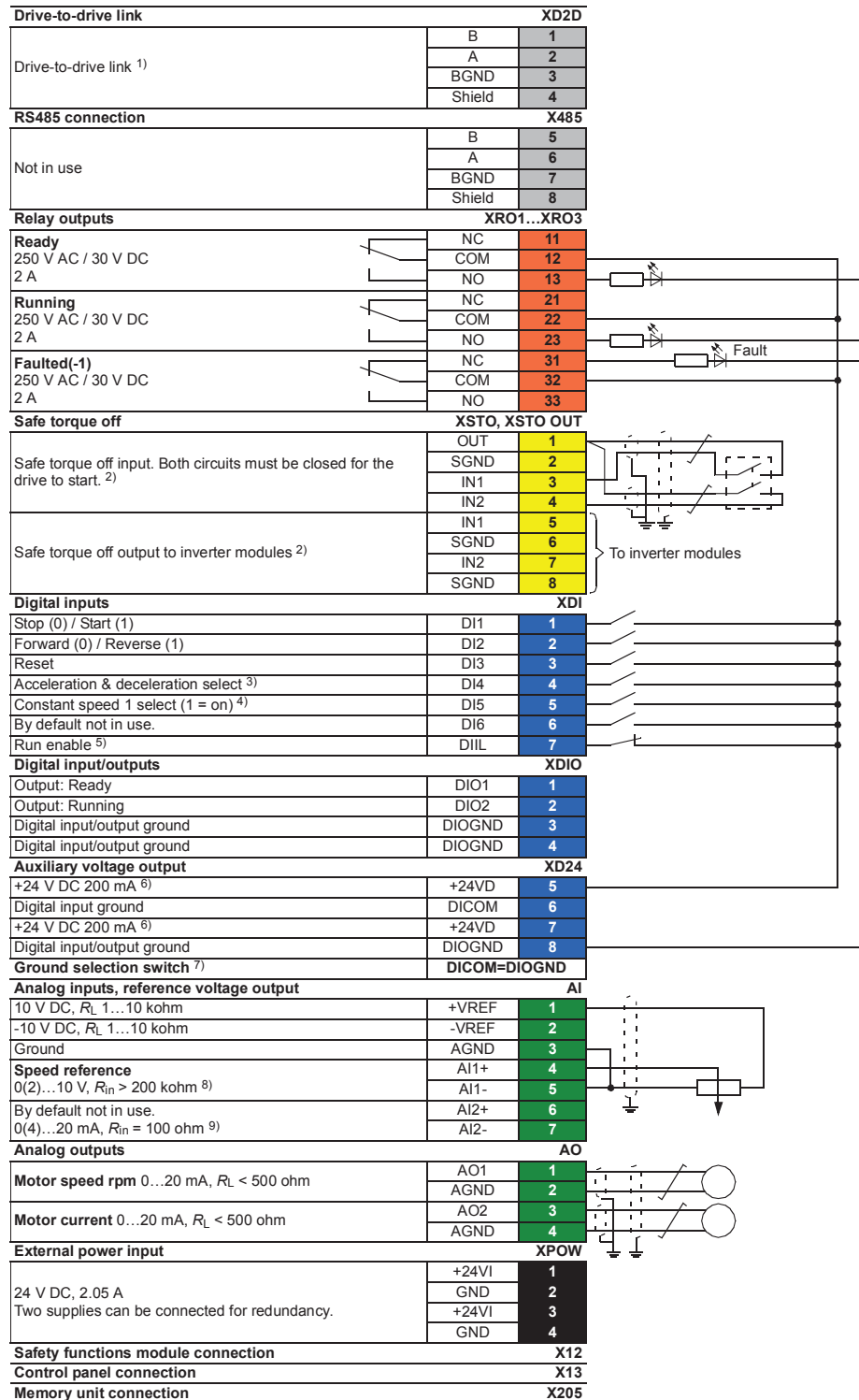


	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay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

Default I/O diagram of the inverter control unit (A41)

The diagram below shows the default I/O connections on the inverter control unit (A41), and describes the use of the connections in the inverter unit. 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 mm² (24...12 AWG). The torque is 0.5 N·m (5 lbf·in).



Notes:

- 1) See section [The XD2D connector \(page 51\)](#).
- 2) See chapter [The Safe torque off function \(page 183\)](#).
- 3) 0 = Acceleration/deceleration ramps defined by parameters 23.12/23.13 in use. 1 = Acceleration/deceleration ramps defined by parameters 23.14/23.15 in use.
- 4) Constant speed 1 is defined by parameter 22.26.
- 5) See section [DIIL input \(page 50\)](#).
- 6) Total load capacity of these outputs is 4.8 W (200 mA at 24 V) minus the power taken by DIO1 and DIO2.
- 7) Determines whether DICOM is separated from DIOGND (ie. common reference for digital inputs floats; in practice, selects whether the digital inputs are used in current sinking or sourcing mode). See also [BCU-x2 ground isolation diagram \(page 55\)](#).
DICOM=DIOGND ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.
- 8) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI1. Change of setting requires reboot of control unit.
- 9) Current [0(4)...20 mA, $R_{in} = 100 \text{ ohm}$] or voltage [0(2)...10 V, $R_{in} > 200 \text{ kohm}$] input selected by switch AI2. Change of setting requires reboot of control unit.

Additional information on the connections**■ External power supply for the control unit (XPOW)**

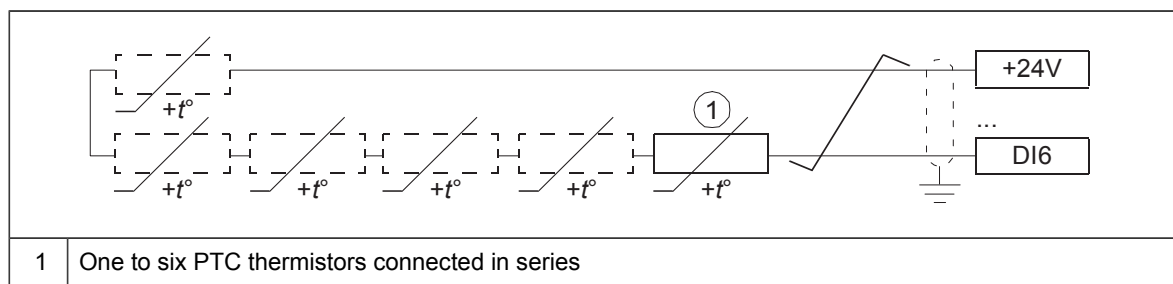
The control unit is powered from a 24 V DC, 2 A supply through terminal block XPOW. With a type BCU control unit, a second supply can be connected to the same terminal block for redundancy.

Using an external supply is recommended if

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

■ DI6 as a PTC sensor input

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



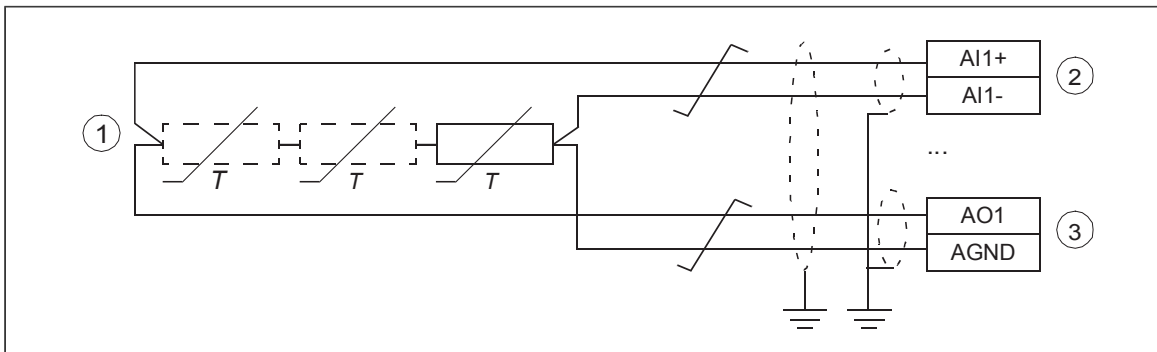


WARNING!

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

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

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



1	One, two or three Pt100, Pt1000 or PTC sensors; or one KTY84 sensor
2	Set the input type to voltage with J1 for analog input AI1 or with J2 for analog input AI2. Set the appropriate analog input unit to V (volt) in parameter group 12 Standard AI.
3	Select the excitation mode in parameter group 13 Standard AO.

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

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



WARNING!

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

■ **DIIL input**

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

Note: This input is NOT SIL or PI certified.

■ **The XD2D connector**

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

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

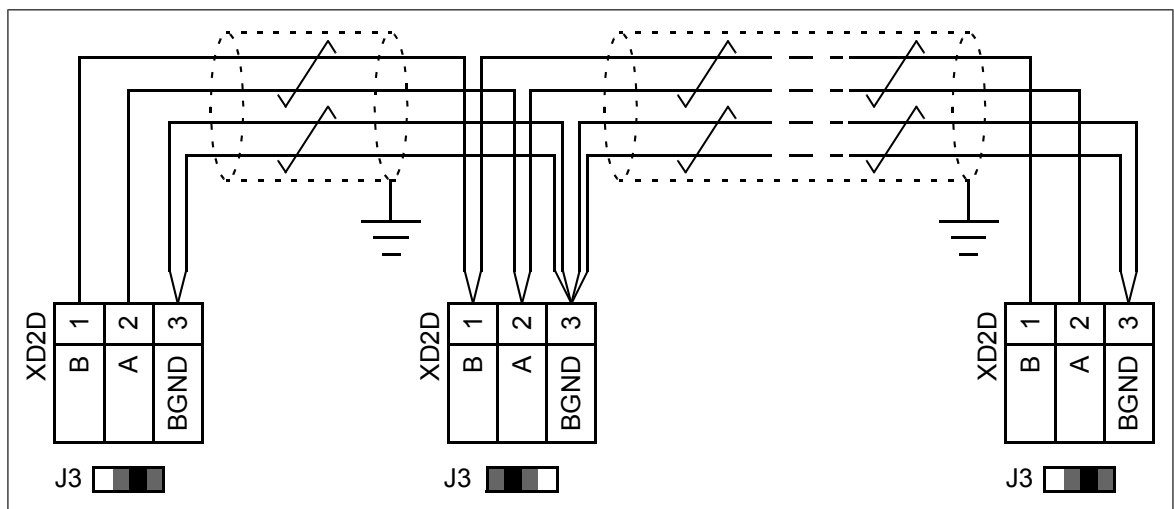
See the firmware manual of the drive for the related parameter settings.

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

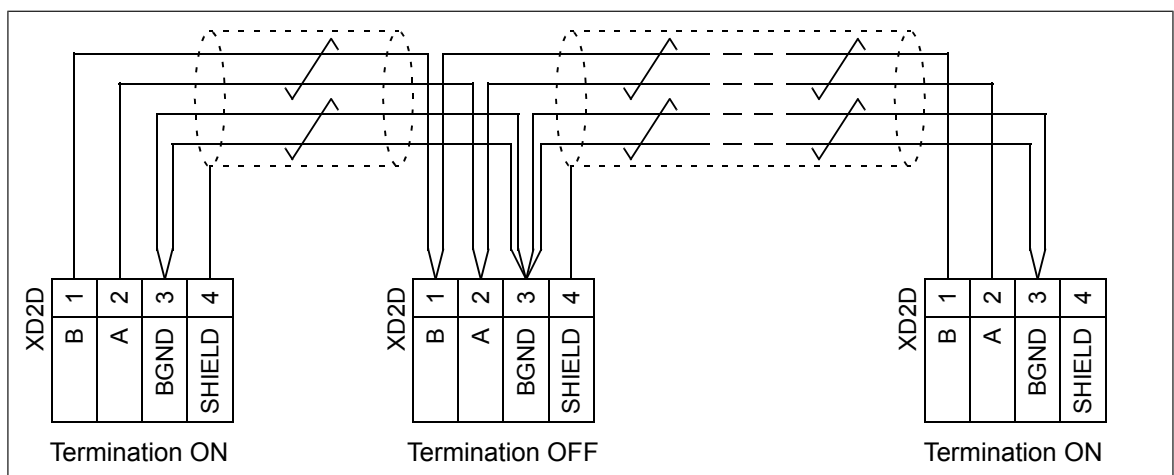
Use shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 to 165 ohm, for example Belden 9842) for the wiring. For best immunity, ABB recommends high quality cable. Keep the cable as short as possible. Avoid unnecessary loops and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

The following diagram shows the wiring between control units.

ZCU-12



ZCU-14, BCU-x2



■ **Safe torque off (XSTO, XSTO OUT)**

See chapter *The Safe torque off function (page 183)*.

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.

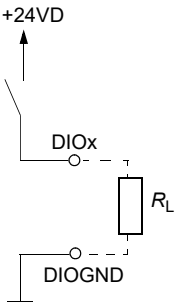
■ **FSO-xx safety functions module connection (X12)**

See the user manual of the FSO-xx module. Note that the FSO-xx safety functions module is not in use in supply, 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.

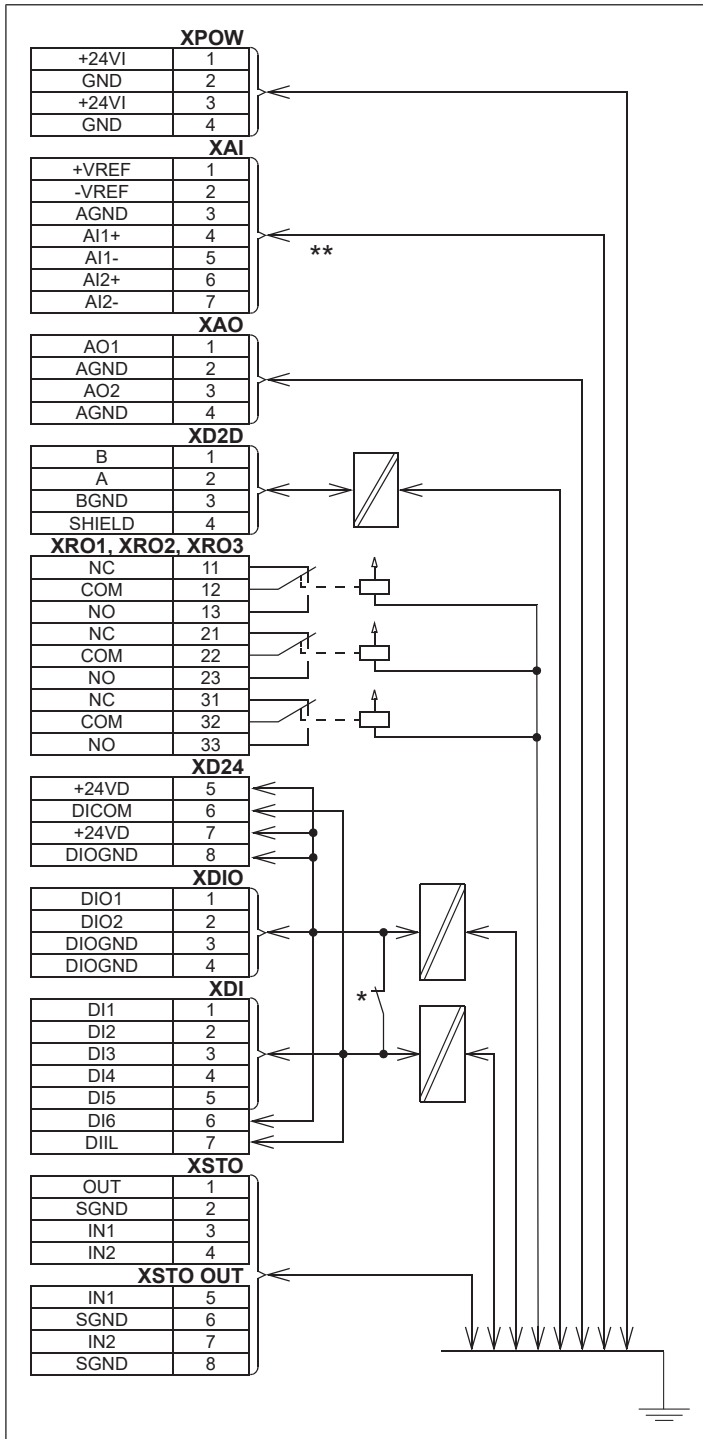
Connector data

Power supply (XPOW)	Connector pitch 5 mm, wire size 2.5 mm ² 24 V ($\pm 10\%$) DC, 2 A External power input. Two supplies can be connected to the BCU-x2 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 (XD24:1 [ZCU-1x], XDI:7 [BCU-x2])	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, parameter group 111/11.	Connector pitch 5 mm, wire size 2.5 mm ² <u>As inputs:</u> 24 V logic levels: "0" < 5 V, "1" > 15 V. R_{in} : 2.0 kohm. Filtering: 1 ms. <u>As outputs:</u> 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 $\pm 1\%$ and -10 V $\pm 1\%$, 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 jumpers (ZCU-1x) or switches (BCU-x2)	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

54 Control units of the drive

Analog outputs AO1 and AO2 (XAO)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>0...20 mA, $R_{load} < 500 \text{ ohm}$</p> <p>Frequency range: 0...300 Hz (ZCU-1x), 0...500 Hz (BCU-x2)</p> <p>Resolution: 11 bit + sign bit</p> <p>Inaccuracy: 2% of full scale range</p>
XD2D connector	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>Physical layer: RS-485</p> <p>Transmission rate: 8 Mbit/s</p> <p>Cable type: Shielded twisted-pair cable with a twisted pair for data and a wire or another pair for signal ground (nominal impedance 100 ... 165 ohm, for example Belden 9842)</p> <p>Maximum length of link: 50 m (164 ft)</p> <p>Termination by jumper (ZCU-1x) or switch (BCU-x2)</p>
RS-485 connection (X485) (BCU-x2 only)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>Physical layer: RS-485</p>
Safe torque off connection (XSTO)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>Input voltage range: -3...30 V DC</p> <p>Logic levels: "0" < 5 V, "1" > 17 V.</p> <p>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.</p> <p>Current consumption: 66 mA (continuous) per STO channel per R8i module</p> <p>EMC (immunity) according to IEC 61326-3-1</p> <p>See also chapter The Safe torque off function (page 183).</p>
Safe torque off output (XSTO OUT) (BCU-x2 only)	<p>Connector pitch 5 mm, wire size 2.5 mm²</p> <p>To STO connector of inverter module.</p>
Control panel connection (X13)	<p>Connector: RJ-45</p> <p>Cable length < 3 m</p>
Ethernet connection (XETH) (BCU-x2 only)	<p>Connector: RJ-45</p> <p>This connection is not supported by the firmware.</p>
SDHC memory card slot (SD CARD) (BCU-x2 only)	<p>Memory card type: SDHC</p> <p>Maximum memory size: 4 GB</p>
<p>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.</p>	

■ **BCU-x2 ground isolation diagram**



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

DICOM=DIOGND: ON

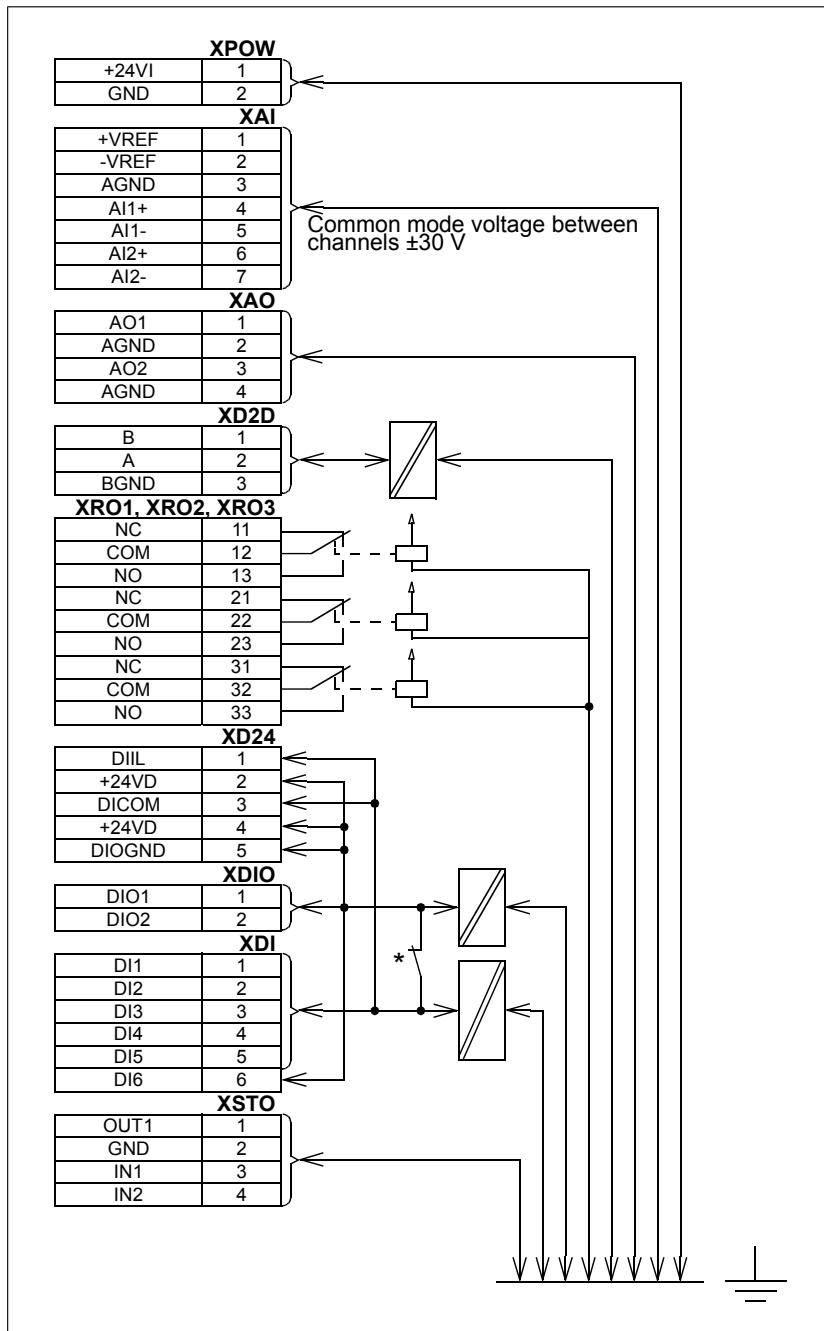
All digital inputs share a common ground (DICOM connected to DIOGND). This is the default setting.

DICOM=DIOGND: OFF

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

**Common mode voltage between each AI input and AGND is +30 V

■ ZCU-1x ground isolation diagram



* Ground selector (J6) settings

(ZCU-12)

(ZCU-14)

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

(ZCU-12)

(ZCU-14)

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

Isolation voltage 50 V.

4

Electrical installation

Contents of this chapter

This chapter describes the electrical installation of ACS880-107 inverter units.

The circuit diagrams in this chapter are simplified presentations. Refer to the diagrams delivered with the drive system for details.

For more information on cable selection, protections, etc., see *Electrical planning instructions for ACS880 multidrive cabinets and modules* (3AUA0000102324 [English]).



WARNING!

Only qualified electricians are allowed to carry out the work described in this chapter. Read the safety instructions given in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]) before you install, commission, use or service the drive.

The tightening torques for the electrical connections are listed in the technical data.

Electrical safety precautions

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



WARNING!

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

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

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

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

General notes

■ Printed circuit boards

**WARNING!**

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

■ Optical components

**WARNING!**

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

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

Checking the insulation of the assembly

■ Measuring the insulation of the drive

**WARNING!**

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

■ Measuring the insulation of the motor and motor cable

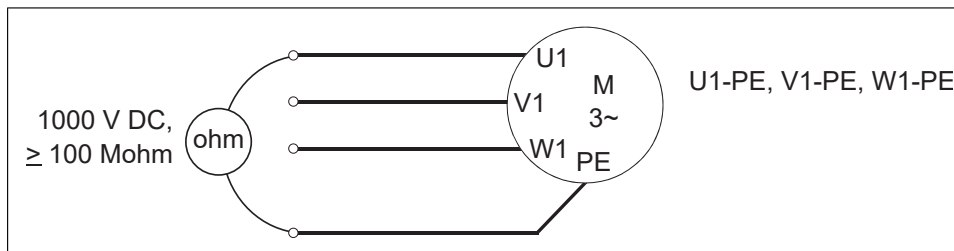
**WARNING!**

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

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

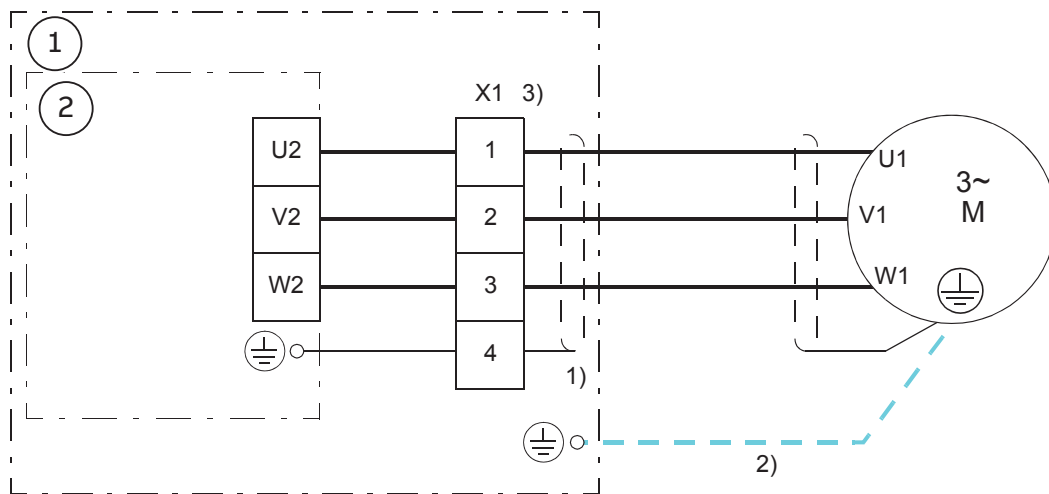
1. Do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Make sure that the motor cable is disconnected from the drive output terminals.
3. Measure the insulation resistance between each phase conductor and the protective earth conductor. Use a measuring voltage of 1000 V DC. The insulation resistance of an ABB motor must be more than 100 Mohm (reference value at 25 °C [77 °F]). For the insulation resistance of other motors, refer to the manufacturer's instructions.

Note: Moisture inside the motor casing reduces the insulation resistance. If you think that there is moisture in the motor, dry the motor and do the measurement again.



Connecting the motor cable – Frame sizes R1i to R5i

■ Diagram



1. Inverter unit cubicle
2. Inverter module

1) 360° grounding at cable lead-through

2) Use a separate grounding cable if the conductivity of the cable shield is less than 50% of the conductivity of the phase conductor in a cable with no symmetrically constructed grounding conductor (see the document *ACS880 multidrive cabinets and modules, Electrical planning instructions* [3AUA00000102324, English]).

3) With frame R4i, terminal X1:4 may not be present if not required by the configuration (for example, output filters). In this case, connect the cable shield directly to the PE busbar.

Note: If there is a symmetrically constructed grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the drive and motor ends.

Do not use an asymmetrically constructed motor cable. Connecting its fourth conductor at the motor end increases bearing currents and causes extra wear.

■ Motor cable connection procedure

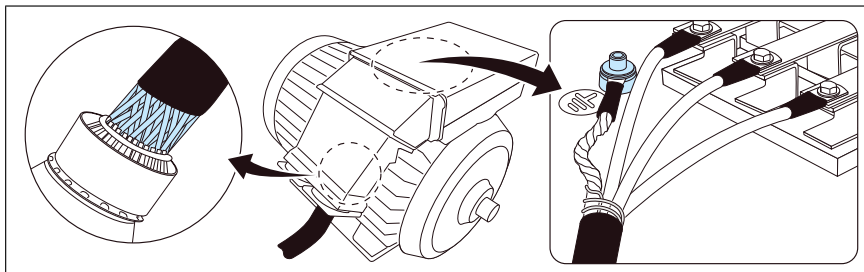


WARNING!

Read and follow the instructions given in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment. Refer to the diagram above. Also refer to the wiring diagrams delivered with the unit for the component designations of the output connectors.

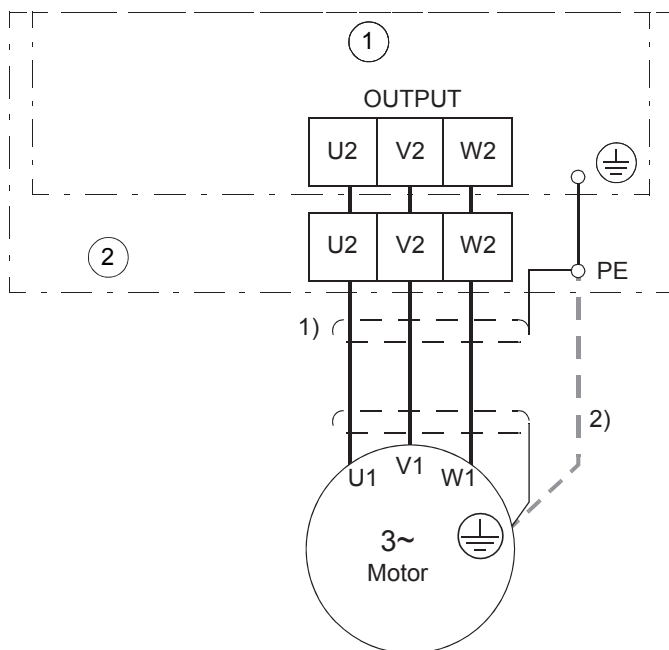
1. Do the steps in section *Electrical safety precautions* (page 57) before you start the work.
2. Run the cable into the cubicle through one of the cable glands provided. Remove the outer jacket of the cable wherever it passes through the cable gland.
3. Cut the cable to suitable length and strip the ends of the individual conductors.
4. Twist the shield strands of the cable together to form a separate conductor and crimp a ferrule onto it. (With frame R4i, connect the cable shield to the PE busbar using a crimp ring terminal.)
5. Connect the conductors to terminal block/connector X1. (If X1:4 is not present, connect the cable shield directly to the PE busbar.)
6. Secure the cable inside the cabinet mechanically.

7. Tighten the cable gland.
8. At the motor, connect the cables according to instructions from the motor manufacturer. Pay special attention to the phase order. For minimum radio-frequency interference, ground the cable shield 360 degrees at the lead-through of the motor terminal box.



Connecting the motor cable – Frame sizes R6i and R7i

■ Diagram



1. Inverter module
2. Cabinet

1) 360° grounding at cable lead-through

2) Use a separate grounding cable if the conductivity of the cable shield is less than 50% of the conductivity of the phase conductor in a cable with no symmetrically constructed grounding conductor (see the document *ACS880 multidrive cabinets and modules, Electrical planning instructions* [3AUA00000102324, English]).

Note: If there is a symmetrically constructed grounding conductor in the motor cable in addition to the conductive shield, connect the grounding conductor to the grounding terminal at the drive and motor ends.

Do not use an asymmetrically constructed motor cable. Connecting its fourth conductor at the motor end increases bearing currents and causes extra wear.

■ Motor cable connection procedure

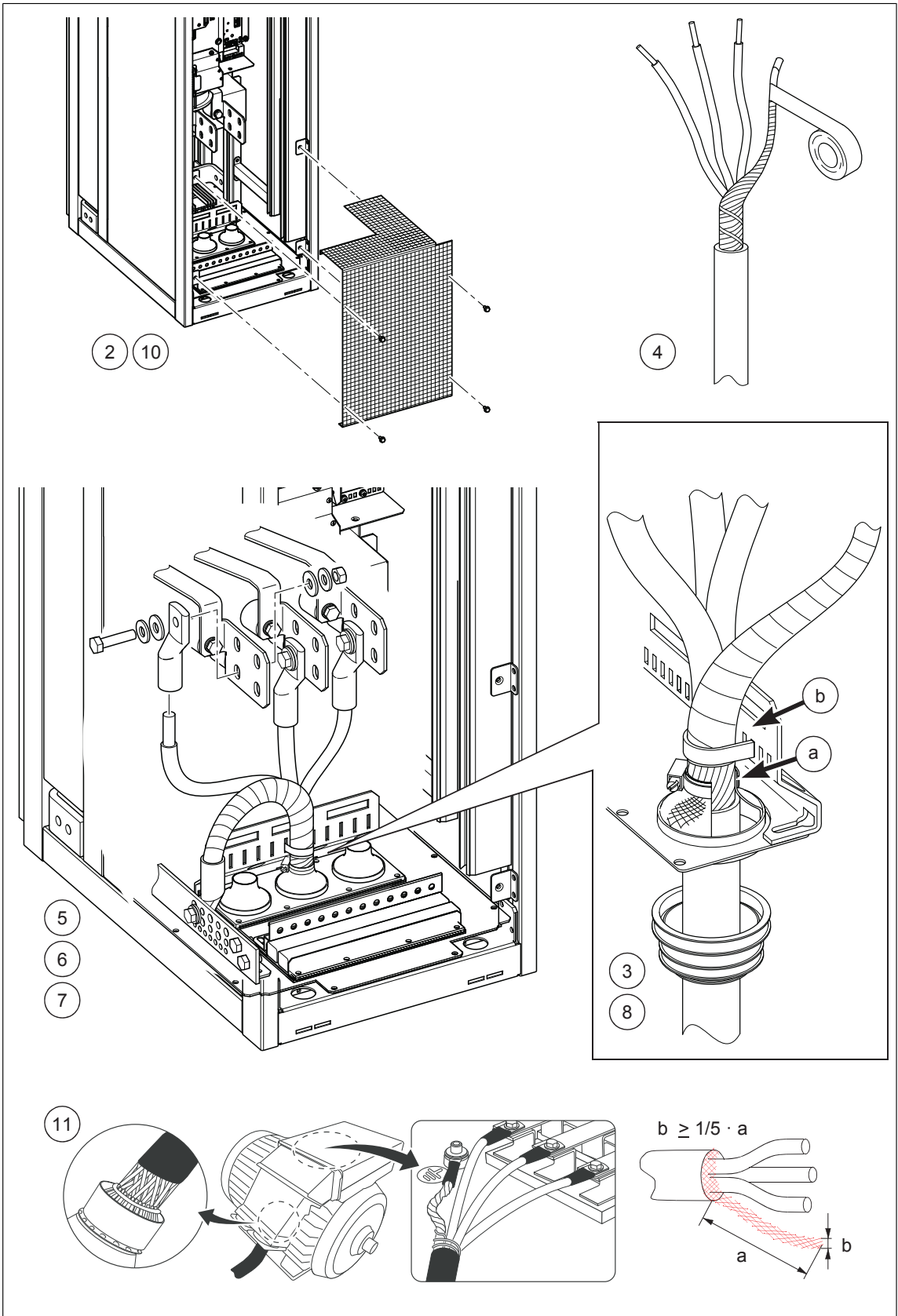
**WARNING!**

Read and follow the instructions given in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment.

Refer to the illustrations below.

1. Do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the shroud covering the lower part of the cubicle.
3. Run the cable into the cubicle through the cable cable entries provided. In case a grounding cable gland is available, remove the outer jacket of the cable where it passes through the cable gland (a).
4. Cut the cable to suitable length and strip the ends of the individual conductors. Twist the shield strands together to form a separate conductor and wrap it with tape.
5. Crimp suitable lug terminals onto the phase conductors and the ground conductor. The dimensions of the output busbars are shown in the technical data.
6. Connect the shield (and any grounding conductors) of the cable to the PE busbar close to the cable entries.
7. Connect the phase conductors of the motor cable to the U2, V2 and W2 terminals.
8. Secure the cable mechanically. It is recommended to arrange for 360° grounding of the shield at the cable entry; an example is shown in the detail drawing (b).
9. Connect the control cables as described in section *Connecting the control cables*.
10. Refit the shroud.
11. At the motor, connect the cables according to instructions from the motor manufacturer. Pay special attention to the phase order. For minimum radio-frequency interference, ground the cable shield 360 degrees at the cable entry of the motor terminal box, or ground the cable by twisting the shield so that the flattened shield is wider than 1/5 of its length.





Connecting the motor cables – Frame size R8i and multiples without common motor terminal cubicle or sine output filter

On units without a common motor terminal cubicle or a sine output filter, the motor cables connect to busbars located behind the inverter module(s). The location and dimensions of the busbars are visible in the dimension drawings delivered with the drive, as well as the example drawings presented in this manual in chapter *Dimensions*.

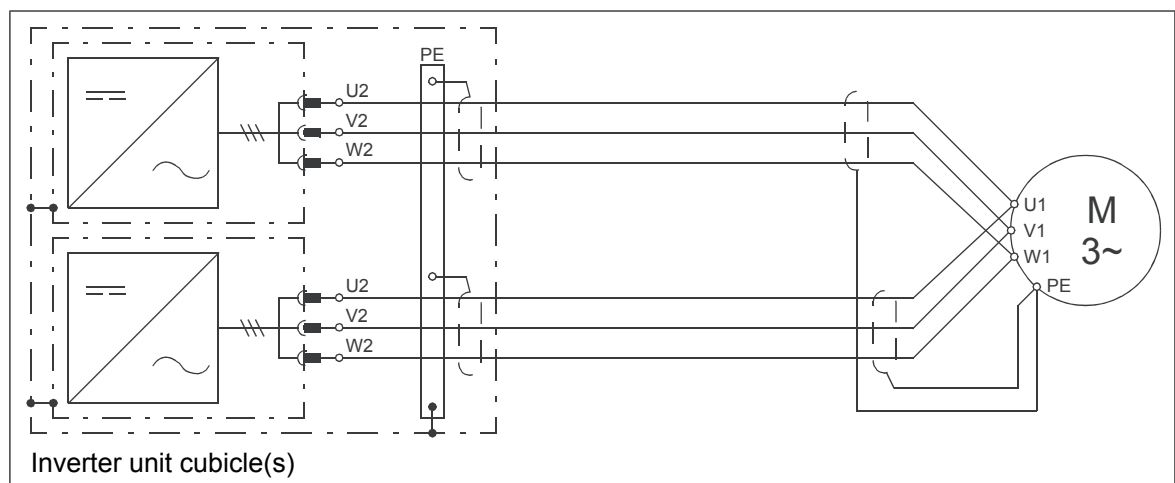
To allow the most room for the work, the modules can be removed completely from the cabinet. For instructions, see section *Removing the inverter module(s)* (page 67).

Especially in the case of multiple inverter modules in the same cubicle, you can consider only removing the fan carriage of each module. This is faster than removing the entire module, but allows less room for the connecting work. For instructions, see section *Removing the fan carriage of an inverter module* (page 71).

■ Motor connection diagram (without option +H366)

All parallel-connected inverter modules are to be cabled separately to the motor.

360° earthing is to be used at cable lead-throughs.

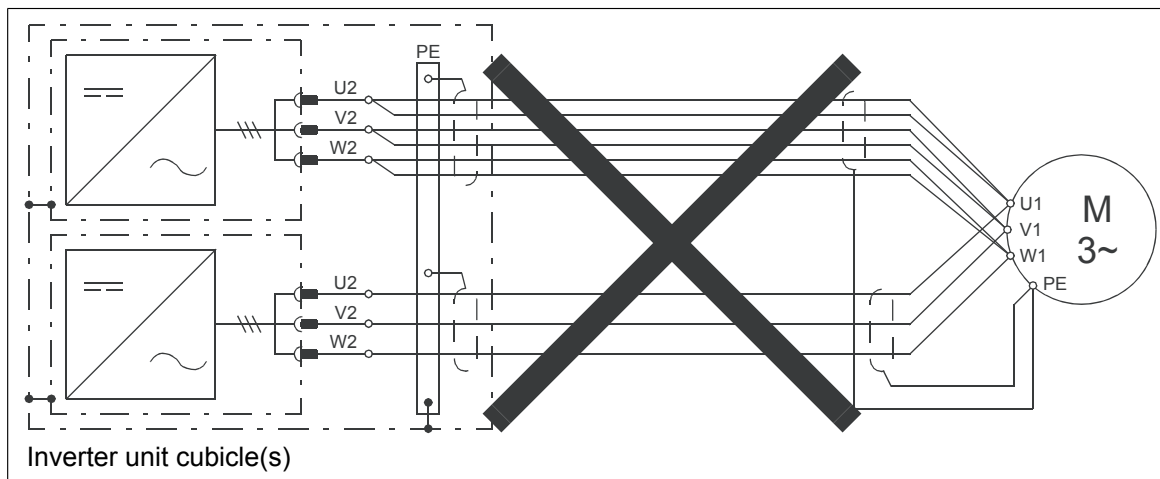


The recommended cable types are given in chapter *Technical data*.



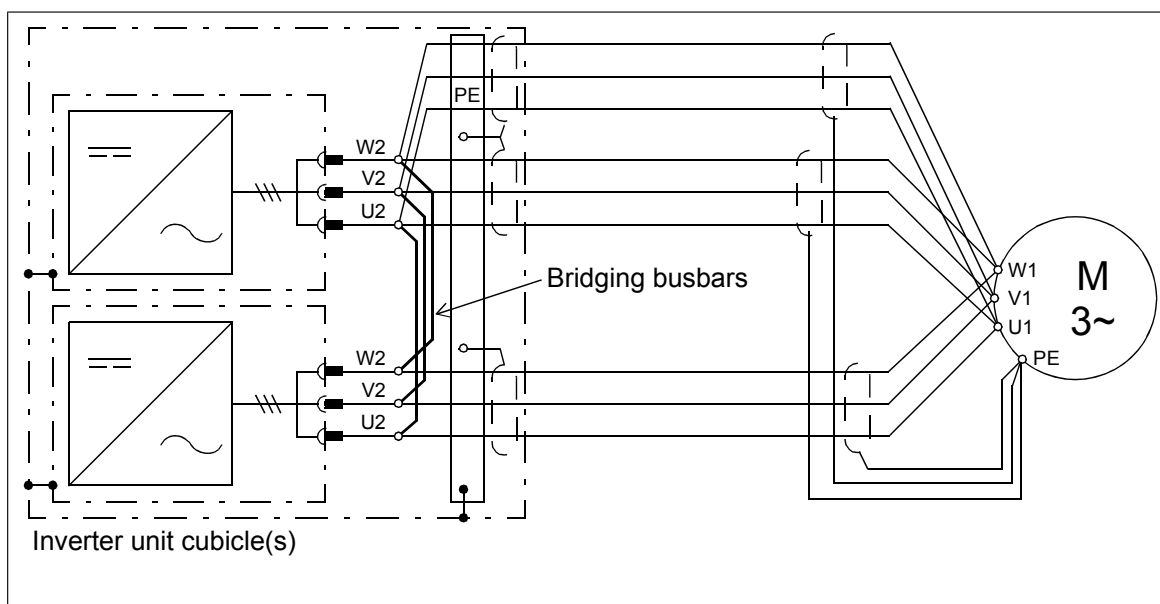
WARNING!

The cabling from all inverter modules to the motor must be physically identical considering cable type, cross-sectional area, and length.



■ **Motor connection diagram (with option +H366)**

With option +H366, the output busbars of the inverter modules **within the same cubicle** are connected by bridging busbars. The bridging balances the motor current between the modules, which allows more cabling options. For example, it is possible to use a number of cables that could not otherwise be evenly distributed between the inverter modules.



The recommended cable types are given in chapter *Technical data*.



WARNING!

The bridging can carry the nominal output of one inverter module. In case of three parallel modules, ensure that the load capacity of the bridging is not exceeded. For example, if the cabling connects to the output busbars at one module only, use the module in the middle.

Note: The +H366 option only interconnects the outputs of inverter modules within the same cubicle, not modules installed in different cubicles. Therefore, when the drive has more than three inverter modules, make sure that the load is distributed evenly between the modules:

- In case of two inverter cubicles of two modules, connect the same number of cables to each cubicle.
- In case of one inverter cubicle with three modules and another with two, each cubicle requires a number of cables proportional to the number of modules within. For example, connect three out of five (or six out of ten, etc.) cables to the cubicle with three modules, the remaining two out of five (four out of ten) cables to the cubicle with two modules.

■ Procedure

Removing the inverter module(s)

To allow more room for cabling work, the inverter modules can be removed completely instead of only the fan carriages.

Refer to the drawings below.

Note: As an alternative to using the extraction/installation ramp, a lifter is available from ABB Service. See *Lifter for air-cooled drive modules user's guide* (3AXD50000332588 [English]).



WARNING!

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

Note: The illustrations represent a frame 2×R8i inverter cubicle with option +F286 (DC switch-disconnector). On units without +F286, the DC busbars are oriented differently, but the procedure is otherwise the same.

1. Do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
2. Open the inverter module cubicle door.
3. Remove the shroud at the top of the cubicle.
4. Detach the terminal block [X50] at the top of the module.
5. Detach the DC busbars from the module. Make note of the order and position of the screws and washers.
6. Detach the wiring connected to the terminals on the front of the module (including fiber optic cabling). Move the disconnected wiring aside.
7. Drives with option +C121 (Marine construction) or +C180 (Seismic design):
 - a. Loosen the bolts holding the transverse retaining bracket both on the left and the right. (During reassembly, tighten these screws to 9 N·m [6.6 lbf-ft].)
 - b. Remove the bolts holding the retaining bracket to the module.
 - c. Remove the retaining bracket.
 - d. Reinstall the bolts to the module. Tighten to 22 N·m (16 lbf-ft).



WARNING! Do not proceed before the bolts are securely in place. Otherwise, the parts of the module can become separated and cause injury or damage.

8. Attach the module extraction/installation ramp (included) to the base of the cabinet so that the tabs on the mounting bracket enter the slots on the ramp.



WARNING!

Check the markings on the ramp to make sure that it is suitable for the plinth height.

9. Remove the two retaining screws at the bottom front of the module.

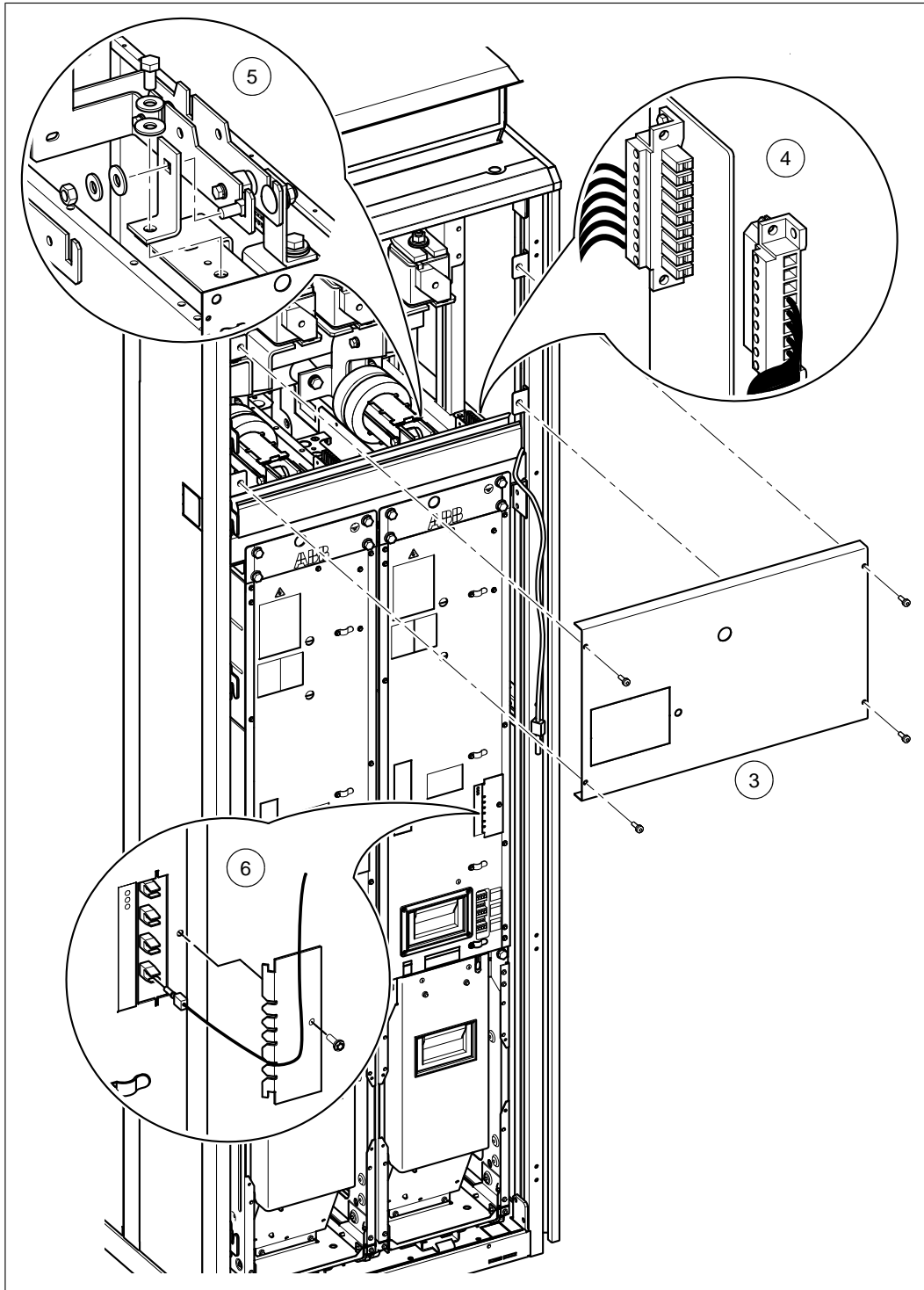


WARNING!

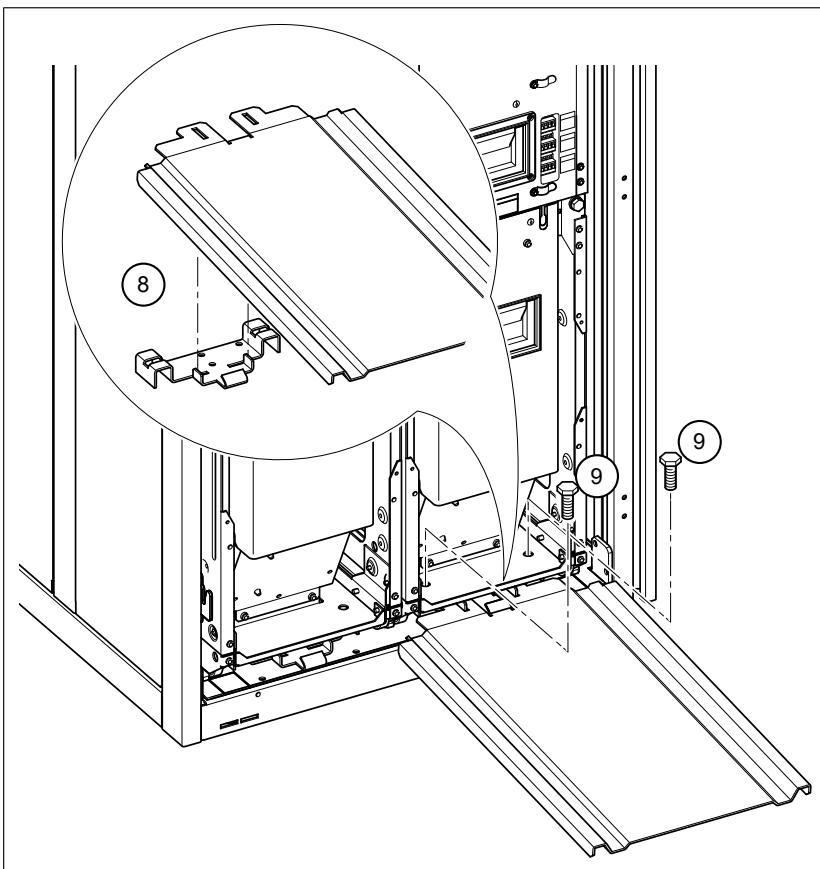
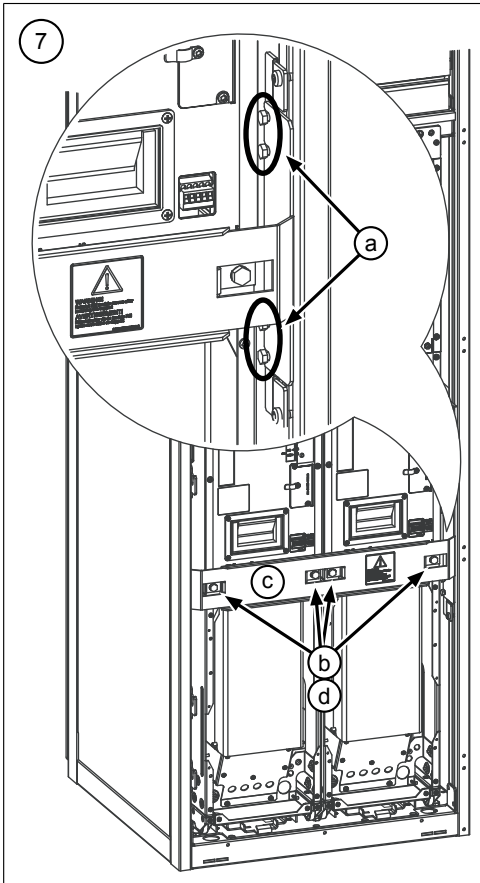
Before you proceed, make sure the cabinet is level, or chock the wheels of the module.

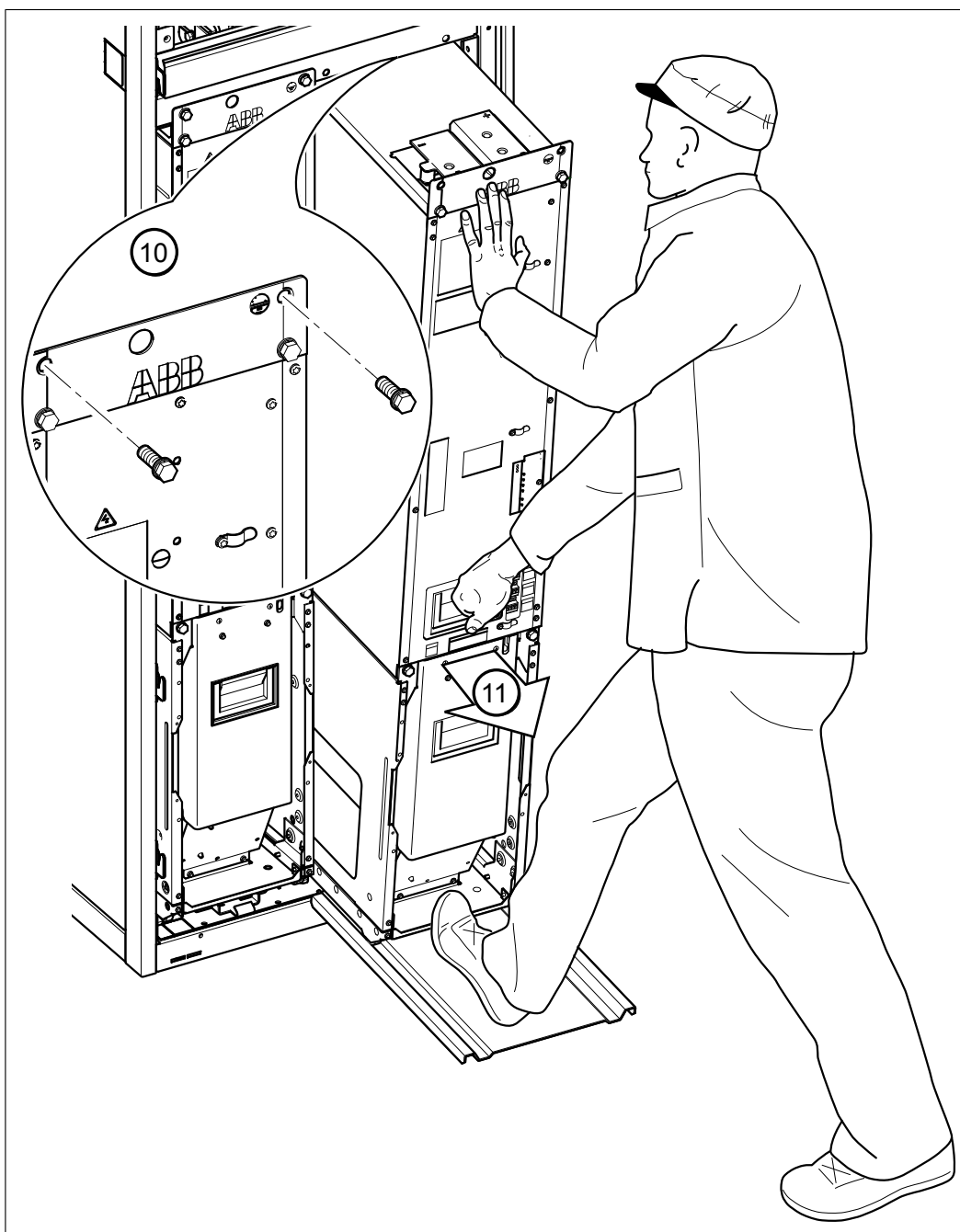
10. Remove the two retaining screws at the top front of the module.
11. Pull the module carefully out along the ramp. While pulling on the handle with your right hand, keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.
12. Move the module into a safe location outside the immediate work area and make sure it cannot topple over. Chock the wheels of the module if the floor is not completely level.
13. Repeat the procedure for the other inverter modules.





70 Electrical installation





Removing the fan carriage of an inverter module

Refer to the drawings below.



WARNING!

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

1. Do the steps in section *Electrical safety precautions* (page 57) before you start the work.
2. Open the inverter module cubicle door.
3. Remove the screws holding the front cover plate. Lift the cover plate somewhat to release it.
4. Disconnect the wiring at the top of the fan carriage.

5. Remove the two screws at the bottom of the fan carriage.



WARNING!

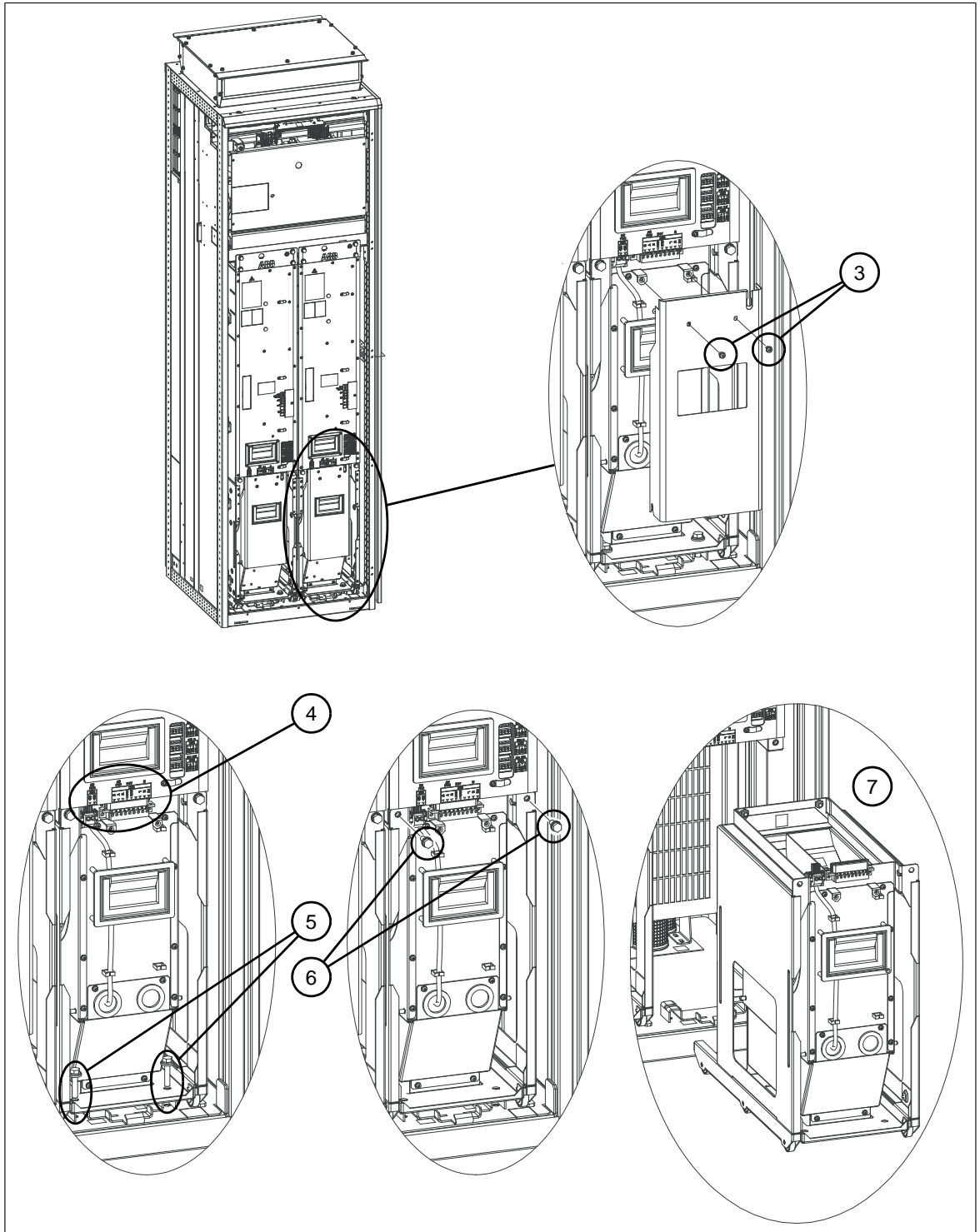
Before you proceed, make sure the two screws holding the top of the inverter module are in place.

6. Remove the two screws at the top of the fan carriage. (During reassembly, tighten these screws to 22 N·m [16 lbf·ft].)

Note: Units with marine or seismic design have an additional transverse bracket that is attached to the module with these screws. At this point, loosen the retaining screws of the bracket at the left and the right ends and remove it. (During reassembly, tighten the bracket retaining screws to 9 N·m [6.6 lbf·ft].)

7. Pull the fan carriage out.
8. Repeat the procedure for other fan carriages in the same cubicle.





Connecting the motor cables

Refer to the drawings below.



WARNING!

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

1. Do the steps in section *Electrical safety precautions* (page 57) before you start the work.
2. Remove the shroud in front of the output busbars.

3. For 360° grounding of the shield at the cable entry, remove the outer jacket of each cable where they pass through the cable entry (a).
4. Cut the cable to suitable length and strip the ends of the individual conductors. Twist the shield strands together to form a separate conductor and wrap it with tape.
5. Crimp suitable lug terminals onto the phase conductors and the ground conductor. The dimensions of the output busbars are shown in chapter Technical data.
6. Connect the phase conductors of the motor cable to the U2, V2 and W2 terminals. You can temporarily remove the plastic insulators (b) between the busbars to make the connecting work easier.

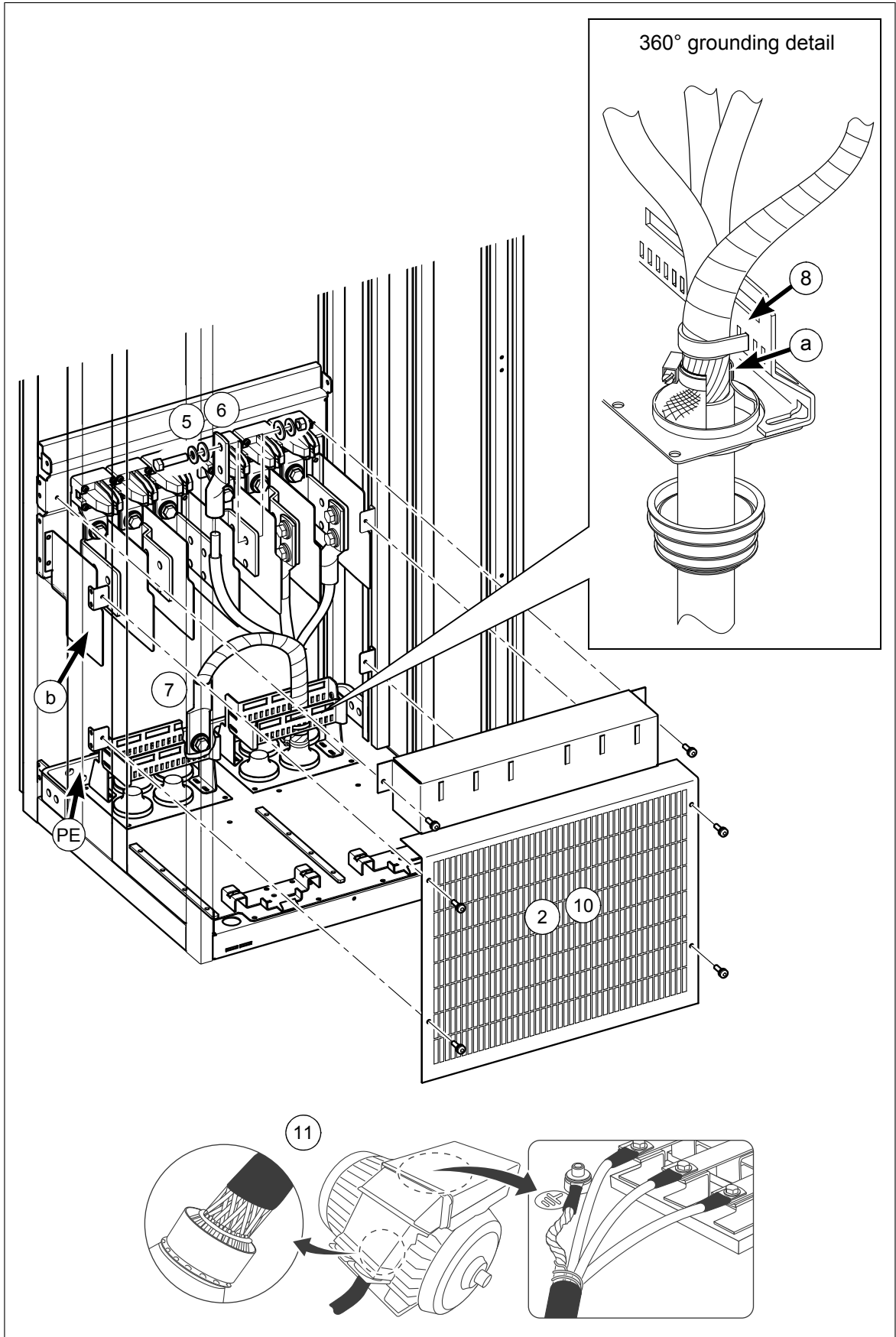


WARNING!

The plastic insulators (b) between the busbars must be in place when the inverter is powered.

7. Connect the shield (and any grounding conductors) of the cable to the PE busbar close to the cable entries.
8. Secure the cable mechanically.
9. Repeat the procedure for other modules (if any).
10. Refit the shroud removed earlier.
11. At the motor, connect the cables according to instructions from the motor manufacturer. Pay special attention to the phase order. For minimum radio-frequency interference, ground the cable shield 360 degrees at the cable entry of the motor terminal box, or ground the cable by twisting the shield so that the flattened shield is wider than 1/5 of its length.





Re-installing the fan carriage of an inverter module

(If the inverter module was removed completely instead of only the fan carriage, proceed to section [Re-inserting the inverter modules into the cubicle \(page 76\)](#)).

The re-installation of the fan carriage is the removal procedure in reverse. See section [Removing the fan carriage of an inverter module \(page 71\)](#).

Re-inserting the inverter modules into the cubicle



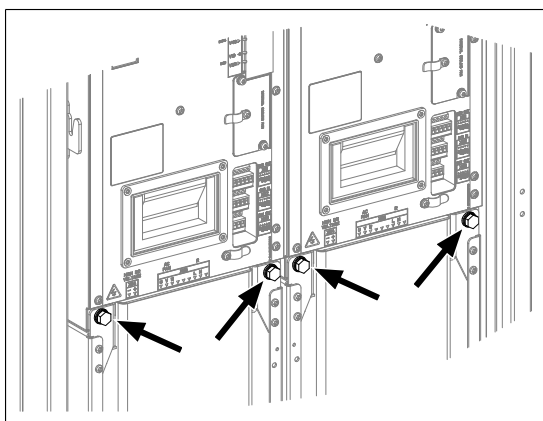
WARNING!

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

1. Make sure there are no tools, debris or any other foreign objects in the cubicle.
2. If not already in place, attach the module extraction/installation ramp (included) to the base of the cabinet so that the tabs on the mounting bracket enter the slots on the ramp.
3. Push the module up the ramp and back into the cubicle.
 - **Keep your fingers away from the edge of the module front plate to avoid pinching.**
 - **Keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.**
4. Secure the top front of the module with two screws. Tighten to 22 N·m (16 lbf·ft).
5. Secure the bottom front of the module with two screws. Tighten to 22 N·m (16 lbf·ft).
6. Remove the ramp.
7. Drives with option +C121 (Marine construction) or +C180 (Seismic design):
 - a. Remove the bolts holding the fan carriage (two bolts per module).



WARNING! The module retaining screws (two at top, two at bottom per module) must be in place before removing these screws. Otherwise, the parts of the module can become separated and cause injury or damage.



- b. Reinstall the transverse retaining bracket. At the ends of the bracket, tighten the screws to 9 N·m [6.6 lbf·ft]. Reinstall the fan carriage bolts removed at previous step, and tighten to 22 N·m (16 lbf·ft).
8. Attach the DC busbars to the module. Tighten to 70 N·m (52 lbf·ft).
9. Reconnect terminal block [X50] at the top of the module.

10. Reconnect the wiring and fiber optic cables to the terminals on the front of the module.
11. Repeat the procedure for the other inverter modules.
12. Reinstall the shroud near the top of the cubicle.



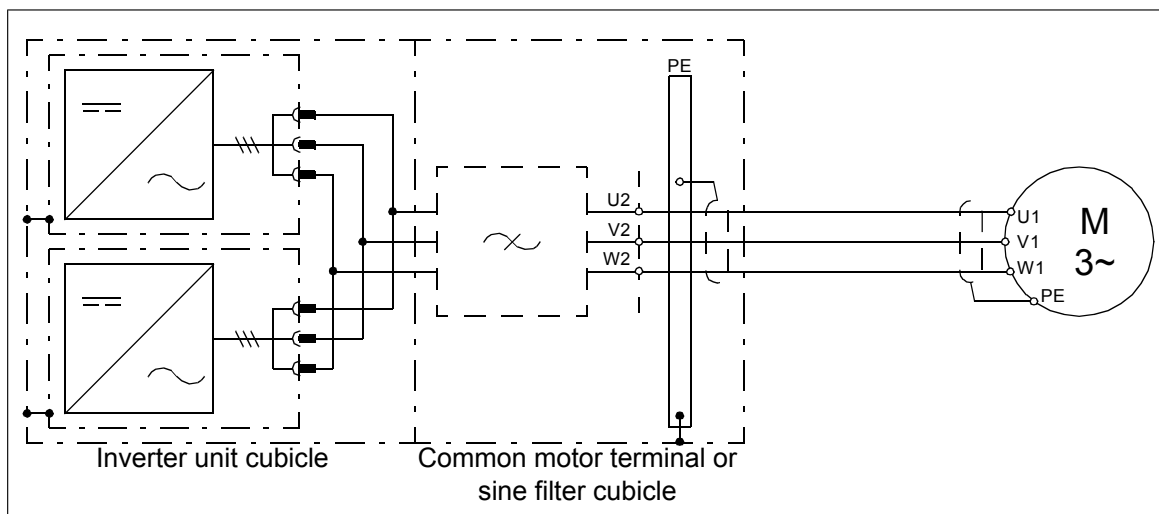
Connecting the motor cables – Frame size R8i and multiples with common motor terminal cubicle

■ Output busbars

If the drive is equipped with option +H359, the motor cables connect to a common motor terminal cubicle. Similarly, if the drive is equipped with option +E206 (sine output filter), the motor cables connect to the output busbars in the sine filter cubicle.

The location and dimensions of the busbars are visible in the dimensional drawings delivered with the drive.

■ Connection diagram



The recommended cable types are given in chapter Technical data.

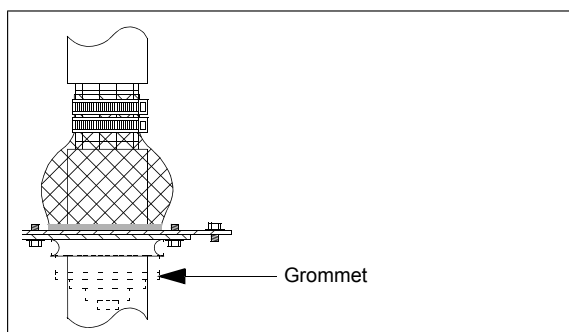
■ Procedure



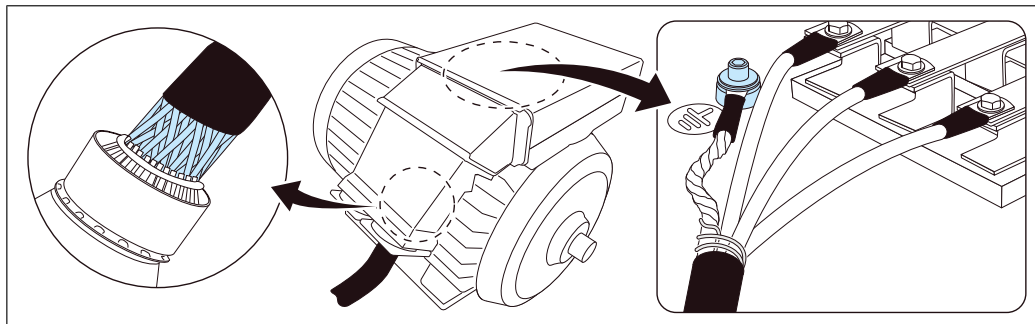
WARNING!

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

1. Do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
2. Open the door of the cubicle and remove the shrouding.
3. Lead the cables into the cubicle. Make the 360° earthing arrangement at the cable entry as shown.



4. Cut the cables to suitable length. Strip the cables and conductors.
5. Twist the cable screens into bundles and connect the bundles to the PE busbar in the cubicle.
6. Connect any separate ground conductors/cables to the PE busbar in the cubicle.
7. Connect the phase conductors to the output terminals. Use the torques specified under *Tightening torques (page 152)*.
8. Refit any shrouding removed earlier and close the cubicle doors.
9. At the motor, connect the cables according to instructions from the motor manufacturer. Pay special attention to the phase order. For minimum radio-frequency interference, ground the cable shield 360 degrees at the lead-through of the motor terminal box, or ground the cable by twisting the shield so that the flattened shield is wider than 1/5 of its length.



Installing optional modules on the control unit

■ Installing an FSO-xx safety functions module (frame sizes R1i...R7i)

In case you need to install multiple optional modules on the control unit, install the FSO-xx first.



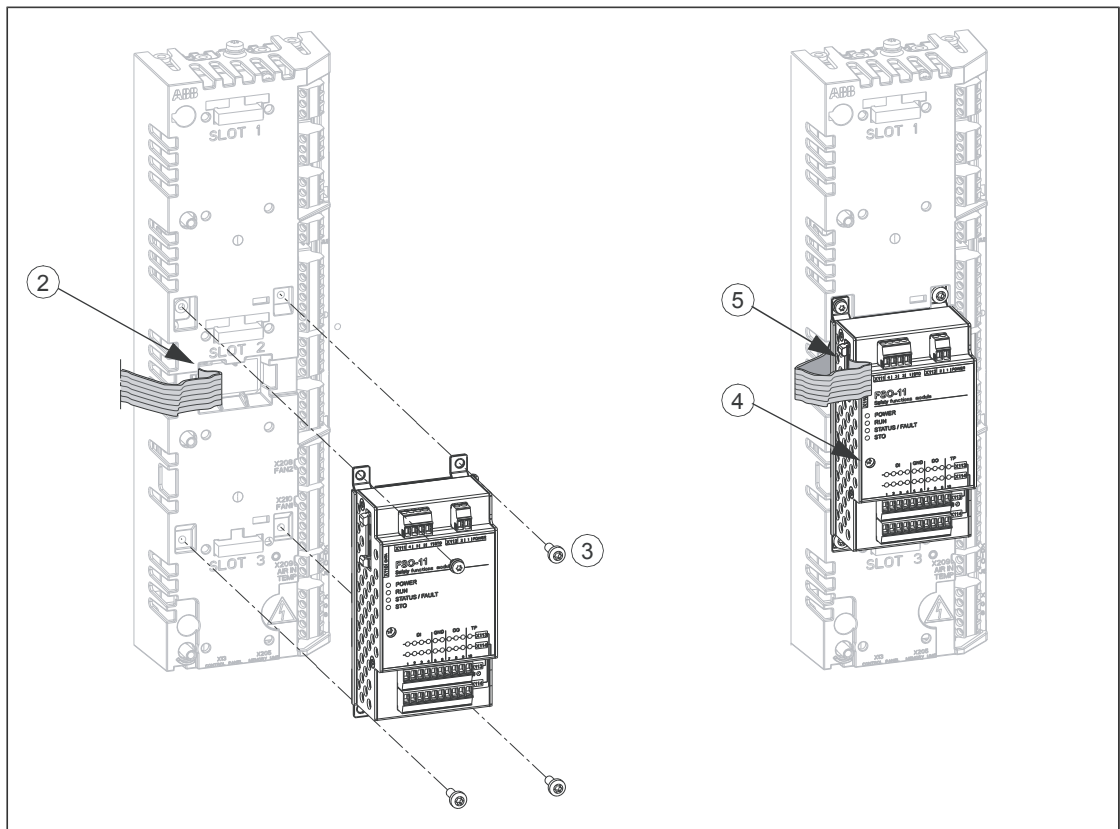
WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
2. The FSO-xx comes with alternative bottom plates for mounting on different units. For mounting on the ZCU-14, the mounting points should be located at the short edges of the module as shown. Replace the bottom plate of the FSO-xx if necessary. For mounting on the ZCU-12, the mounting points should be located at the long edges. Replace the bottom plate of the FSO-xx if necessary.
3. Connect the data cable to connector X12 on the control unit.
4. Put the FSO-xx into its position on slot 2 of the control unit.
5. Tighten the FSO-xx electronics grounding screw to tightening torque **0.8 N·m**.
Note: The screw tightens the connections and grounds the module. It is essential for fulfilling the EMC requirements and for proper operation of the module.
6. Attach the module by the bottom plate with four screws.



7. Connect the other end of the data cable to connector X110 on the FSO-xx.
8. To complete the installation, refer to the instructions in the user's manual delivered with the FSO-xx.



■ Installing an FSO-xx safety functions module (frame sizes R8i and multiples)



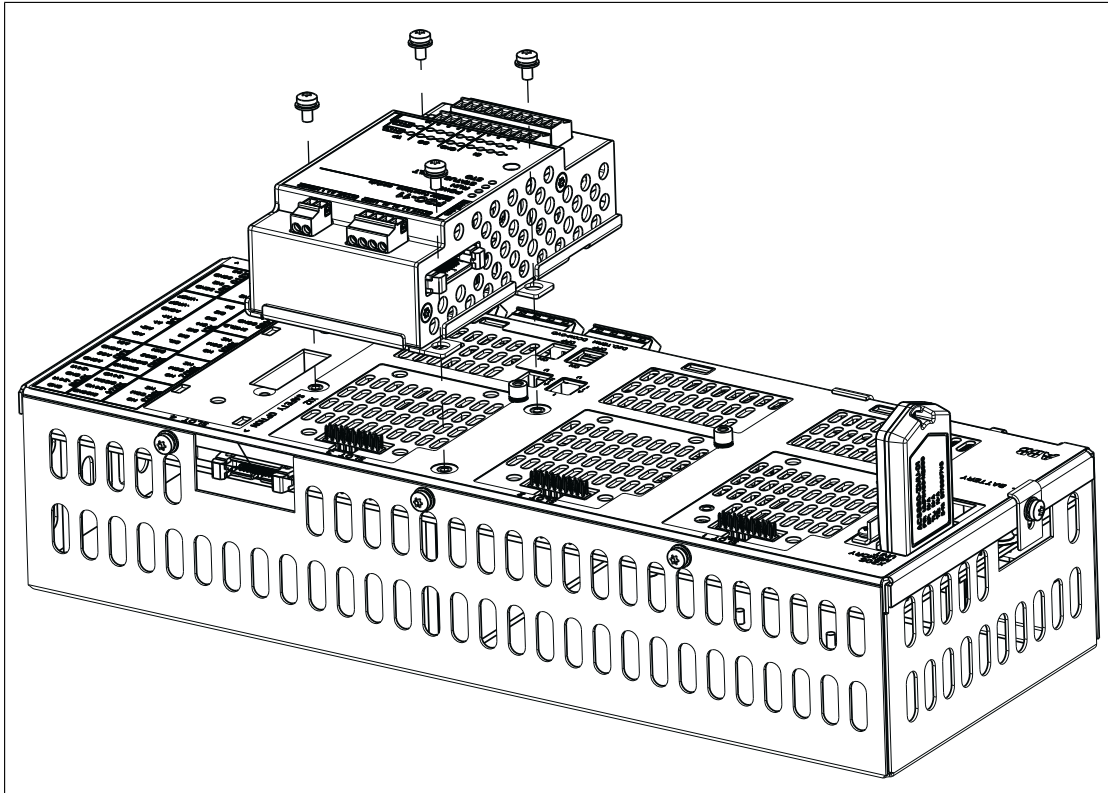
WARNING!

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

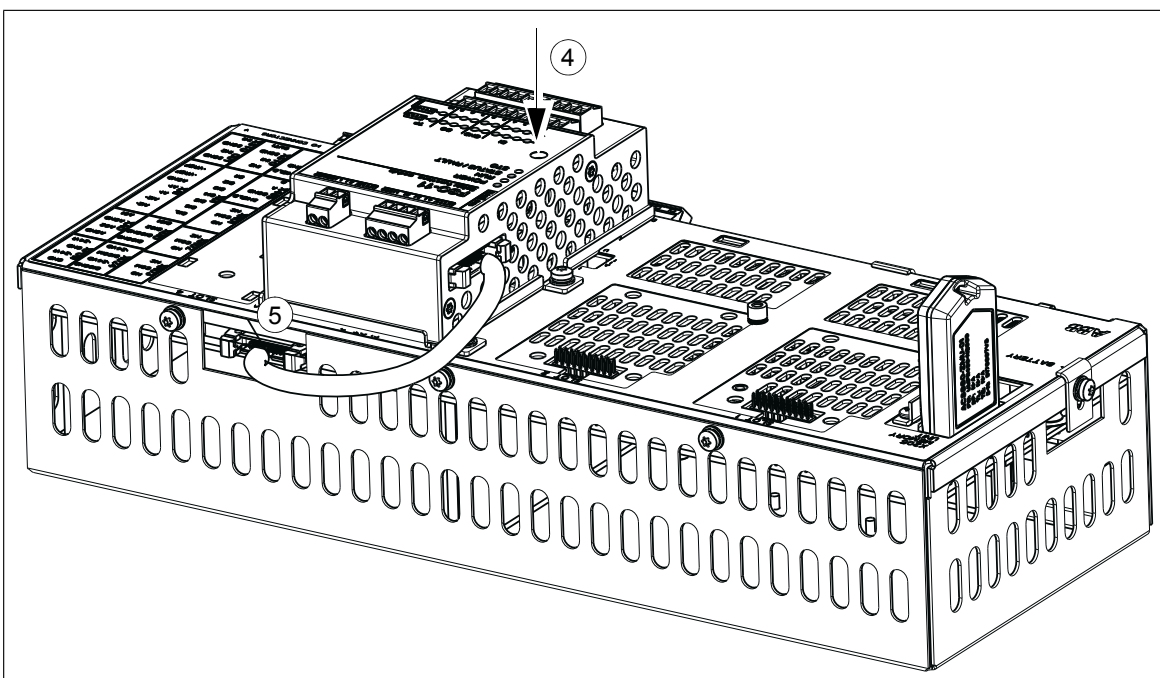
This procedure describes the installation of an FSO-xx safety functions module onto the BCU control unit. (The FSO-xx can alternatively be installed beside the control unit, which is the standard with factory-installed FSO-xx modules. For instructions, see the FSO-xx manual.)

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
2. The FSO-xx comes with alternative bottom plates for mounting on different units. For mounting on the BCU, the mounting points should be located at the long edges of the module as shown. Replace the bottom plate of the FSO-xx if necessary.

3. Fasten the FSO-xx onto slot 3 of the BCU control unit [A41] with four screws.



4. Tighten the FSO-xx electronics grounding screw.
Note: The screw tightens the connections and grounds the module. It is essential for fulfilling the EMC requirements and for proper operation of the module.
5. Connect the FSO-xx data cable between FSO-xx connector X110 and BCU-x2 connector X12.
6. To complete the installation, refer to the instructions in the User's manual delivered with the FSO-xx.



■ Installation of I/O extension, fieldbus adapter and pulse encoder interface modules



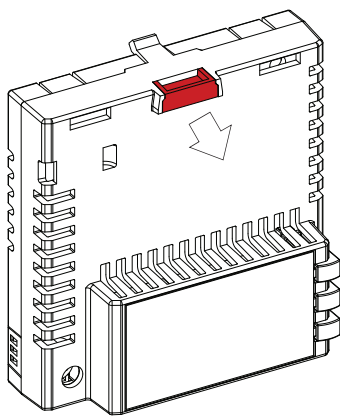
WARNING!

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

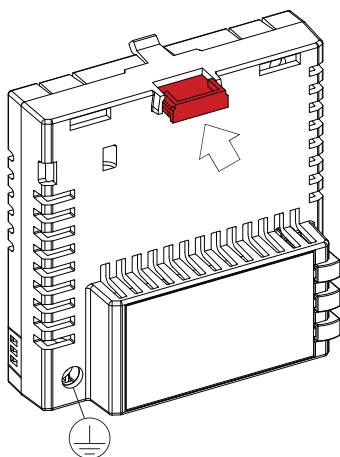
Pay attention to the free space required by the cabling or terminals coming to the option modules.

1. Repeat the steps described in [Electrical safety precautions \(page 57\)](#).
2. Pull out the lock.

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



3. Install the module to a free option module slot on the control unit.
4. Push in the lock.



5. Tighten the grounding screw to a torque of 0.8 N·m (7 lbf·in).

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



WARNING!

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

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

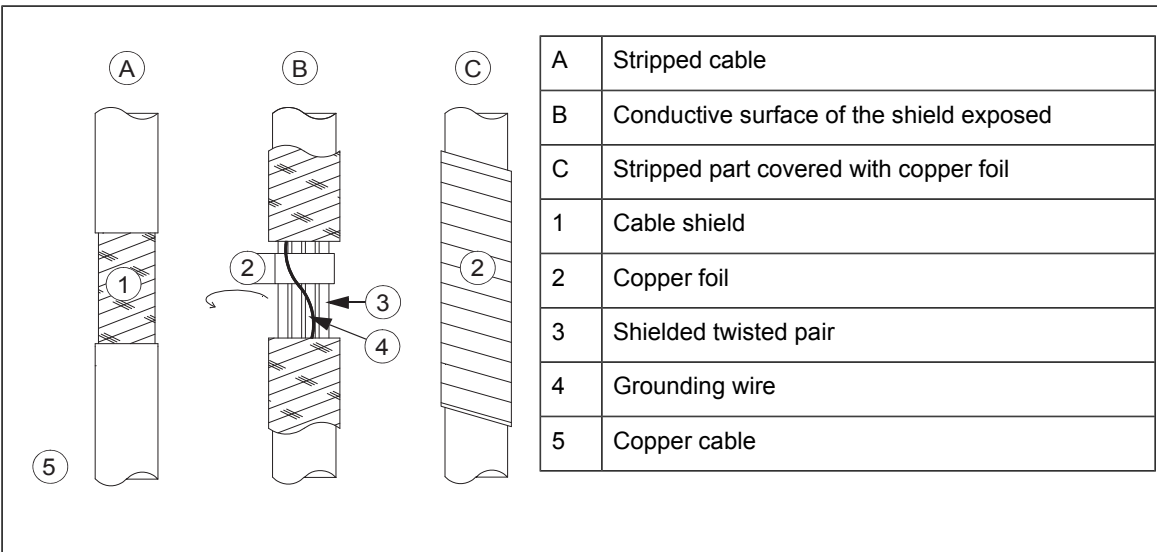
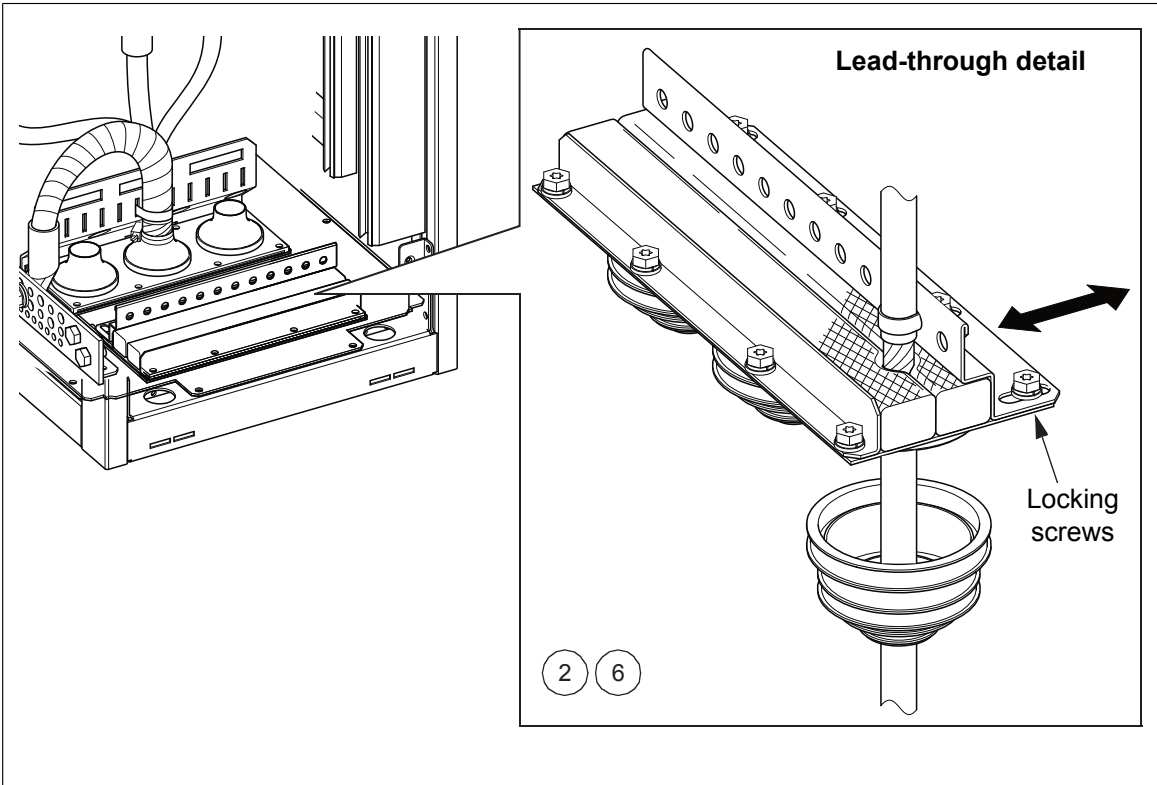


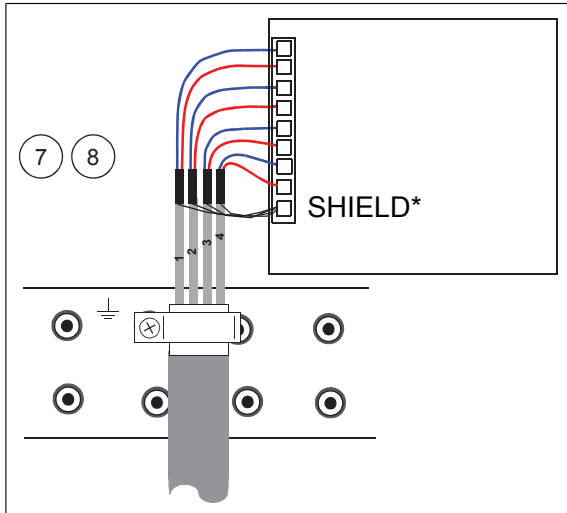
Connecting the control cables

Frame R1i...R4i, R6i and R7i inverter modules use a ZCU-14 control unit, frame R5i modules use a ZCU-12 control unit, and frame R8i modules (and multiples) use a BCU control unit. The cabinet has a control cable entry that consist of grommets and two conductive grounding cushions that press against the exposed cable shields. Refer to the drawings below.

1. In the cabinet, remove shrouding wherever necessary to allow access to the cable entry and trunking inside the cubicle.
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. (Top entry units only) Sort the cables so that the thinnest and thickest cables are at the opposite ends of the opening as shown below. If several cables are run through one grommet, seal the entry using Loctite 5221 or equivalent.
4. Run the cables to their eventual connection points using existing trunking wherever possible. Protect the cables against any sharp edges or hot surfaces.
5. 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).
6. Push the cushions firmly together so that they press on the exposed cable shields. Tighten the locking screws.
7. When connecting to the inverter control unit, remove the outer sheathing of the cable at one of the grounding clamps near the terminals. Tighten the clamp onto the bare cable shield.
In case no clamp plate is available at the connection point, twist the outer shield strands into a bundle, crimp a ring terminal onto it and connect it to the nearest suitable grounding point.
8. 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. Connect the shields of twisted pairs to a "shield" terminal if provided; otherwise twist the shields into a bundle, crimp a ring terminal onto it and connect it to the nearest chassis grounding point.
9. Refit any shrouds removed earlier.
10. At the other end of the cables, leave the shields unconnected or ground them via a capacitor (eg. 3.3 nF / 630 V).







Connecting a PC

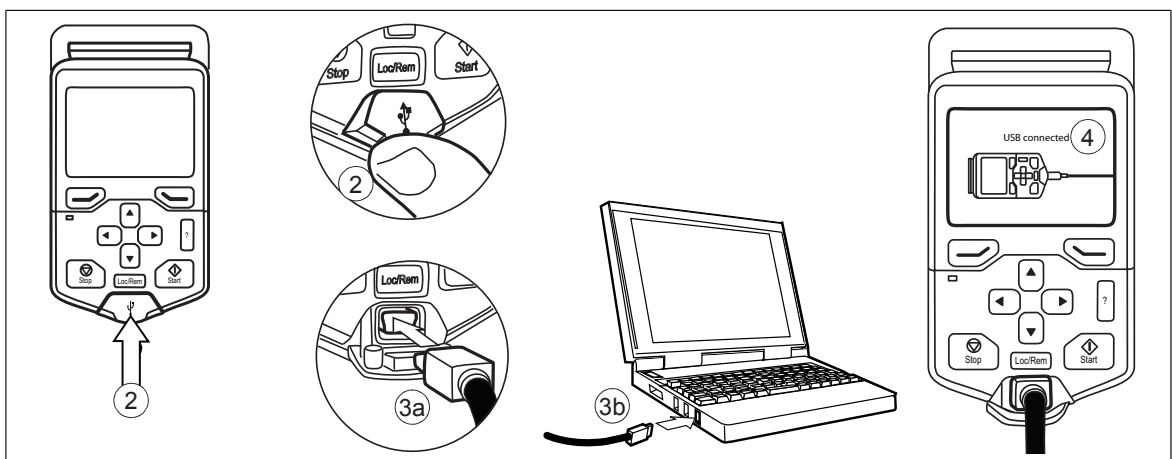


WARNING!

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

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

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



Panel bus (Control of several units from one control panel)

One control panel (or PC) can be used to control several drives (or inverter units, supply units etc.) by constructing a panel bus. This is done by daisy-chaining the panel connections of the drives. Some drives have the necessary (twin) panel connectors in the control panel

holder; those that do not require the installation of an FDPI-02 module (available separately). For further information, see the hardware description and *FDPI-02 diagnostics and panel interface user's manual* (3AUA0000113618 [English]).

The maximum allowed length of the cable chain is 100 m (328 ft).

1. Connect the panel to one drive using an Ethernet (for example Cat 5e) cable.
 - Use Menu - Settings - Edit texts - Drive to give a descriptive name to the drive
 - Use parameter 49.01* to assign the drive with a unique node ID number
 - Set other parameters in group 49* if necessary
 - Use parameter 49.06* to validate any changes.

*The parameter group is 149 with supply (line-side), brake or DC/DC converter units. Repeat the above for each drive.

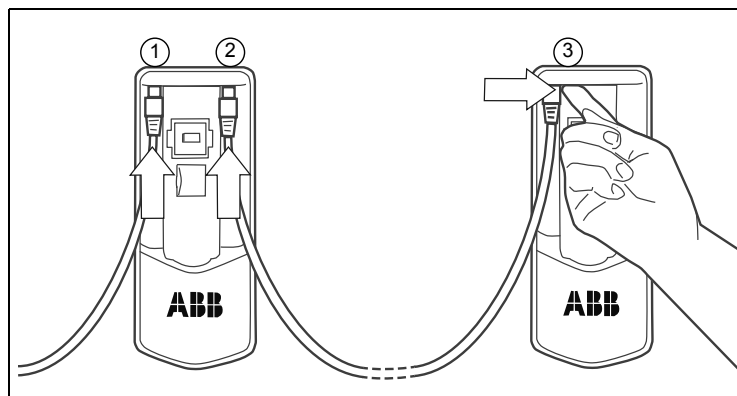
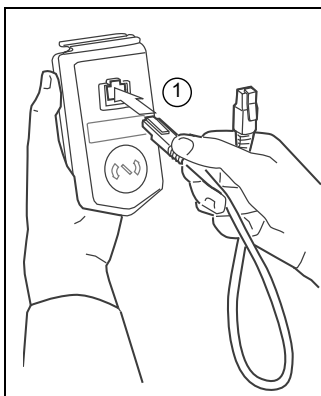
2. With the panel connected to one unit, link the units using Ethernet cables.
3. Switch on the bus termination on the drive that is farthest from the control panel in the chain.
 - With drives that have the panel mounted on the front cover, move the terminating switch into the outer position.
 - With an FDPI-02 module, move termination switch S2 into the TERMINATED position.

Make sure that bus termination is off on all other drives.

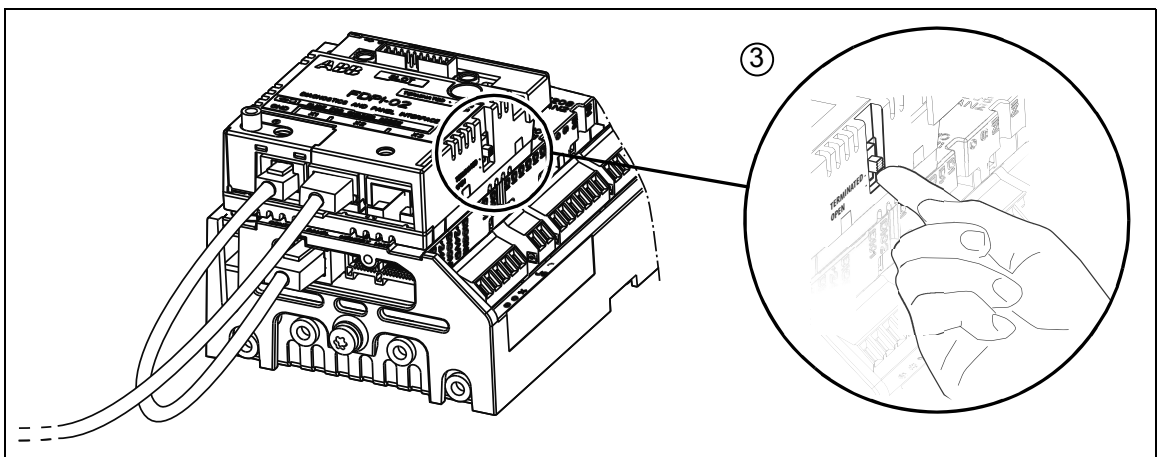
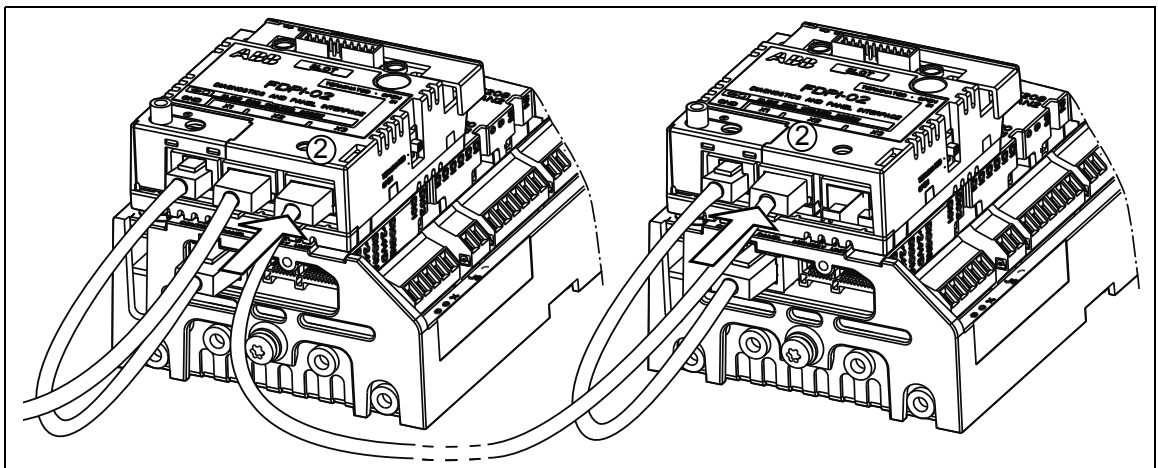
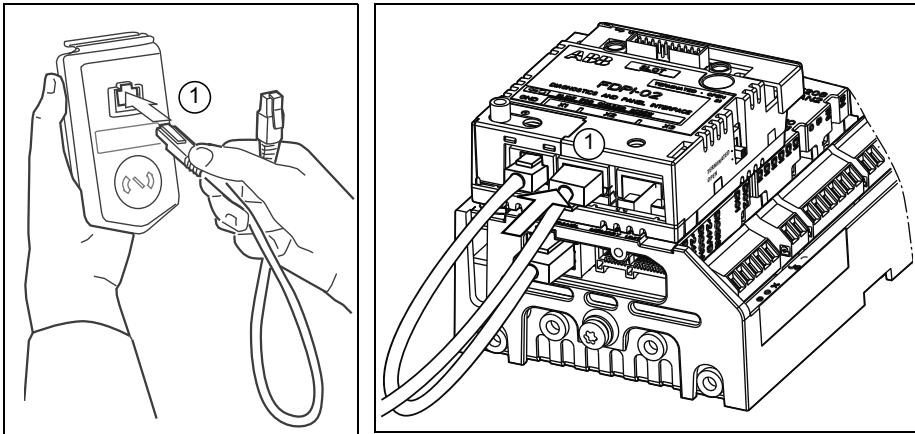
4. On the control panel, switch on the panel bus functionality (Options - Select drive - Panel bus). The drive to be controlled can now be selected from the list under Options - Select drive.

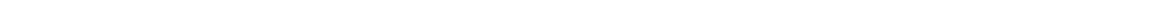
If a PC is connected to the control panel, the drives on the panel bus are automatically displayed in the Drive composer tool.

With twin connectors in the control panel holder:



With FDPI-02 modules:





5

Installation checklist of the drive

Contents of this chapter

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

Checklist

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



WARNING!

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

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



WARNING!

Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.

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

92 Installation checklist of the drive

Make sure that ...	<input checked="" type="checkbox"/>
The cooling air flows freely in and out of the drive.	<input type="checkbox"/>
If the drive is connected to a network other than a symmetrically grounded TN-S system: You have done all the required modifications (for example, you may need to disconnect the EMC filter or ground-to-phase varistor). See the electrical installation instructions in the supply unit manual.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor(s) between the drive and the switchboard, the conductor is connected to correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The input power cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
There is an adequately sized protective earth (ground) conductor between the motor and the drive, and the conductor is connected to the correct terminal, and the terminal is tightened to the correct torque. Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The motor cable is connected to the correct terminals, the phase order is correct, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
The motor cable is routed away from other cables.	<input type="checkbox"/>
No power factor compensation capacitors are connected to the motor cable.	<input type="checkbox"/>
Proper grounding has also been measured according to the regulations.	<input type="checkbox"/>
The control cables are connected to the correct terminals, and the terminals are tightened to the correct torque.	<input type="checkbox"/>
The voltage setting of the auxiliary voltage transformers (if any) is correct. See the electrical installation instructions.	<input type="checkbox"/>
If a drive bypass connection will be used: The direct-on-line contactor of the motor and the drive output contactor are either mechanically and/or electrically interlocked, that is, they cannot be closed at the same time. A thermal overload device must be used for protection when bypassing the drive. Refer to local codes and regulations.	<input type="checkbox"/>
There are no tools, foreign objects or dust from drilling inside the drive.	<input type="checkbox"/>
The area in front of the drive is clean: the drive cooling fan cannot draw any dust or dirt inside.	<input type="checkbox"/>
Cover(s) of the motor connection box are in place. Cabinet shrouds are in place and doors are closed.	<input type="checkbox"/>
The motor and the driven equipment are ready for power-up.	<input type="checkbox"/>

6

Start-up

Contents of this chapter

This chapter describes the hardware commissioning of the inverter unit. For information on setting up the control program, refer to the appropriate firmware manual. For information on commissioning the supply unit, refer to its hardware manual.

Start-up procedure

The tasks which are needed in certain cases only are marked with underlining, and option codes are given in brackets. Default device designations (if any) are given in brackets after the name, for example “main switch-disconnector (Q1)”. The same device designations are also used in the circuit diagrams.

These instructions cannot and do not cover all possible start-up tasks of a customized drive. Always refer to the delivery-specific circuit diagrams when proceeding with the start-up.



WARNING!

Only qualified electricians are allowed to do the work described in this chapter.

Note: For certain options (such as functional safety options +Q950, +Q951, +Q952, +Q957, +Q963, +Q964, +Q978, +Q979), additional start-up instructions are given in their separate manuals.

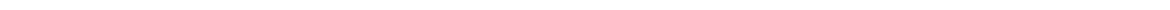
Action	<input checked="" type="checkbox"/>
Safety	
WARNING! Obey the safety instructions during the start-up procedure. See the <i>Safety instructions for ACS880 multidrive cabinets and modules</i> (3AUA0000102301 [English]).	<input type="checkbox"/>

Action	<input checked="" type="checkbox"/>
Pre-requisites	
The mechanical and electrical installation of the drive has been inspected and approved. See <i>Installation checklist of the drive (page 91)</i> .	<input type="checkbox"/>
The insulation resistance of the assembly has been checked according to instructions. See <i>Electrical installation (page 57)</i> .	<input type="checkbox"/>
The supply unit of the drive system has been started up according to the instructions in its hardware manual.	<input type="checkbox"/>
Checks/Settings with no voltage connected	
Do the steps listed in <i>Electrical safety precautions (page 57)</i> . Refer to the hardware manual of the supply unit for more information.	<input type="checkbox"/>
Check the settings of breakers/switches in the auxiliary circuits. See the circuit diagrams delivered with the drive.	<input type="checkbox"/>
Disconnect any unfinished or uninspected auxiliary voltage (115/230 V AC) cables that lead from the terminal blocks to the outside of the equipment.	<input type="checkbox"/>
Check that both channels of the Safe torque off circuit connected to the STO input of the inverter control unit (A41) are closed. Refer to the wiring diagrams delivered with the drive. With parallel-connected frame R8i inverter modules, check that the STO OUT output on the inverter control unit (A41) is chained to the STO inputs of all inverter modules. If the Safe torque off functionality is not used, check that the STO input on all inverter modules is correctly wired to +24 V and ground.	<input type="checkbox"/>
<u>Drives with Pt100 relays (option +(n)L506):</u> <ul style="list-style-type: none"> • Check the connections against the circuit diagrams of the delivery. • Set the alarm and trip levels of the Pt100 relays. Set the alarm and trip levels of the Pt100 relay as low as possible based on the operating temperature and test results of the machine. The trip level can be set, for example, 10 °C higher than what the temperature of the machine is at maximal load in the maximum environmental temperature. We recommend to set the operating temperatures of the relay, typically for example, as follows: <ul style="list-style-type: none"> • 120...140 °C when only tripping is in use • alarm 120...140 °C and trip 130...150 °C when both alarm and tripping are used. 	<input type="checkbox"/>
Powering up the auxiliary circuit of the drive	
Make sure that it is safe to connect voltage. Ensure that <ul style="list-style-type: none"> • nobody is working on the drive or circuits that have been wired from outside into the drive cabinet • the cover of the motor terminal box is in place. 	<input type="checkbox"/>
Close the circuit breakers and/or fuse disconnectors supplying the auxiliary voltage circuits.	<input type="checkbox"/>
Close the cabinet doors.	<input type="checkbox"/>
Close the main breaker of the supply transformer.	<input type="checkbox"/>
Switch on the auxiliary voltage.	<input type="checkbox"/>
Setting up the inverter unit parameters, and performing the first start	
Set up the inverter control program. See the appropriate start-up guide and/or firmware manual. There is a separate start-up guide only for some control programs.	<input type="checkbox"/>
With inverter units consisting of frame R8i modules, check the setting of parameter <i>95.09 Switch fuse controller</i> .	<input type="checkbox"/>
<u>Drives with a sine output filter (option +E206):</u> Check that bit 1 of parameter <i>95.15 Special HW settings</i> is activated.	<input type="checkbox"/>
<u>Drives with an fieldbus adapter module (optional):</u> Set the fieldbus parameters. Activate the appropriate assistant (if present) in the control program, or see the user's manual of the fieldbus adapter module, and the drive firmware manual. Check that the communication works between the drive and the PLC.	<input type="checkbox"/>
<u>Drives with an encoder interface module (optional):</u> Set the encoder parameters. Activate the appropriate assistant (if present) in the control program, or see the user's manual of the encoder interface module, and the drive firmware manual.	<input type="checkbox"/>



Action	<input checked="" type="checkbox"/>
Powering up the main circuit of the drive	
Start the supply unit according to the instructions in its hardware manual.	<input type="checkbox"/>
On-load checks	
Start the motor to perform the ID run.	<input type="checkbox"/>
Check that the cooling fans rotate freely in the right direction, and the air flows upwards.	<input type="checkbox"/>
Check that the motor starts, stops and follows the speed reference in the correct direction when controlled with the control panel.	<input type="checkbox"/>
Check that the motor starts, stops and follows the speed reference in the correct direction when controlled through the customer-specific I/O or fieldbus.	<input type="checkbox"/>
<u>Drives in which the Safe torque off control circuit is in use:</u> Test and validate the operation of the Safe torque off function. See section Acceptance test procedure (page 192) .	<input type="checkbox"/>
<u>Drives with an emergency stop circuit (options +Q951, +Q952, +Q963, +Q964, +Q978, +Q979):</u> Test and validate the operation of the emergency-stop circuit. See the delivery specific circuit diagrams and wiring, start-up and operating instructions of the option.	<input type="checkbox"/>
<u>Drives with the Prevention of unexpected start-up with safety relay (option +Q957):</u> Test and validate the operation of the Prevention of unexpected start-up circuit. See the delivery specific circuit diagrams and wiring, start-up and operating instructions of the option.	<input type="checkbox"/>
<u>Test and validate the operation of Prevention of unexpected start with FSO-xx (option +Q950):</u> Test and validate the operation of the Prevention of unexpected start-up circuit. See the delivery specific circuit diagrams and wiring, start-up and operating instructions of the option.	<input type="checkbox"/>





7

Maintenance

Contents of this chapter

This chapter contains preventive maintenance instructions.



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

Maintenance intervals

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

Maintenance task/object	Years from start-up													
	0	1	2	3	4	5	6	7	8	9	10	11	12	...
Cooling														
Inverter module main cooling fan										R				
Frame R5i auxiliary cooling fan										R				
Frame R8i circuit board compartment fan										R				
Cabinet cooling fan (50 Hz)										R				
Cabinet cooling fan (60 Hz)							R						R	
Batteries														
Control unit battery							R						R	
Control panel battery										R				
Connections and environment														
Air inlet and outlet cleaning (IP22/IP42)		I	I	I	I	I	I	I	I	I	I	I	I	I
Cabinet door filter change (IP54)		R	R	R	R	R	R	R	R	R	R	R	R	R
Checking tightness of cable and busbar terminals. Tightening if needed.		I	I	I	I	I	I	I	I	I	I	I	I	I
Checking ambient conditions (dustiness, corrosion, temperature)		I	I	I	I	I	I	I	I	I	I	I	I	I
Cleaning of heatsinks		I	I	I	I	I	I	I	I	I	I	I	I	I
Quality of supply voltage		P	P	P	P	P	P	P	P	P	P	P	P	P
Spare parts														
Spare parts		I	I	I	I	I	I	I	I	I	I	I	I	I
DC circuit capacitor reforming (spare modules and spare capacitors)		P	P	P	P	P	P	P	P	P	P	P	P	P

4FPS10000292961

Symbols

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

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

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

Maintenance timers and counters

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

Cabinet

■ Cleaning the interior of the cabinet



WARNING!

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

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



WARNING!

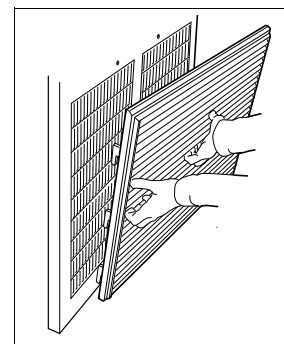
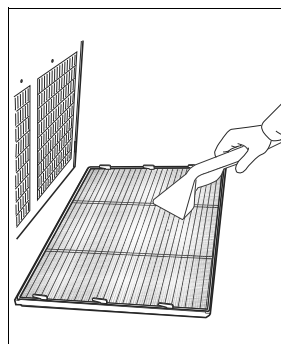
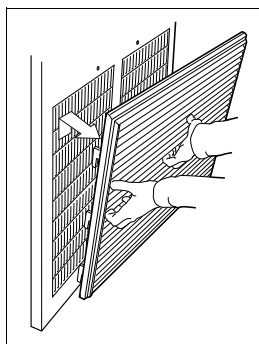
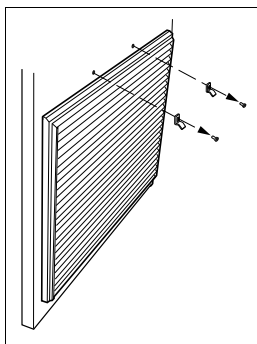
Use a vacuum cleaner with antistatic hose and nozzle, and wear a grounding wristband. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Open the cabinet door.
3. Clean the interior of the cabinet. Use a vacuum cleaner and a soft brush.
4. Clean the air inlets of the fans and air outlets of the modules (top).
5. Clean the air inlet gratings (if any) on the door.
6. Close the door.

■ Cleaning the door air inlets (IP22 and IP42)

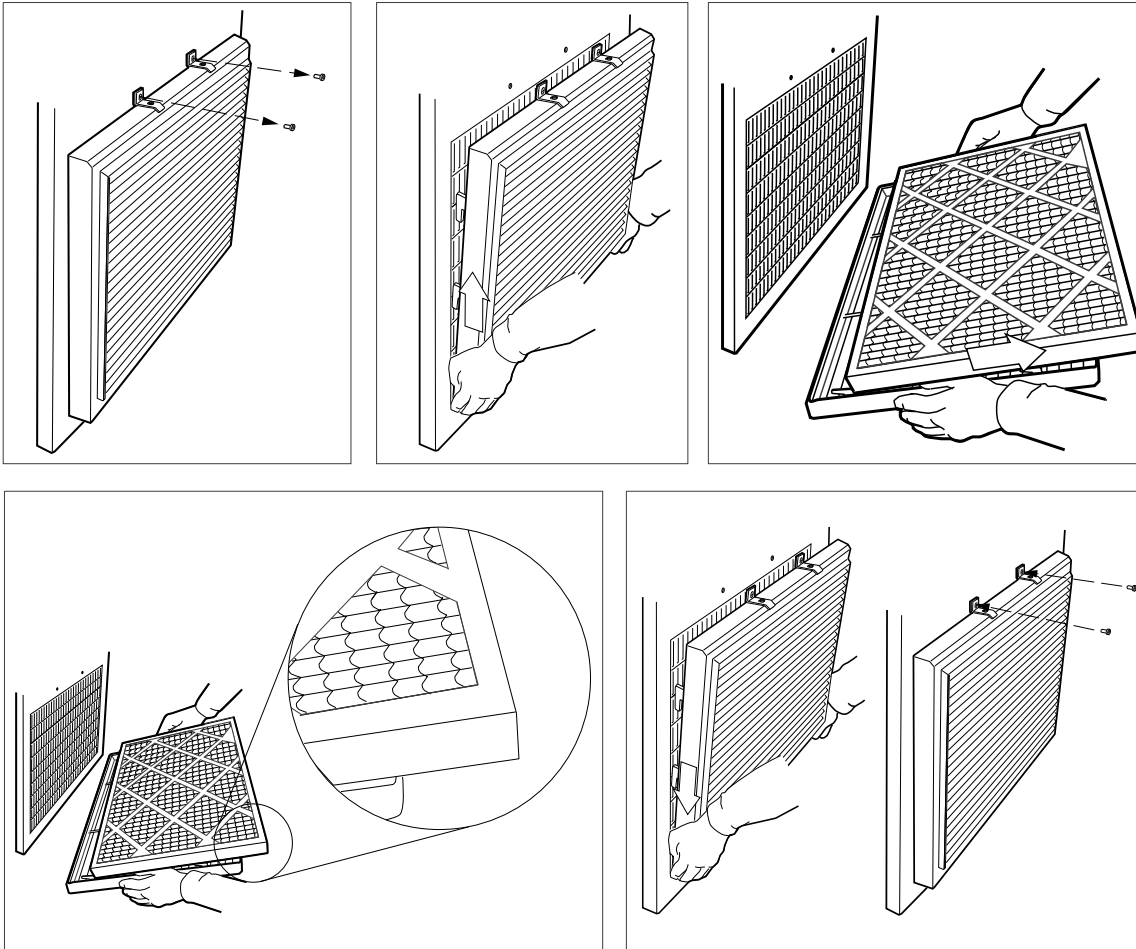
Check the dustiness of the air inlet meshes. If the dust cannot be removed by vacuum cleaning from outside through the grating holes with a small nozzle, proceed as follows:

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the fasteners at the top of the grating.
3. Lift the grating and pull it away from the door.
4. Vacuum clean or wash the grating on both sides.
5. Reinstall the grating in reverse order.



■ Replacing the inlet door filters (IP54)

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the fasteners at the top of the grating.
3. Lift the grating and pull it away from the door.
4. Remove the air filter mat.
5. Place the new filter mat in the grating the metal wire side facing the door.
6. Reinstall the grating in reverse order.



■ Replacing the outlet (roof) filters (IP54)

1. Remove the front and back gratings of the fan cubicle by lifting them upwards.
2. Remove the air filter mat.
3. Place the new filter mat in the grating.
4. Reinstall the gratings in reverse order.

■ Cleaning the heatsink

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

**WARNING!**

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

**WARNING!**

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the drive module from the cabinet.
3. Remove the module cooling fan(s). See the separate instructions.
4. Blow dry, clean and oil-free compressed air from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. If there is a risk of dust entering adjoining equipment, do the cleaning in another room.
5. Reinstall the cooling fan.

Cooling fans

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

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

■ Module cooling fans

Replacing the R1i and R2i module cooling fan

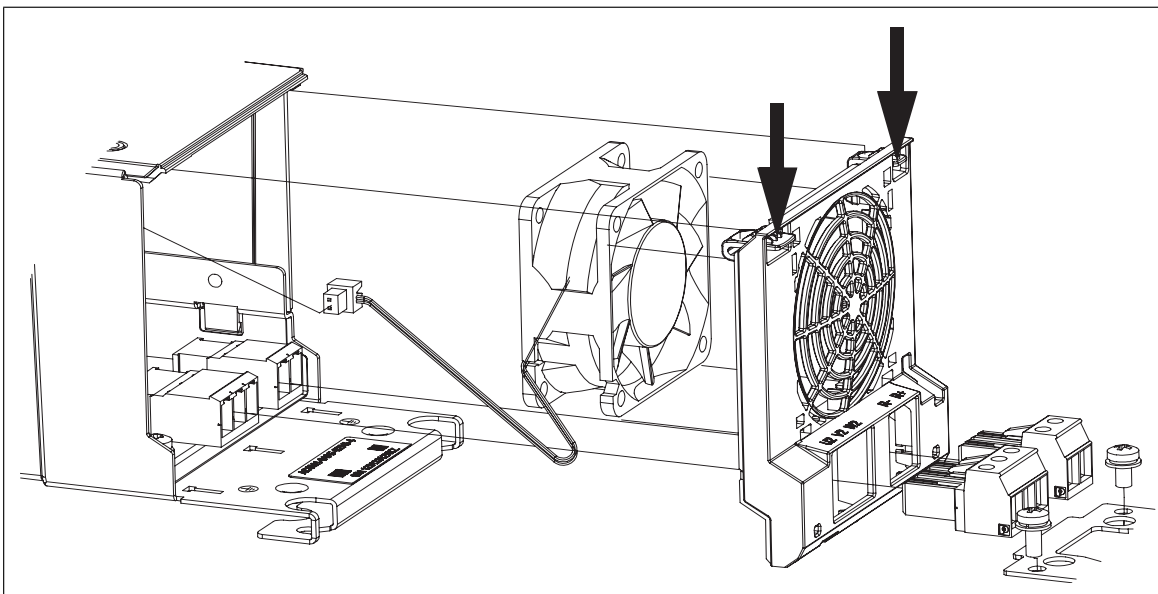


WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions* (page 57) before you start the work.
2. Detach the power cable clamp plate and terminal blocks.
3. Release the retaining clips (arrowed) carefully using a screwdriver.
4. Pull the fan holder out.
5. Disconnect the fan cable.
6. Carefully bend the clips on the fan holder to free the fan.
7. Install new fan in reverse order.

Note: The airflow direction is bottom-to-top. Install the fan so that the arrow on it points up.



In the drawing, the direction of airflow is from right to left.

Replacing the R3i and R4i module cooling fan

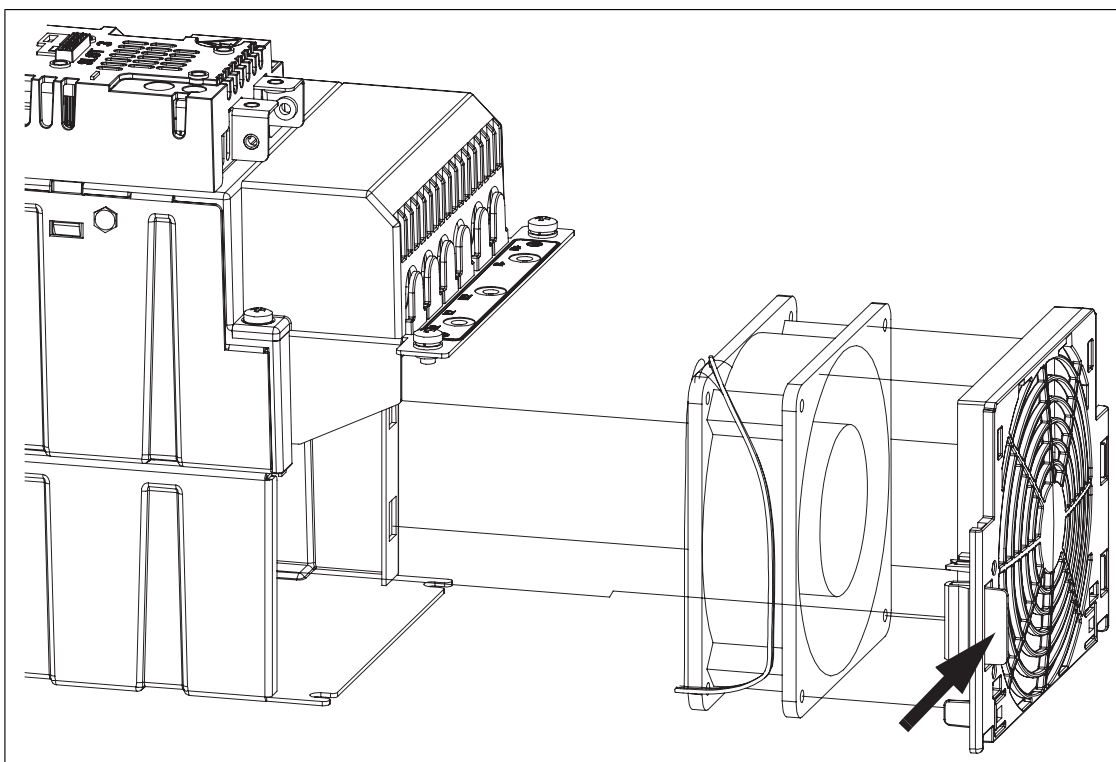


WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. To remove the fan, release the retaining clip (arrowed) carefully using a screwdriver.
3. Pull the fan holder out.
4. Disconnect the fan cable.
5. Carefully bend the clips on the fan holder to free the fan.
6. Install new fan in reverse order.

Note: The airflow direction is bottom-to-top. Install the fan so that the airflow arrow points up.



In the picture direction of airflow is from right to left.

Replacing the R5i module main cooling fan (without option +C204)



WARNING!

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

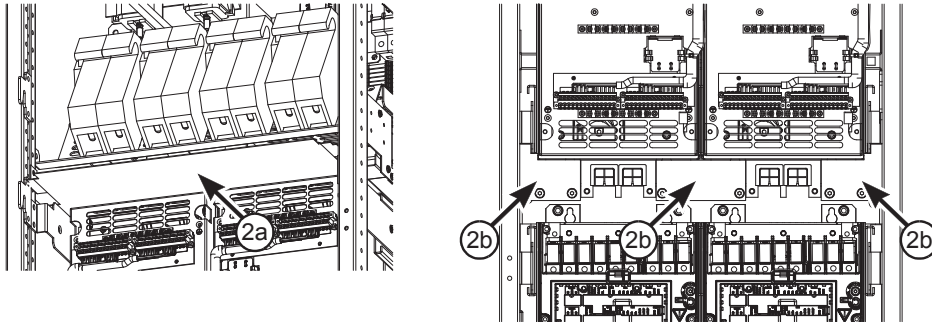


WARNING!

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

The main cooling fan is located at the top of the module. The replacement of the main cooling fan requires that the module is pulled outwards far enough to create room above the module.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the air baffles shown:
 - Upper-row module: (2a) above the module
 - Lower-row module: (2b) above the module.



3. Disconnect all cabling from the module. Move the cables aside.
4. Remove the four mounting nuts and screws of the module (two at the top edge, two at the bottom edge).
5. Pull the module carefully outwards along its rails until the fan at the top is accessible.



WARNING!

Do not pull the module out any further than what is required to change the fan (unless you intend to remove the module completely). The rails have no stops to prevent the module from sliding all the way out.

6. Lift the fan mounting plate by the front edge.
7. Unplug the power supply wires.
8. Lift out the fan assembly.

Install the new fan assembly and insert the module in reverse order to the above. Make sure that the fan blows upwards.

Replacing the R5i module main cooling fan (with option +C204)



WARNING!

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

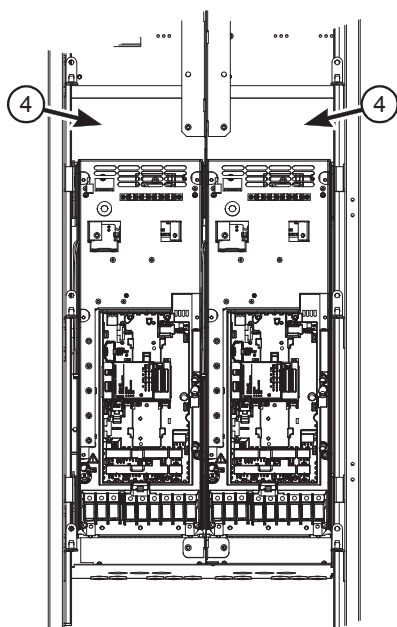


WARNING!

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

The main cooling fan is located at the top of the module.

1. Stop the inverter.
2. Switch off the DC switch-disconnector of the compartment and open the door. You can completely remove the door for easier access.
3. Remove the fuses from the DC switch-disconnector of the compartment.
4. Remove the air baffle above the module.



5. Lift the fan mounting plate by the front edge.
6. Unplug the power supply wires.
7. Lift out the fan assembly.

Install the new fan assembly and insert the module in reverse order to the above. Make sure that the fan blows upwards.

Replacing the R5i module auxiliary cooling fan

Frame R5i modules have an auxiliary fan located at the top front of the module.



WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.

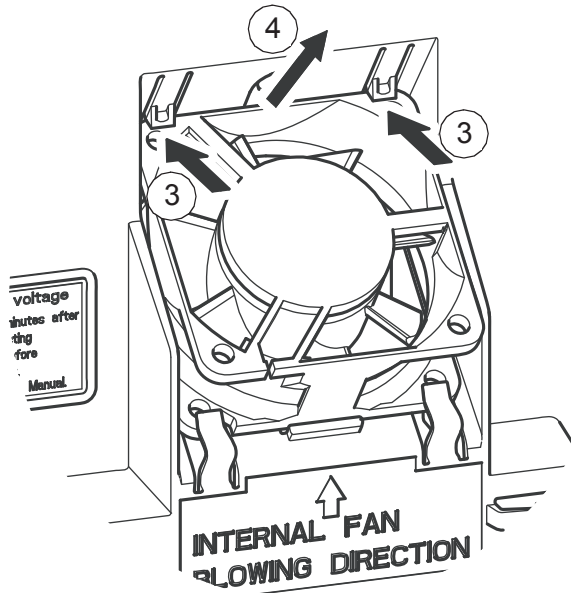
Note: If the module is installed in its own compartment (option +C204), it is allowed to perform this procedure after

 - a) the module-specific DC switch-disconnector has been opened, and
 - b) the module-specific DC fuses have been removed.

All other safety actions mentioned apply.
2. Unplug the fan from the control unit. Make note of the connector the plug is connected to.

3. Push the two locking tabs gently inwards to release the fan.
4. Remove the fan.

Install new fan in reverse order. Make sure that the fan blows upwards (the arrows on the fan frame and the fan holder point in the same direction).



Replacing the R6i and R7i module cooling fan

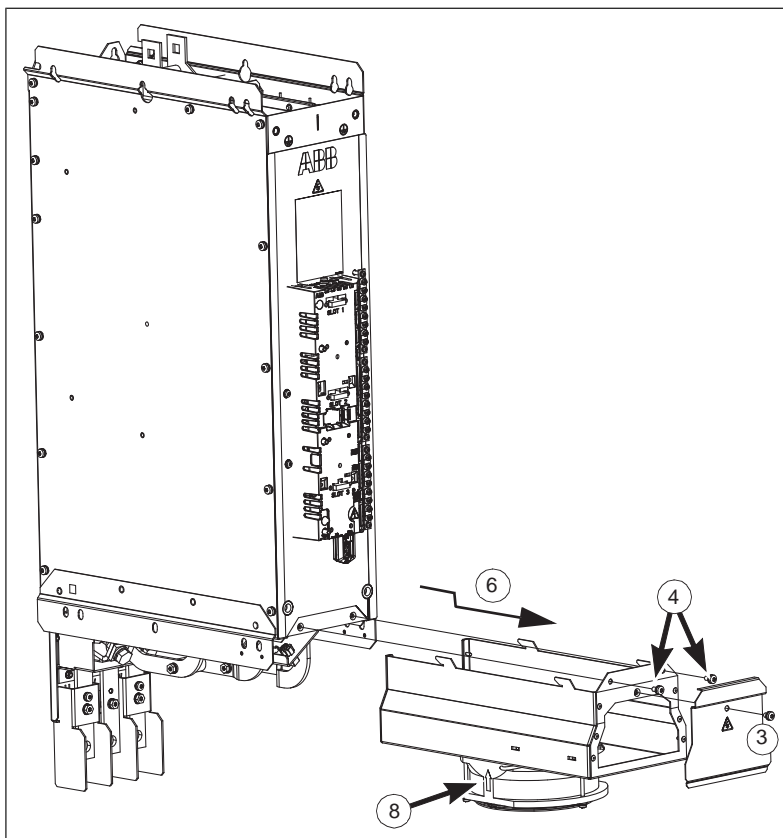
Frame R6i modules have one fan, R7i modules have two.



WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Open the door. Remove any shrouding in front of the fan unit.
3. Remove the front plate.
4. Remove the two screws that lock the fan unit.
5. Unplug the power supply wire(s) of the fan(s).
6. To free the fan holder, pull it slightly outwards (about 5 mm), then downwards.
7. Detach the fan(s) from the fan holder.
8. Install new fan(s) in reverse order to the above.
9. **Note:** The airflow direction is bottom-to-top. Make sure that the airflow direction arrow on the fan points upward.



Replacing R8i module cooling fan (speed-controlled version)

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



WARNING!

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

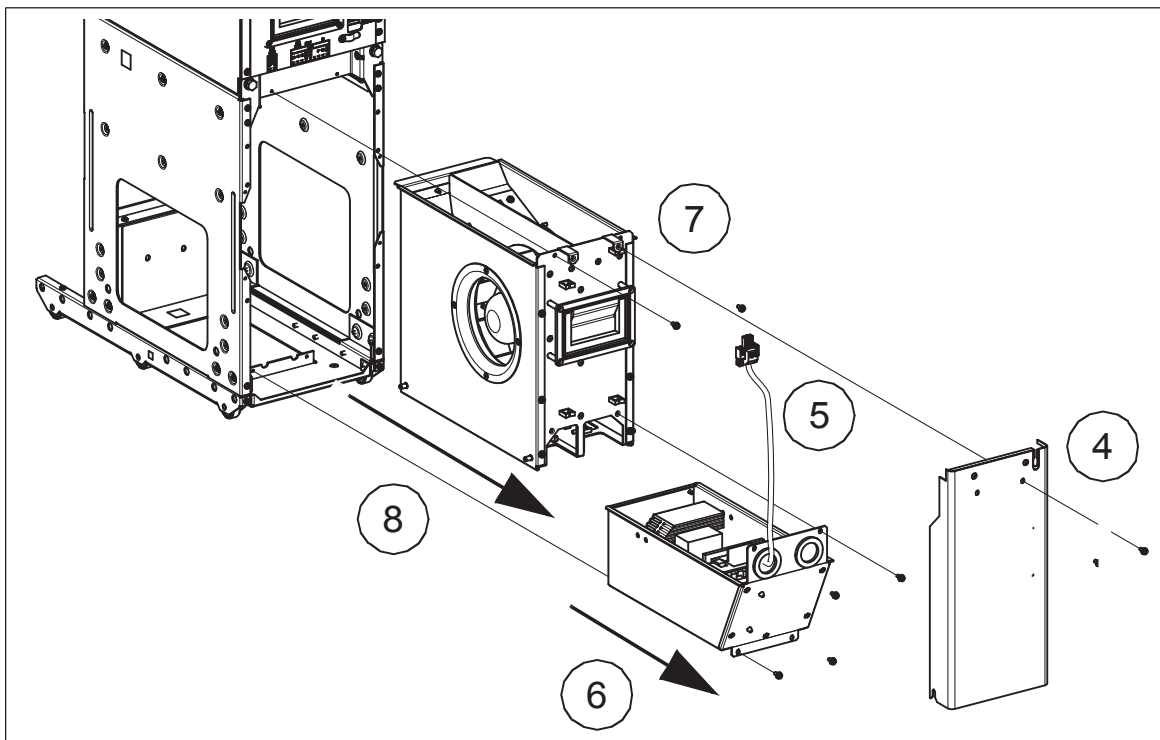
If you are not a qualified electrical professional, do not do installation or maintenance work.



WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Open the cubicle door.
3. Remove the shroud in front of the fan (if any).
4. Remove the screws holding the front cover plate. Lift the cover plate somewhat to release it.
5. Disconnect the fan wiring.
6. Remove the unit below the fan.
7. Remove the screws of the fan unit.
8. Pull out the fan unit.
9. Install a new fan in reverse order.



Replacing R8i module cooling fan (direct-on-line version)

**WARNING!**

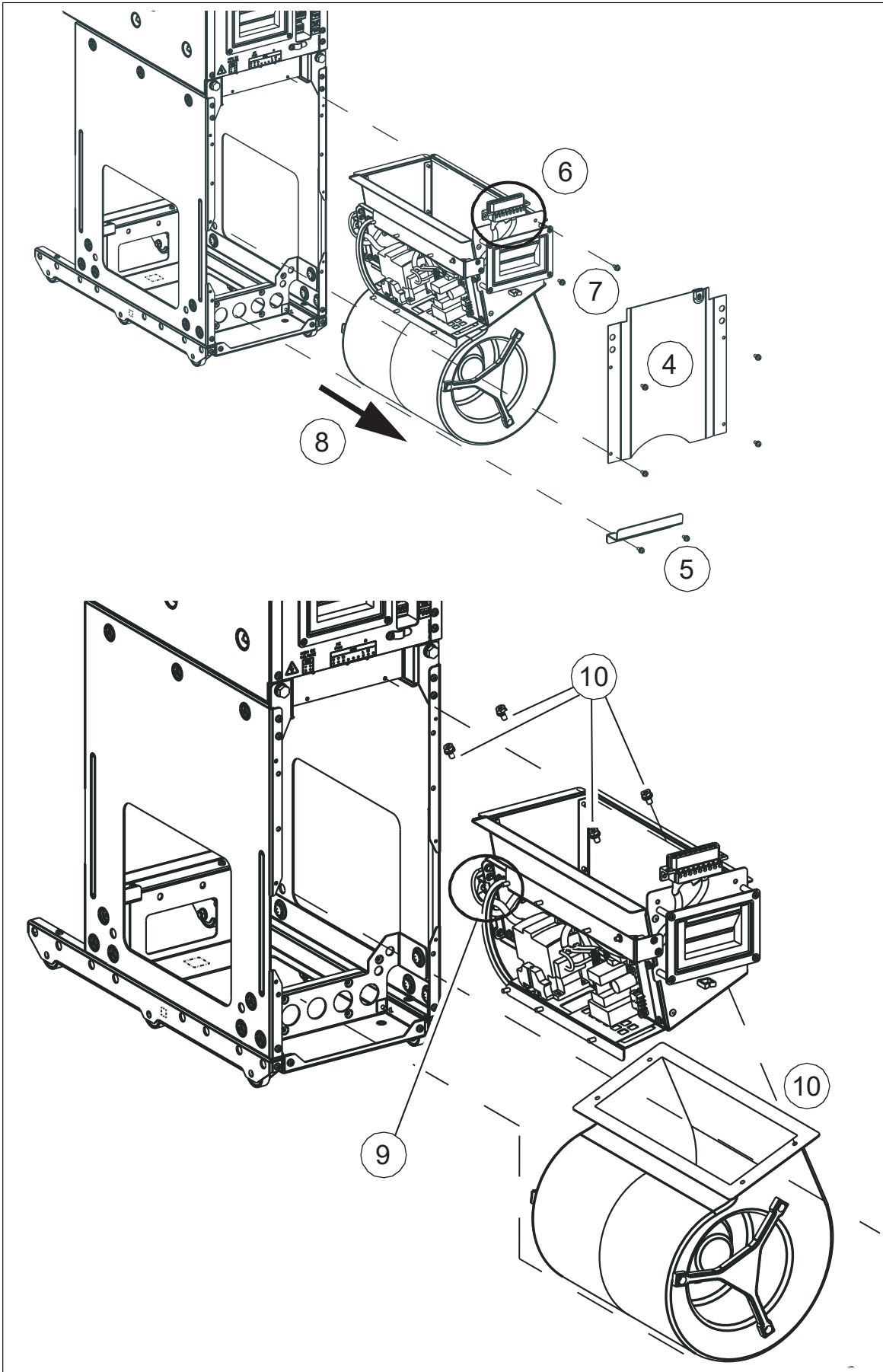
Obey the safety instructions given in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

**WARNING!**

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
 2. Open the door.
 3. Remove the shroud in front of the fan (if any).
 4. Remove the screws holding the front cover plate. Lift the cover plate somewhat to release it.
 5. Remove the bracket.
 6. Disconnect the wiring of the fan unit.
 7. Remove the screws of the fan unit.
 8. Pull out the fan unit.
 9. Disconnect the fan wire from the fan unit.
 10. Remove the screws of the fan.
 11. Install a new fan in reverse order.
-



Replacing the circuit board compartment fan

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

The fan is accessible from the front of the module.

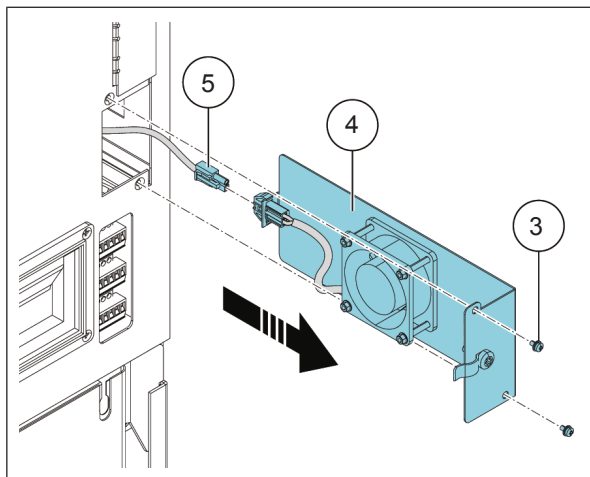


WARNING!

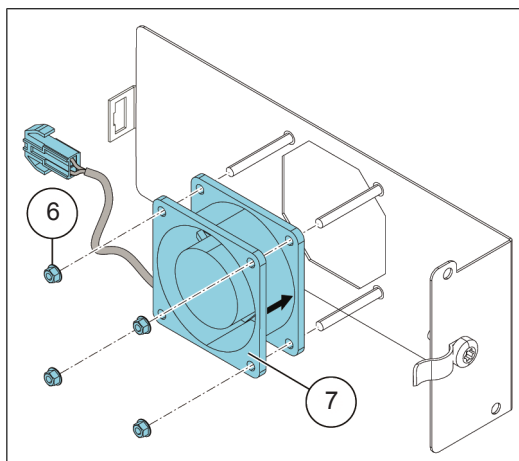
Obey the safety instructions given in *ACS880 multidrive cabinets and modules safety instructions* (3AUA0000102301 [English]). If you ignore the safety instructions, injury or death, or damage to the equipment can occur.

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

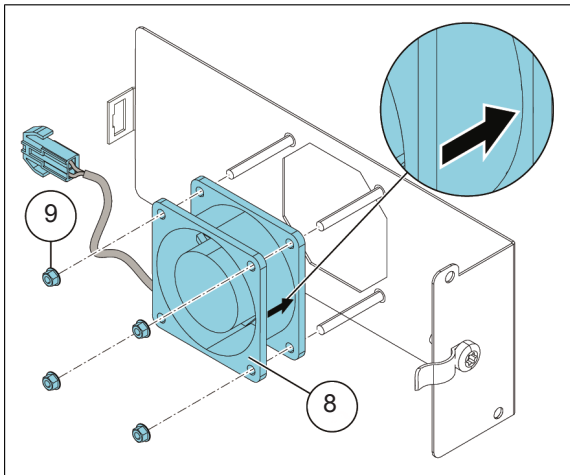
1. Stop the drive and do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
2. Open the door of the module cubicle.
3. Remove the two M4×12 (T20) screws which lock the fan holder.
4. Pull the fan holder out of the module.
5. Disconnect the fan cable.



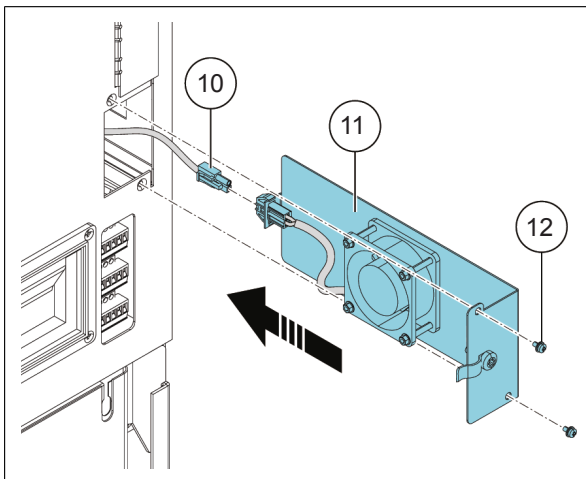
6. Remove the four M3 (5.5 mm) nuts which hold the fan.
7. Remove the fan from the fan holder.



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



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



■ Cabinet cooling fans

Replacing R1i...R5i cabinet fans

300...600 mm wide cubicles containing frame R1i...R5i inverter modules have one exhaust fan in the top compartment of the cubicle. 800 mm and 1000 mm wide cabinets have two fans.



WARNING!

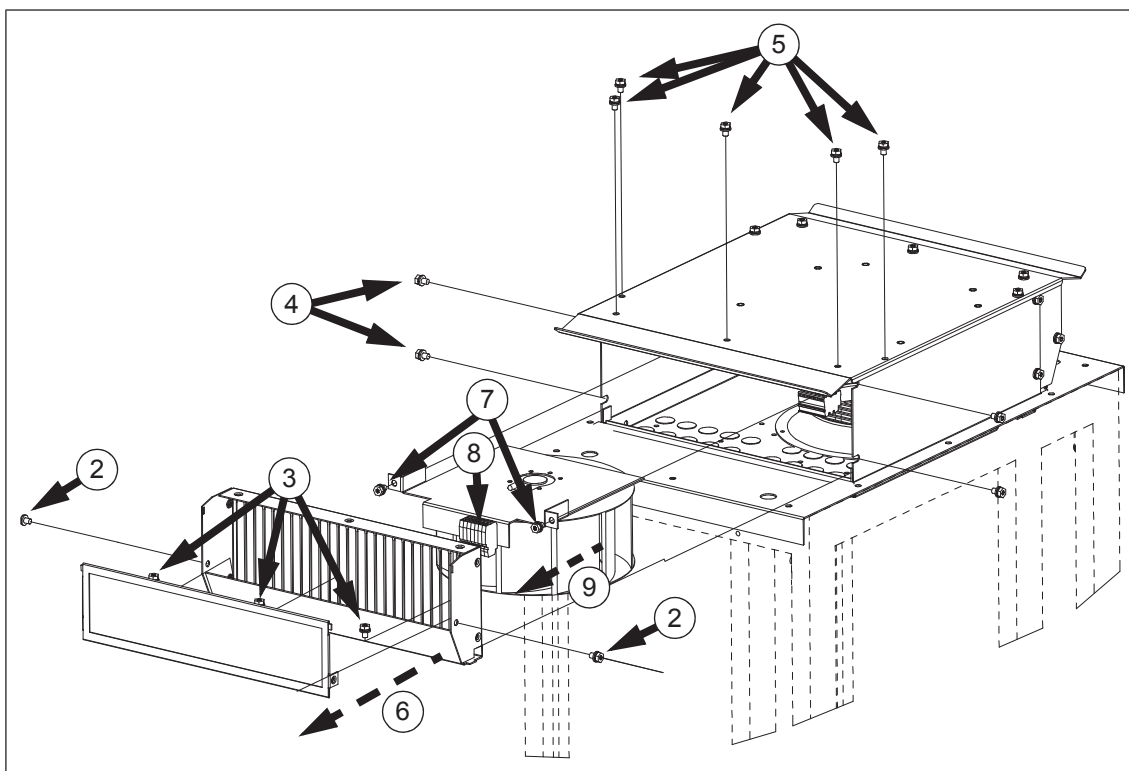
Obey the instructions in chapter Safety instructions. If you ignore them, injury or death, or damage to the equipment can occur.

**WARNING!**

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the front mesh (1 screw at either side).
3. Remove the 3 screws holding the lower edge of the front grating.
4. Slacken the four screws connecting the fan compartment to the grating (2 at either side).
5. Remove the five screws closest to the front edge of the top plate.
6. Pull the front grating out. You may need to bend the top plate slightly upwards out of the way.
7. Remove the two screws holding the fan assembly.
8. Disconnect the fan cable.
9. Pull out the fan assembly. Detach the fan.

Install the new fan in reverse order.



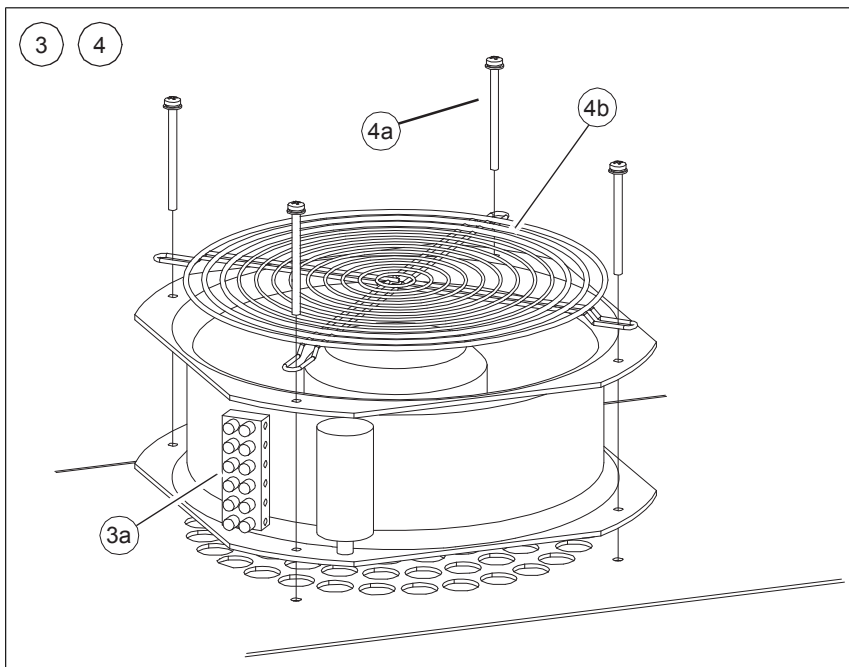
Replacing the control cubicle fan (Frame R8i and multiples)

**WARNING!**

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the shrouding (if any) in front of the fan.
3. Disconnect the fan wiring (a).

4. Remove the fastening screws (a) and finger guard (b) of the fan.
5. Install the new fan in reverse order. Make sure that the arrow indicating the air flow direction points upwards (floor fan) or inward (door fan).



Inverter modules

■ Replacing R1i...R4i inverter module (with option +C204, modules in their own compartments)

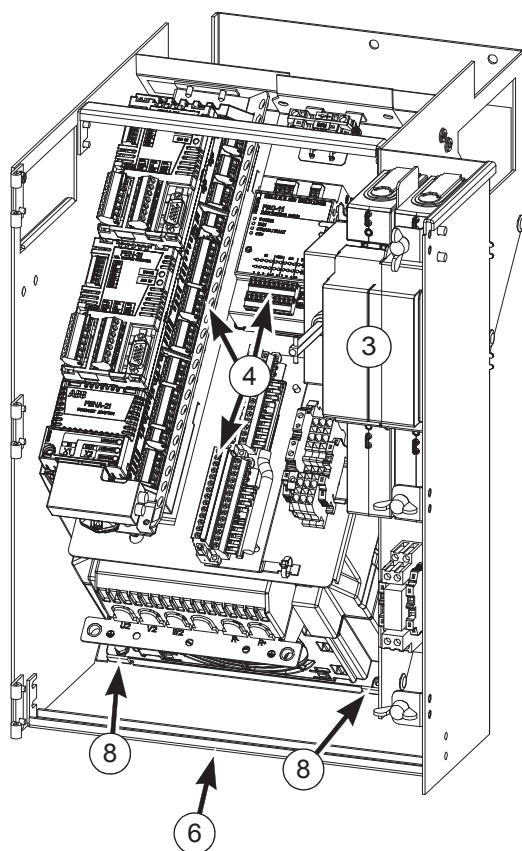


WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Switch off the DC switch-disconnector of the compartment and open the door. You can remove the door entirely for better access.
3. Remove the fuses from the DC switch-disconnector of the compartment.
4. Disconnect the control wiring from the inverter control unit and other equipment mounted onto the module.
5. If present, remove the FSO-xx module together with its mounting plate.
6. Remove the transverse brace in front of the base of the inverter module.
7. Disconnect the output cabling at the base of the inverter module.
8. Secure a good grip on the module to prevent it from falling out, and remove the two screws holding the base of the inverter module.
9. Carefully slide the module down and towards the front until you can access the DC plug connector at the top. Detach the connector.
10. Lift the inverter module out of its compartment.
11. (Frames R3i and R4i only) In case the module is replaced, transfer the DC connector extension from the old module to the new module.

Refit the module in reverse order.



■ Replacing R5i inverter module (without option +C204)

See [Replacing the R5i module main cooling fan \(without option +C204\) \(page 103\)](#)

■ Replacing R5i inverter module (with option +C204, modules in their own compartments)

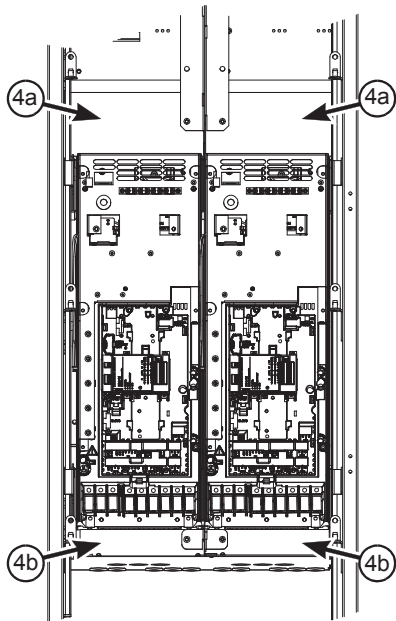


WARNING!

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

1. Stop the drive and do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
2. Switch off the DC switch-disconnector of the compartment and open the door. You can remove the door entirely for easier access.
3. Remove the fuses from the DC switch-disconnector of the compartment.

- Remove the air baffles above (4a) and below (4b) the module.



- Disconnect all cabling from the module. Move the cables aside.
- Secure a good grip on the module to prevent it from falling out, and remove the four mounting nuts and screws of the module (two at the top edge, two at the bottom edge).
- Pull the module out along its rails.

Reinstall the module in reverse order to the above.

■ Replacing R6i and R7i inverter modules



WARNING!

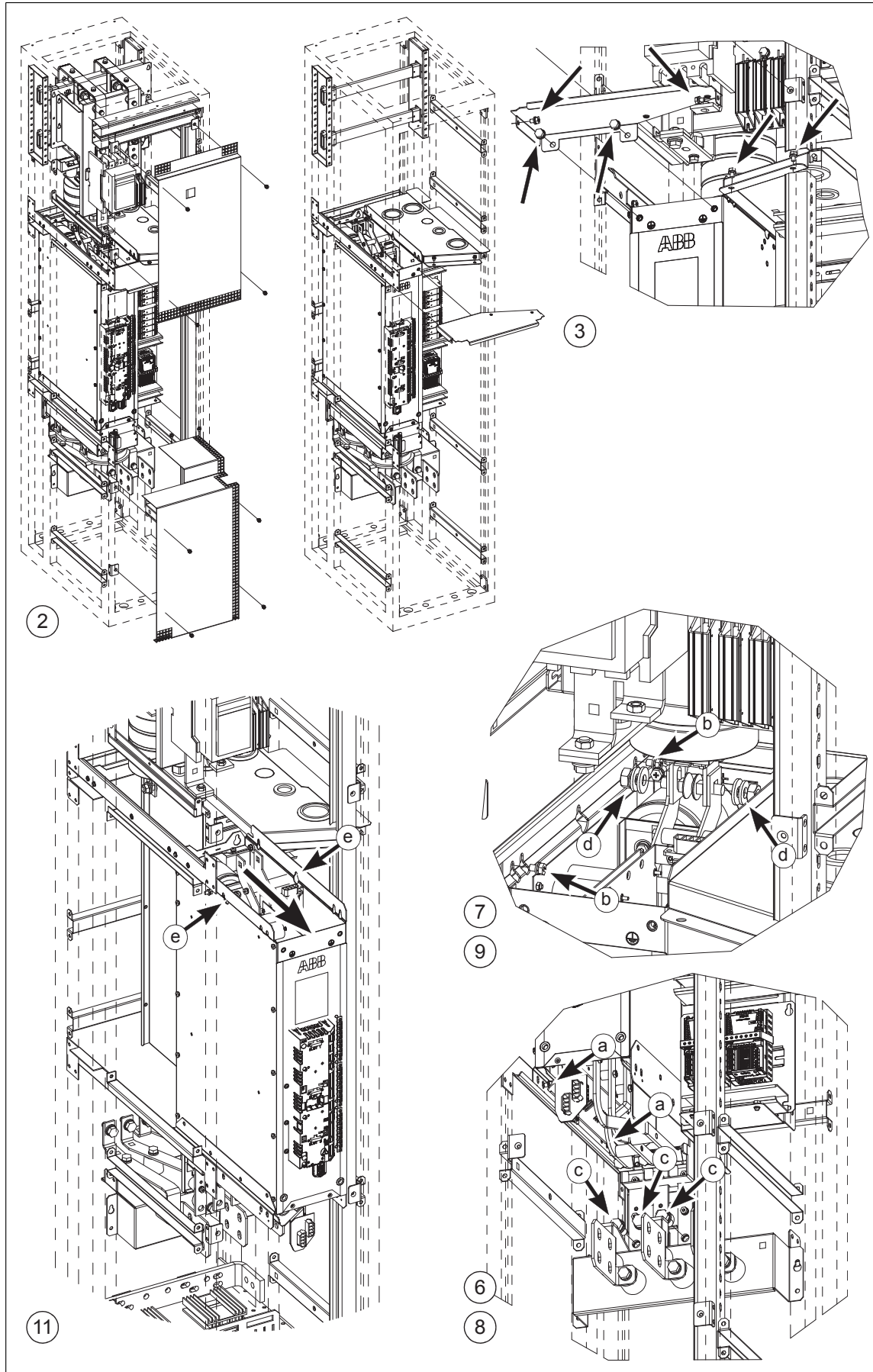
Read the safety instructions given in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

Note: A lifting device is available from ABB. See *Converter module lifting device for drive cabinets hardware manual* (3AXD50000210268 [English]).

- Stop the drive and do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
- Remove the shrouds.
- Remove the air baffle at the top of the module (6 screws, arrowed).
- Detach the wiring from the inverter control unit.
- Remove the fan(s) as advised under Replacement of module fan(s) (frames R6i and R7i).
- Remove the two screws holding the module at the bottom (a).
- Remove the two screws holding the module at the top (b).
- Disconnect the AC busbars by removing the three screws (c).
- Disconnect the DC busbars by removing the two screws (d).
- (Frame R7i only) Disconnect the charging resistors (if present).

11. Pull the module outwards until the lifting eyes (e) at each side of the module are accessible.
12. Attach a hoist to the lifting eyes and pull the module out.

Refit the module in reverse order.



■ Replacing R8i inverter modules

Removing the inverter module(s)

To allow more room for cabling work, the inverter modules can be removed completely instead of only the fan carriages.

Refer to the drawings below.

Note: As an alternative to using the extraction/installation ramp, a lifter is available from ABB Service. See *Lifter for air-cooled drive modules user's guide* (3AXD50000332588 [English]).



WARNING!

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

Note: The illustrations represent a frame 2×R8i inverter cubicle with option +F286 (DC switch-disconnector). On units without +F286, the DC busbars are oriented differently, but the procedure is otherwise the same.

1. Do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Open the inverter module cubicle door.
3. Remove the shroud at the top of the cubicle.
4. Detach the terminal block [X50] at the top of the module.
5. Detach the DC busbars from the module. Make note of the order and position of the screws and washers.
6. Detach the wiring connected to the terminals on the front of the module (including fiber optic cabling). Move the disconnected wiring aside.
7. Drives with option +C121 (Marine construction) or +C180 (Seismic design):
 - a. Loosen the bolts holding the transverse retaining bracket both on the left and the right. (During reassembly, tighten these screws to 9 N·m [6.6 lbf·ft].)
 - b. Remove the bolts holding the retaining bracket to the module.
 - c. Remove the retaining bracket.
 - d. Reinstall the bolts to the module. Tighten to 22 N·m (16 lbf·ft).



WARNING! Do not proceed before the bolts are securely in place. Otherwise, the parts of the module can become separated and cause injury or damage.

8. Attach the module extraction/installation ramp (included) to the base of the cabinet so that the tabs on the mounting bracket enter the slots on the ramp.



WARNING!

Check the markings on the ramp to make sure that it is suitable for the plinth height.

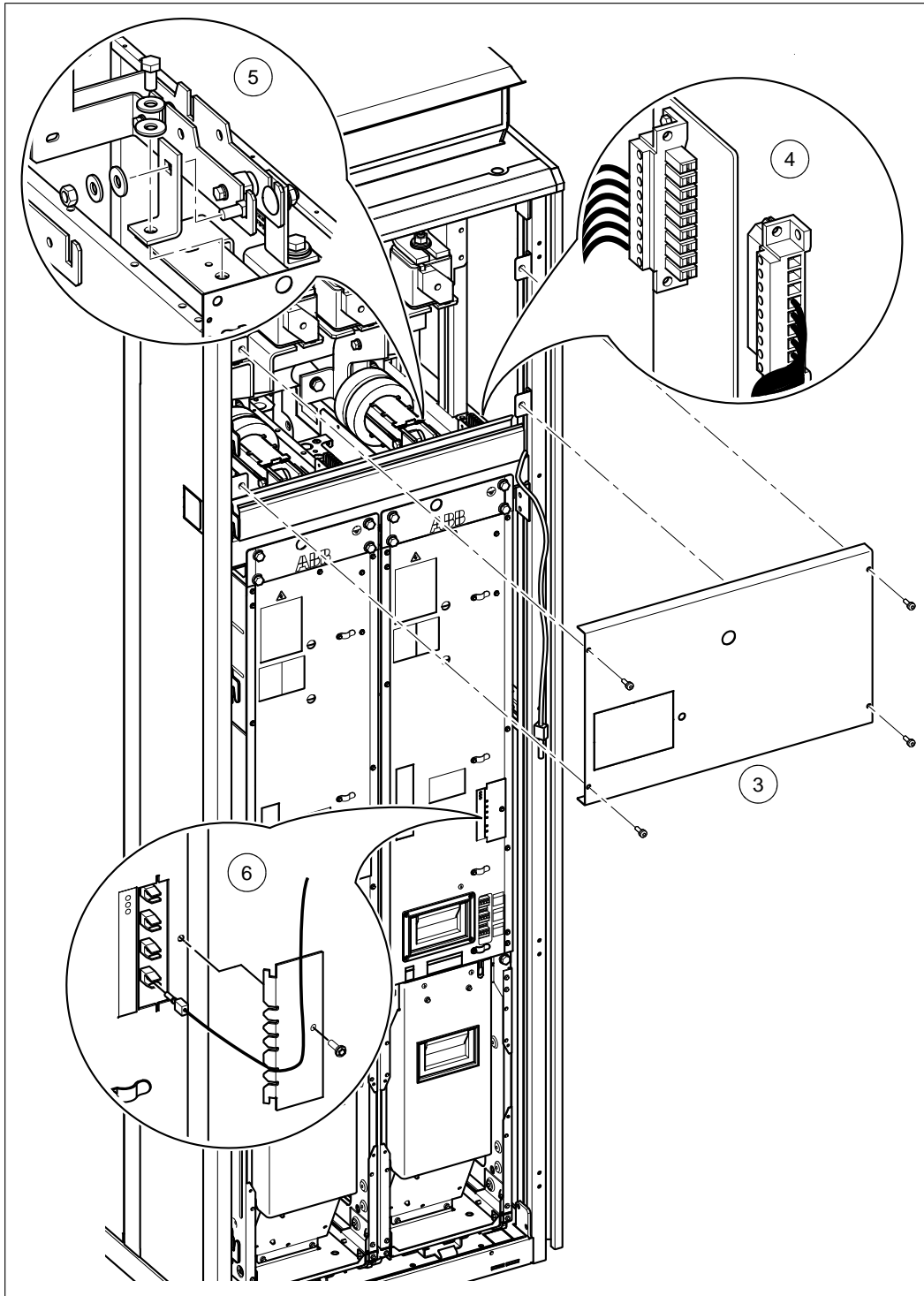
9. Remove the two retaining screws at the bottom front of the module.

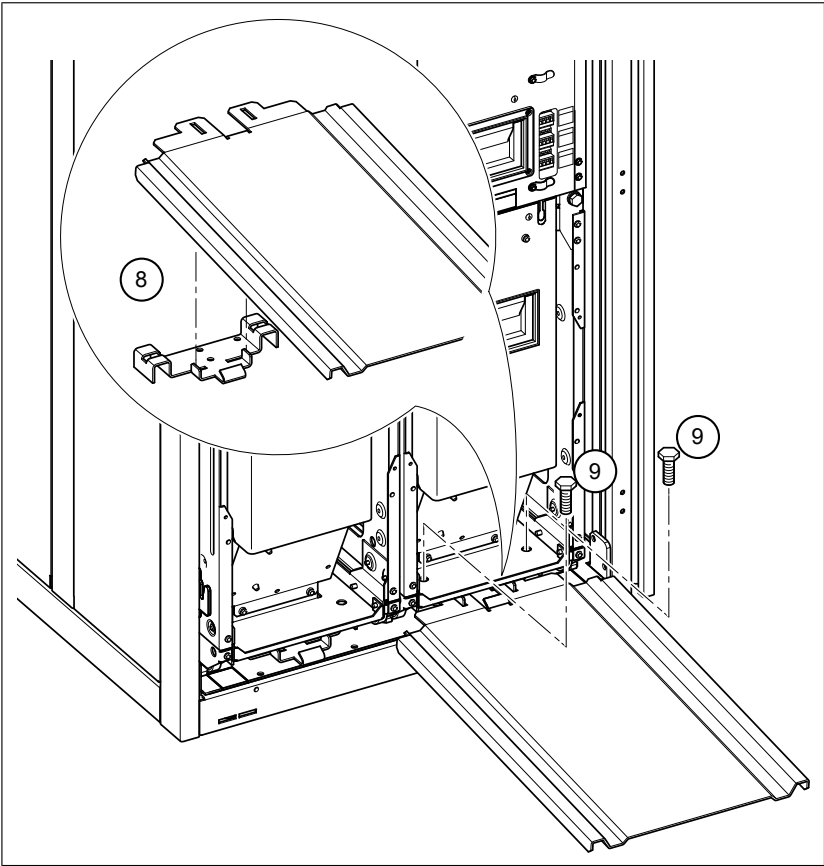
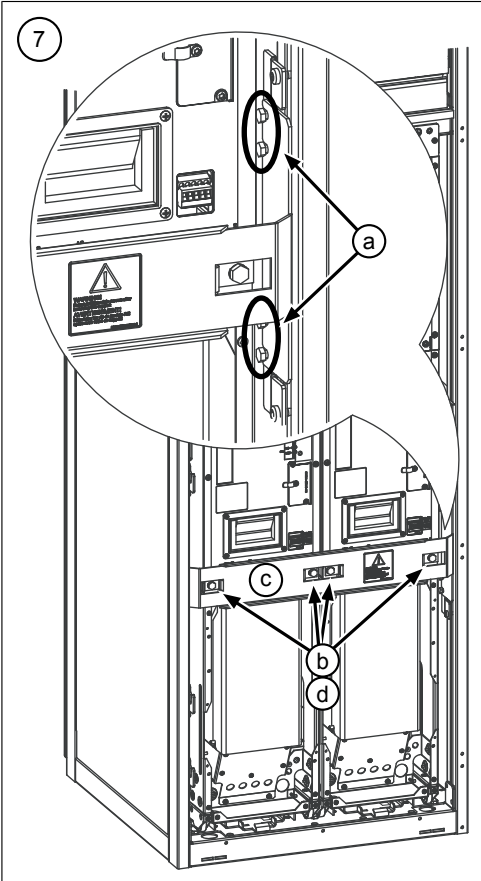


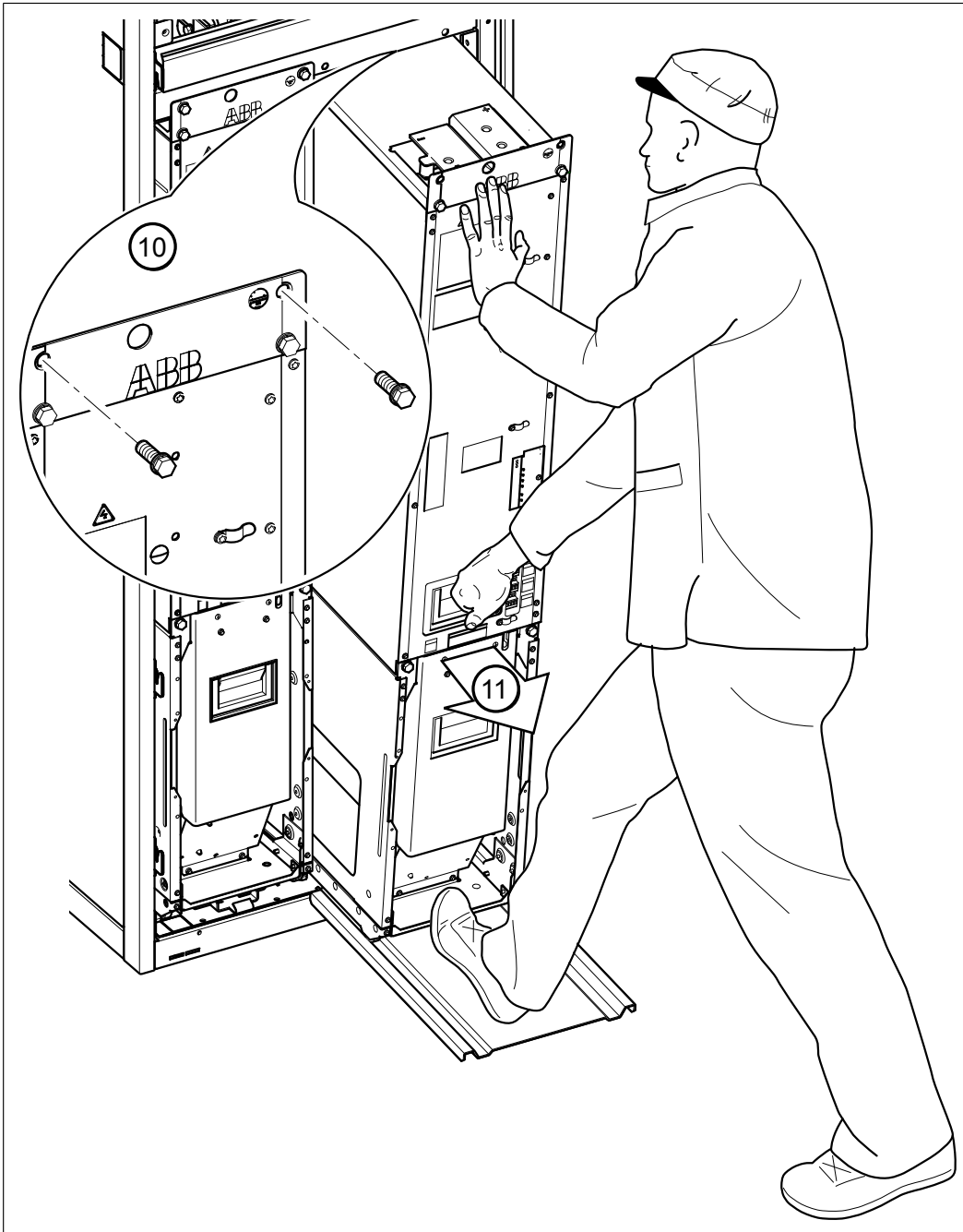
WARNING!

Before you proceed, make sure the cabinet is level, or chock the wheels of the module.

10. Remove the two retaining screws at the top front of the module.
11. Pull the module carefully out along the ramp. While pulling on the handle with your right hand, keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.
12. Move the module into a safe location outside the immediate work area and make sure it cannot topple over. Chock the wheels of the module if the floor is not completely level.
13. Repeat the procedure for the other inverter modules.







Re-inserting the inverter modules into the cubicle



WARNING!

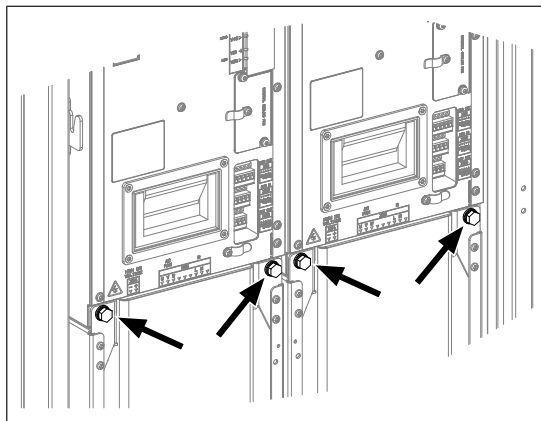
Read the safety instructions given in *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]). If you ignore them, injury or death, or damage to the equipment can occur.

1. Make sure there are no tools, debris or any other foreign objects in the cubicle.
2. If not already in place, attach the module extraction/installation ramp (included) to the base of the cabinet so that the tabs on the mounting bracket enter the slots on the ramp.

3. Push the module up the ramp and back into the cubicle.
 - **Keep your fingers away from the edge of the module front plate to avoid pinching.**
 - **Keep a constant pressure with one foot on the base of the module to prevent the module from falling on its back.**
4. Secure the top front of the module with two screws. Tighten to 22 N·m (16 lbf·ft).
5. Secure the bottom front of the module with two screws. Tighten to 22 N·m (16 lbf·ft).
6. Remove the ramp.
7. Drives with option +C121 (Marine construction) or +C180 (Seismic design):
 - a. Remove the bolts holding the fan carriage (two bolts per module).



WARNING! The module retaining screws (two at top, two at bottom per module) must be in place before removing these screws. Otherwise, the parts of the module can become separated and cause injury or damage.



- b. Reinstall the transverse retaining bracket. At the ends of the bracket, tighten the screws to 9 N·m [6.6 lbf·ft]. Reinstall the fan carriage bolts removed at previous step, and tighten to 22 N·m (16 lbf·ft).
8. Attach the DC busbars to the module. Tighten to 70 N·m (52 lbf·ft).
9. Reconnect terminal block [X50] at the top of the module.
10. Reconnect the wiring and fiber optic cables to the terminals on the front of the module.
11. Repeat the procedure for the other inverter modules.
12. Reinstall the shroud near the top of the cubicle.

Activating the reduced run of the inverter unit

A “reduced run” function is available for inverter units consisting of parallel-connected inverter modules. The function makes it possible to continue operation with limited current even if one (or more) module is out of service, for example, because of maintenance work. In principle, reduced run is possible with only one module, but the physical requirements of operating the motor still apply; for example, the modules remaining in use must be able to provide the motor with enough magnetizing current.

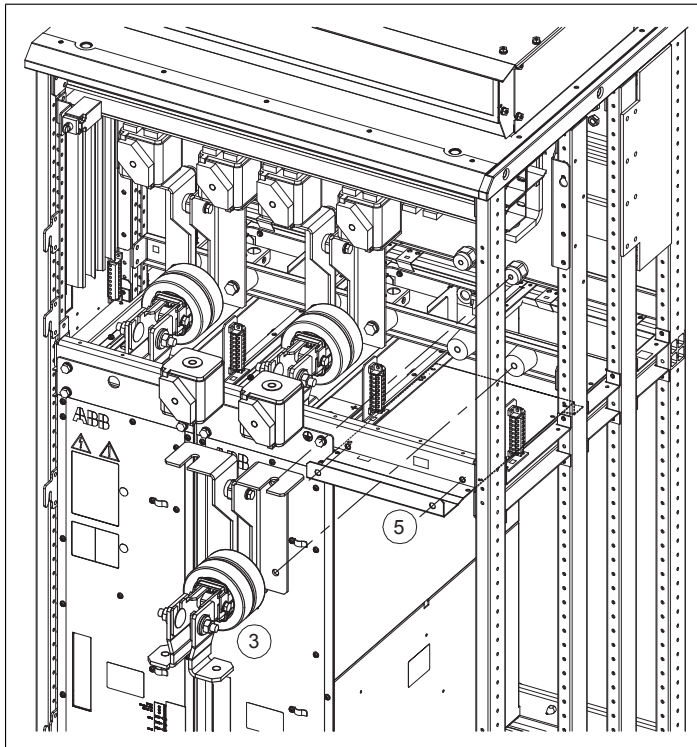


WARNING!

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

Refer to the drawing below.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the shrouding above the module bay (in front of the DC fuses).
3. Remove the DC fuses and the busbar assembly connecting the fuses to the inverter module. Store these parts – they are to be reinstalled only with the inverter module. Make note of the order of washers.
4. Remove the faulty module from its bay. See the module replacement instructions.
5. Install the air baffle (included) to the underside of the top module guide:
 - Fasten the front edge of the baffle to the module mounting holes using the module mounting screws (2 × M8). Tighten to 9 N·m (6.6 lbf-ft).
 - Fasten the left/right sides of the baffle using M4 screws wherever possible. (This depends on the location of the module in the cubicle.) Tighten to 1...2 N·m (0.7 ... 1.5 lbf-ft).



6. If the inverter control unit (A41) is powered from the faulty module, connect the power supply wiring to another module using the extension wire set included.
 7. If the Safe torque off (STO) function is in use, install the jumper wire set included in the STO wiring in place of the missing module. (This is not needed if the module was the last on the STO wire chain.)
 8. Reinstall all shrouding removed earlier.

Note: Do not reinstall the DC fuses or busbars but store them elsewhere until the module can be reinstalled.
 9. Switch on the power to the drive.
 10. Enter the number of inverter modules present into parameter *95.13 Reduced run mode*.
 11. Reset all faults and start the drive.
 12. If the Safe torque off (STO) function is in use, perform an acceptance test. See the STO instructions.
-

The maximum current is now automatically limited according to the new inverter configuration. A mismatch between the number of detected modules and the value set in 95.13 will generate a fault.

Returning the module

1. Install the module in reverse order. Use the following tightening torques:
 - DC busbar assembly to upper insulators (2 × M8): 9 N·m (6.6 lbf·ft)
 - DC busbar assembly to lower insulators (2 × M10): 18 N·m (13.3 lbf·ft)
 - Fuses to DC busbars: 50 N·m (37 lbf·ft) (Bussmann), 46 N·m (34 lbf·ft) (Mersen/Ferraz-Shawmut)
 - Module to cabinet frame (4 × M8): 22 N·m (16 lbf·ft)
 - DC busbar assembly to module DC input (2 × M12): 70 N·m (52 lbf·ft)
2. Restore the original wiring (STO and control unit power supply whenever needed).
3. Set parameter 95.13 to 0 to disable the reduced run function.
4. If the Safe torque off (STO) function is in use, perform an acceptance test. See the STO instructions.

Replacing DC fuses (frame R8i and multiples)



WARNING!

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



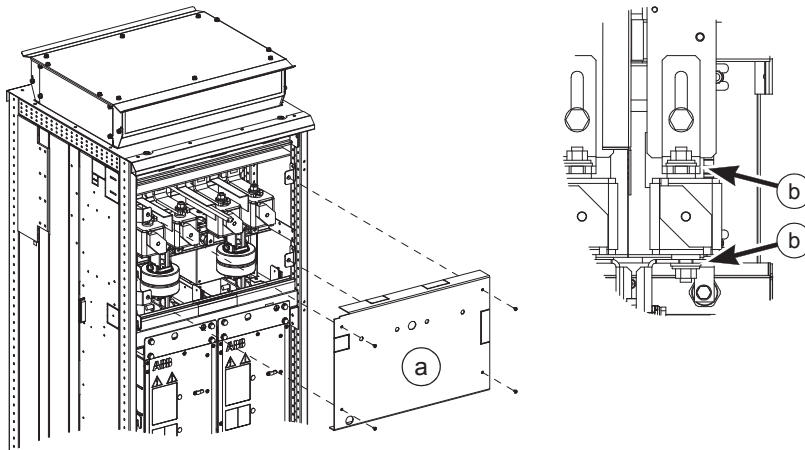
WARNING!

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

Note: The illustrations represent a frame 2×R8i inverter cubicle with option +F286 (DC switch-disconnector). On units without +F286, the DC busbars are oriented differently, but the procedure is otherwise the same unless noted.

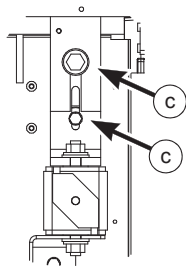
1. Stop the drive and do the steps in section [Electrical safety precautions \(page 57\)](#) before you start the work.
 2. Remove the shroud (a) in front of the fuses.
-

3. Loosen the nuts (b) of the blown fuse.

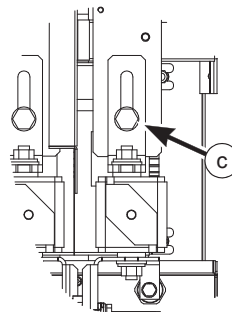


4. Loosen the mounting screws of the top busbar (c) so that you can adjust the gap for the fuse block.

Without DC switch



With DC switch (+F286)

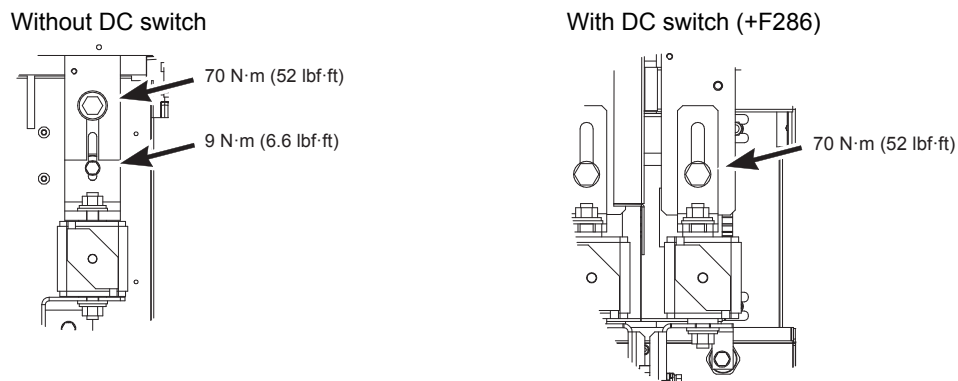


5. Slide out the fuse block.
6. Move the screws, nuts and washers from the blown fuse to the new fuse. Make sure to keep the washers in the original order.

Note: See the technical data for a table of recommended fuses.

7. Insert the new fuse block into its slot. Tighten both nuts of the fuse only until there is no play between the fuse and the busbars.

8. Tighten the mounting screws of the top busbars to torque as shown.



9. Tighten the fuse block nuts to torque as follows:
- Cooper-Bussmann fuses: 50 N·m (37 lbf·ft)
 - Mersen (Ferraz Shawmut) fuses: 46 N·m (34 lbf·ft)
 - Other: Refer to the fuse manufacturer's instructions.
10. Reinstall the shroud removed earlier. Tighten the screws to 6 N·m (4.4 lbf·ft).

Capacitors

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

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

■ Reforming the capacitors

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

Control units

■ Replacing the memory unit

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

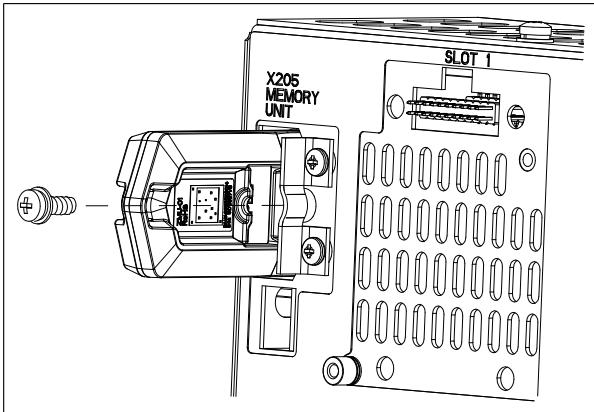


WARNING!

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

1. Stop the drive and do the steps in section *Electrical safety precautions* (page 57) before you start the work.
2. Make sure that the control unit is not powered.

3. Remove the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.



■ Replacing the ZCU-14 control unit battery

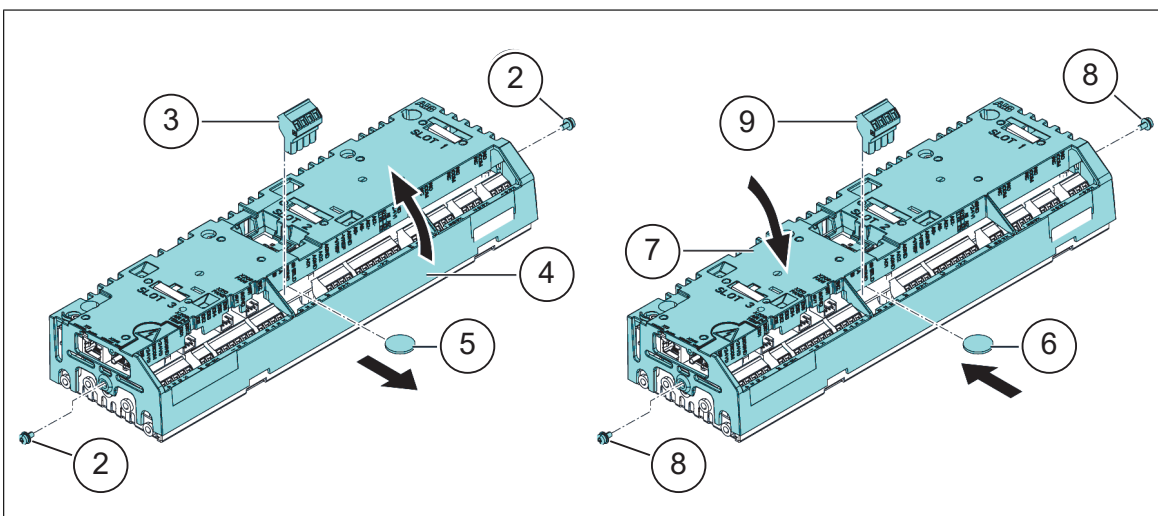


WARNING!

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

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

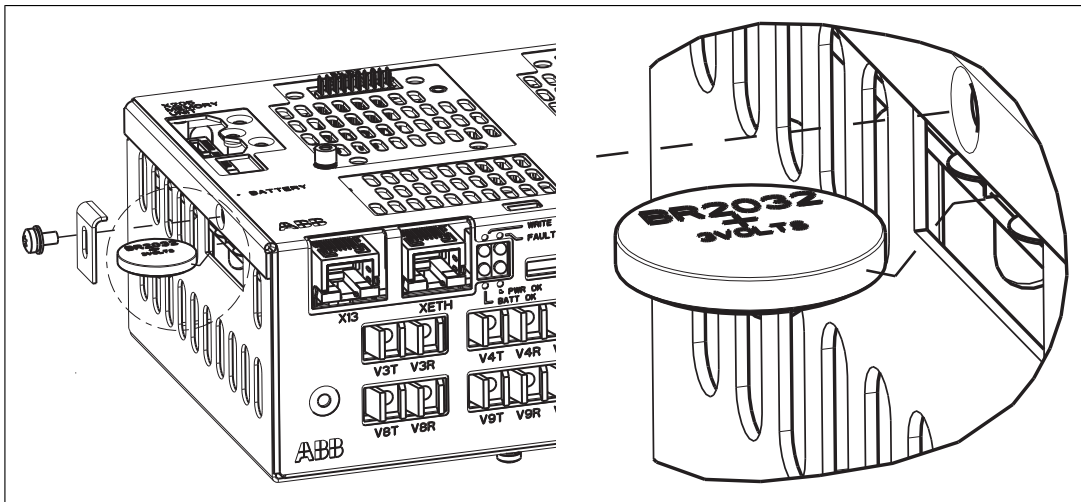
1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Remove the M4×8 [T20] screws at the ends of the control unit.
3. To see the battery, remove the XD2D terminal block.
4. Carefully lift the edge of the control unit cover on the side with the I/O terminal blocks.
5. Carefully pull the battery out of the battery holder.
6. Carefully put a new CR2032 battery into the battery holder.
7. Close the control unit cover.
8. Tighten the M4×8 [T20] screws.
9. Install the XD2D terminal block.



■ Replacing the BCU control unit battery

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 57)* before you start the work.
2. Undo the fastening screw and remove the battery
3. Replace the battery with a new BR2032 battery.
4. Dispose of the old battery according to local disposal rules or applicable laws.
5. Set the real-time clock.



■ Control panel

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

Cleaning the control panel

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

Replacing the control panel battery

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

8

Technical data

Contents of this chapter

This chapter contains the technical specifications of the inverter unit, for example, the ratings, technical specifications and requirements, and provisions for fulfilling the requirements for CE and other markings.

Ratings

Inverter unit type ACS880-107- ...	Frame size	Input ratings	Output ratings							
			No-overload use				Light-overload use		Heavy-duty use	
			I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}
A	A	A	kW	kVA	A	kW	A	kW		
$U_N = 400\text{ V}$										
004A8-3	R1i	5.8	7.0	4.8	1.5	3.3	4.5	1.5	4.0	1.5
006A0-3	R1i	7.2	8.8	6.0	2.2	4.2	5.5	2.2	5.0	1.5
008A0-3	R1i	9.6	10.5	8.0	3.0	5.5	7.6	3.0	6.0	2.2
0011A-3	R2i	12.6	13.5	10.5	4.0	7.3	9.7	4.0	9.0	3.0
0014A-3	R2i	16.8	16.5	14.0	5.5	9.7	13.0	5.5	11.0	4.0
0018A-3	R2i	21.6	21	18.0	7.5	12.5	16.8	7.5	14.0	5.5
0025A-3	R3i	30	33	25	11.0	17.3	23	11.0	19.0	7.5
0035A-3	R3i	42	44	35	15.0	24.2	32	15.0	29	11.0
0044A-3	R3i	53	53	44	18.5	30.5	41	18.5	35	15.0
0050A-3	R3i	60	66	50	22	35	46	22	44	22
0061A-3	R4i	73	78	61	30	42	57	30	52	22
0078A-3	R4i	94	100	78	37	54	74	37	69	30

Inverter unit type ACS880-107- ...	Fame size	Input ratings		Output ratings						
				No-overload use			Light-overload use		Heavy-duty use	
		I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	A	A	kW	kVA	A	kW	A	kW
0094A-3	R4i	113	124	94	45	65	90	45	75	37
0100A-3	R4i	125	125	104	55	72	100	55	78	37
0140A-3	R6i	169	183	141	75	98	135	75	105	55
0170A-3	R6i	203	220	169	90	117	162	90	126	55
0210A-3	R6i	247	268	206	110	143	198	110	154	75
0250A-3	R6i	295	320	246	132	170	236	132	184	90
0300A-3	R7i	360	390	300	160	208	288	160	224	110
0350A-3	R7i	420	455	350	200	42	336	160	262	132
0470A-3	R8i	529	620	470	250	326	451	250	352	160
0640A-3	R8i	720	840	640	355	443	614	315	479	250
0760A-3	R8i	855	990	760	400	527	730	400	568	315
0900A-3	R8i	1013	1080	900	500	624	864	450	673	355
1250A-3	2×R8i	1406	1630	1250	630	866	1200	630	935	500
1480A-3	2×R8i	1665	1930	1480	800	1025	1420	800	1107	630
1760A-3	2×R8i	1980	2120	1760	1000	1219	1690	900	1316	710
2210A-3	3×R8i	2486	2880	2210	1200	1531	2122	1200	1653	900
2610A-3	3×R8i	2936	3140	2610	1400	1808	2506	1400	1952	1000
3450A-3	4×R8i	3881	4140	3450	1800	2390	3312	1800	2581	1400
4290A-3	5×R8i	4826	5150	4290	2400	2972	4118	2000	3209	1800
5130A-3	6×R8i	5771	6160	5130	2800	3554	4925	2400	3837	2000
$U_N = 500\text{ V}$										
003A6-5	R1i	4.3	5.3	3.6	1.5	3.1	3.4	1.5	3.0	1.5
004A8-5	R1i	5.8	7.0	4.8	2.2	4.2	4.5	2.2	4.0	1.5
006A0-5	R1i	7.2	8.8	6.0	3.0	5.2	5.5	3.0	5.0	2.2
008A0-5	R1i	9.6	10.5	8.0	4.0	6.9	7.6	4.0	6.0	3.0
0011A-5	R2i	12.6	13.5	10.5	5.5	9.1	9.7	5.5	9.0	4.0
0014A-5	R2i	16.8	16.5	14.0	7.5	12.1	13.0	7.5	11.0	5.5
0018A-5	R2i	21.6	21	18.0	11.0	15.6	16.8	11.0	14.0	7.5
0025A-5	R3i	30	33	25	15.0	21.7	23	15.0	19.0	11.0
0030A-5	R3i	36	36	30	18.5	26.0	28	18.5	24	15.0
0035A-5	R3i	42	44	35	22	30	32	22	29	18.5
0050A-5	R3i	60	66	50	30	43	46	30	44	22
0061A-5	R4i	73	78	61	37	53	57	37	52	30
0078A-5	R4i	94	100	78	45	68	74	45	69	45
0094A-5	R4i	113	124	94	55	81	90	55	75	45
0110A-5	R6i	136	147	113	75	98	108	75	85	55
0140A-5	R6i	163	177	136	90	118	131	90	102	55
0170A-5	R6i	198	215	165	110	143	158	110	123	75

Inverter unit type ACS880-107- ...	Fame size	Input ratings	Output ratings							
			No-overload use				Light-overload use		Heavy-duty use	
		I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	A	A	kW	kVA	A	kW	A	kW
0200A-5	R6i	236	256	197	132	171	189	132	147	90
0240A-5	R6i	288	312	240	160	208	230	160	180	110
0300A-5	R7i	362	393	302	200	262	290	200	226	132
0340A-5	R7i	408	442	340	250	294	326	200	254	160
0440A-5	R8i	495	580	440	250	381	422	250	329	200
0590A-5	R8i	664	770	590	400	511	566	355	441	250
0740A-5	R8i	833	970	740	500	641	710	450	554	355
0810A-5	R8i	911	1060	810	560	701	778	500	606	400
1150A-5	2×R8i	1294	1500	1150	800	996	1104	710	860	560
1450A-5	2×R8i	1631	1890	1450	1000	1256	1392	900	1085	710
1580A-5	2×R8i	1778	2060	1580	1100	1368	1517	1000	1182	800
2150A-5	3×R8i	2419	2800	2150	1500	1862	2064	1400	1608	1100
2350A-5	3×R8i	2644	3060	2350	1600	2035	2256	1500	1758	1200
3110A-5	4×R8i	3499	4050	3110	2000	2693	2986	2000	2326	1600
3860A-5	5×R8i	4343	5020	3860	2400	3343	3706	2400	2887	2000
4610A-5	6×R8i	5186	6000	4610	3200	3992	4426	2800	3448	2400
U _N = 690 V										
007A3-7	R5i	8.2	9.5	7.3	5.5	8.7	7.0	5.5	5.5	4.0
009A8-7	R5i	11.0	12.7	9.8	7.5	11.7	9.4	7.5	7.3	5.5
014A2-7	R5i	16.0	18.5	14.2	11.0	17.0	13.6	11.0	10.6	7.5
0018A-7	R5i	20	23	18.0	15.0	21.5	17.3	15.0	13.5	11.0
0022A-7	R5i	25	29	22	18.5	26.3	21	18.5	16.5	15.0
0027A-7	R5i	30	35	27	22	32	26	22	20	18.5
0035A-7	R5i	39	46	35	30	42	34	30	26	22
0042A-7	R5i	47	55	42	37	50	40	37	31	30
0052A-7	R5i	59	68	52	45	62	50	45	39	37
0062A-7	R6i	74	81	62	55	74	60	55	46	45
0082A-7	R6i	98	107	82	75	98	79	75	61	55
0100A-7	R6i	119	129	99	90	118	95	90	74	75
0130A-7	R6i	150	163	125	110	149	120	110	94	75
0140A-7	R6i	173	187	144	132	172	138	132	108	90
0190A-7	R6i	230	250	192	160	229	184	160	144	132
0220A-7	R7i	260	282	217	200	259	208	200	162	160
0270A-7	R7i	324	351	270	250	323	259	250	202	200
0340A-7	R8i	383	510	340	315	406	326	250	254	200
0410A-7	R8i	461	620	410	400	490	394	355	307	250
0530A-7	R8i	596	800	530	500	633	509	450	396	355
0600A-7	R8i	675	900	600	560	717	576	560	449	400

Inverter unit type ACS880-107- ...	Frame size	Input ratings		Output ratings						
				No-overload use			Light-overload use		Heavy-duty use	
		I_1	I_{max}	I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	A	A	kW	kVA	A	kW	A	kW
0800A-7	2×R8i	900	1200	800	800	956	768	710	598	560
1030A-7	2×R8i	1159	1550	1030	1000	1231	989	900	770	710
1170A-7	2×R8i	1316	1760	1170	1100	1398	1123	1000	875	800
1540A-7	3×R8i	1733	2310	1540	1400	1840	1478	1400	1152	1100
1740A-7	3×R8i	1958	2610	1740	1600	2080	1670	1600	1302	1200
2300A-7	4×R8i	2588	3450	2300	2000	2749	2208	2000	1720	1600
2860A-7	5×R8i	3218	4290	2860	2800	3418	2746	2400	2139	2000
3420A-7	6×R8i	3848	5130	3420	3200	4087	3283	3200	558	2400
3990A-7	7×R8i	4489	5990	3990	3600	4769	3830	3600	2985	2800
4560A-7	8×R8i	5130	6840	4560	4400	5450	4378	4000	3411	3200
5130A-7	9×R8i	5771	7700	5130	4800	6131	4925	4800	3837	3600
5700A-7	10×R8i	6413	8550	5700	5600	6812	5472	5200	4264	4000

■ Definitions

U_N	Nominal AC supply voltage of drive system
I_1	Nominal rms input current
I_2	Nominal output current (available continuously with no over-loading)
P_N	Typical motor power in no-overload use The horsepower ratings are typical NEMA motor sizes at 460 V (ACS880-107-xxxxA-5) and 575 V (ACS880-107-xxxxA-7) respectively.
S_N	Apparent power in no-overload use
I_{Ld}	Continuous rms output current allowing 10% overload for 1 minute every 5 minutes
P_{Ld}	Typical motor power in light-overload use
I_{max}	Maximum output current. Available for 10 seconds at start; otherwise as long as allowed by drive temperature.
I_{Hd}	Continuous rms output current allowing 50% overload for 1 minute every 5 minutes
P_{Hd}	Typical motor power in heavy-duty use

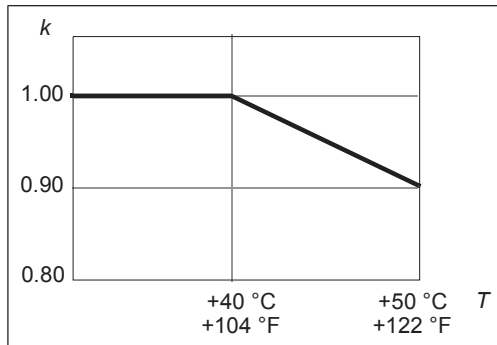
Note:

- The ratings apply at an ambient temperature of 40 °C (104 °F).
- To achieve the rated motor power given in the table, the rated current of the drive must be higher than or equal to the rated motor current.
- The DriveSize dimensioning tool available from ABB is recommended for selecting the drive, motor and gear combination.

Derating

■ Surrounding air temperature derating

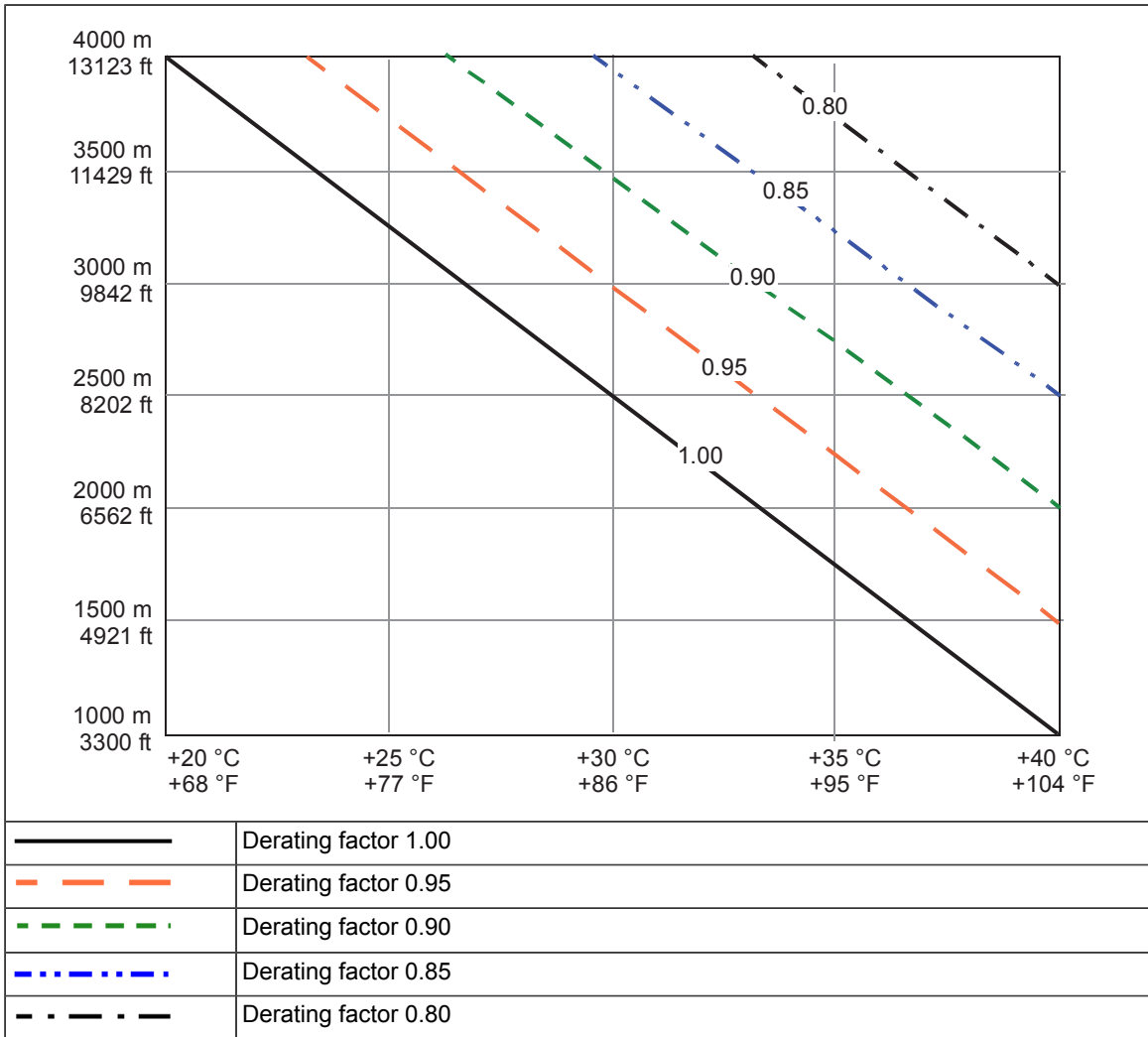
In the temperature range +40...50 °C (+104...122 °F), the rated output current is derated by 1 percentage point for every added 1 °C (1.8 °F). The output current can be calculated by multiplying the current given in the rating table by the derating factor (k):



■ Altitude derating

At altitudes 1000 ... 2000 m (3281 ... 6562 ft) above sea level, the output current derating is 1 percentage point for every added 100 m (328 ft). For example, the derating factor for 1500 m (4921 ft) is 0.95. For altitudes above 2000 m (6562 ft), contact ABB.

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



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

Inverter modules used, DC fuses, DC capacitances

Inverter unit type	Inverter module(s) used		Module-specific DC fuses		DC capacitance µF
	Qty	Type	Qty	Type	
$U_N = 400 \text{ V}$					
ACS880-107-004A8-3	1	ACS880-107-004A8-3	2	*Cooper Bussmann FWP-10A14F	280
ACS880-107-006A0-3	1	ACS880-104-006A0-3	2	*Cooper Bussmann FWP-10A14F	280
ACS880-107-008A0-3	1	ACS880-104-008A0-3	2	*Cooper Bussmann FWP-15A14F	280
ACS880-107-0011A-3	1	ACS880-104-0011A-3	2	*Cooper Bussmann FWP-20A14F	435
ACS880-107-0014A-3	1	ACS880-104-0014A-3	2	*Cooper Bussmann FWP-25A14F	865
ACS880-107-0018A-3	1	ACS880-104-0018A-3	2	*Cooper Bussmann FWP-32A14F	865
ACS880-107-0025A-3	1	ACS880-104-0025A-3	2	*Mersen 6,921 CP URQ 27x60/50	785
ACS880-107-0035A-3	1	ACS880-104-0035A-3	2	*Mersen 6,921 CP URQ 27x60/63	785
ACS880-107-0044A-3	1	ACS880-104-0044A-3	2	*Mersen 6,921 CP URQ 27x60/80	1178
ACS880-107-0050A-3	1	ACS880-104-0050A-3	2	*Mersen 6,921 CP URQ 27x60/100	1178
ACS880-107-0061A-3	1	ACS880-104-0061A-3	2	*Mersen 6,921 CP URQ 27x60/125	1570

Inverter unit type	Inverter module(s) used		Module-specific DC fuses		DC capacitance
	Qty	Type	Qty	Type	µF
ACS880-107-0078A-3	1	ACS880-104-0078A-3	2	*Mersen 6,921 CP URQ 27x60/160	2355
ACS880-107-0094A-3	1	ACS880-104-0094A-3	2	*Mersen 6,921 CP URQ 27x60/200	2355
ACS880-107-0100A-3	1	ACS880-104-0100A-3	2	*Mersen 6,921 CP URQ 27x60/200	2355
ACS880-107-0140A-3	1	ACS880-104-0140A-3	2	Cooper Bussmann 170M4410	4500
ACS880-107-0170A-3	1	ACS880-104-0170A-3	2	Cooper Bussmann 170M4412	4500
ACS880-107-0210A-3	1	ACS880-104-0210A-3	2	Cooper Bussmann 170M4413	4500
ACS880-107-0250A-3	1	ACS880-104-0250A-3	2	Cooper Bussmann 170M4414	6750
ACS880-107-0300A-3	1	ACS880-104-0300A-3	2	Cooper Bussmann 170M4416	9000
ACS880-107-0350A-3	1	ACS880-104-0350A-3	2	Cooper Bussmann 170M4417	9000
ACS880-107-0470A-3	1	ACS880-104-0470A-3	2	Cooper Bussmann 170M6413	11250
ACS880-107-0640A-3	1	ACS880-104-0640A-3	2	Cooper Bussmann 170M6416	13500
ACS880-107-0760A-3	1	ACS880-104-0760A-3	2	Cooper Bussmann 170M6417	18000
ACS880-107-0900A-3	1	ACS880-104-0900A-3	2	Cooper Bussmann 170M6419	18000
ACS880-107-1250A-3	2	ACS880-104-0640A-3	4	Cooper Bussmann 170M6416	27000
ACS880-107-1480A-3	2	ACS880-104-0760A-3	4	Cooper Bussmann 170M6417	36000
ACS880-107-1760A-3	2	ACS880-104-0900A-3	4	Cooper Bussmann 170M6419	36000
ACS880-107-2210A-3	3	ACS880-104-0760A-3	6	Cooper Bussmann 170M6417	54000
ACS880-107-2610A-3	3	ACS880-104-0900A-3	6	Cooper Bussmann 170M6419	54000
ACS880-107-3450A-3	4	ACS880-104-0900A-3	8	Cooper Bussmann 170M6419	72000
ACS880-107-4290A-3	5	ACS880-104-0900A-3	10	Cooper Bussmann 170M6419	90000
ACS880-107-5130A-3	6	ACS880-104-0900A-3	12	Cooper Bussmann 170M6419	108000
U _N = 500 V					
ACS880-107-003A6-5	1	ACS880-104-003A6-5	2	*Cooper Bussmann FWP-10A14F	280
ACS880-107-004A8-5	1	ACS880-104-004A8-5	2	*Cooper Bussmann FWP-10A14F	280
ACS880-107-006A0-5	1	ACS880-104-006A0-5	2	*Cooper Bussmann FWP-15A14F	280
ACS880-107-008A0-5	1	ACS880-104-008A0-5	2	*Cooper Bussmann FWP-20A14F	280
ACS880-107-0011A-5	1	ACS880-104-0011A-5	2	*Cooper Bussmann FWP-25A14F	435
ACS880-107-0014A-5	1	ACS880-104-0014A-5	2	*Cooper Bussmann FWP-32A14F	865
ACS880-107-0018A-5	1	ACS880-104-0018A-5	2	*Mersen 6,921 CP URQ 27x60/50	865
ACS880-107-0025A-5	1	ACS880-104-0025A-5	2	*Mersen 6,921 CP URQ 27x60/50	785
ACS880-107-0030A-5	1	ACS880-104-0030A-5	2	*Mersen 6,921 CP URQ 27x60/63	785
ACS880-107-0035A-5	1	ACS880-104-0035A-5	2	*Mersen 6,921 CP URQ 27x60/80	785
ACS880-107-0050A-5	1	ACS880-104-0050A-5	2	*Mersen 6,921 CP URQ 27x60/100	1178
ACS880-107-0061A-5	1	ACS880-104-0061A-5	2	*Mersen 6,921 CP URQ 27x60/125	1570
ACS880-107-0078A-5	1	ACS880-104-0078A-5	2	*Mersen 6,921 CP URQ 27x60/160	2355
ACS880-107-0094A-5	1	ACS880-104-0094A-5	2	*Mersen 6,921 CP URQ 27x60/200	2355
ACS880-107-0110A-5	1	ACS880-104-0110A-5	2	Cooper Bussmann 170M4409	4500
ACS880-107-0140A-5	1	ACS880-104-0140A-5	2	Cooper Bussmann 170M4410	4500
ACS880-107-0170A-5	1	ACS880-104-0170A-5	2	Cooper Bussmann 170M4412	4500
ACS880-107-0200A-5	1	ACS880-104-0200A-5	2	Cooper Bussmann 170M4412	4500

Inverter unit type	Inverter module(s) used		Module-specific DC fuses		DC capacitance
	Qty	Type	Qty	Type	µF
ACS880-107-0240A-5	1	ACS880-104-0240A-5	2	Cooper Bussmann 170M4414	6750
ACS880-107-0300A-5	1	ACS880-104-0300A-5	2	Cooper Bussmann 170M4416	9000
ACS880-107-0340A-5	1	ACS880-104-0340A-5	2	Cooper Bussmann 170M4417	9000
ACS880-107-0440A-5	1	ACS880-104-0440A-5	2	Cooper Bussmann 170M6413	11250
ACS880-107-0590A-5	1	ACS880-104-0590A-5	2	Cooper Bussmann 170M6415	13500
ACS880-107-0740A-5	1	ACS880-104-0740A-5	2	Cooper Bussmann 170M6417	18000
ACS880-107-0810A-5	1	ACS880-104-0810A-5	2	Cooper Bussmann 170M6417	18000
ACS880-107-1150A-5	2	ACS880-104-0590A-5	4	Cooper Bussmann 170M6415	27000
ACS880-107-1450A-5	2	ACS880-104-0740A-5	4	Cooper Bussmann 170M6417	36000
ACS880-107-1580A-5	2	ACS880-104-0810A-5	4	Cooper Bussmann 170M6417	36000
ACS880-107-2150A-5	3	ACS880-104-0740A-5	6	Cooper Bussmann 170M6417	54000
ACS880-107-2350A-5	3	ACS880-104-0810A-5	6	Cooper Bussmann 170M6417	54000
ACS880-107-3110A-5	4	ACS880-104-0810A-5	8	Cooper Bussmann 170M6417	72000
ACS880-107-3860A-5	5	ACS880-104-0810A-5	10	Cooper Bussmann 170M6417	90000
ACS880-107-4610A-5	6	ACS880-104-0810A-5	12	Cooper Bussmann 170M6417	108000
$U_N = 690 \text{ V}$					
ACS880-107-007A3-7	1	ACS880-104-007A3-7	2	*Mersen FR27UB10C32T	343
ACS880-107-009A8-7	1	ACS880-104-009A8-7	2	*Mersen FR27UB10C32T	343
ACS880-107-014A2-7	1	ACS880-104-014A2-7	2	*Mersen FR27UB10C32T	343
ACS880-107-0018A-7	1	ACS880-104-0018A-7	2	*Mersen FR27UB10C40T	343
ACS880-107-0022A-7	1	ACS880-104-0022A-7	2	*Mersen FR27UB10C40T	687
ACS880-107-0027A-7	1	ACS880-104-0027A-7	2	*Mersen FR27UB10C50T	687
ACS880-107-0035A-7	1	ACS880-104-0035A-7	2	*Mersen FR27UB10C63T	687
ACS880-107-0042A-7	1	ACS880-104-0042A-7	2	*Mersen FR27UB10C80T	687
ACS880-107-0052A-7	1	ACS880-104-0052A-7	2	*Mersen FR27UB10C100T	687
ACS880-107-0062A-7	1	ACS880-104-0062A-7	2	Cooper Bussmann 170M3392	1500
ACS880-107-0082A-7	1	ACS880-104-0082A-7	2	Cooper Bussmann 170M4388	1500
ACS880-107-0100A-7	1	ACS880-104-0100A-7	2	Cooper Bussmann 170M4389	1500
ACS880-107-0130A-7	1	ACS880-104-0130A-7	2	Cooper Bussmann 170M4390	3000
ACS880-107-0140A-7	1	ACS880-104-0140A-7	2	Cooper Bussmann 170M4391	3000
ACS880-107-0190A-7	1	ACS880-104-0190A-7	2	Cooper Bussmann 170M4392	3000
ACS880-107-0240A-7	1	ACS880-104-0220A-7	2	Cooper Bussmann 170M4393	4500
ACS880-107-0290A-7	1	ACS880-104-0270A-7	2	Cooper Bussmann 170M4395	4500
ACS880-107-0340A-7	1	ACS880-104-0340A-7	2	Cooper Bussmann 170M6544	6000
ACS880-107-0410A-7	1	ACS880-104-0410A-7	2	Cooper Bussmann 170M6546	6000
ACS880-107-0530A-7	1	ACS880-104-0530A-7	2	Cooper Bussmann 170M6548	9000
ACS880-107-0600A-7	1	ACS880-104-0600A-7	2	Cooper Bussmann 170M6549	9000
ACS880-107-0800A-7	2	ACS880-104-0410A-7	4	Cooper Bussmann 170M6546	12000
ACS880-107-1030A-7	2	ACS880-104-0530A-7	4	Cooper Bussmann 170M6548	18000
ACS880-107-1170A-7	2	ACS880-104-0600A-7	4	Cooper Bussmann 170M6549	18000

Inverter unit type	Inverter module(s) used		Module-specific DC fuses		DC capacitance
	Qty	Type	Qty	Type	µF
ACS880-107-1540A-7	3	ACS880-104-0530A-7	6	Cooper Bussmann 170M6548	27000
ACS880-107-1740A-7	3	ACS880-104-0600A-7	6	Cooper Bussmann 170M6549	27000
ACS880-107-2300A-7	4	ACS880-104-0600A-7	8	Cooper Bussmann 170M6549	36000
ACS880-107-2860A-7	5	ACS880-104-0600A-7	10	Cooper Bussmann 170M6549	45000
ACS880-107-3420A-7	6	ACS880-104-0600A-7	12	Cooper Bussmann 170M6549	54000
ACS880-107-3990A-7	7	ACS880-104-0600A-7	14	Cooper Bussmann 170M6549	63000
ACS880-107-4560A-7	8	ACS880-104-0600A-7	16	Cooper Bussmann 170M6549	72000
ACS880-107-5130A-7	9	ACS880-104-0600A-7	18	Cooper Bussmann 170M6549	81000
ACS880-107-5700A-7	10	ACS880-104-0600A-7	20	Cooper Bussmann 170M6549	90000

*These are the DC fuses used for the protection of individual modules. The cubicle also contains larger main DC fuses that are common to all modules. The size of the main DC fuses depends on the number and size of the inverter modules. Blown fuses must be replaced using equivalent fuses.

Noise and cooling characteristics

Inverter unit type ACS880-107-...	Noise level	Heat dissipation			Air flow		
		Inverter unit	Sine filter (option +E206)	Total	Inverter unit	Sine filter (option +E206)	Total
	dB(A)	kW	kW	kW	m ³ /h (ft ³ /min)	m ³ /h (ft ³ /min)	m ³ /h (ft ³ /min)
U _N = 400 V							
004A8-3	47	0.07	*	–	24 (14)	*	–
006A0-3	47	0.08	*	–	24 (14)	*	–
008A0-3	47	0.09	*	–	24 (14)	*	–
0011A-3	39	0.11	*	–	48 (28)	*	–
0014A-3	39	0.14	*	–	48 (28)	*	–
0018A-3	39	0.17	*	–	48 (28)	*	–
0025A-3	63	0.20	*	–	142 (84)	*	–
0035A-3	63	0.30	*	–	142 (84)	*	–
0044A-3	71	0.35	*	–	200 (118)	*	–
0050A-3	71	0.41	*	–	200 (118)	*	–
0061A-3	70	0.50	*	–	290 (171)	*	–
0078A-3	70	0.60	*	–	290 (171)	*	–
0094A-3	70	0.74	*	–	290 (171)	*	–
0100A-3	70	0.75	*	–	290 (171)	*	–
0140A-3	71	1.1	*	–	650 (383)	*	–
0170A-3	71	1.4	*	–	650 (383)	*	–
0210A-3	71	1.8	*	–	650 (383)	*	–
0250A-3	71	2.0	*	–	650 (383)	*	–
0300A-3	72	2.5	*	–	940 (553)	*	–
0350A-3	72	3.1	*	–	940 (553)	*	–

Inverter unit type ACS880-107-...	Noise level	Heat dissipation			Air flow		
		Inverter unit	Sine filter (option +E206)	Total	Inverter unit	Sine filter (option +E206)	Total
	dB(A)	kW	kW	kW	m ³ /h (ft ₃ /min)	m ³ /h (ft ₃ /min)	m ³ /h (ft ₃ /min)
0470A-3	**72	4.8	5.0	9.8	**1300 (765)	2000 (1180)	3300 (1940)
0640A-3	**72	6.7	5.0	11.7	**1300 (765)	2000 (1180)	3300 (1940)
0760A-3	**72	8.0	5.0	13.0	**1300 (765)	2000 (1180)	3300 (1940)
0900A-3	**72	10	7	17	**1300 (765)	2000 (1180)	3300 (1940)
1250A-3	**74	13	10	23	**2600 (1530)	4000 (2350)	6600 (3880)
1480A-3	**74	16	10	26	**2600 (1530)	4000 (2350)	6600 (3880)
1760A-3	**74	20	14	34	**2600 (1530)	4000 (2350)	6600 (3880)
2210A-3	**76	23	14	37	**3900 (2295)	4000 (2350)	7900 (4650)
2610A-3	**76	30	21	51	**3900 (2295)	6000 (3530)	9900 (5830)
3450A-3	**76	40	21	61	**5200 (3060)	6000 (3530)	11200 (6590)
4290A-3	**77	50	28	78	**6500 (3825)	8000 (4710)	14500 (8535)
5130A-3	**78	60	35	95	**7800 (4590)	10000 (5890)	17800 (10480)
U _N = 500 V							
003A6-5	47	0.06	*	–	24 (14)	*	–
004A8-5	47	0.07	*	–	24 (14)	*	–
006A0-5	47	0.08	*	–	24 (14)	*	–
008A0-5	47	0.09	*	–	24 (14)	*	–
0011A-5	39	0.13	*	–	48 (28)	*	–
0014A-5	39	0.15	*	–	48 (28)	*	–
0018A-5	39	0.18	*	–	48 (28)	*	–
0025A-5	63	0.23	*	–	142 (84)	*	–
0030A-5	63	0.28	*	–	142 (84)	*	–
0035A-5	63	0.32	*	–	142 (84)	*	–
0050A-5	71	0.48	*	–	200 (118)	*	–
0061A-5	70	0.55	*	–	290 (171)	*	–
0078A-5	70	0.65	*	–	290 (171)	*	–
0094A-5	70	0.80	*	–	290 (171)	*	–
0110A-5	71	1.0	*	–	650 (383)	*	–
0140A-5	71	1.2	*	–	650 (383)	*	–
0170A-5	71	1.5	*	–	650 (383)	*	–
0200A-5	71	1.8	*	–	650 (383)	*	–
0240A-5	71	2.0	*	–	650 (383)	*	–
0300A-5	72	2.7	*	–	940 (553)	*	–
0340A-5	72	3.2	*	–	940 (553)	*	–
0440A-5	**72	4.7	2.5	7.2	**1300 (765)	700 (410)	2000 (1180)
0590A-5	**72	6.3	6.0	12.3	**1300 (765)	2000 (1180)	3300 (1940)
0740A-5	**72	8.1	6.0	14.1	**1300 (765)	2000 (1180)	3300 (1940)
0810A-5	**72	9.3	8.0	17.3	**1300 (765)	2000 (1180)	3300 (1940)

Inverter unit type ACS880-107-...	Noise level	Heat dissipation			Air flow		
		Inverter unit	Sine filter (option +E206)	Total	Inverter unit	Sine filter (option +E206)	Total
	dB(A)	kW	kW	kW	m ³ /h (ft ₃ /min)	m ³ /h (ft ₃ /min)	m ³ /h (ft ₃ /min)
1150A-5	**74	12	8	20	**2600 (1530)	2000 (1180)	4600 (2710)
1450A-5	**74	16	12	28	**2600 (1530)	4000 (2350)	6600 (3880)
1580A-5	**74	18	16	34	**2600 (1530)	4000 (2350)	6600 (3880)
2150A-5	**76	24	16	40	**3900 (2295)	4000 (2350)	7900 (4650)
2350A-5	**76	27	24	51	**3900 (2295)	6000 (3530)	9900 (5830)
3110A-5	**76	36	24	60	**5200 (3060)	6000 (3530)	11200 (6590)
3860A-5	**77	44	32	76	**6500 (3825)	8000 (4710)	14500 (8535)
4610A-5	**78	53	40	93	**7800 (4590)	10000 (5890)	17800 (10480)
U _N = 690 V							
007A3-7	62	0.22	*	–	280 (165)	*	–
009A8-7	62	0.28	*	–	280 (165)	*	–
014A2-7	62	0.40	*	–	280 (165)	*	–
0018A-7	62	0.49	*	–	280 (165)	*	–
0022A-7	62	0.58	*	–	280 (165)	*	–
0027A-7	62	0.66	*	–	280 (165)	*	–
0035A-7	62	0.86	*	–	280 (165)	*	–
0042A-7	62	1.00	*	–	280 (165)	*	–
0052A-7	62	1.12	*	–	280 (165)	*	–
0062A-7	71	0.80	*	–	650 (383)	*	–
0082A-7	71	1.1	*	–	650 (383)	*	–
0100A-7	71	1.3	*	–	650 (383)	*	–
0130A-7	71	1.5	*	–	650 (383)	*	–
0140A-7	71	1.8	*	–	650 (383)	*	–
0190A-7	71	2.5	*	–	650 (383)	*	–
0220A-7	72	2.8	*	–	940 (553)	*	–
0270A-7	72	3.3	*	–	940 (553)	*	–
0340A-7	**72	5.2	3.0	8.2	**1300 (765)	700 (410)	2000 (1180)
0410A-7	**72	6.1	3.0	9.1	**1300 (765)	700 (410)	2000 (1180)
0530A-7	**72	7.9	7.0	14.9	**1300 (765)	2000 (1180)	3300 (1940)
0600A-7	**72	9.0	7.0	16.0	**1300 (765)	2000 (1180)	3300 (1940)
0800A-7	**74	12	7	19	**2600 (1530)	2000 (1180)	4600 (2710)
1030A-7	**74	15	9	24	**2600 (1530)	2000 (1180)	4600 (2710)
1170A-7	**74	18	9	27	**2600 (1530)	2000 (1180)	4600 (2710)
1540A-7	**76	23	18	41	**3900 (2295)	4000 (2350)	7900 (4650)
1740A-7	**76	26	18	44	**3900 (2295)	4000 (2350)	7900 (4650)
2300A-7	**76	35	18	53	**5200 (3060)	4000 (2350)	9200 (5410)
2860A-7	**77	43	27	70	**6500 (3825)	6000 (3530)	12500 (7360)
3420A-7	**78	52	27	79	**7800 (4590)	6000 (3530)	13800 (8120)

Inverter unit type ACS880-107-...	Noise level	Heat dissipation			Air flow		
		Inverter unit	Sine filter (option +E206)	Total	Inverter unit	Sine filter (option +E206)	Total
	dB(A)	kW	kW	kW	m ³ /h (ft ₃ /min)	m ³ /h (ft ₃ /min)	m ³ /h (ft ₃ /min)
3990A-7	**78	60	36	96	**9100 (5360)	8000 (4710)	17100 (10060)
4560A-7	**79	69	36	105	**10400 (6120)	8000 (4710)	18400 (10830)
5130A-7	**79	78	45	123	**11700 (6890)	10000 (5890)	21700 (12770)
5700A-7	**79	86	54	140	**13000 (7650)	12000 (7060)	25000 (14710)

*Contact your local ABB representative for availability and technical data of sine filters.

**Maximum value with direct-on-line cooling fan.

Sine output filter data

Sine output filters are available as option +E206. The table below shows the types and technical data of the filters and filter cubicles used. The standard filters listed require no current derating.

For availability of sine output filters for other inverter unit types, contact your local ABB representative.

Inverter unit type ACS880-107...	Sine filter(s) used		Nominal current	Dimensions		Cooling data	
	Qty	Type		Width	weight	Heat dissipation	Air flow
				A	mm	kg (lbs)	kW
U _N = 400 V							
0470A-3	1	NSIN-0900-6	783	1000	840 (1850)	See <i>Noise and cooling characteristics</i> (page 139)	
0640A-3	1	NSIN-0900-6	783	1000	840 (1850)		
0760A-3	1	NSIN-0900-6	783	1000	840 (1850)		
0900A-3	1	NSIN-1380-6	1201	1000	960 (2120)		
1250A-3	2	NSIN-0900-6	1488	2000	1680 (3700)		
1480A-3	2	NSIN-0900-6	1488	2000	1680 (3700)		
1760A-3	2	NSIN-1380-6	2282	2000	1920 (4230)		
2210A-3	2	NSIN-1380-6	2282	2000	1920 (4230)		
2610A-3	3	NSIN-1380-6	3387	3000	2880 (6350)		
3450A-3	3	NSIN-1380-6	3387	3000	2880 (6350)		
4290A-3	4	NSIN-1380-6	4468	4000	3840 (8470)		
5130A-3	5	NSIN-1380-6	5525	5000	4800 (10580)		
U _N = 500 V							

Inverter unit type ACS880- 107...	Sine filter(s) used		Nominal current	Dimensions		Cooling data	
	Qty	Type		Width	weight	Heat dissipation	Air flow
			A	mm	kg (lbs)	kW	m ³ /h (ft ³ /min)
0440A-5	1	NSIN-0485-6	447	400	340 (750)	See <i>Noise and cooling characteristics (page 139)</i>	
0590A-5	1	NSIN-0900-6	783	1000	840 (1850)		
0740A-5	1	NSIN-0900-6	783	1000	840 (1850)		
0810A-5	1	NSIN-1380-6	1201	1000	960 (2120)		
1150A-5	1	NSIN-1380-6	1201	1000	960 (2120)		
1450A-5	2	NSIN-0900-6	1488	2000	1680 (3700)		
1580A-5	2	NSIN-1380-6	2282	2000	1920 (4230)		
2150A-5	2	NSIN-1380-6	2282	2000	1920 (4230)		
2350A-5	3	NSIN-1380-6	3387	3000	2880 (6350)		
3110A-5	3	NSIN-1380-6	3387	3000	2880 (6350)		
3860A-5	4	NSIN-1380-6	4468	4000	3840 (8470)		
4610A-5	5	NSIN-1380-6	5525	5000	4800 (10580)		
$U_N = 690 \text{ V}$							
0340A-7	1	NSIN-0485-6	447	400	340 (750)	See <i>Noise and cooling characteristics (page 139)</i>	
0410A-7	1	NSIN-0485-6	447	400	340 (750)		
0530A-7	1	NSIN-0900-6	783	1000	840 (1850)		
0600A-7	1	NSIN-0900-6	783	1000	840 (1850)		
0800A-7	1	NSIN-0900-6	783	1000	840 (1850)		
1030A-7	1	NSIN-1380-6	1201	1000	960 (2120)		
1170A-7	1	NSIN-1380-6	1201	1000	960 (2120)		
1540A-7	2	NSIN-1380-6	2282	2000	1920 (4230)		
1740A-7	2	NSIN-1380-6	2282	2000	1920 (4230)		
2300A-7	2	NSIN-1380-6	2282	2000	1920 (4230)		
2860A-7	3	NSIN-1380-6	3387	3000	2880 (6350)		
3420A-7	3	NSIN-1380-6	3387	3000	2880 (6350)		
3990A-7	4	NSIN-1380-6	4468	4000	3840 (8470)		
4560A-7	4	NSIN-1380-6	4468	4000	3840 (8470)		
5130A-7	5	NSIN-1380-6	5525	5000	4800 (10580)		
5700A-7	6	NSIN-1380-6	6557	6000	5760 (12700)		

Input power (DC) connection

Voltage (U_1)	ACS880-107-xxxx-3: 513...566 V DC. This is indicated in the type designation label as typical input voltage level (566 V DC). ACS880-107-xxxx-5: 513...707 V DC. This is indicated in the type designation label as typical input voltage levels (566/679/707 V DC). ACS880-107-xxxx-7: 709...976 V DC. This is indicated in the type designation label as typical input voltage levels (742/849/976 V DC).
Drive AC supply network type	TN (grounded) and IT (ungrounded) systems up to 690 V AC, corner-grounded systems up to 600 V AC

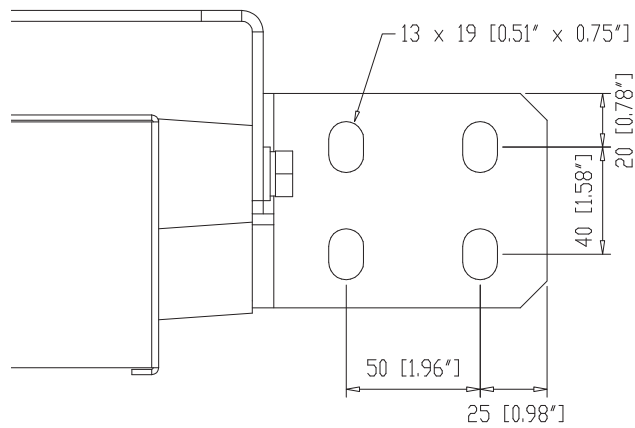
Motor (AC) connection

Motor types	Asynchronous AC induction motors, permanent magnet synchronous motors and AC induction servomotors
Voltage (U_2)	3-phase symmetrical, U_{max} at field weakening point: ACS880-107-xxxx-3: 0...400 V AC. The maximum value (400 V) is a typical drive input voltage level shown on the type designation label of the supply unit corresponding to 380...415 V AC. ACS880-107-xxxx-5: 0...400/480/500 V AC. The maximum values (400/480/500 V) are typical drive input voltage levels shown on the type designation label of the supply unit corresponding to 380...500 V AC. ACS880-107-xxxx-7: 0...525/600/690 V AC. The maximum values (525/600/690 V) are typical drive input voltage levels shown on the type designation label of the supply unit corresponding to 525...690 V AC.
Frequency (f_2)	0...500 Hz, except 0...120 Hz with sine output filters (option +E206) 0...120 Hz for frames R1i...R5i with du/dt filters (option +E205) 0...200 Hz for frames R6i and R7i with du/dt filters (option +E205) <ul style="list-style-type: none"> • For higher operational output frequencies, please contact your local ABB representative. • Operation above 150 Hz may require type-specific derating. For more information, contact your local ABB representative.
Current	See the technical data.
Switching frequency	Frames R1i...R4i: 4.5 kHz (typical) Frames R5i...R8i: 3 kHz (typical) The switching frequency can vary per frame and voltage. For exact values, please contact your local ABB representative.
Maximum recommended motor cable length	*Frames R1i...R2i: 150 m (492 ft) *Frames R3i...R7i: 300 m (984 ft) Frame R8i and multiples: 500 m (1640 ft) *Tested with 100 m (328 ft) for EMC Category C3. See standards and markings information in <i>Electrical planning instructions for ACS880 multidrive cabinets and modules</i> (3AUA0000102324 [English]). Note: Longer cables cause a motor voltage decrease which limits the available motor power. The decrease depends on the motor cable length and characteristics. Contact ABB for more information. Note that a sine filter (optional) at the drive output also causes a voltage decrease.

**Output terminals
(Frames R1i to R5i)**

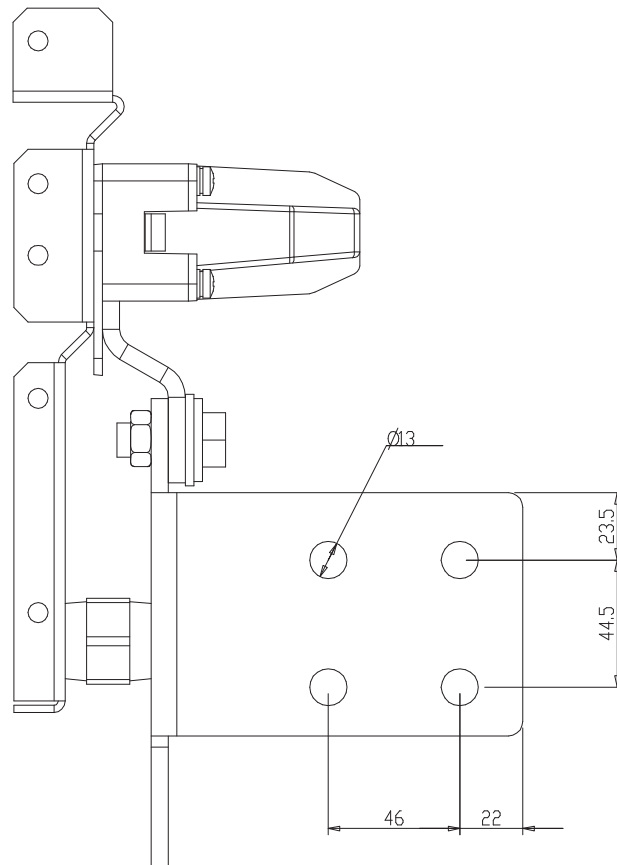
Frame size	U2, V2, W2, PE (terminal block X1)				Type
	Max. wire size		Tightening torque		
	mm ²	AWG	N·m	lbf·in	
R1i, R2i	6 (stranded)	10	0.7 ... 0.8	6.2 ... 7.1	Detachable screw terminal block
	10 (solid)				
R3i, R5i	16	6	1.7 ... 1.8	15...16	
R4i	50 (copper cable)	1/0	6...8	53...71	Screw terminal block
	70 (aluminum cable) (option +H371)	2/0	15	133	

**Output terminals
(Frames R6i and R7i)–
Side view**



Screw size: M12 or 1/2". Tightening torque: 70 N·m (52 lbf·ft)
 Busbar material: Tin-plated copper

Output terminals (Frame R8i) – Side view



Screw size: M12 or ½". Tightening torque: 70 N·m (52 lbf·ft)

Busbar material: Tin-plated copper

Typical power cable sizes

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

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

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

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

Control connections

See chapter *Control units of the drive (page 41)*.

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

Optical components

The specifications of the optic cable are as follows:

- Storage temperature: -55 ... +85 °C (-67 ... +185 °F)
- Installation temperature: -20 ... +70 °C (-4 ... +158 °F)
- Maximum short-term tensile force: 50 N (11.2 lbf)
- Minimum short-term bend radius: 25 mm (1.0 in)
- Minimum long-term bend radius: 35 mm (1.4 in)
- Maximum long-term tensile load: 1 N (3.6 ozf)
- Flexing: Max. 1000 cycles

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

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

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

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

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 alti- tudes over 2000 m, contact ABB. Output derated above 1000 m (3281 ft).	-	-
Air temperature	0 ... +40 °C (+32 ... +104 °F). No con- densation 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)
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 environ- mental conditions - Part 3- 3: Classification of groups of environmental paramet- ers and their severities - Stationary use of weather protected locations Chemical gases: Class 3C2 Solid particles: Class 3S2 (3S1 with IP20). No con- ductive 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
Pollution degree	2		
Vibration IEC/EN 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Envir- onmental 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 construc- tion (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

Cooling

Method	Fans built in inverter modules, exhauster fans in frame R1i...R5i cubicles, and IP54 cubicles of other frame sizes. Fan in cooling air inlet of control cubicles (frame R8i and multiples).
Filter material (IP54)	Inlet (door): Camfil/airComp 300-50 Outlet (roof): Camfil/airTex G150

Air flow	See <i>Noise and cooling characteristics (page 139)</i>
----------	---

Cabinet finish

Polyester thermosetting powder coating on visible surfaces, color RAL 7035 and RAL 9017.

Packaging

Cabinets are fastened to the pallet with screws and braced at the top to the package walls against swaying inside the package. Package elements are attached to each other with screws.

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 product 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.

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

Markings

See *Electrical planning instructions for ACS880 multidrive cabinets and modules (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.



Circuit diagrams

Refer to the circuit diagrams delivered with the unit.

10

Dimensions and weights

Contents of this chapter

This chapter contains information on the dimensions and weights of ACS880-107 inverter cubicles.

Frames R1i...R7i

■ Frames R1i...R5i

Because of the modularity of the design, the width of the cubicle varies between 400...1000 mm according to the number and size of the modules.

The following drawing displays a 400 mm wide cubicle, but the main dimensions apart from width are also applicable to wider cubicles. For details, refer to the dimension drawings delivered with the unit.

Option +C128 (cooling air intake through floor of cabinet) extends the cabinet depth by 130 mm.

Weights

The table shows the estimated maximum weights of R1i...R5i cubicles.

Frame size	Cubicle width	Estimated max. weight	
	mm	kg	lbs
R1i...R4i	400	240	530
	600	310	685
	800	400	880
	1000	485	1070

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Frame size	Cubicle width	Estimated max. weight	
	mm	kg	lbs
R5i	300	200	440
	*500	320	705
	**500	280	615

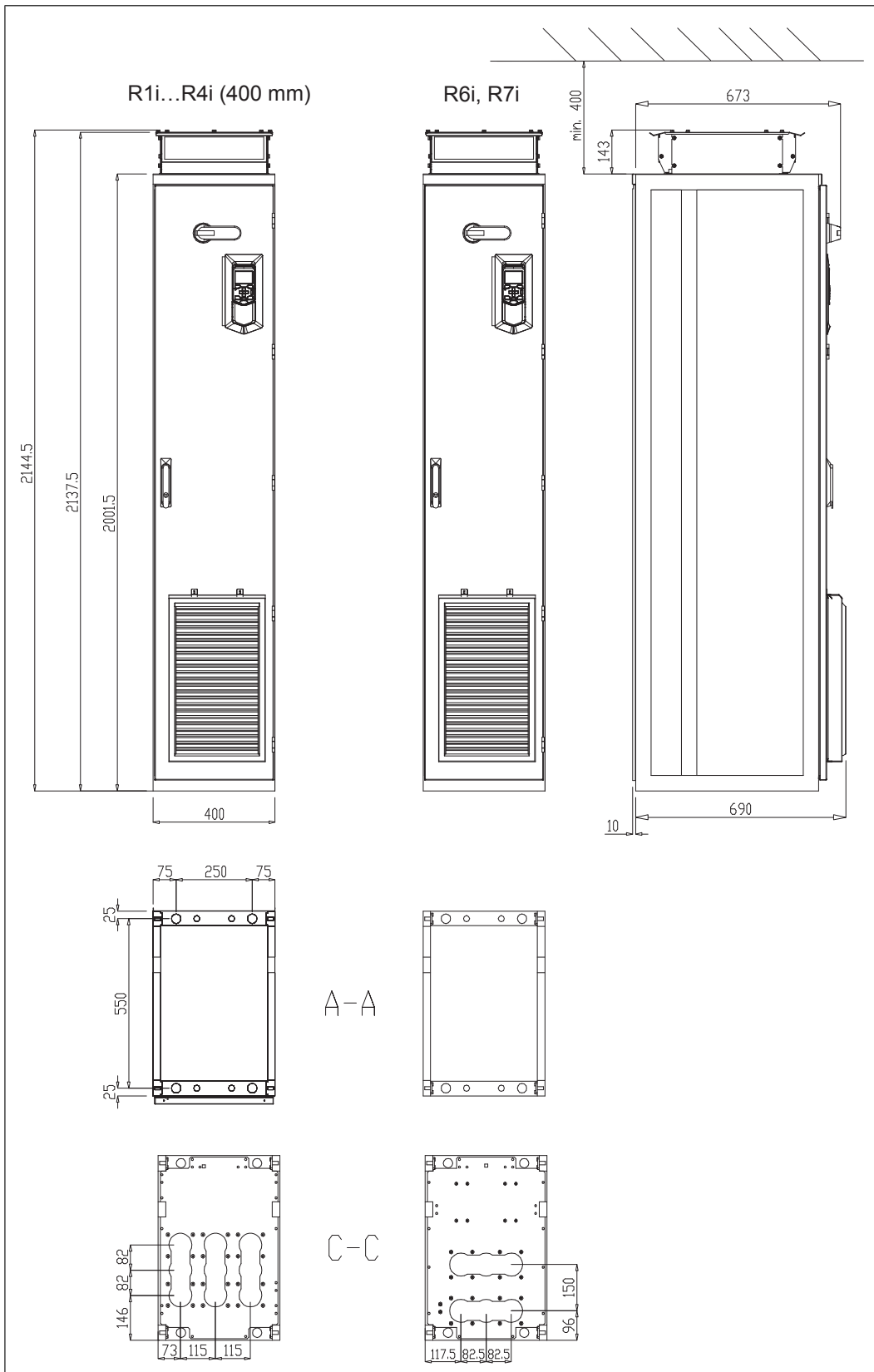
*Without option +C204, **with option +C204.

■ **Frames R6i and R7i**

Each frame R6i and R7i inverter unit is housed in a 400 mm wide cubicle such as the one pictured below. The approximate weight of the cubicle is 250 kg (550 lbs). For details, refer to the dimension drawings delivered with the unit.

Options +H353 (motor cabling through roof of cabinet) and +C128 (cooling air intake through floor of cabinet) extend the cabinet depth by 130 mm.

■ Dimension drawing, 400 mm wide cubicle



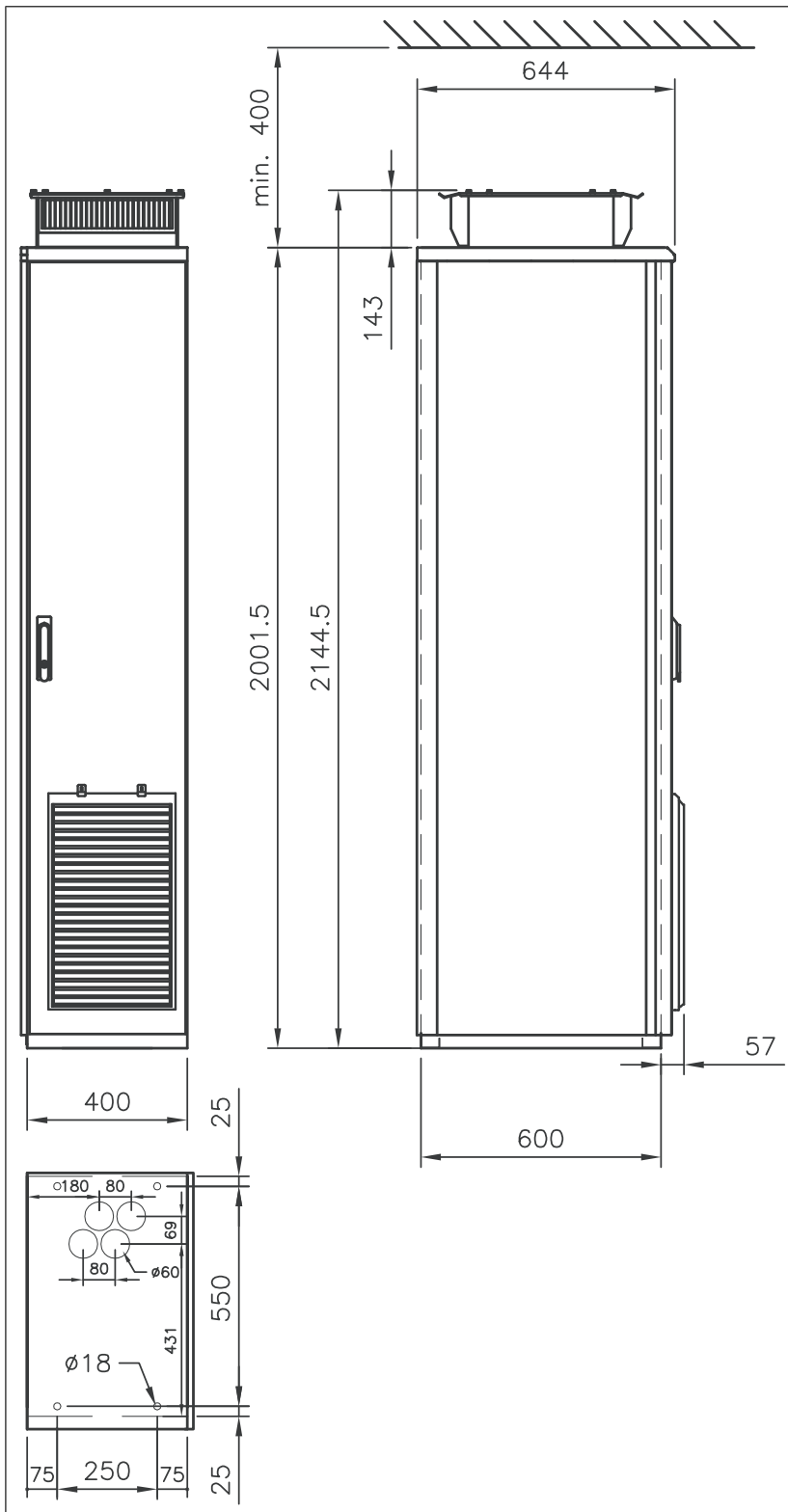
Frame R8i and multiples

The standard cubicle widths are 400 mm (frame R8i), 600 mm (2×R8i) and 800 mm (3×R8i). The approximate weights of the cubicles are 320, 510 and 660 kg (705, 1125 and 1455 lbs) respectively. Larger inverter units are combinations of these cubicles.

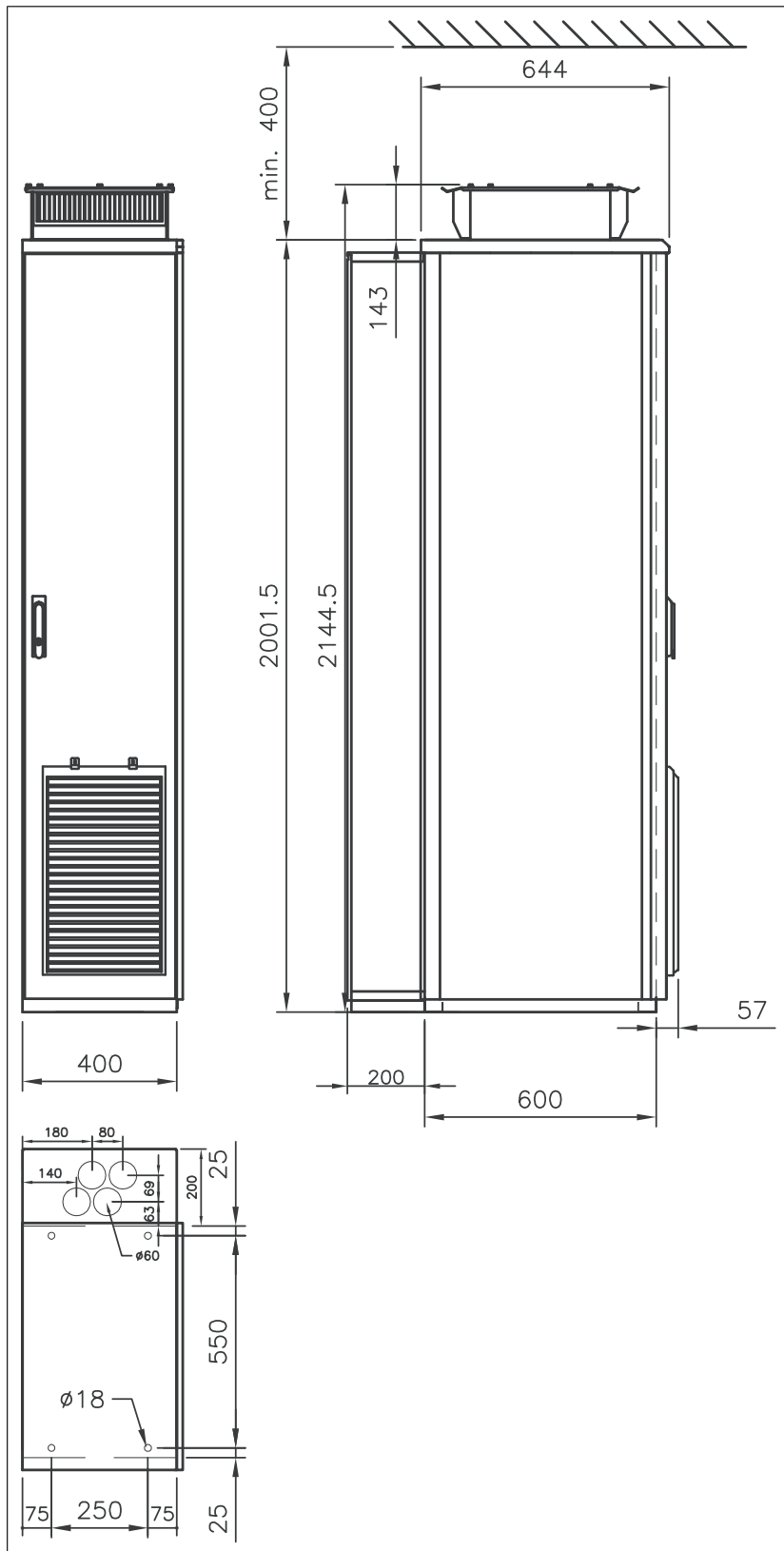
As standard, the control equipment is located in a separate 300 mm wide cubicle (DCU); a 400 mm wide cubicle is optionally available.

Option +C128 (cooling air intake through floor of cabinet) extends the cabinet depth by 130 mm. Option +H353 (motor cabling through roof of cabinet) extends the cabinet depth by 200 mm.

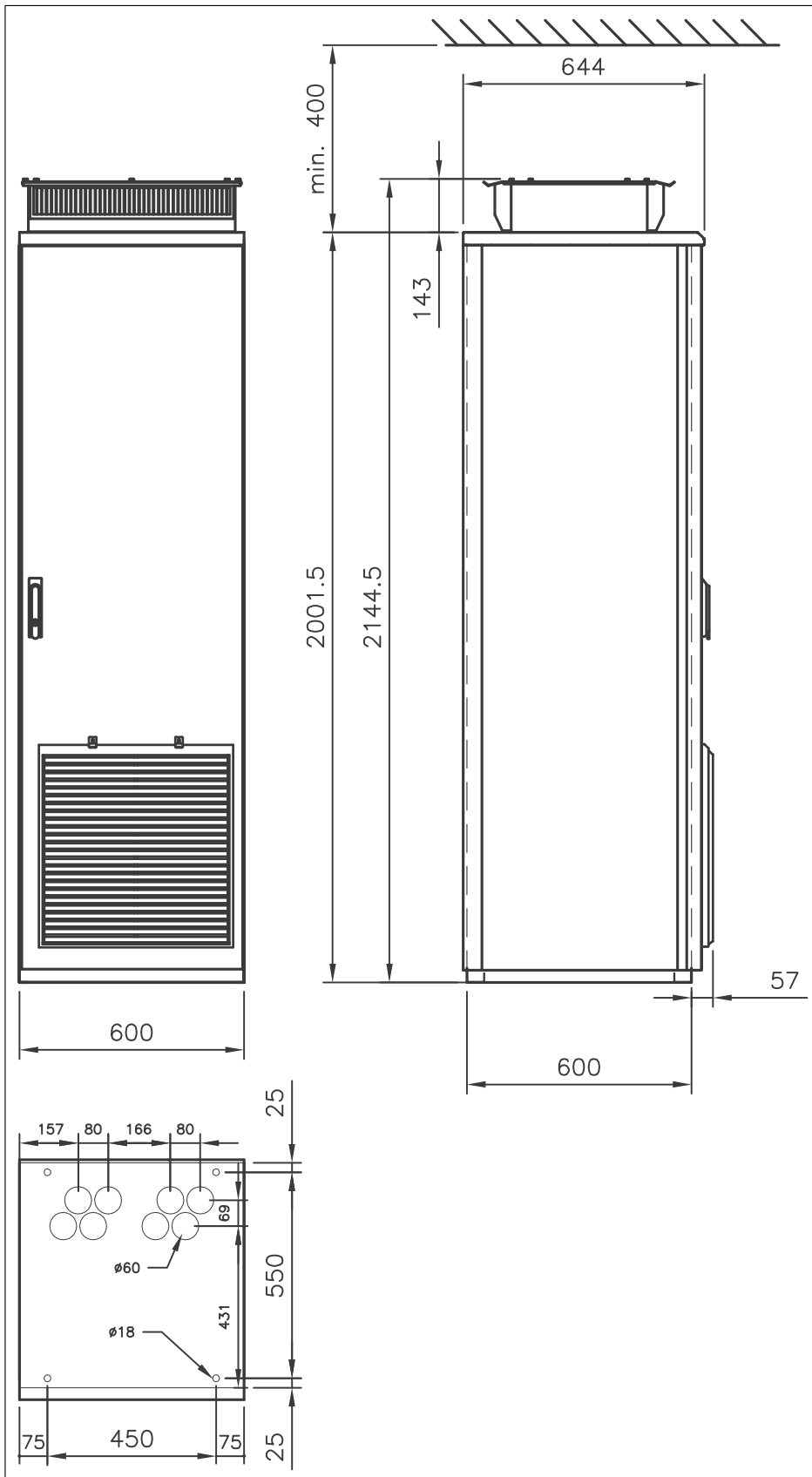
■ Dimension drawing, R8i (without +C128 or +H353), bottom cable exit



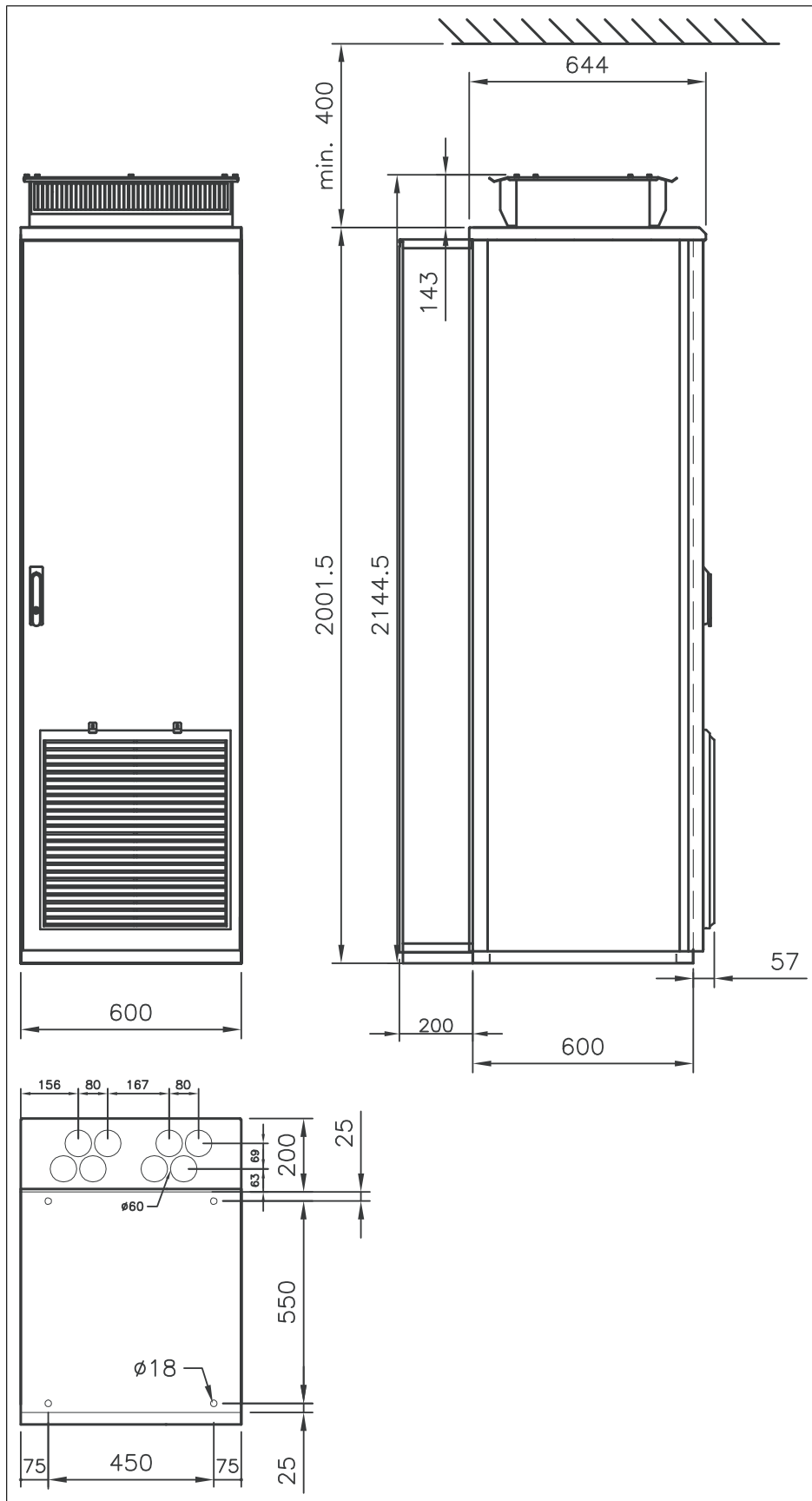
■ Dimension drawing, R8i (without +C128 or +H353), top cable exit



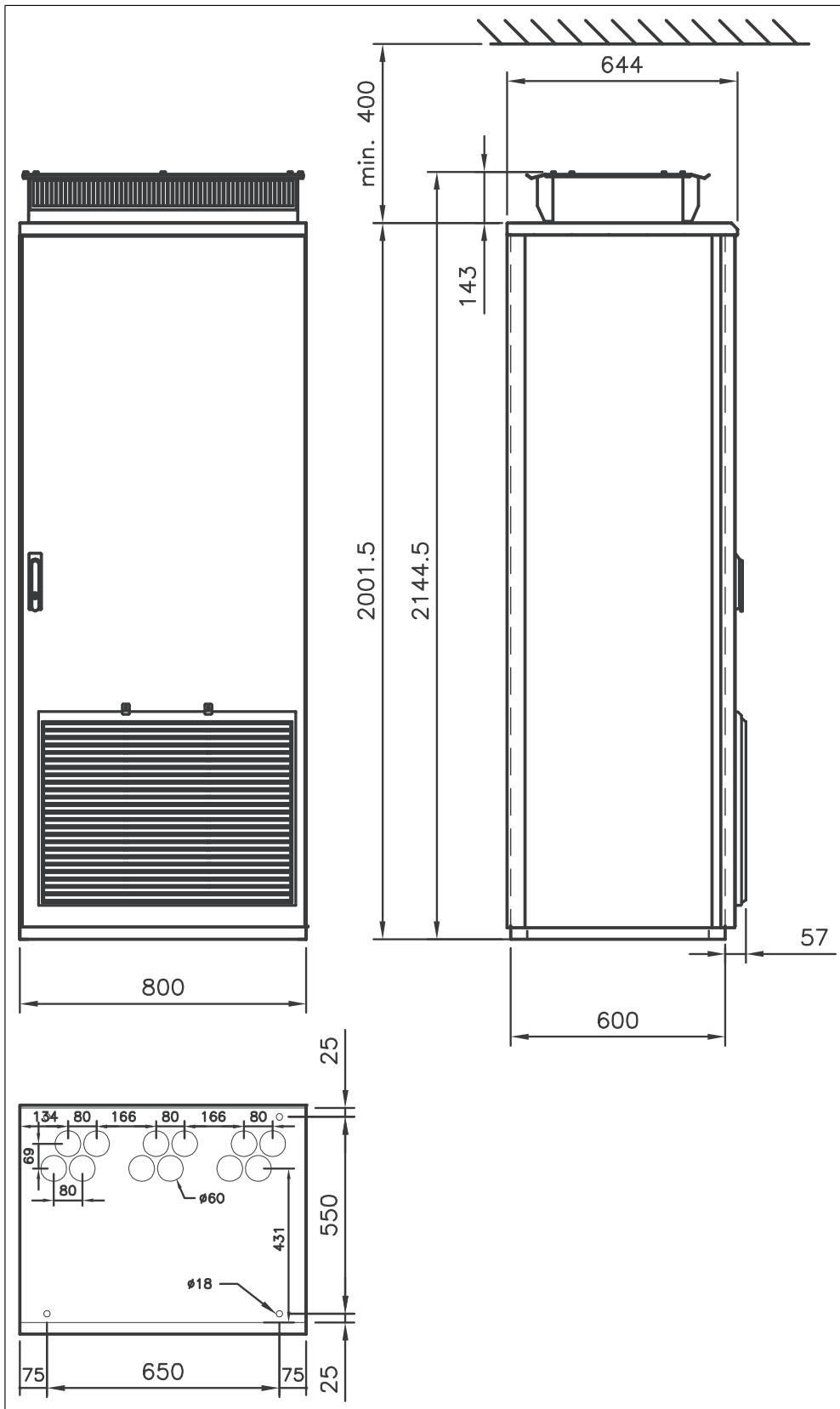
■ Dimension drawing, 2×R8i (without +C128 or +H353), bottom cable exit



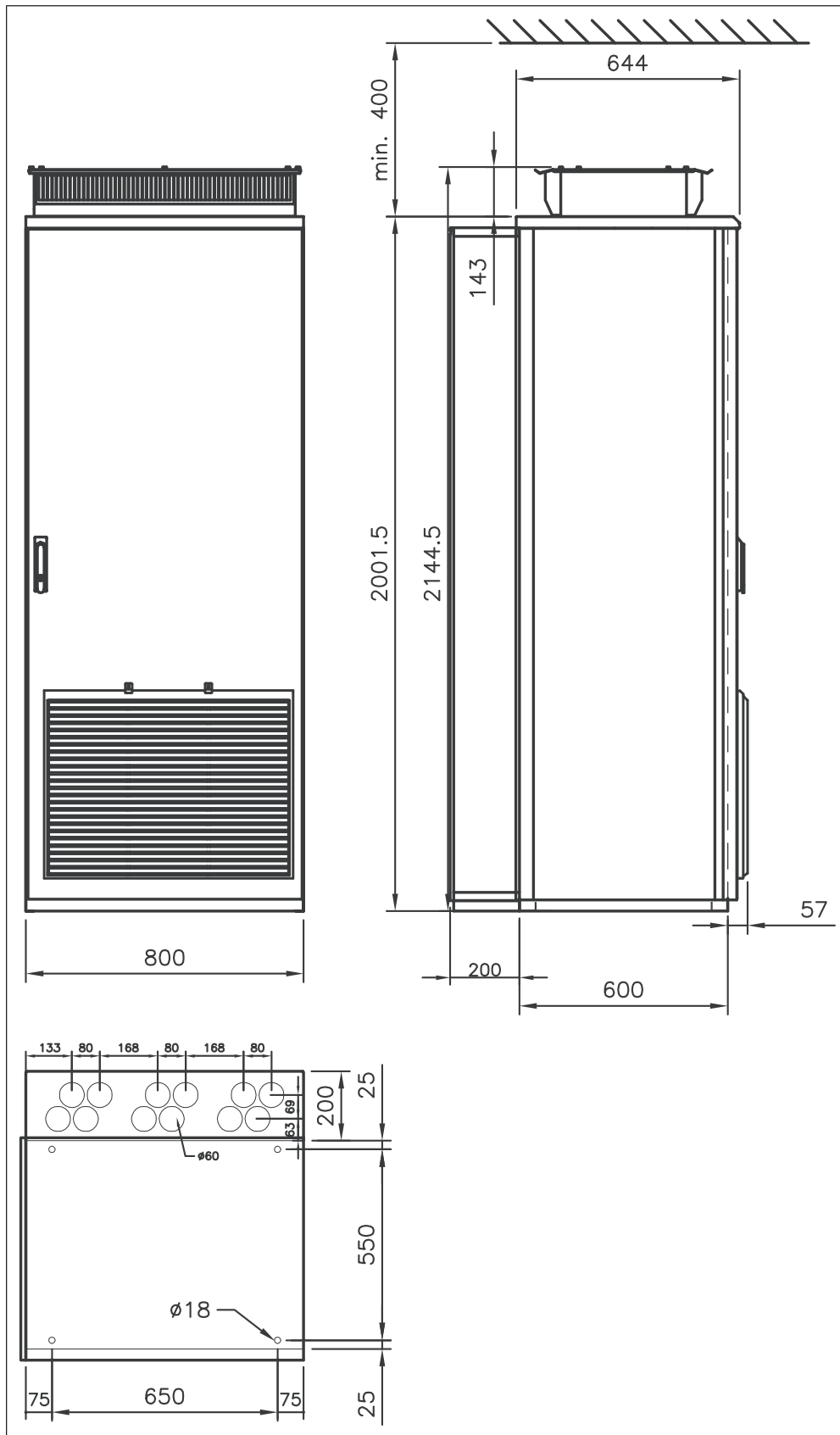
■ Dimension drawing, 2×R8i (without +C128 or +H353), top cable exit



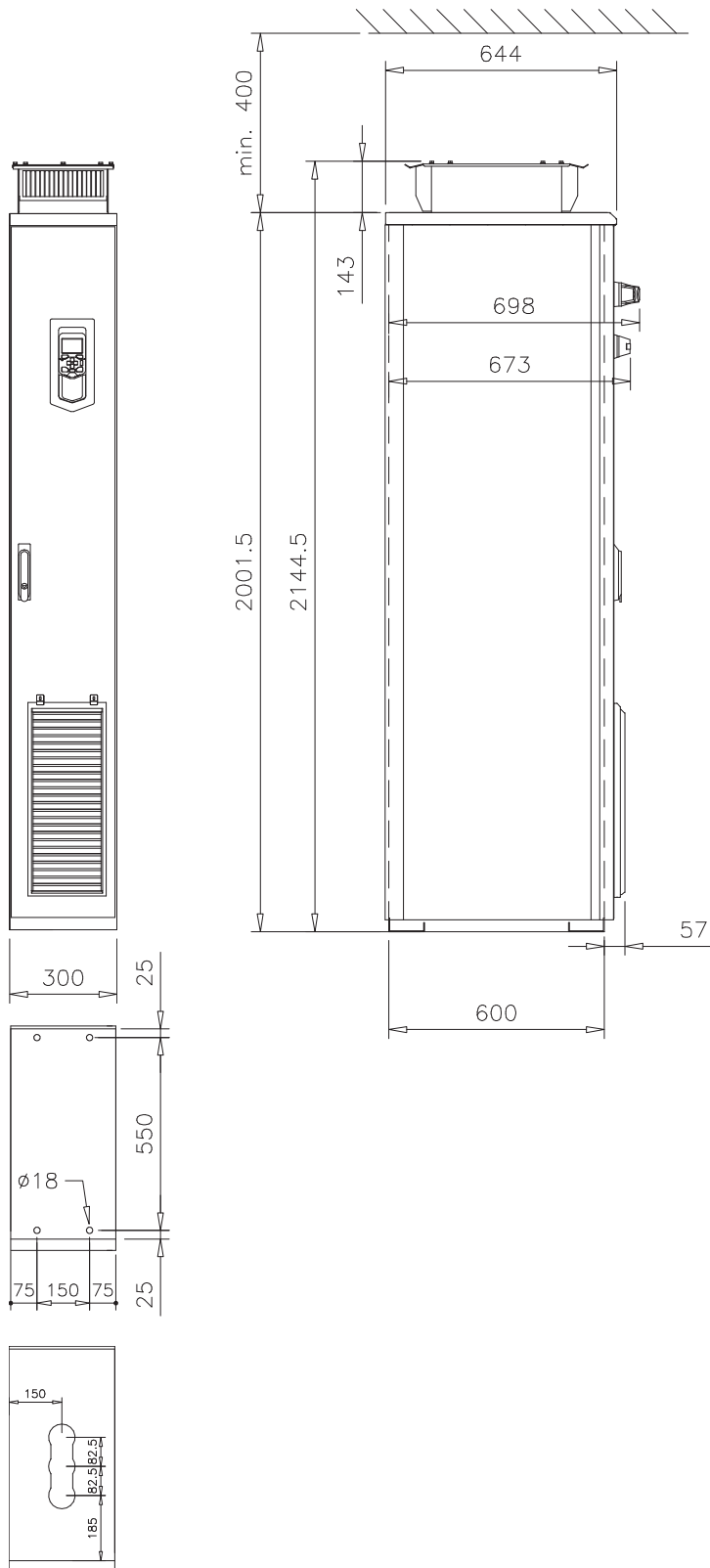
■ Dimension drawing, 3×R8i (without +C128 or +H353), bottom cable exit



■ Dimension drawing, 3×R8i (without +C128 or +H353), top cable exit



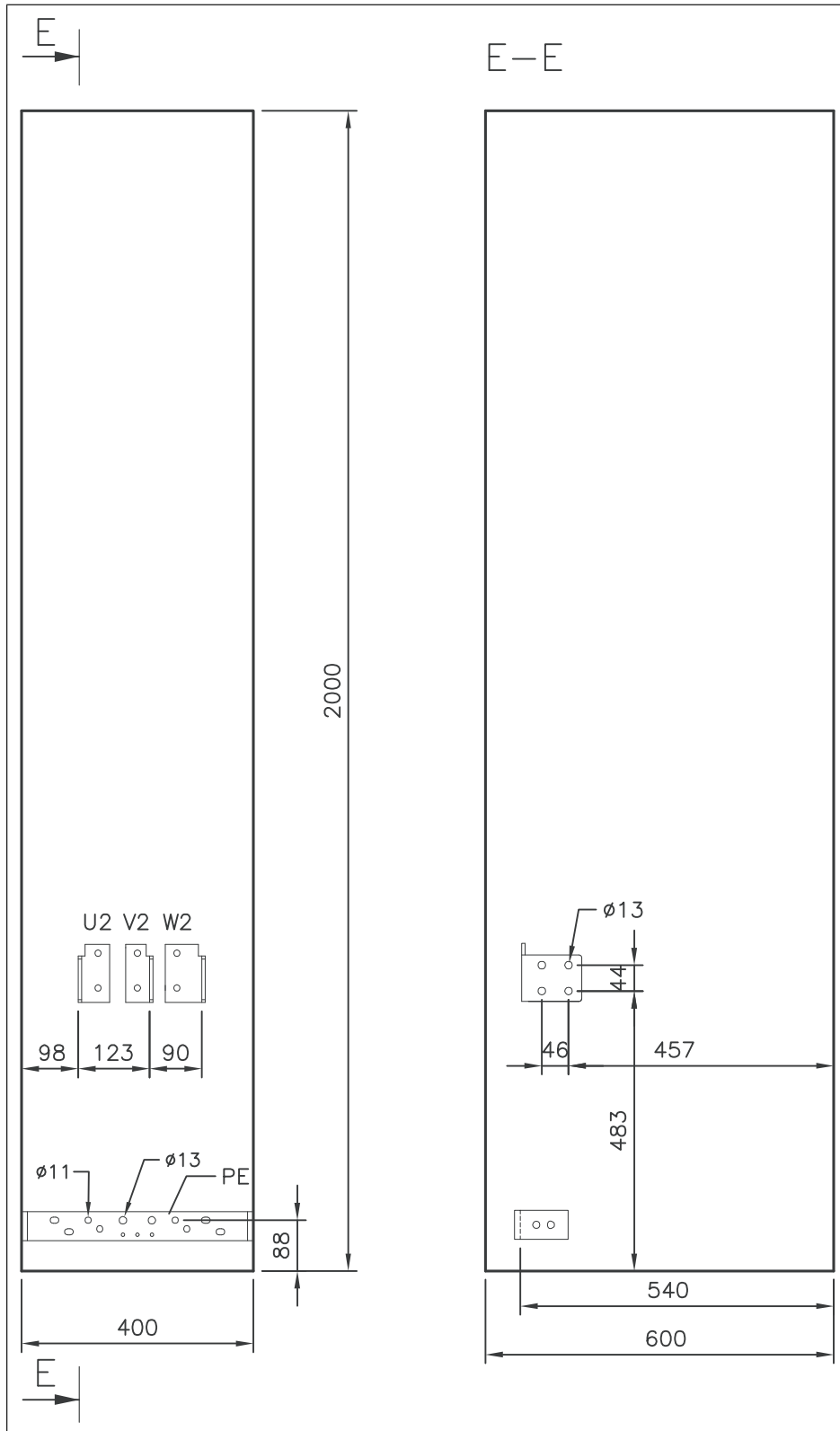
■ Dimension drawing, drive control unit (DCU) (300 mm)



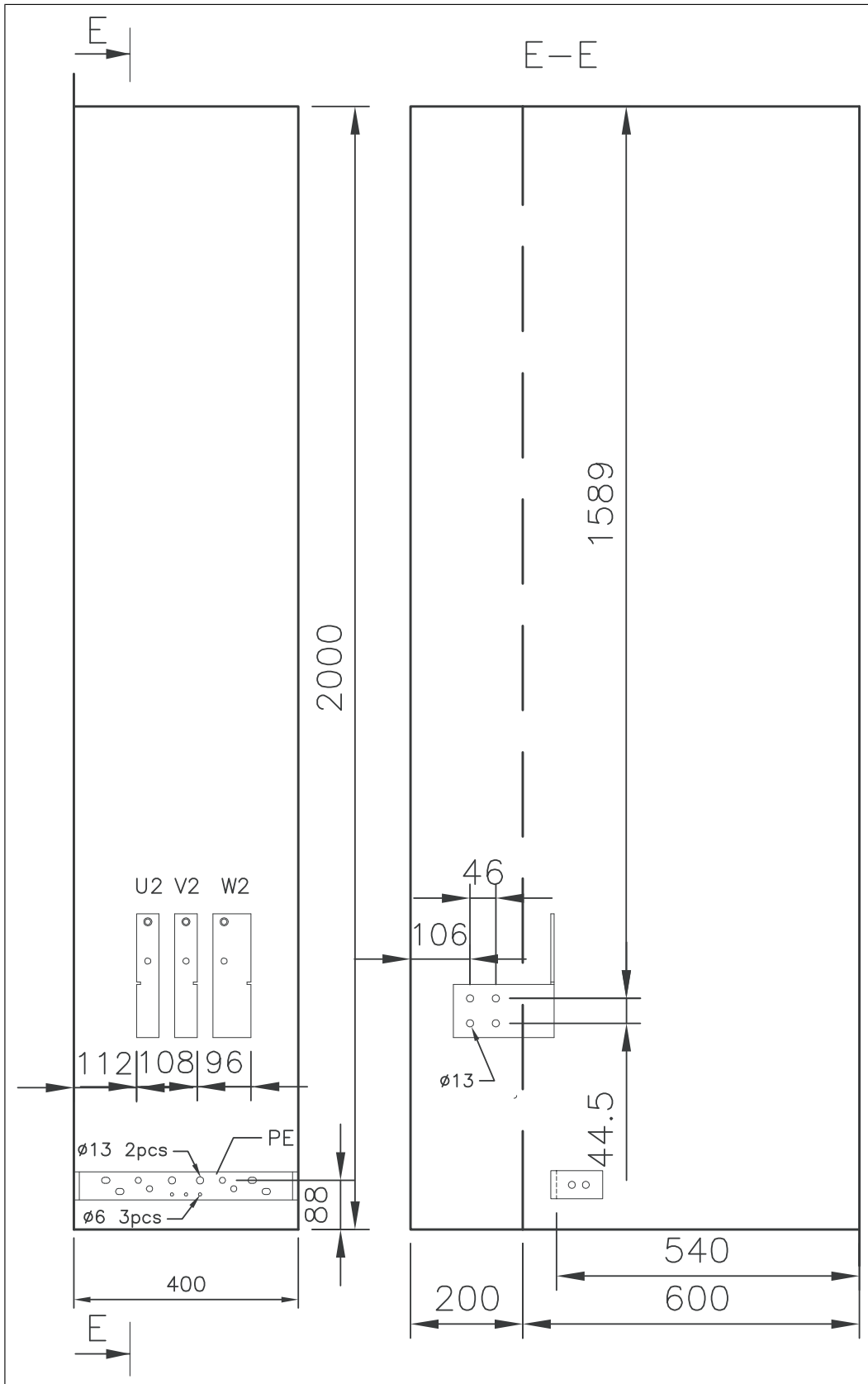
■ Location and size of output terminals

Units without common motor terminal cubicle

Inverter module cubicle with one R8i module, bottom cable exit

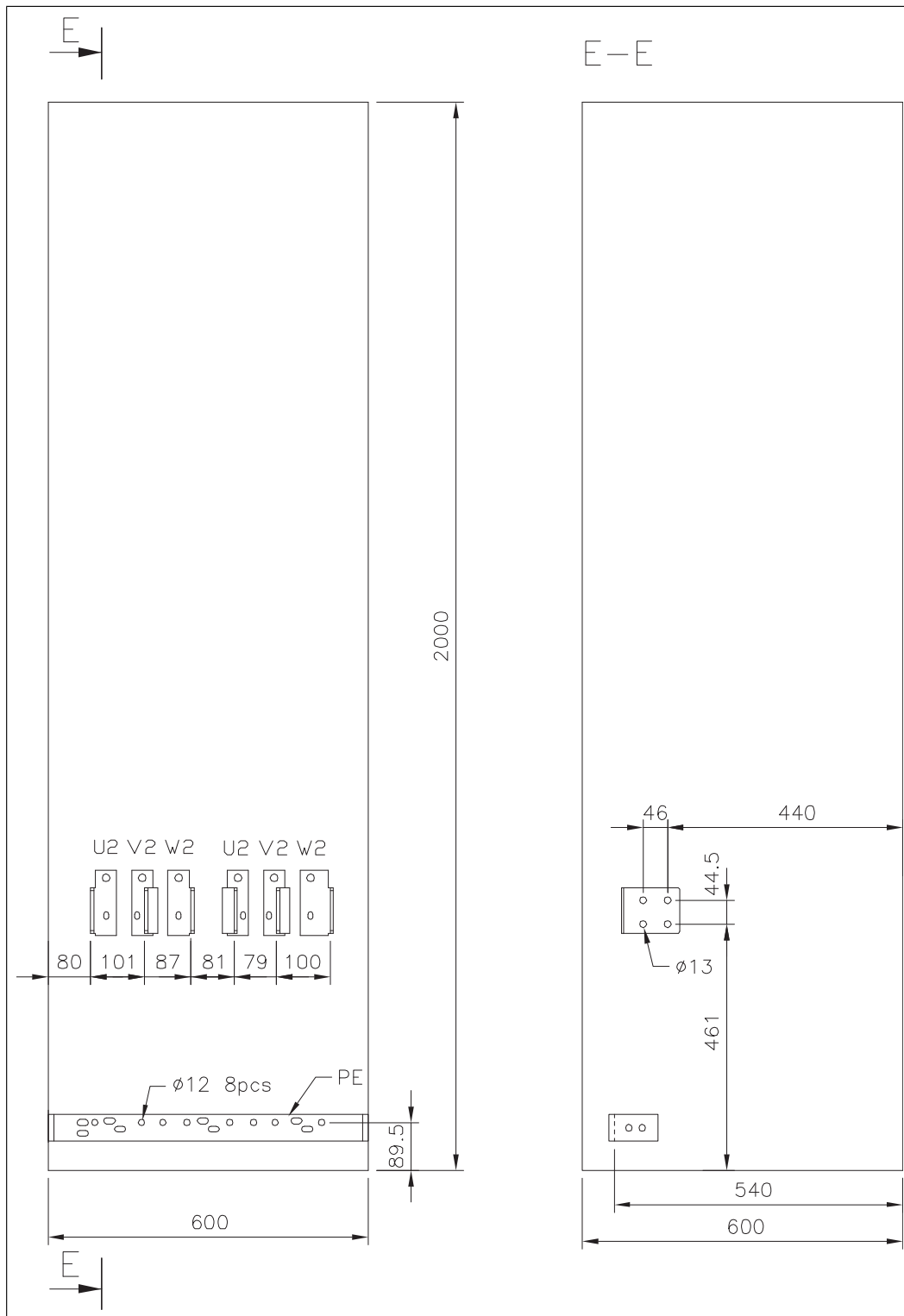


Inverter module cubicle with one R8i module, top cable exit

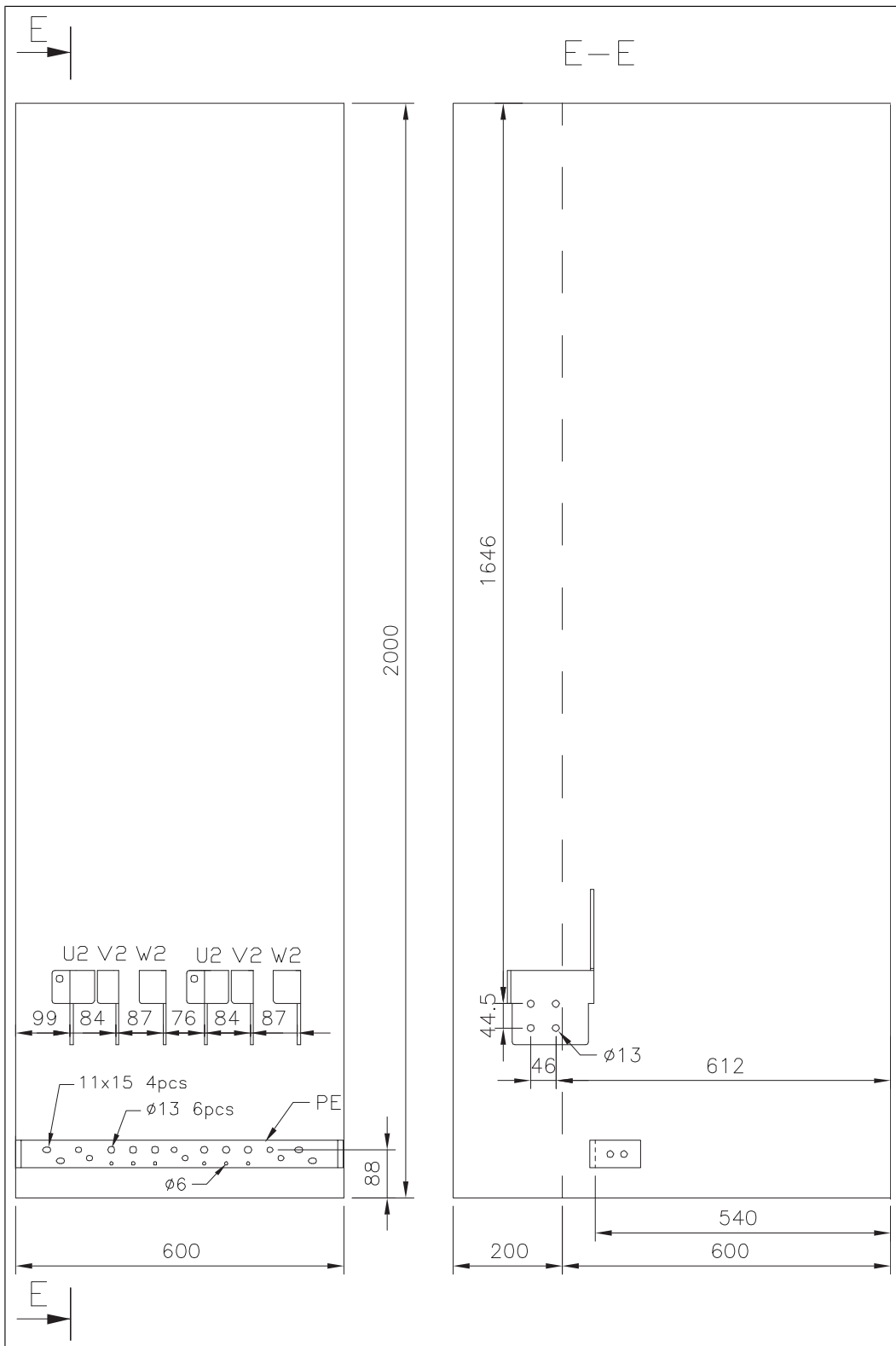


170 Dimensions and weights

Inverter module cubicle with two R8i modules, bottom cable exit

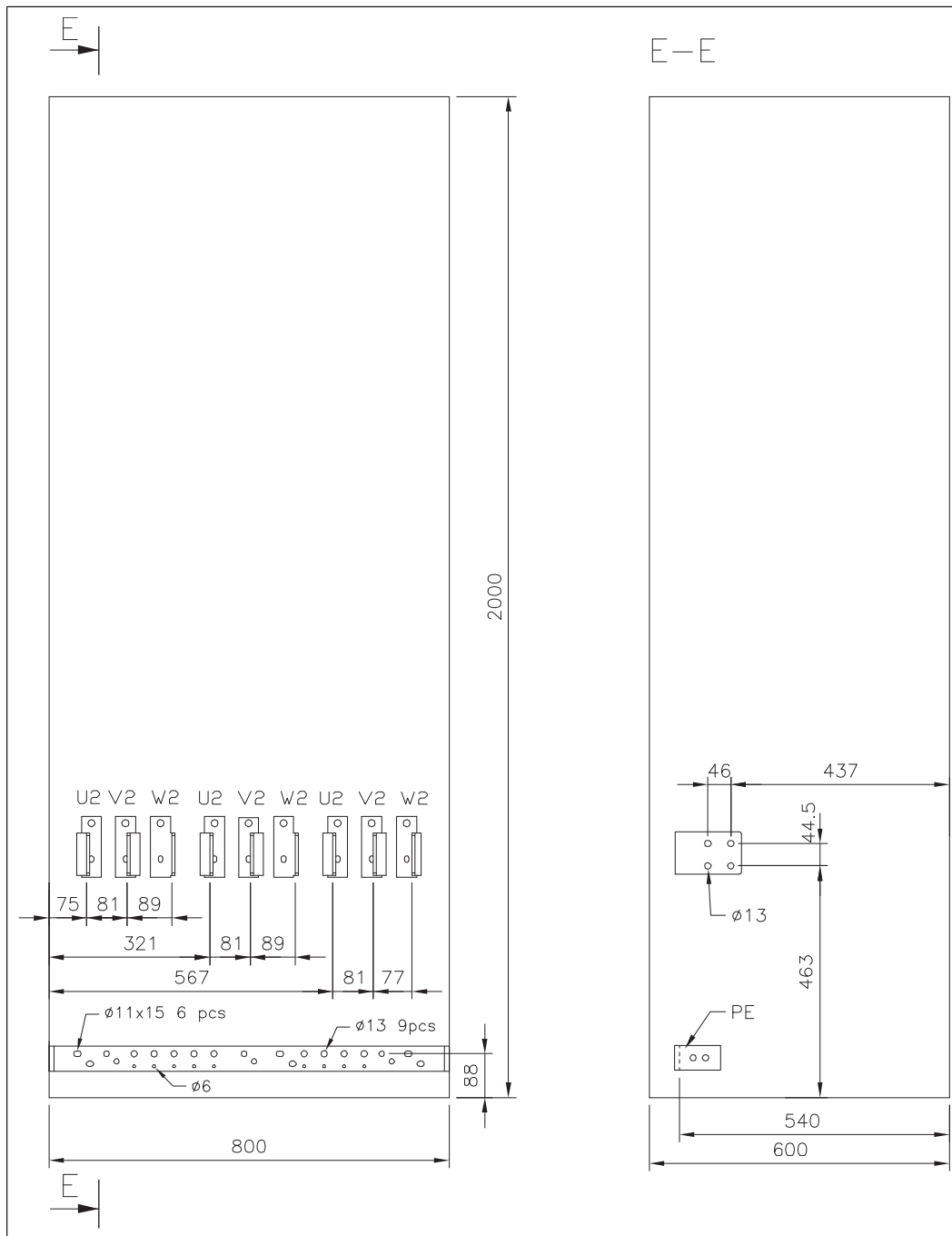


Inverter module cubicle with two R8i modules, top cable exit

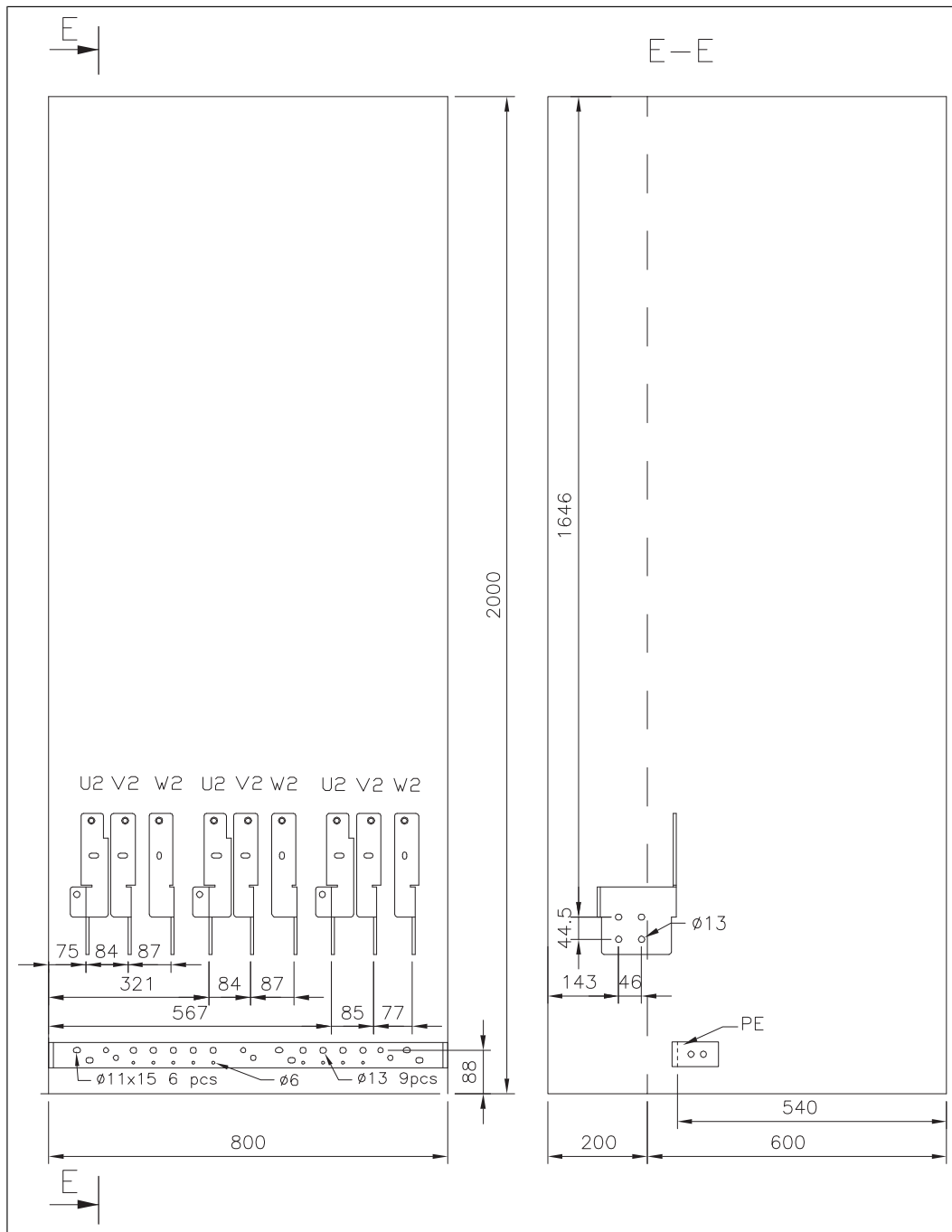


172 Dimensions and weights

Inverter module cubicle with three R8i modules, bottom cable exit

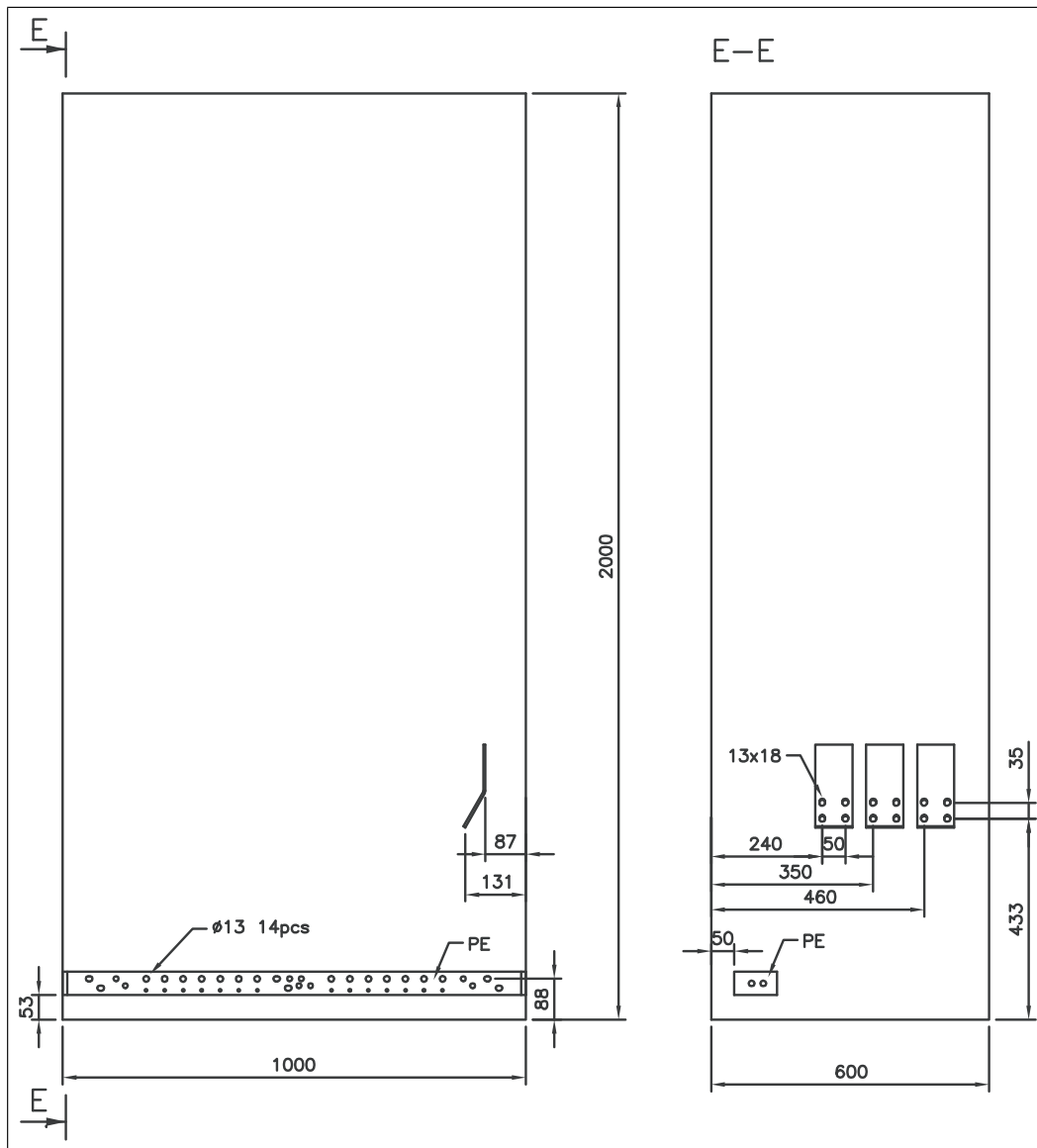


Inverter module cubicle with three R8i modules, top cable exit

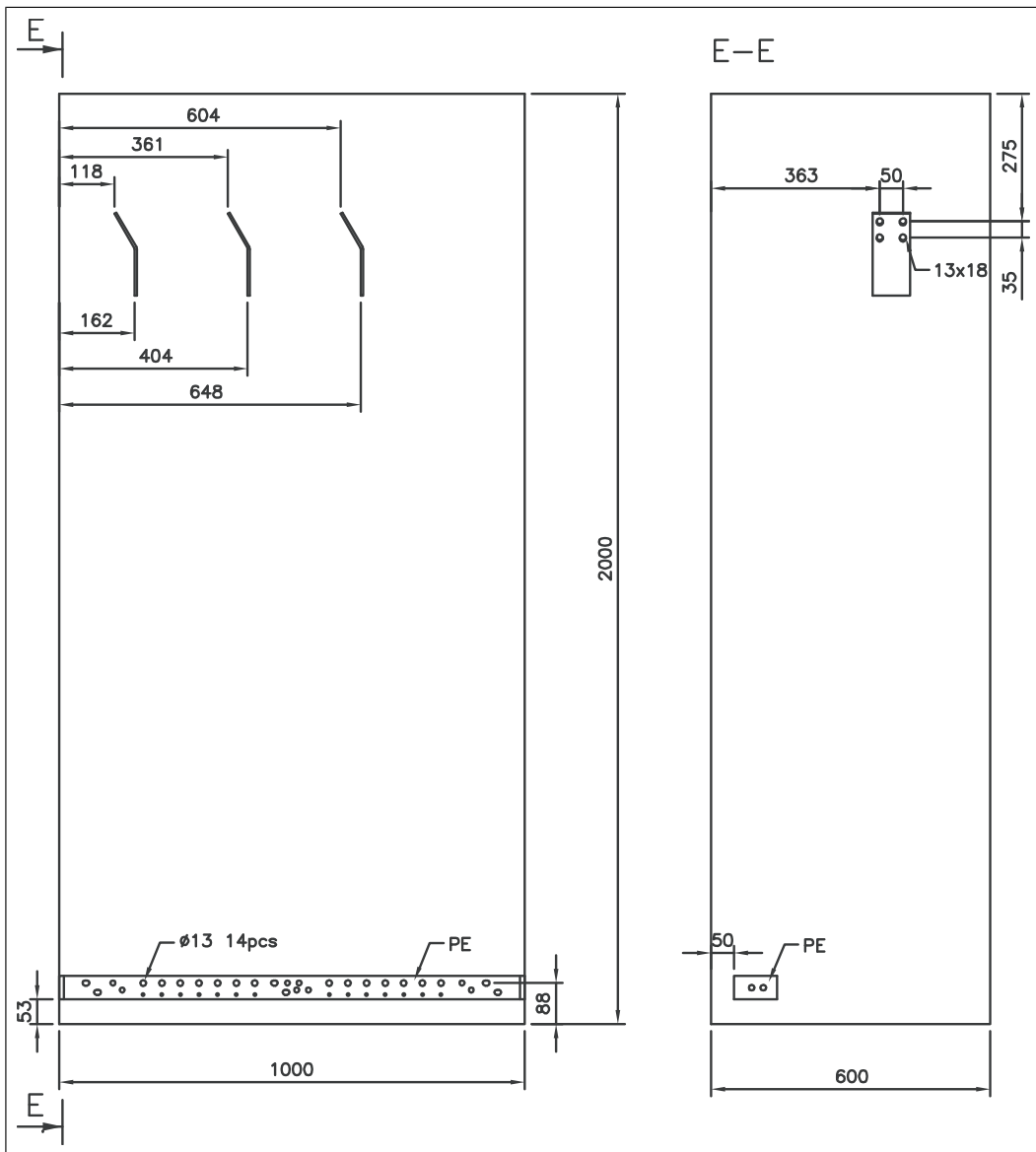


174 Dimensions and weights

Sine filter cubicle, 1000 mm, bottom cable exit

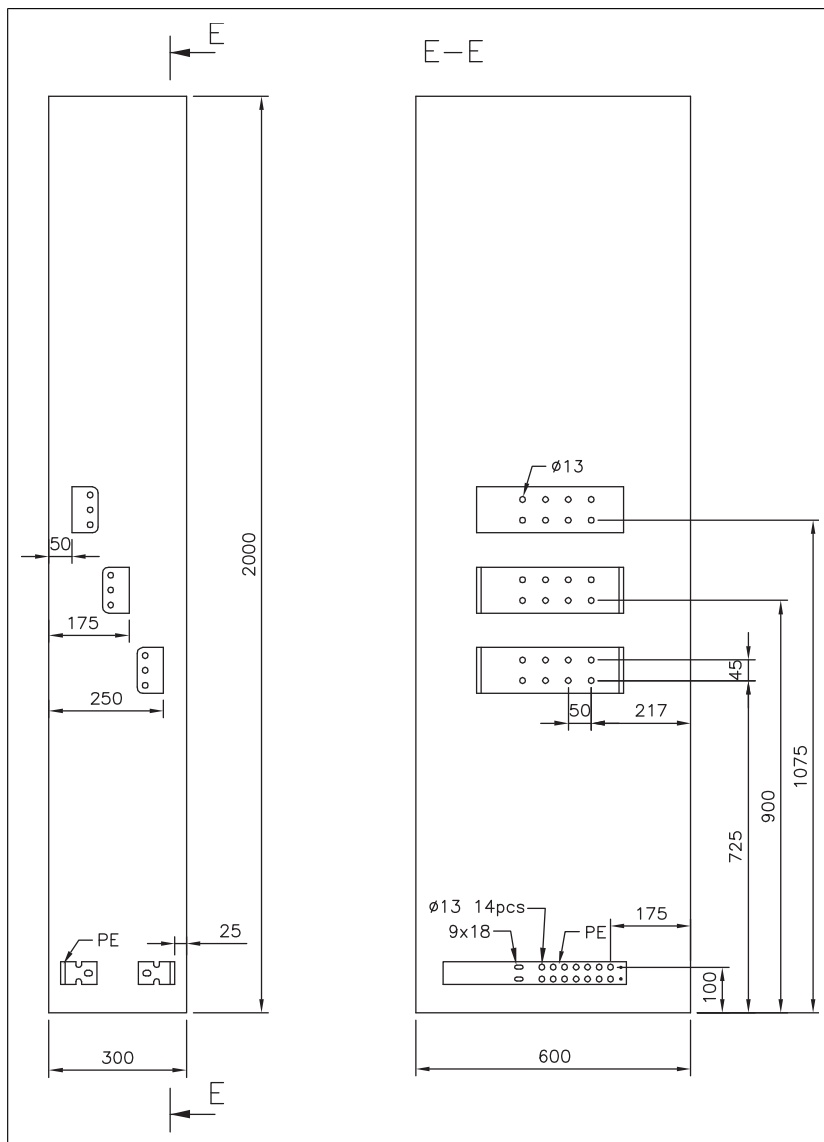


Sine filter cubicle, 1000 mm, top cable exit

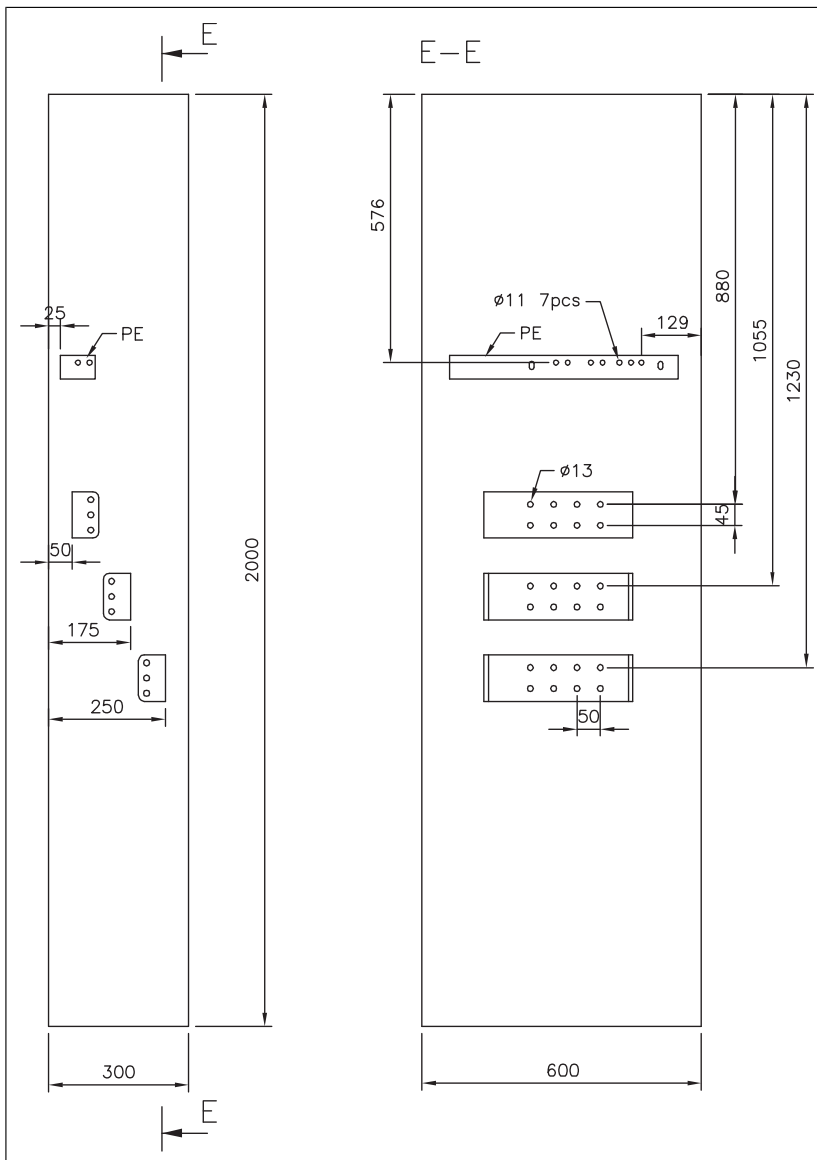


Units with common motor terminal cubicle (+H359)

Cubicle width 300 mm, bottom cable exit

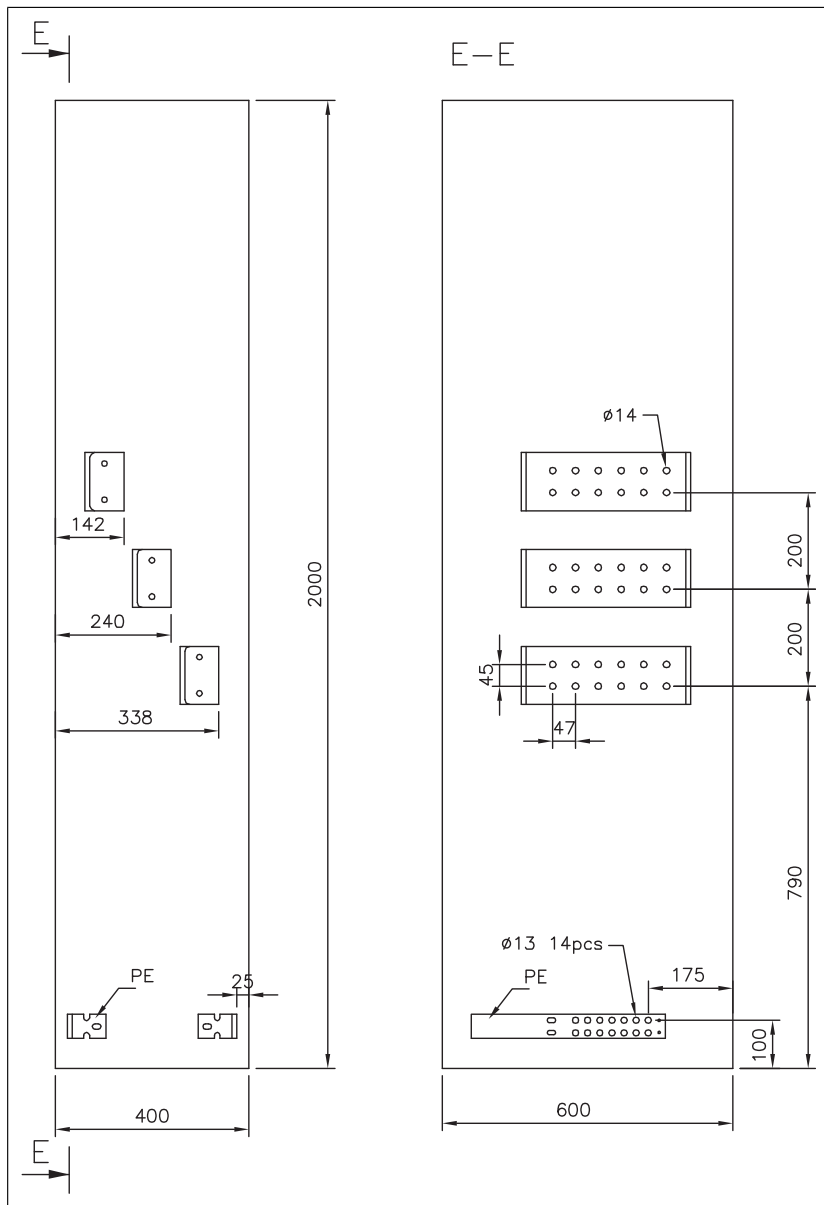


Cubicle width 300 mm, top cable exit

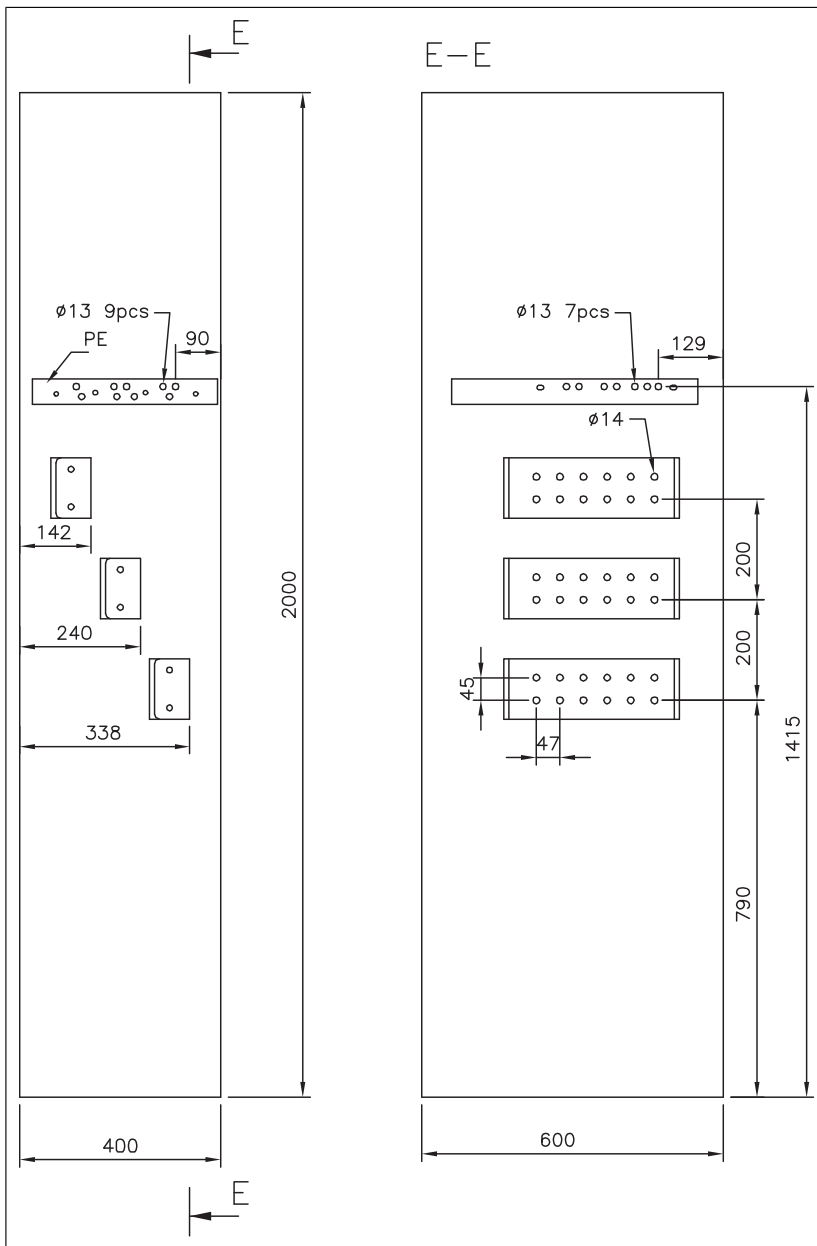


178 Dimensions and weights

Cubicle width 400 mm, bottom cable exit

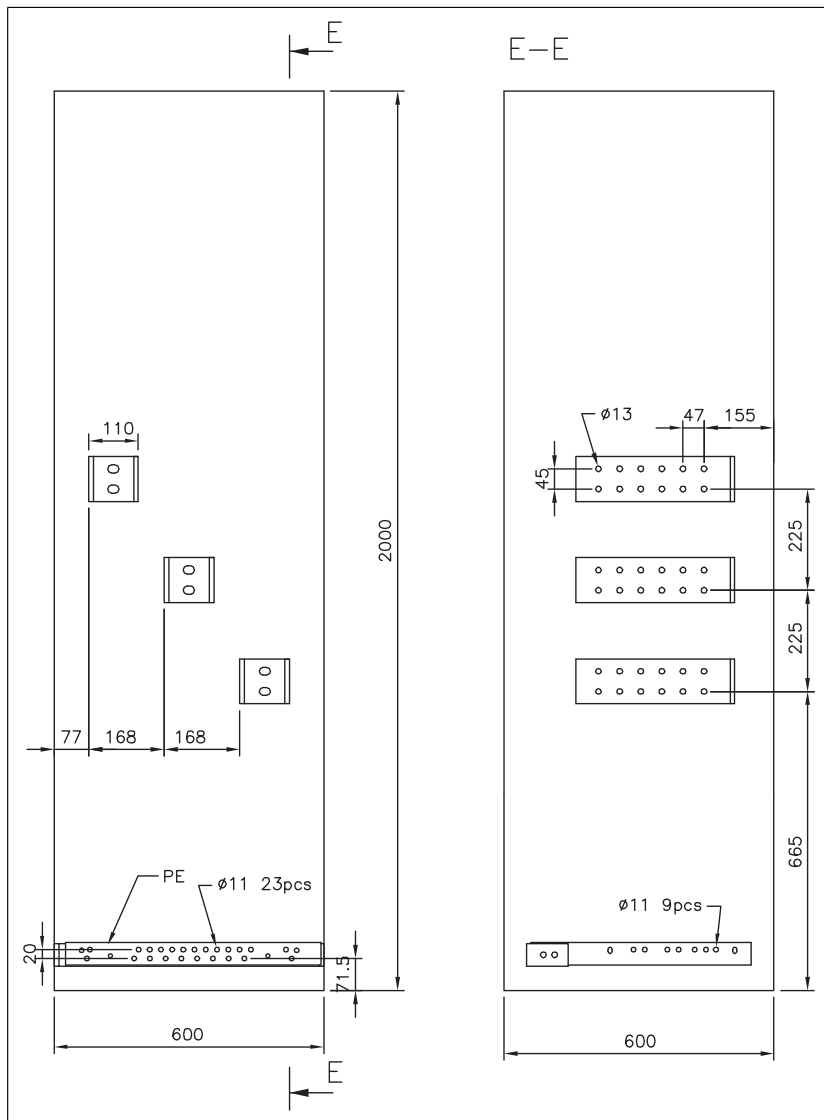


Cubicle width 400 mm, top cable exit

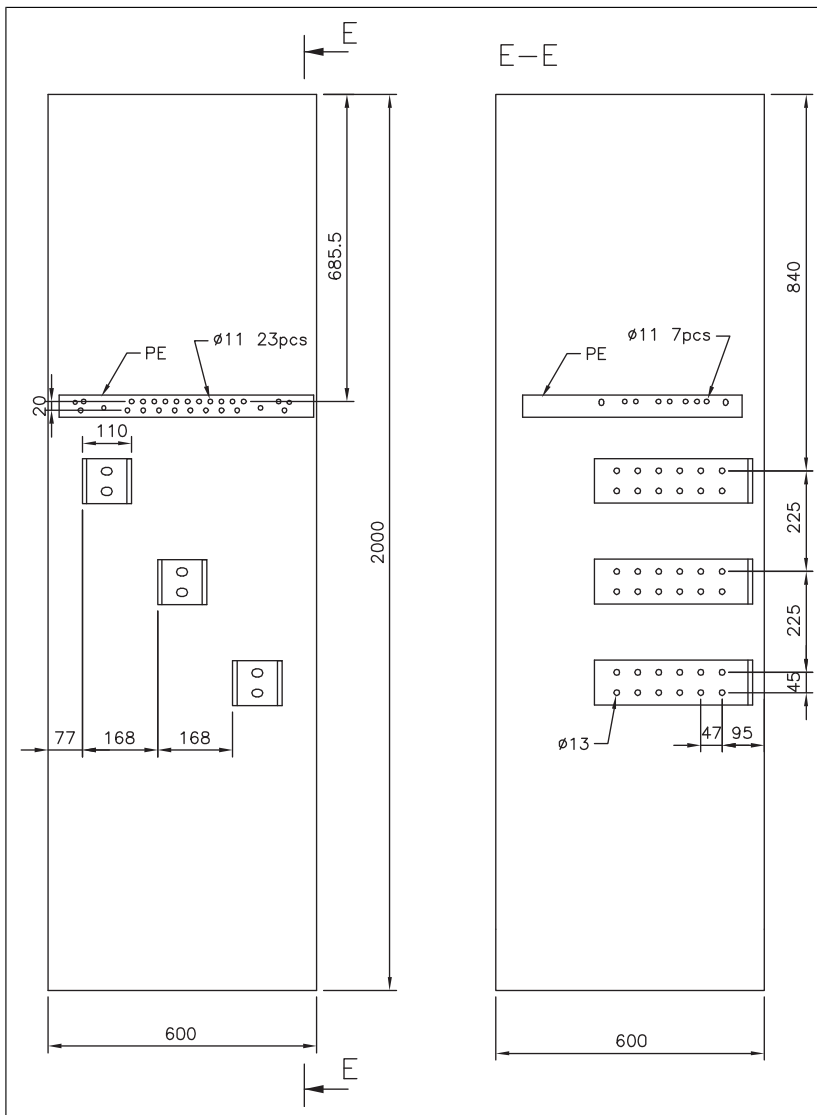


180 Dimensions and weights

Cubicle width 600 mm, bottom cable exit



Cubicle width 600 mm, top cable exit



11

The Safe torque off function

Contents of this chapter

This chapter describes the Safe torque off (STO) function of the inverter and gives instructions for its use.

Description



WARNING!

In case of parallel-connected drives or dual-winding motors, the STO must be activated on each drive to remove the torque from the motor.

The Safe torque off function can be used, for example, as the final actuator device of safety circuits that stop the inverter in case of danger (such as an emergency stop circuit). Another typical application is a prevention of unexpected start-up function that enables short-time maintenance operations like cleaning or work on non-electrical parts of the machinery without switching off the power supply to the inverter.

When activated, the Safe torque off function disables the control voltage of the power semiconductors of the inverter output stage (A, see the diagrams below), thus preventing the inverter from generating the torque required to rotate the motor. If the motor is running when Safe torque off is activated, it coasts to a stop.

The Safe torque off function has a redundant architecture, that is, both channels must be used in the safety function implementation. The safety data given in this manual is calculated for redundant use, and does not apply if both channels are not used.

The Safe torque off function complies with these standards:

Standard	Name
IEC 60204-1:2016 EN 60204-1:2006 + A1:2009 + AC:2010	<i>Safety of machinery – Electrical equipment of machines – Part 1: General requirements</i>
IEC 61000-6-7:2014	<i>Electromagnetic compatibility (EMC) – Part 6-7: Generic standards – Immunity requirements for equipment intended to perform functions in a safety-related system (functional safety) in industrial locations</i>
IEC 61326-3-1:2017	<i>Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 3-1: Immunity requirements for safety-related systems and for equipment intended to perform safety-related functions (functional safety) – General industrial applications</i>
IEC 61508-1:2010	<i>Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements</i>
IEC 61508-2:2010	<i>Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems</i>
IEC 61511-1:2016	<i>Functional safety – Safety instrumented systems for the process industry sector</i>
IEC 61800-5-2:2016 EN 61800-5-2:2007	<i>Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional</i>
IEC 62061:2005 + A1:2012 + A2:2015 EN 62061:2005 + AC:2010 + A1:2013 + A2:2015	<i>Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems</i>
EN ISO 13849-1:2015	<i>Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design</i>
EN ISO 13849-2:2012	<i>Safety of machinery – Safety-related parts of control systems – Part 2: Validation</i>

The function also corresponds to Prevention of unexpected start-up as specified by EN ISO 14118:2018 (ISO 14118:2017), and Uncontrolled stop (stop category 0) as specified in EN/IEC 60204-1.

■ Compliance with the European Machinery Directive

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

Wiring

For the electrical specifications of the STO connection, see the technical data of the control unit.

■ Activation switch

In the wiring diagrams, the activation switch has the designation [K]. This represents a component such as a manually operated switch, an emergency stop push button switch, or the contacts of a safety relay or safety PLC.

- In case a manually operated activation switch is used, the switch must be of a type that can be locked out to the open position.
- The contacts of the switch or relay must open/close within 200 ms of each other.
- An FSO-xx safety functions module or an FPTC-0x thermistor protection module can also be used. For more information, see the module documentation.

■ Cable types and lengths

- Double-shielded twisted-pair cable is recommended.
- Maximum cable lengths:
 - 300 m (1000 ft) between activation switch [K] and inverter control unit
 - 60 m (200 ft) between multiple drives or inverter units
 - 60 m (200 ft) between external power supply and first control unit
 - 30 m (100 ft) between BCU control unit and last inverter module in the chain.

Note: A short-circuit in the wiring between the switch and an STO terminal causes a dangerous fault. Therefore, it is recommended to use a safety relay (including wiring diagnostics) or a wiring method (shield grounding, channel separation) which reduces or eliminates the risk caused by the short-circuit.

Note: The voltage at the STO input terminals of the control unit (or frame R8i inverter module) must be at least 17 V DC to be interpreted as “1”.

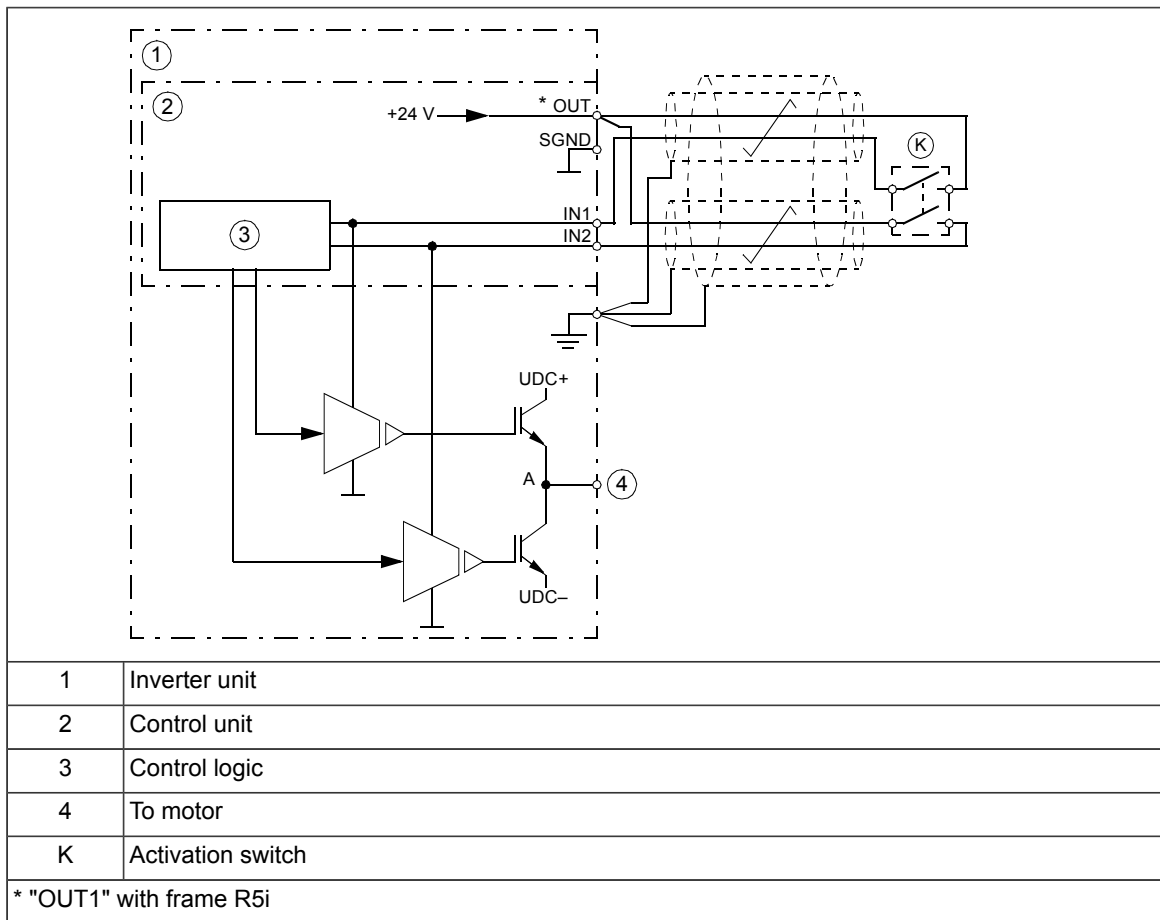
The pulse tolerance of the input channels is 1 ms.

■ Grounding of protective shields

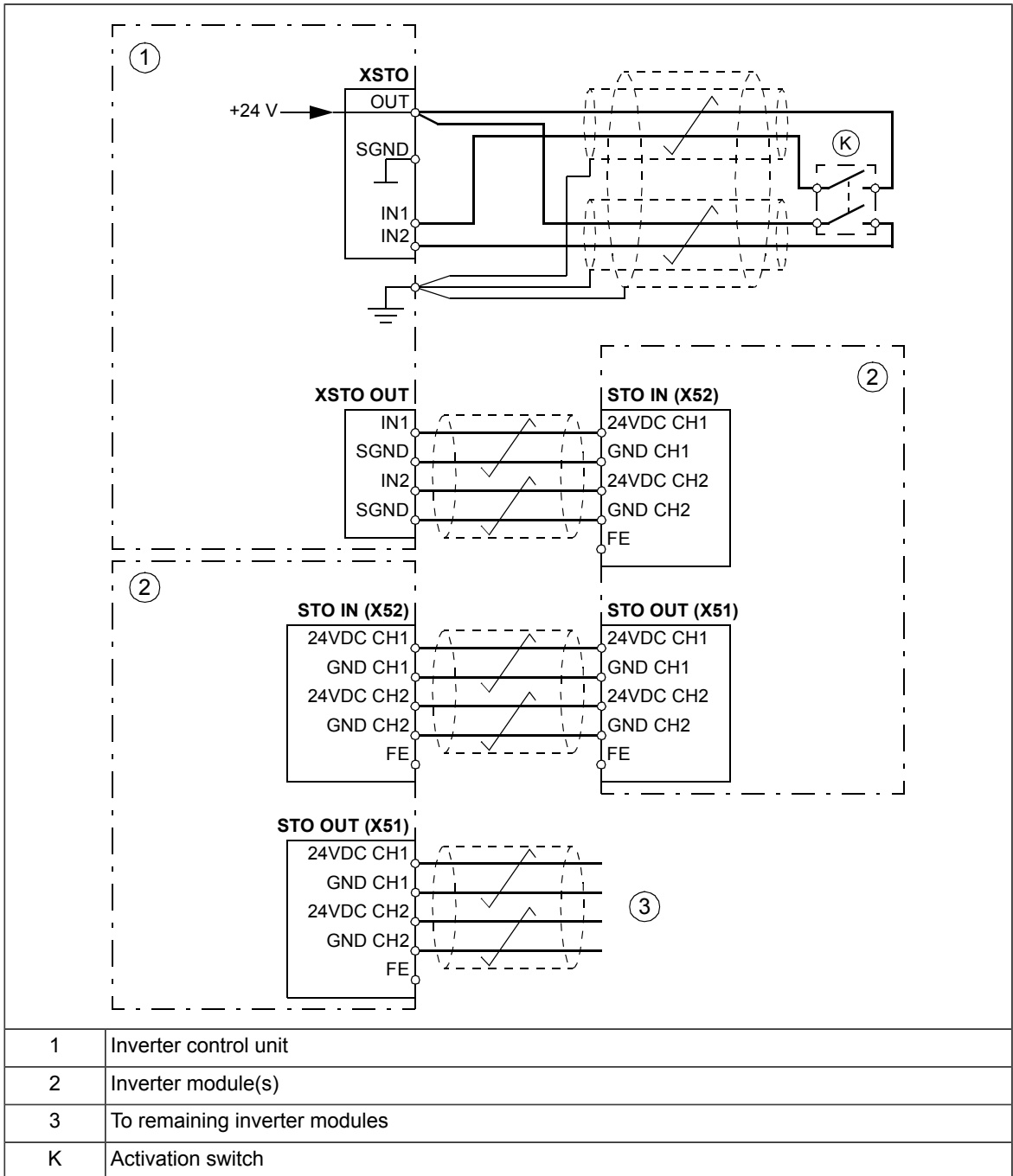
- Ground the shield in the cabling between the activation switch and the control unit at the control unit only.
 - Ground the shield in the cabling between two control units at one control unit only.
 - Do not ground the shield in the cabling between BCU and R8i module, or between R8i modules.
-

■ Dual-channel connection with internal power supply

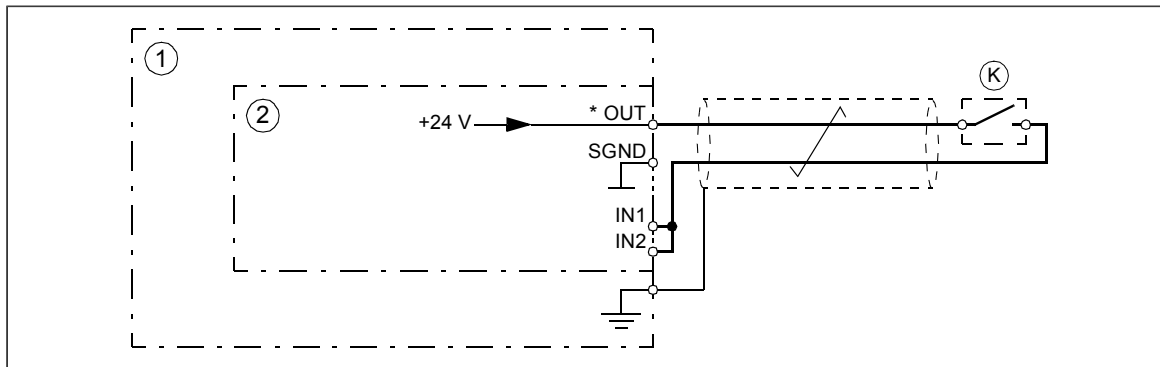
Frames R1i...R7i



Frame R8i and multiples



■ Single-channel connection of activation switch



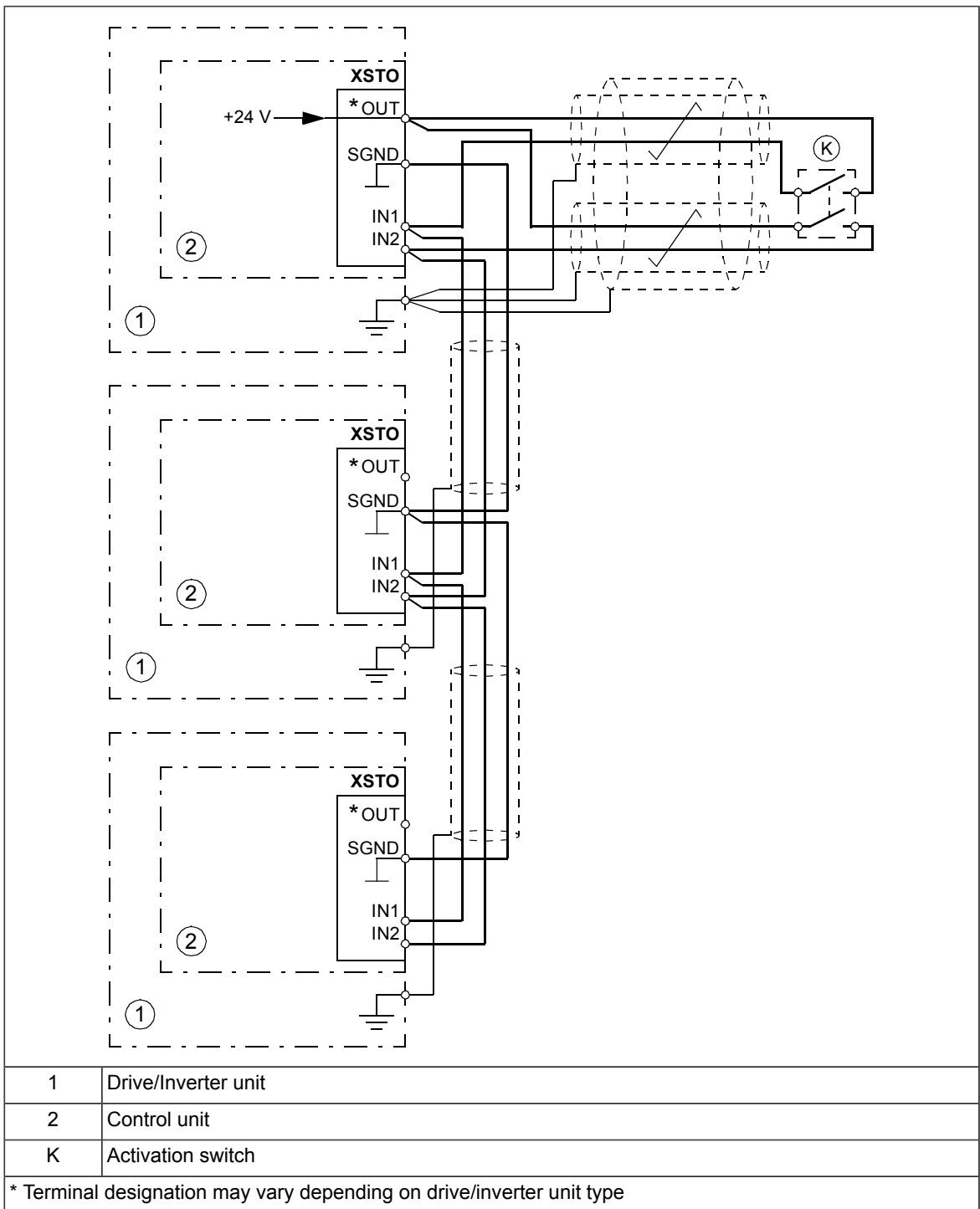
Note:

- Both STO inputs (IN1, IN2) must be connected to the activation switch. Otherwise, no SIL/PL classification is given.
- Pay special attention to avoiding any potential failure modes for the wiring. For example, use shielded cable. For measures for fault exclusion of wiring, see eg. EN ISO 13849-2:2012, table D.4.

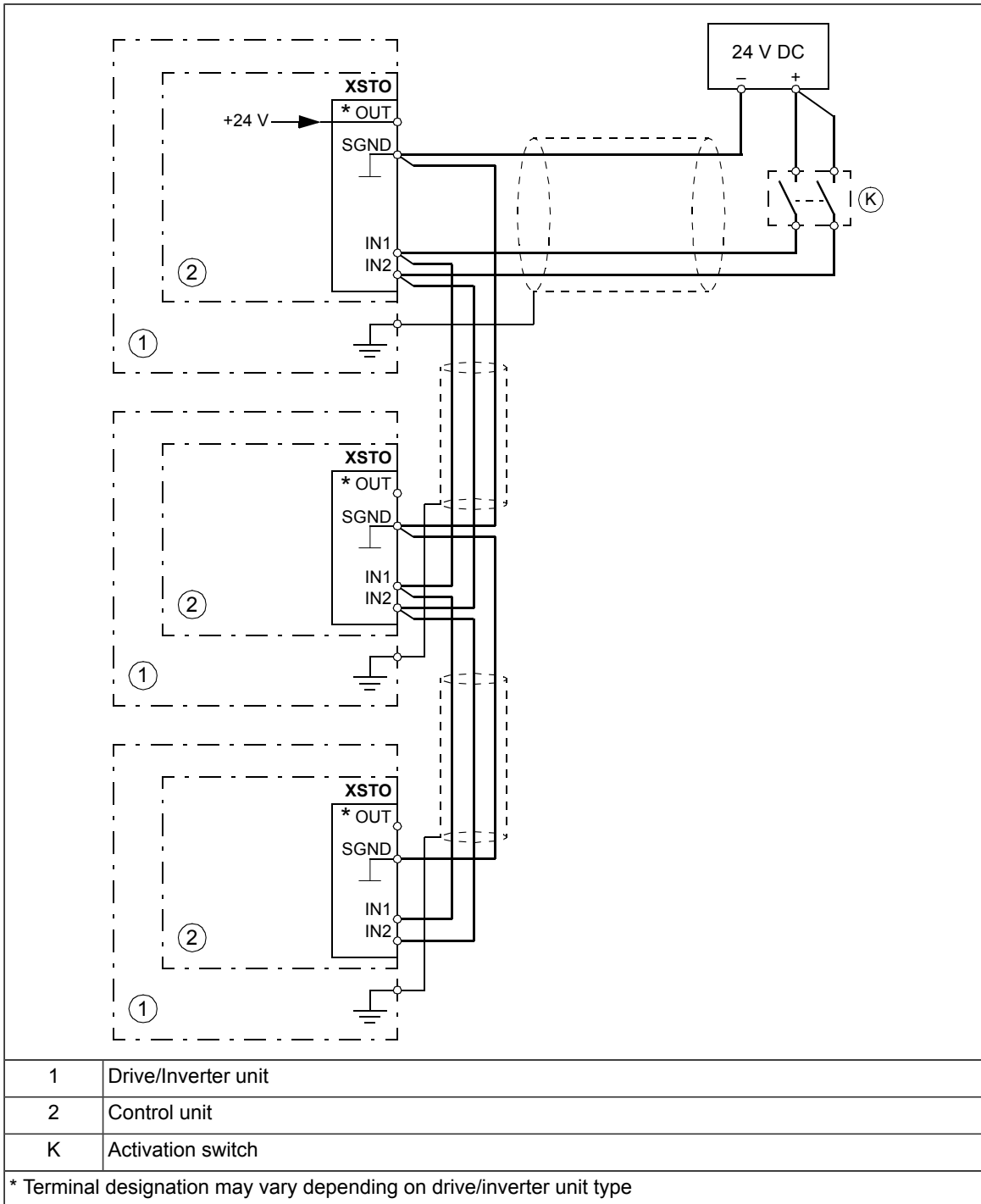
1	Inverter unit
2	Control unit
K	Activation switch
* "OUT1" with frame R5i	

■ Multiple drives

Internal power supply



External power supply



Operation principle

1. The Safe torque off activates (the activation switch is opened, or safety relay contacts open).
2. The STO inputs of the inverter control unit de-energize.
3. The control unit cuts off the control voltage from the output IGBTs.
4. The control program generates an indication as defined by parameter 31.22 (see the firmware manual of the inverter).

The parameter selects which indications are given when one or both STO signals are switched off or lost. The indications also depend on whether the inverter is running or stopped when this occurs.

Note: This parameter does not affect the operation of the STO function itself. The STO function will operate regardless of the setting of this parameter: a running inverter will stop upon removal of one or both STO signals, and will not start until both STO signals are restored and all faults reset.

Note: The loss of only one STO signal always generates a fault as it is interpreted as a malfunction of STO hardware or wiring.

5. The motor coasts to a stop (if running). The inverter cannot restart while the activation switch or safety relay contacts are open. After the contacts close, a reset may be needed (depending on the setting of parameter 31.22). A new start command is required to start the inverter.
-

Start-up including acceptance test

To ensure the safe operation of a safety function, validation is required. The final assembler of the machine must validate the function by performing an acceptance test. The acceptance test must be performed

- at initial start-up of the safety function
- after any changes related to the safety function (circuit boards, wiring, components, settings, etc.)
- after any maintenance work related to the safety function.

■ Competence

The acceptance test of the safety function must be carried out by a competent person with adequate expertise and knowledge of the safety function as well as functional safety, as required by IEC 61508-1 clause 6. The test procedures and report must be documented and signed by this person.

■ Acceptance test reports


Signed acceptance test reports must be stored in the logbook of the machine. The report shall include documentation of start-up activities and test results, references to failure reports and resolution of failures. Any new acceptance tests performed due to changes or maintenance shall be logged into the logbook.

■ Acceptance test procedure

After wiring the Safe torque off function, validate its operation as follows.

Note: If the drive is equipped with safety option +L536, +L537, +Q950, +Q951, +Q952, +Q957, +Q963, +Q964, +Q978 or +Q979, do the procedure shown in the documentation of the option.

Note: All inverter modules of the inverter unit must be powered and connected to the STO circuit during the acceptance test.

Action	<input checked="" type="checkbox"/>
 WARNING! Obey the safety instructions. If you ignore them, injury or death, or damage to the equipment can occur.	<input type="checkbox"/>
Make sure that the inverter can be run and stopped freely during start-up.	<input type="checkbox"/>
Stop the inverter (if running), switch the input power off and isolate the inverter from the power line using a disconnecter.	<input type="checkbox"/>
Check the STO circuit connections against the wiring diagram.	<input type="checkbox"/>
Close the disconnecter and switch the power on.	<input type="checkbox"/>
Test the operation of the STO function when the motor is stopped. <ul style="list-style-type: none"> • Give a stop command for the inverter (if running) and wait until the motor shaft is at a standstill. Make sure that the inverter operates as follows: <ul style="list-style-type: none"> • Open the STO circuit. The inverter generates an indication if one is defined for the 'stopped' state in parameter 31.22 (see the firmware manual). • Give a start command to verify that the STO function blocks the inverter's operation. The inverter generates a warning. The motor should not start. • Close the STO circuit. • Reset any active faults. Restart the inverter and check that the motor runs normally. 	<input type="checkbox"/>

Action	<input checked="" type="checkbox"/>
<p>Test the operation of the STO function when the motor is running.</p> <ul style="list-style-type: none"> • Start the inverter and make sure the motor is running. • Open the STO circuit. The motor should stop. The inverter generates an indication if one is defined for the 'running' state in parameter 31.22 (see the firmware manual). • Reset any active faults and try to start the inverter. • Make sure that the motor stays at a standstill and the inverter operates as described above in testing the operation when the motor is stopped. • Close the STO circuit. • Reset any active faults. Restart the inverter and check that the motor runs normally. 	<input type="checkbox"/>
<p>Test the operation of the failure detection of the inverter. The motor can be stopped or running.</p> <ul style="list-style-type: none"> • Open the 1st channel of the STO circuit (wire coming to IN1). If the motor was running, it should coast to a stop. The inverter generates a <i>FA81 Safe Torque Off 1 loss</i> fault indication (see the firmware manual). • Give a start command to verify that the STO function blocks the inverter's operation. The motor should not start. • Close the STO circuit. • Reset any active faults. Restart the inverter and check that the motor runs normally. • Open the 2nd channel of the STO circuit (wire coming to IN2). If the motor was running, it should coast to a stop. The inverter generates a <i>FA82 Safe Torque Off 2 loss</i> fault indication (see the firmware manual). • Give a start command to verify that the STO function blocks the inverter's operation. The motor should not start. • Close the STO circuit. • Reset any active faults. Restart the inverter and check that the motor runs normally. 	<input type="checkbox"/>
<p>Document and sign the acceptance test report which verifies that the safety function is safe and accepted for operation.</p>	<input type="checkbox"/>

Use

1. Open the activation switch, or activate the safety functionality that is wired to the STO connection.
2. The STO inputs on the inverter control unit de-energize, and the control unit cuts off the control voltage from the output IGBTs.
3. The control program generates an indication as defined by parameter 31.22 (see the firmware manual of the inverter).
4. The motor coasts to a stop (if running). The inverter will not restart while the activation switch or safety relay contacts are open.
5. Deactivate the STO by closing the activation switch, or resetting the safety functionality that is wired to the STO connection.
6. Reset any faults before restarting.



WARNING!

The Safe torque off function does not disconnect the voltage of the main and auxiliary circuits from the inverter. Therefore maintenance work on electrical parts of the inverter or the motor can only be carried out after isolating the inverter from the supply and all other voltage sources.



WARNING!

The Safe torque off functionality is only achieved through the XSTO connector of the inverter control unit (A41). True Safe torque off functionality is not achieved through the XSTO connectors of other control units (such as the supply control unit or the brake control unit).

The Safe torque off function is supported by any ACS880 inverter or drive control program. It is not supported by supply, DC/DC converter or brake firmware.



WARNING!

(With permanent magnet or synchronous reluctance [SynRM] motors only)

In case of a multiple IGBT power semiconductor failure, the inverter can produce an alignment torque which maximally rotates the motor shaft by $180/p$ degrees (with permanent magnet motors) or $180/2p$ degrees (with synchronous reluctance [SynRM] motors) regardless of the activation of the Safe torque off function. p denotes the number of pole pairs.

Notes:

- If a running inverter is stopped by using the Safe torque off function, the inverter will cut off the motor supply voltage and the motor will coast to a stop. If this causes danger or is not otherwise acceptable, stop the inverter and machinery using the appropriate stop mode before activating the Safe torque off function.
 - The Safe torque off function overrides all other functions of the inverter.
 - The Safe torque off function is ineffective against deliberate sabotage or misuse.
 - The Safe torque off function has been designed to reduce the recognized hazardous conditions. In spite of this, it is not always possible to eliminate all potential hazards. The assembler of the machine must inform the final user about the residual risks.
-

Maintenance

After the operation of the circuit is validated at start-up, the STO function shall be maintained by periodic proof testing. In high demand mode of operation, the maximum proof test interval is 20 years. In low demand mode of operation, the maximum proof test interval is 5 or 2 years; see section [Safety data \(page 197\)](#). It is assumed that all dangerous failures of the STO circuit are detected by the proof test. To perform the proof test, do the [Acceptance test procedure \(page 192\)](#).

Note: See also the Recommendation of Use CNB/M/11.050 (published by the European co-ordination of Notified Bodies) concerning dual-channel safety-related systems with electromechanical outputs:

- When the safety integrity requirement for the safety function is SIL 3 or PL e (cat. 3 or 4), the proof test for the function must be performed at least every month.
- When the safety integrity requirement for the safety function is SIL 2 (HFT = 1) or PL d (cat. 3), the proof test for the function must be performed at least every 12 months.

The STO function of the drive does not contain any electromechanical components.

In addition to proof testing, it is a good practice to check the operation of the function when other maintenance procedures are carried out on the machinery.

Include the Safe torque off operation test described above in the routine maintenance program of the machinery that the inverter runs.

If any wiring or component change is needed after start up, or the parameters are restored, do the test given in section [Acceptance test procedure \(page 192\)](#).

Use only spare parts approved by ABB.

Record all maintenance and proof test activities in the machine logbook.

■ Competence

The maintenance and proof test activities of the safety function must be carried out by a competent person with adequate expertise and knowledge of the safety function as well as functional safety, as required by IEC 61508-1 clause 6.

Fault tracing

The indications given during the normal operation of the Safe torque off function are selected by inverter control program parameter 31.22.

The diagnostics of the Safe torque off function cross-compare the status of the two STO channels. In case the channels are not in the same state, a fault reaction function is performed and the inverter trips on an "STO hardware failure" fault. An attempt to use the STO in a non-redundant manner, for example activating only one channel, will trigger the same reaction.

See the firmware manual of the inverter control program for the indications generated by the inverter, and for details on directing fault and warning indications to an output on the control unit for external diagnostics.

Any failures of the Safe torque off function must be reported to ABB.

Safety data

The safety data for the Safe torque off function is given below.

Note: The safety data is calculated for redundant use, and does not apply if both STO channels are not used.

Frame size	SIL/ SILCL	PL	SFF (%)	PFH ($T_1 = 20$ a) (1/h)	PFD _{avg} ($T_1 = 2$ a)	PFD _{avg} ($T_1 = 5$ a)	MTTF _D (a)	DC (%)	Cat.	SC	HFT	CCF	T _M (a)
R1i R2i R3i R4i	3	e	98.8	3.23E-09	2.83E-05	7.08E-05	24293	≥90	3	3	1	80	20
R5i	3	e	96.7	3.36E-09	2.51E-05	6.27E-05	16946	≥90	3	3	1	80	20
R6i R7i	3	e	99.0	3.87E-09	3.39E-05	8.47E-05	6538	≥90	3	3	1	80	20
R8i	3	e	>99	5.0E-11	4.5E-07	1.1E-06	23970	≥90	3	3	1	80	20
2×R8i	3	e	>99	6.2E-11	5.5E-07	1.3E-06	16330	≥90	3	3	1	80	20
3×R8i	3	e	>99	7.3E-11	6.5E-07	1.6E-06	12390	≥90	3	3	1	80	20
4×R8i	3	e	>99	8.4E-11	7.6E-07	1.9E-06	9980	≥90	3	3	1	80	20
5×R8i	3	e	>99	9.5E-11	8.6E-07	2.1E-06	8360	≥90	3	3	1	80	20
6×R8i	3	e	>99	1.1E-10	9.6E-07	2.4E-06	7190	≥90	3	3	1	80	20
7×R8i	3	e	>99	1.2E-10	1.1E-06	2.6E-06	6310	≥90	3	3	1	80	20
8×R8i	3	e	>99	1.3E-10	1.2E-06	2.8E-06	5620	≥90	3	3	1	80	20
9×R8i	3	e	>99	1.4E-10	1.3E-06	3.1E-06	5060	≥90	3	3	1	80	20
10×R8i	3	e	>99	1.5E-10	1.4E-06	3.3E-06	4610	≥90	3	3	1	80	20

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- The following temperature profile is used in safety value calculations:
 - 670 on/off cycles per year with $\Delta T = 71.66$ °C
 - 1340 on/off cycles per year with $\Delta T = 61.66$ °C
 - 30 on/off cycles per year with $\Delta T = 10.0$ °C
 - 32 °C board temperature at 2.0% of time
 - 60 °C board temperature at 1.5% of time
 - 85 °C board temperature at 2.3% of time.
- The STO is a type A (frames R1i...R7i) or type B (frame R8i and multiples) safety component as defined in IEC 61508-2.
- Relevant failure modes:
 - The STO trips spuriously (safe failure)
 - The STO does not activate when requested
 - A fault exclusion on the failure mode “short circuit on printed circuit board” has been made (EN 13849-2, table D.5). The analysis is based on an assumption that one failure occurs at one time. No accumulated failures have been analyzed.

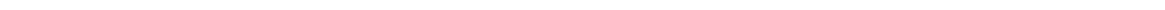
- STO response times:
 - STO reaction time (shortest detectable break): 1 ms
 - STO response time:
 - Frames R1i...R7i: 2 ms (typical), 5 ms (maximum)
 - Frame R8i and multiples: 2 ms (typical), 25 ms (maximum)
 - Fault detection time: Channels in different states for longer than 200 ms
 - Fault reaction time: Fault detection time + 10 ms
- Indication delays:
 - STO fault indication (parameter 31.22) delay: < 500 ms
 - STO warning indication (parameter 31.22) delay: < 1000 ms

■ Abbreviations

Abbr.	Reference	Description
Cat.	EN ISO 13849-1	Classification of the safety-related parts of a control system in respect of their resistance to faults and their subsequent behavior in the fault condition, and which is achieved by the structural arrangement of the parts, fault detection and/or by their reliability. The categories are: B, 1, 2, 3 and 4.
CCF	EN ISO 13849-1	Common cause failure (%)
DC	EN ISO 13849-1	Diagnostic coverage
HFT	IEC 61508	Hardware fault tolerance
MTTF _D	EN ISO 13849-1	Mean time to dangerous failure: (Total number of life units) / (Number of dangerous, undetected failures) during a particular measurement interval under stated conditions
PFD _{avg}	IEC 61508	Average probability of dangerous failure on demand, that is, mean unavailability of a safety-related system to perform the specified safety function when a demand occurs
PFH	IEC 61508	Average frequency of dangerous failures per hour, that is, average frequency of a dangerous failure of a safety related system to perform the specified safety function over a given period of time
PL	EN ISO 13849-1	Performance level. Levels a...e correspond to SIL
SC	IEC 61508	Systematic capability
SFF	IEC 61508	Safe failure fraction (%)
SIL	IEC 61508	Safety integrity level (1...3)
SILCL	IEC/EN 62061	Maximum SIL (level 1...3) that can be claimed for a safety function or subsystem
STO	IEC/EN 61800-5-2	Safe torque off
T ₁	IEC 61508-6	Proof test interval. T ₁ is a parameter used to define the probabilistic failure rate (PFH or PFD) for the safety function or subsystem. Performing a proof test at a maximum interval of T ₁ is required to keep the SIL capability valid. The same interval must be followed to keep the PL capability (EN ISO 13849) valid. See also section Maintenance.
T _M	EN ISO 13849-1	Mission time: the period of time covering the intended use of the safety function/device. After the mission time elapses, the safety device must be replaced. Note that any T _M values given cannot be regarded as a guarantee or warranty.

■ **TÜV certificate**

The TÜV certificate is available on the Internet at www.abb.com/drives/documents.



Further information

Product and service inquiries

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

Product training

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

Providing feedback on ABB manuals

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

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