ABB INDUSTRIAL DRIVES

ACS880-104LC inverter modules

Hardware manual

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Hardware manual

3AXD50000045610 Rev B
EN
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1

Introduction to the manual

Contents of this chapter

This chapter gives basic information on the manual.

Applicability

This manual is applicable to ACS880-104LC inverter modules for user-defined cabinet installations.

Safety instructions

Follow all safety instructions delivered with the drive.

- Read the **complete safety instructions** before you install, commission, use or service the drive. The complete safety instructions are given in *ACS880 liquid-cooled multidrive cabinets and modules safety instructions* (3AXD50000048633 [English]).
- Read the **software-function-specific warnings and notes** before changing the default settings of a function. For each function, the warnings and notes are given in the section describing the related user-adjustable parameters.
- Read the **task-specific safety instructions** before starting the task. See the section describing the task.

Target audience

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

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

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

Categorization by frame size and option code

The instructions and technical data which concern only certain module or frame sizes are marked with a size identifier.

The module size can be identified from the basic code visible on the type designation label, for example, “ACS880-104LC-0850A-7”, where 0850A is the module size. The option codes of the module are listed after a plus sign. Chapter Ordering information, section Frame R8i and multiples explains the type designation code in detail.

The frame size of the module can be, for example, R8i or 2×R8i, the latter representing an inverter unit consisting of two parallel-connected R8i inverter modules. The table under section Ratings lists the units and frame sizes.

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.

Related documents

Manual	Code
General manuals	
ACS880 liquid-cooled multidrive cabinets and modules safety instructions	3AXD50000048633
ACS880 liquid-cooled multidrive cabinets and modules electrical planning instructions	3AXD50000048634
Drive modules cabinet design and construction instructions	3AUA0000107668
BCU-02/12/22 control units hardware manual	3AUA0000113605
CIO-01 I/O module for distributed I/O bus control user's manual	3AXD50000126880
Supply module manuals	
ACS880-204LC IGBT supply modules hardware manual	3AXD50000284436
ACS880 IGBT supply control program firmware manual	3AUA0000131562
ACS880-304LC+A019 diode supply modules hardware manual	3AXD50000045157
ACS880 diode supply control program firmware manual	3AUA0000103295
Inverter module manuals and guides	
ACS880-104LC inverter modules hardware manual	3AXD50000045610
ACS880 primary control program firmware manual	3AUA0000085967
ACS880 primary control program quick start-up guide	3AUA0000098062
Brake module and DC/DC converter module manuals	
ACS880-604LC 1-phase brake chopper modules hardware manual	3AXD50000184378
ACS880-1604LC DC/DC converter modules hardware manual	3AXD50000371631
ACS880 DC/DC converter control program firmware manual	3AXD50000024671
Option manuals	
ACS880-1007LC liquid cooling unit user's manual	3AXD50000129607
ACX-AP-x assistant control panels user's manual	3AUA0000085685
BAMU-12C auxiliary measurement unit hardware manual	3AXD50000117840
Drive composer start-up and maintenance PC tool user's manual	3AUA0000094606
Drive application programming (IEC 61131-3) manual	3AUA0000127808
Manuals and quick guides for I/O extension modules, fieldbus adapters, safety functions modules, etc.	

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

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

Terms and abbreviations

Term	Description
BCON	Type of control board
BCU	Type of control unit
BDPS	Internal power supply board in frame R8i modules
Brake chopper	Conducts the surplus energy from the intermediate circuit of the drive to the brake resistor when necessary. The chopper operates when the DC link voltage exceeds a certain maximum limit. The voltage rise is typically caused by deceleration (braking) of a high inertia motor.
CIO	I/O module for controlling cabinet fans
CMF	Common mode filtering
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
DC link capacitors	Energy storage which stabilizes the intermediate circuit DC voltage
DDCS	Distributed drives communication system protocol
DPMP	Optional mounting platform for door mounting of control panel
Drive	Frequency converter for controlling AC motors
EFB	Embedded fieldbus
EMC	Electromagnetic compatibility
EMI	Electromagnetic interference
FAIO	Optional analog I/O extension module
FBA	Fieldbus adapter
FCAN	Optional CANopen® adapter module
FCNA	Optional ControlNet™ adapter module
FDCO	DDCS communication module
FDNA	Optional DeviceNet™ adapter module
FDPI	Diagnostics and panel interface board
FECA	Optional EtherCAT 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-11	Optional Ethernet adapter module for EtherNet/IP™, Modbus TCP® and PROFINET IO® protocols
FENA-21	Optional Ethernet adapter module for EtherNet/IP™, Modbus TCP® and PROFINET IO® protocols, 2-port
FEPL	Optional Ethernet POWERLINK adapter module
FIO-01	Optional digital I/O extension module
FIO-11	Optional analog I/O extension module
Four-quadrant operation	Operation of a machine in both the forward and reverse directions in both motoring and generating modes. Also used as an attribute of a drive; a regenerative drive can operate the electric machine in all four modes, while a non-regenerative drive can only operate the machine in motoring mode.
FPBA	Optional PROFIBUS DP adapter module
Frame, frame size	Physical size of the drive or power module
FSCA	Optional Modbus RTU adapter module
FSO-12, FSO-21	Optional functional safety modules
Generic enclosure	See chapter *Ordering information*.
HTL	High-threshold logic
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.

Term	Description
Inverter module	Inverter bridge, related components and drive DC link capacitors enclosed in a metal frame or enclosure. Intended for cabinet installation.
Inverter unit	Inverter module(s) under control of one control board, and related components. One inverter unit typically controls one motor.
Multidrive	Drive for controlling several motors which are typically coupled to the same machinery. Includes one supply unit, and one or several inverter units.
NBRA	Series of optional brake chopper modules
NBRW	Series of optional, liquid-cooled brake chopper modules
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
RFI	Radio-frequency interference
SIL	Safety integrity level (1...3) (IEC 61508)
STO	Safe torque off (IEC/EN 61800-5-2)
THD	Total harmonic distortion
TTL	Transistor-transistor logic
UPS	Uninterruptible power supply
VX25	Enclosure system by Rittal (www.rittal.com)
ZMU	Type of memory unit, attached to the control unit

2

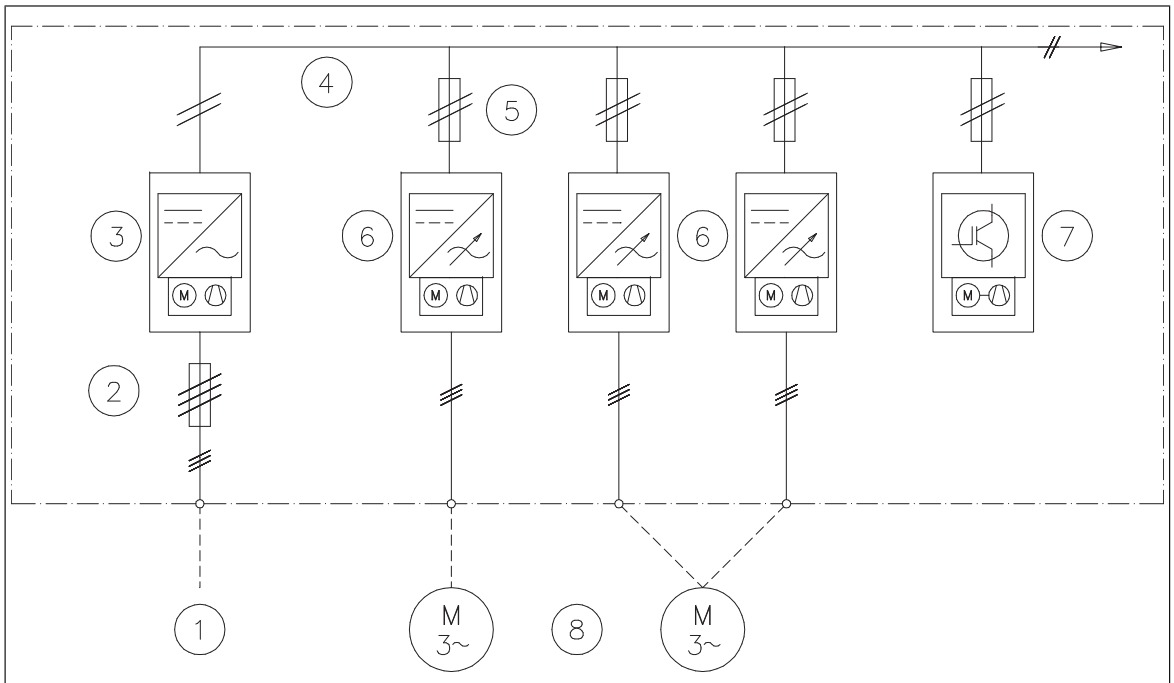
Operation principle and hardware description

Contents of this chapter

This chapter describes a typical drive system and the hardware of ACS880-104LC inverter modules.

Overview diagram of the drive system

The diagram below depicts a common DC bus drive system.



No.	Description
1	AC supply
2	Input (AC) fuses
3	Supply unit
4	DC bus
5	Inverter DC fuses (with or without a DC switch/disconnector)
6	Inverter units (in this example, one of the two units consists of two inverter modules connected in parallel)
7	Brake unit (brake resistors not shown)
8	Motor(s)

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 (SynRM) motors

Cooling system

See chapter *Internal cooling circuit (page 143)*.

Inverter module 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.

ACS880-104LC modules can be used to construct inverter units with a power rating of 350 kW up to several megawatts. Up to approximately 500…800 kW (depending on supply voltage), inverter units consist of one module only; higher power ratings are achieved by connecting multiple modules in parallel.

All inverter modules have coated circuit boards as standard.

The dimension drawings of the inverter modules are presented in a separate chapter.

Frame R8i and multiples

Frame R8i modules are used to achieve output powers from approximately 350 kW upwards in single or parallel configurations.

The DC connection of the module is by busbars and located at the top. The motor connection is via a quick connector at the back of the module that couples when the module is inserted into the cubicle. Each parallel-connected module is cabled separately to the motor, or connected by busbars to adjacent modules to reduce the number of cables. It is also possible to build an AC bus from each module to a separate output cubicle.

Internal du/dt filtering is mandatory with all 690 volt units and all parallel-connected modules. 690 volt modules have internal du/dt filtering as standard.

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

DC connection and capacitor charging

The module must be equipped with external DC fuses.

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

A capacitor charging circuit must be fitted if:

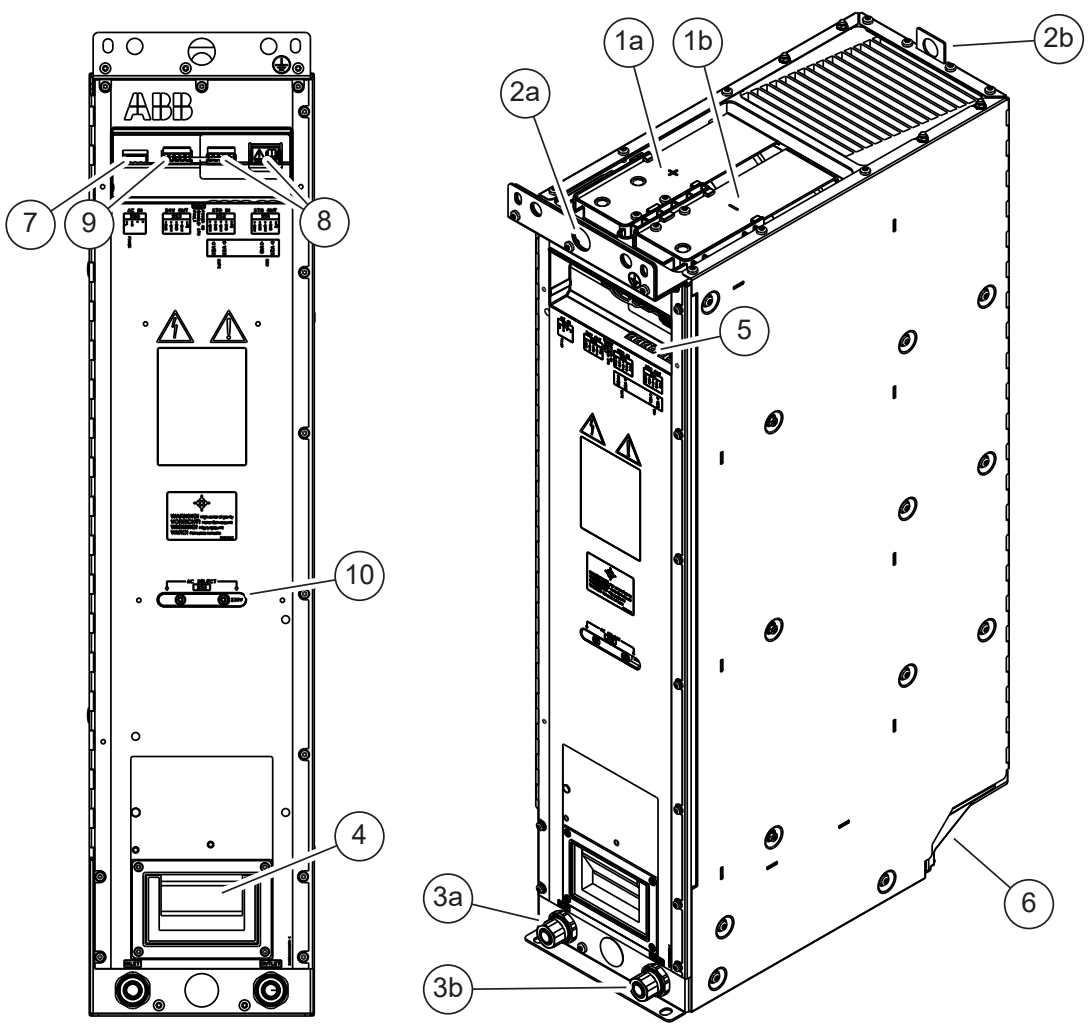
- the module is connected to the DC bus through a DC switch/disconnector, or
- the module is directly connected to the DC bus and the supply unit of the system does not have a charging capability.

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

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

Frame R8i hardware

Module layout



1	DC connection busbars, + (a) and - (b)
2	Lifting eyes, front (a) and back (b)
3	Coolant in (a) and out (b) connectors
4	Handle
5	Fiber optic connectors
6	Quick connector (AC connection) (the counterpart fastened to the cabinet behind the module)
7	Terminal block X50 (auxiliary power input for internal boards)
8	Terminal block X51 and X52 (Safe torque off in inverter modules only)
9	Terminal block X53 (24 V DC power output)
10	Auxiliary voltage selector (115 or 230 V)
11	Unpainted fastening hole. The grounding point (PE) between module frame and cabinet frame.

Coolant connectors

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

Connectors X50…X59

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

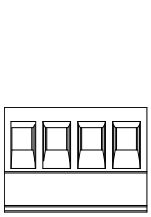
Note:
With parallel-connected R8i modules, it is strongly recommended to use an external 24 V DC supply to power the BCU control unit.

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

If the Safe torque off (STO) function is not used, the “24V” inputs on X52 must be connected to +24 V (on connector X53, for example) on each inverter module. On a new module, a jumper wire set installed at the factory makes this connection.

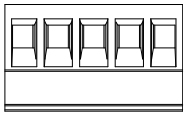
If the STO function is to be implemented, the jumper wire set must be removed – a mechanical interlocking device is factory-installed on connectors X51 and X52 to this effect.

For STO, X52 (STO IN) is wired to the STO OUT connector on the BCU control unit. Connector X51 on the module is wired to connector X52 on the next module (if present). For details, see chapter The Safe torque off function.



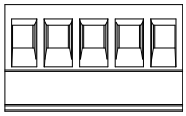
AC IN			
X50			
L	N		
POWER			

Auxiliary voltage inputs for internal power supply (BDPS)



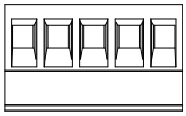
24V OUT				
X53				
GND	+24V	GND	+24V	FE

24 V DC output (for eg. BCU control unit)



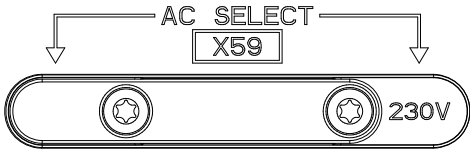
STO IN				
X52				
+24V	GND	+24V	GND	FE

STO signals from BCU control unit

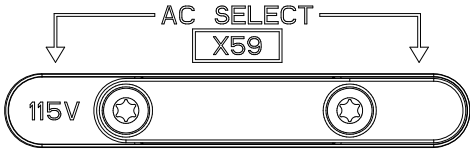


STO OUT				
X51				
+24V	GND	+24V	GND	FE

STO signal forwarding output to next inverter module (if present)

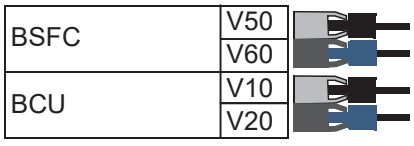


Auxiliary voltage: 230 V AC



Auxiliary voltage: 115 V AC

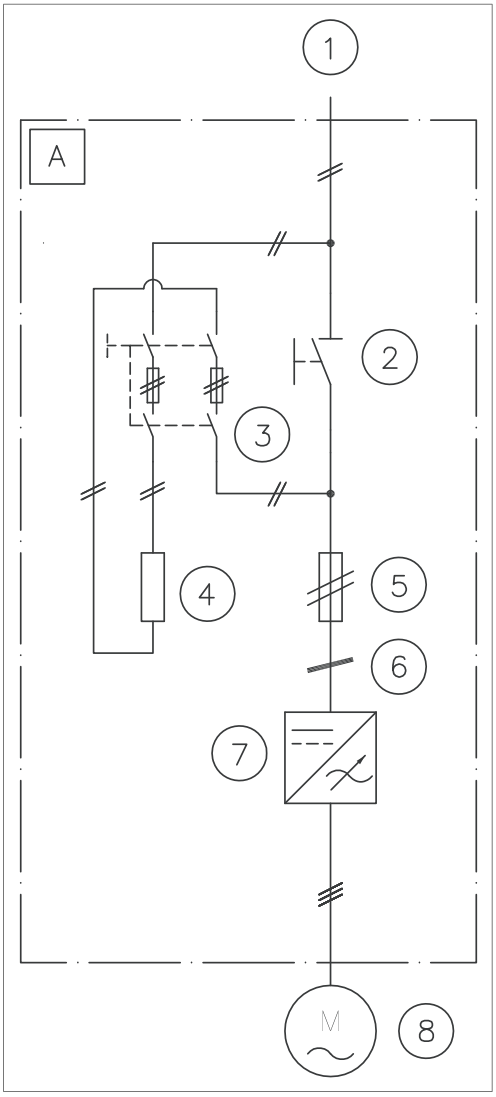
Fiber optic connectors



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

Overview circuit diagram of a frame R8i inverter unit

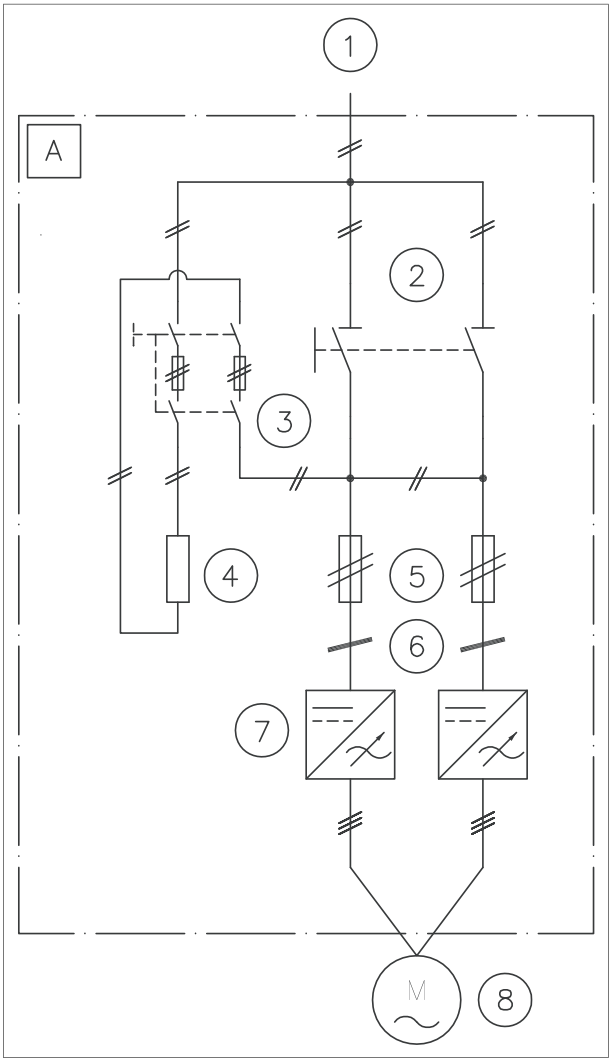
The following figure shows a simplified connection example of an inverter unit based on a frame R8i inverter module.



Item	Explanation	Available through
A	Inverter cubicle	-
1	DC supply	-
2	DC switch/disconnector (optional)	ABB or third party
3	Charging switch (optional)	ABB or third party
4	Charging resistor (optional)	ABB or third party
5	DC fuses	ABB or third party
6	Common mode filters	ABB
7	Inverter module	ABB
8	Motor	ABB (not part of ACS880-104LC product offering) or third party

Overview circuit diagram of a frame 2×R8i inverter unit

The following figure shows a simplified connection example of an inverter based on two parallel-connected frame R8i inverter modules.



Item	Explanation	Available through
A	Inverter cubicle	-
1	DC supply	-
2	DC switch/disconnector (optional)	ABB or third party
3	Charging switch (optional)	ABB or third party
4	Charging resistors (optional)	ABB or third party
5	DC fuses	ABB or third party
6	Common mode filters	ABB
7	Inverter modules	ABB
8	Motor	ABB (not part of ACS880-104LC product offering) or third party

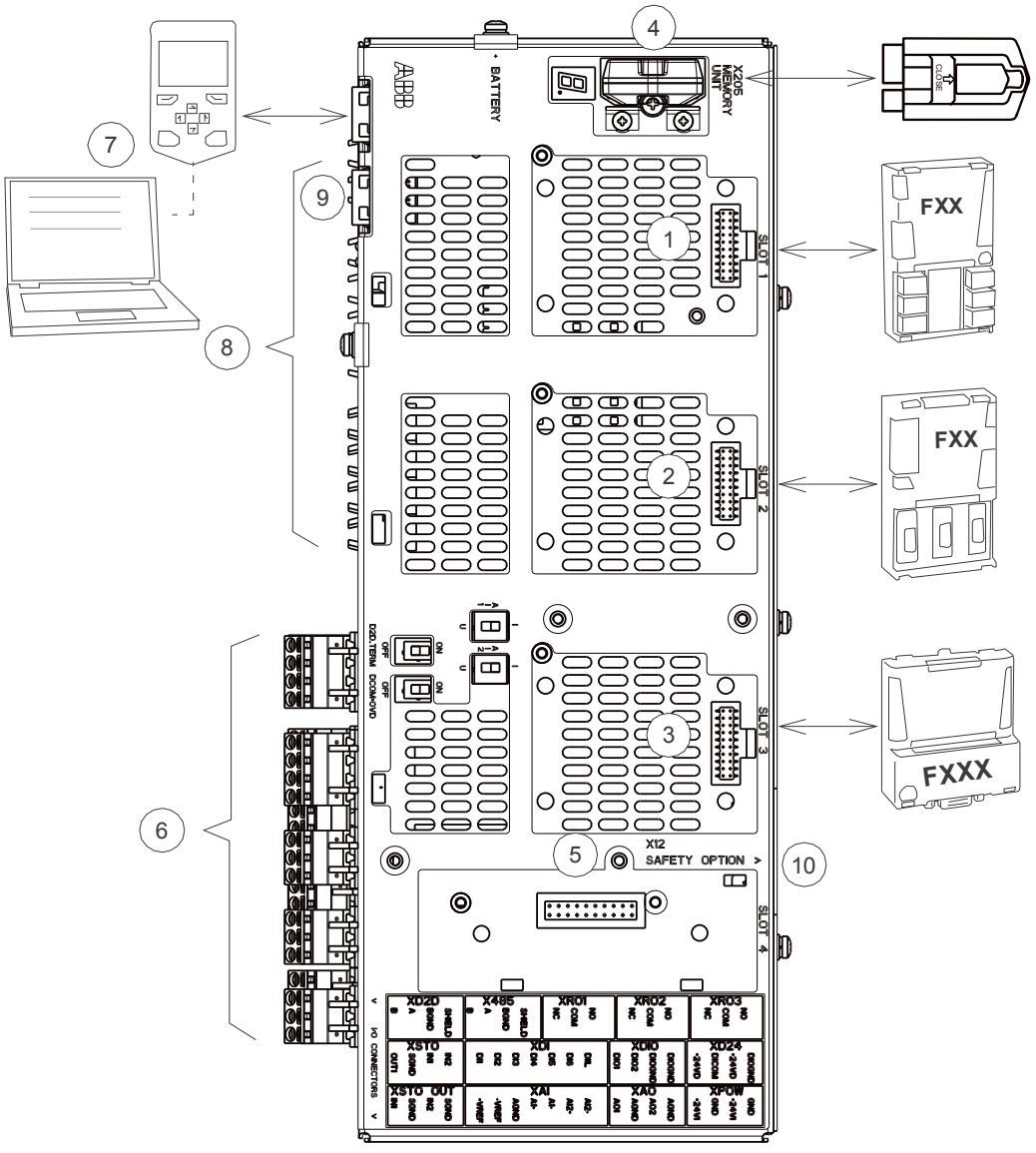
Cabinet layout and cooling

See chapter *Cabinet construction (page 33)*.

Control interfaces

Overview of the control connections of the BCU control unit

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



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

The ACx-AP-x control panel

The ACx-AP-x control panel 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 the cabinet door using a DPMP-01 mounting platform (available separately).

One control panel can be used to control several inverter units through a panel link provided that each unit is equipped with panel holder or an FDPI-02 module.

Note:
A control panel is required for the commissioning of an ACS880 drive system, even if the Drive composer PC tool is used.

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

Control by PC tools

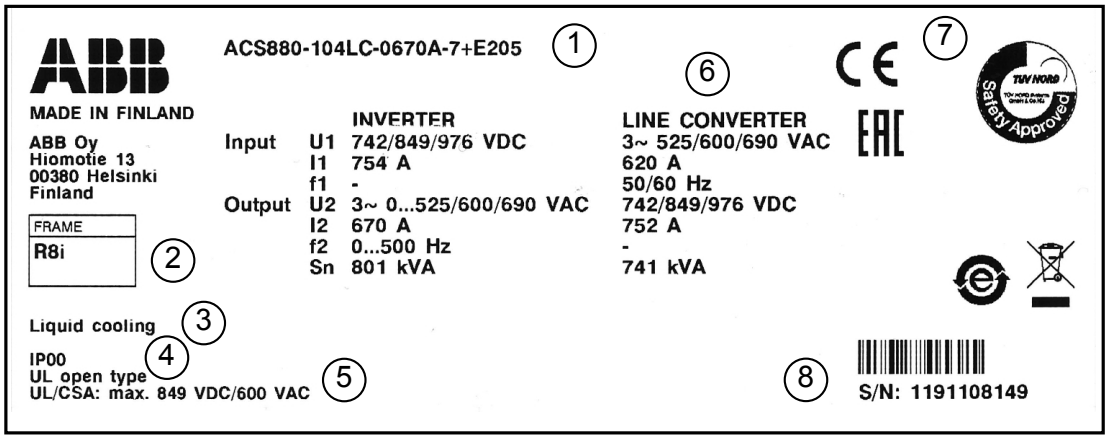
There is a USB connector on the front of the panel that can be used to connect a PC to the drive. When a PC is connected to the control panel, the control panel keypad is disabled.

For more information section Connecting a PC.

Type designation label

Each inverter module has a type designation label attached to it. The type designation stated on the label contains information on the specifications and configuration of the unit. The first digits express the basic construction of the unit, for example “ACS880-104LC-0850A-7”. Any optional selections are given thereafter, separated by plus signs.

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



No.	Description
1	Type designation
2	Frame size
3	Cooling method
4	Degree of protection
5	UL/CSA data
6	Ratings
7	Valid markings. See *Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048634 [English]).
8	Serial number. The first digit of the serial number refers to the manufacturing plant. The next four digits refer to the unit’s manufacturing year and week, respectively. The remaining digits complete the serial number so that there are no two units with the same number.

3

Moving and unpacking the module

Contents of this chapter

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

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

Moving and unpacking the module

The modules are delivered on a wooden base, boxed in corrugated cardboard. The cardboard box is tied to the base with PET bands.

1. Cut off the bands.
2. Lift off the cardboard box.
3. Remove any filling material.
4. Cut open the plastic wrapping of the module.
5. Lift off the module.
6. Check that there are no signs of damage.

Dispose of or recycle the packaging according to the local regulations.

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

4

Cabinet construction

Contents of this chapter

This chapter instructs in placing the modules and additional equipment into a cabinet.

For general instructions, see *Cabinet design and construction instructions for drive modules* (3AUA0000107668 [English]).

Limitation of liability

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

General

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

Installation examples

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

This section includes installation examples of inverter modules in Rittal VX25 series as well as generic enclosures. Each example includes a table that lists:

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

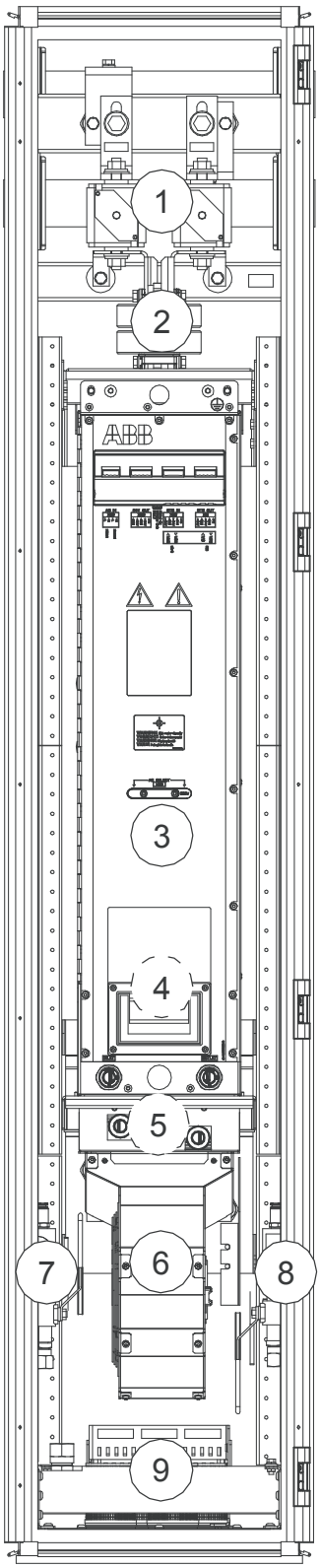
You can find kit-specific assembly drawings, step-by-step instructions and kit information on the Internet (https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content).

The example includes also cabinet assembly drawings that show each stage listed in the table. More detailed steps of each stage are described in the kit-specific assembly drawings.

For general instructions, refer to *Cabinet design and construction instructions for ACS880/ACS880LC multidrive modules* (3AUA0000107668 [English]).

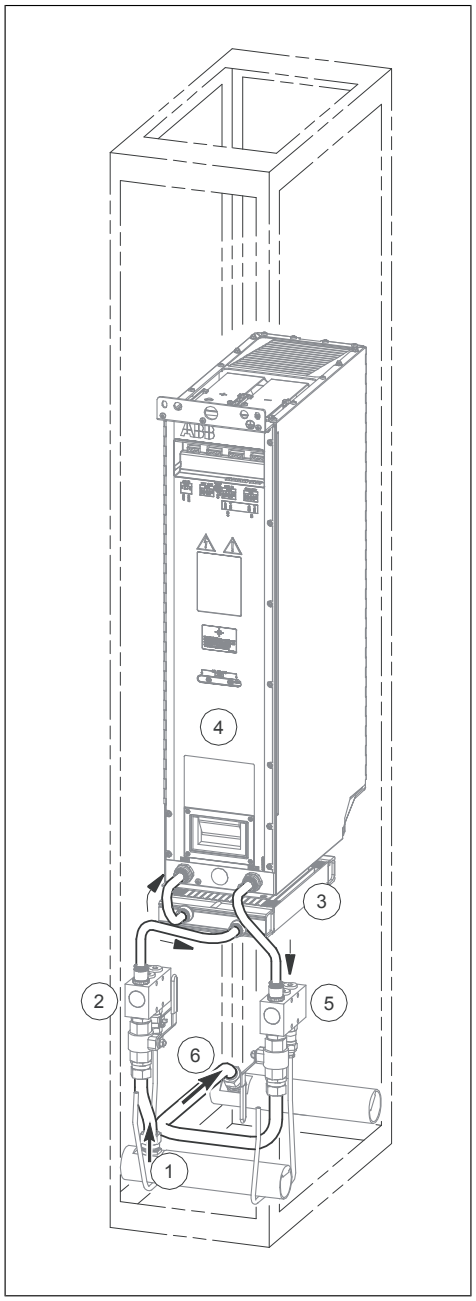
One R8i module in a 400 mm wide Rittal VX25 enclosure

Layout drawing



No.	Description
1	DC fuses (DC switch can alternatively be installed)
2	Common mode filters
3	Inverter module
4	Output busbars
5	Heat exchanger (between module and cooling fan)
6	Cooling fan
7	Inlet manifold with stop and drain valves
8	Outlet manifold with sotp and drain valves
9	Cable entries

Pipe routing example

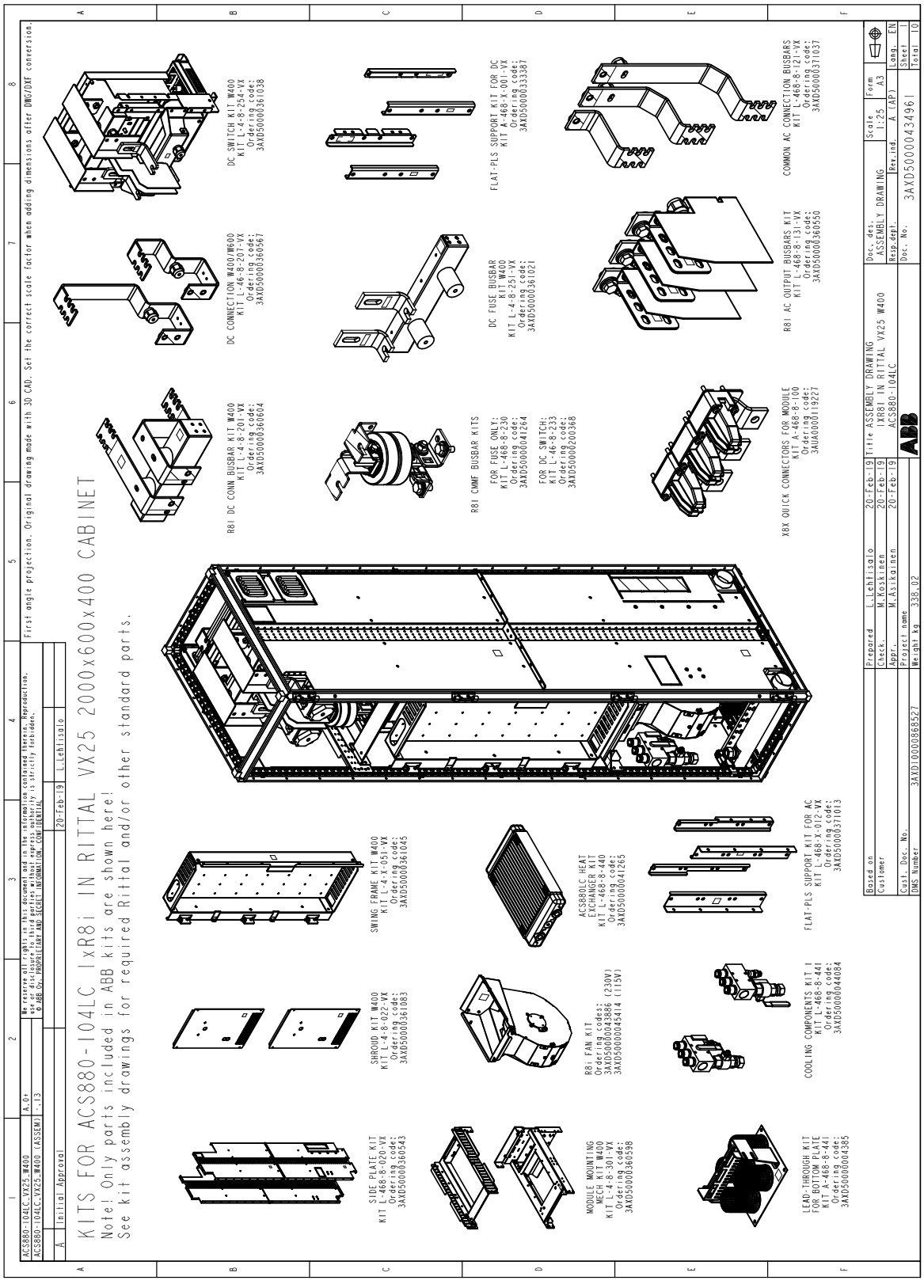


No.	Description
1	Coolant in
2	Inlet manifold with stop and drain valves
3	Heat exchanger
4	Inverter
5	Outlet manifold with stop and drain valves
6	Coolant out

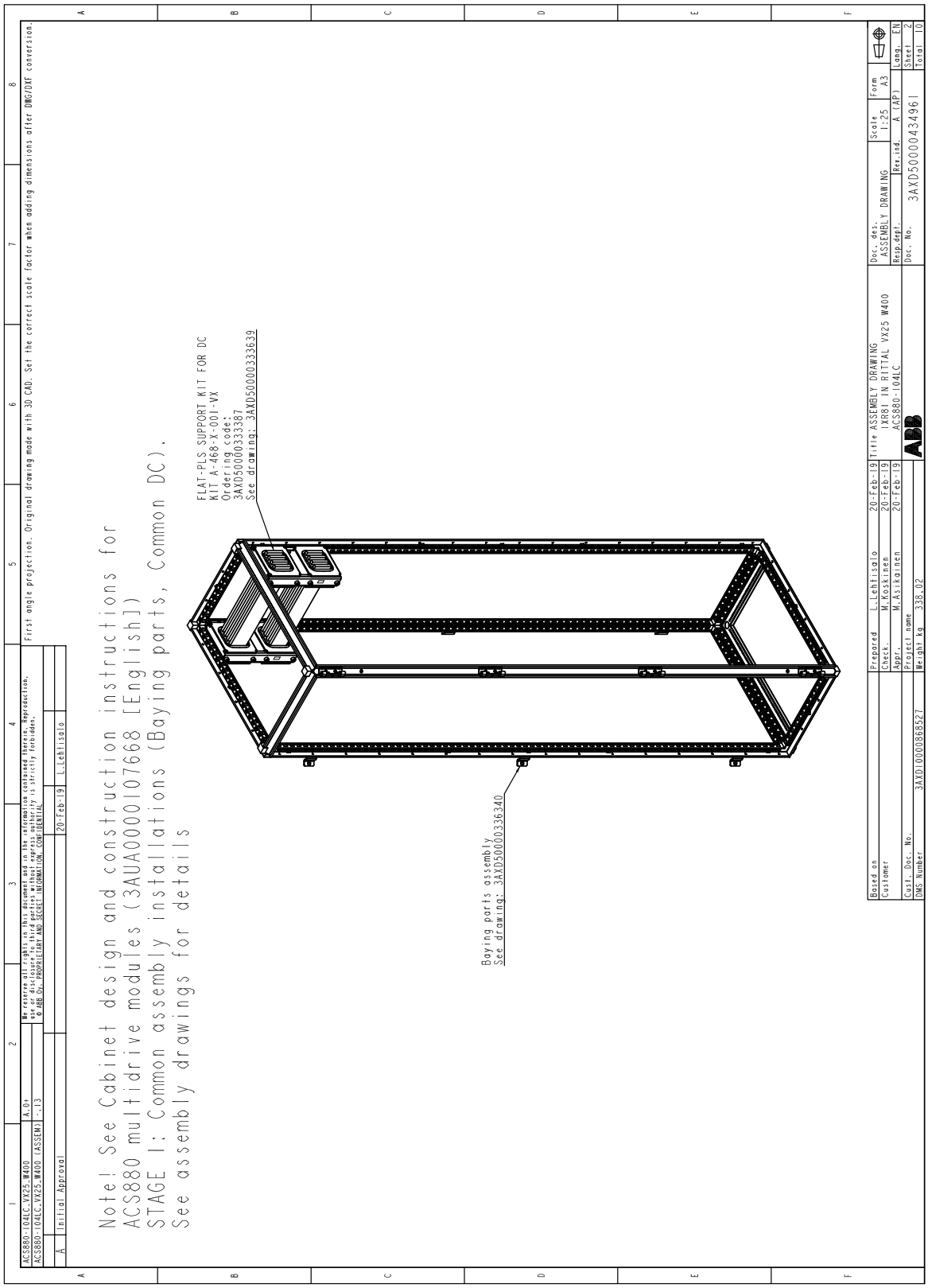
Installation stages

No.	Installation stage	Instruction code	Kit code	Kit ordering code
1	Baying parts	3AXD50000336340	-	-
	DC bus support kit	3AXD50000333639	A-468-X-001-VX	3AXD50000333387
2	Side plates	3AXD50000327591	L-468-8-020-VX	3AXD50000360543
	Module mounting mechanics	3AXD50000330461	L-4-8-301-VX	3AXD50000360598
	Quick connector	-	A-468-8-100	3AUA0000119227
3A	AC output terminals (for cabling)	3AXD50000330874	L-468-8-131-VX	3AXD50000360550
	Cable entry	3AXD50000004817	L-468-8-441	3AXD50000004385
3B	Common AC bus support kit	3AXD50000370870	L-468-X-012-VX	3AXD50000371013
	AC output busbars (for connection to common AC bus)	3AXD50000352791	L-468-8-121-VX	3AXD50000371037
4	Cooling fan	-	-	3AXD50000043886 / 3AXD50000045414
	Heat exchanger	-	L-468-8-440	3AXD50000041265
	Coolant distribution manifolds	3AXD50000048217	L-468-8-441	3AXD50000044084
	PE busbar	-	-	-
5A	DC busbars (for configuration without DC switch)	3AXD50000332861	L-4-8-201-VX	3AXD50000360604
		3AXD50000332885	L-4-8-251-VX	3AXD50000361021
		3AXD50000041311	L-468-8-230	3AXD50000041264
5B	DC switch and busbars	3AXD50000342600	L-4-8-254-VX	3AXD50000361038
		3AXD50000343614	L-46-8-207-VX	3AXD50000360567
		3AXD50000205042	L-46-8-233	3AXD50000200368
6	Module installation	-	-	-
7	Swing-out frame	3AXD50000345106	L-4-X-051-VX	3AXD50000361045
	Shrouding	3AXD50000353354	L-4-8-022-VX	3AXD50000361083

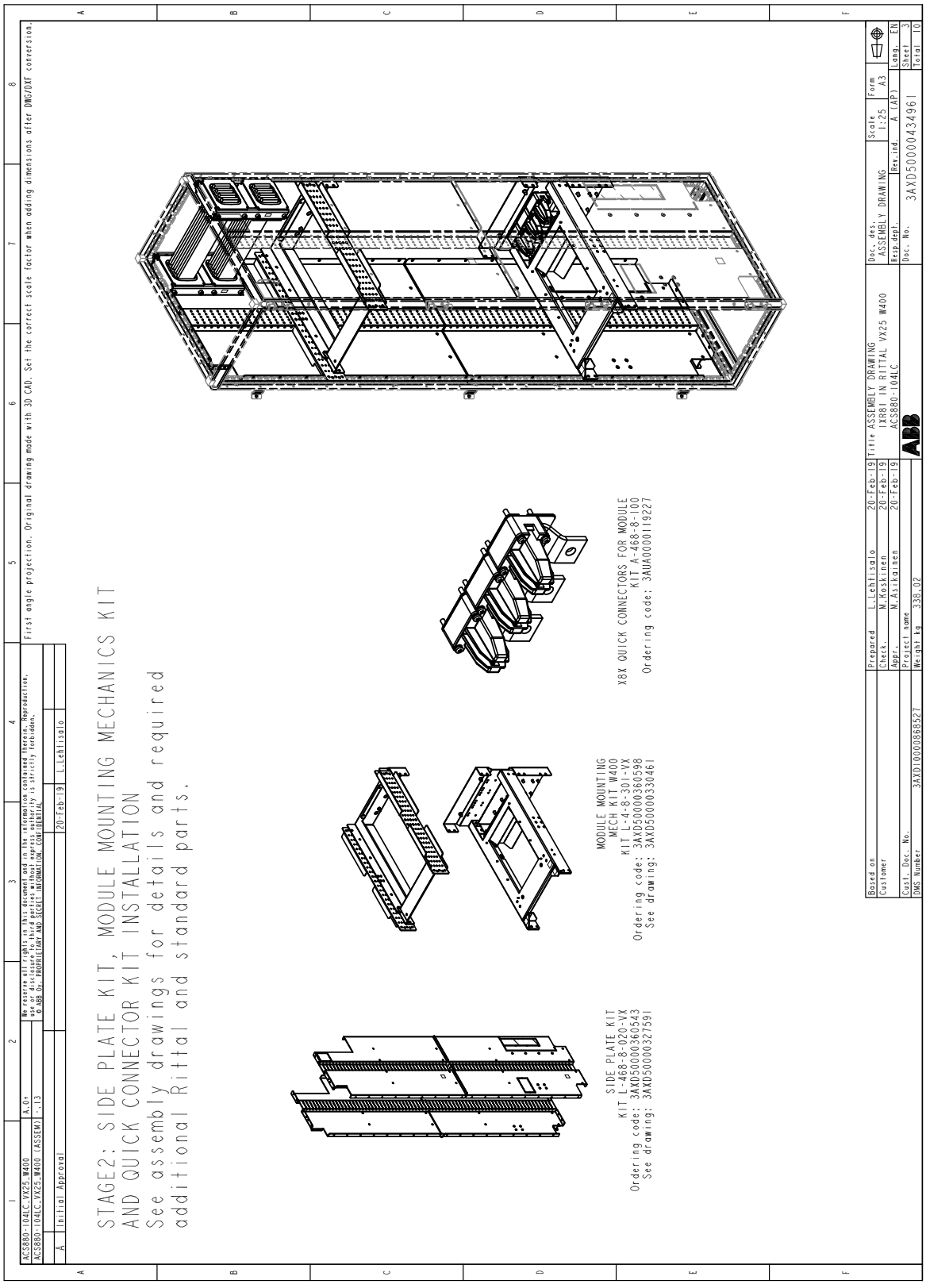
Overview of kits



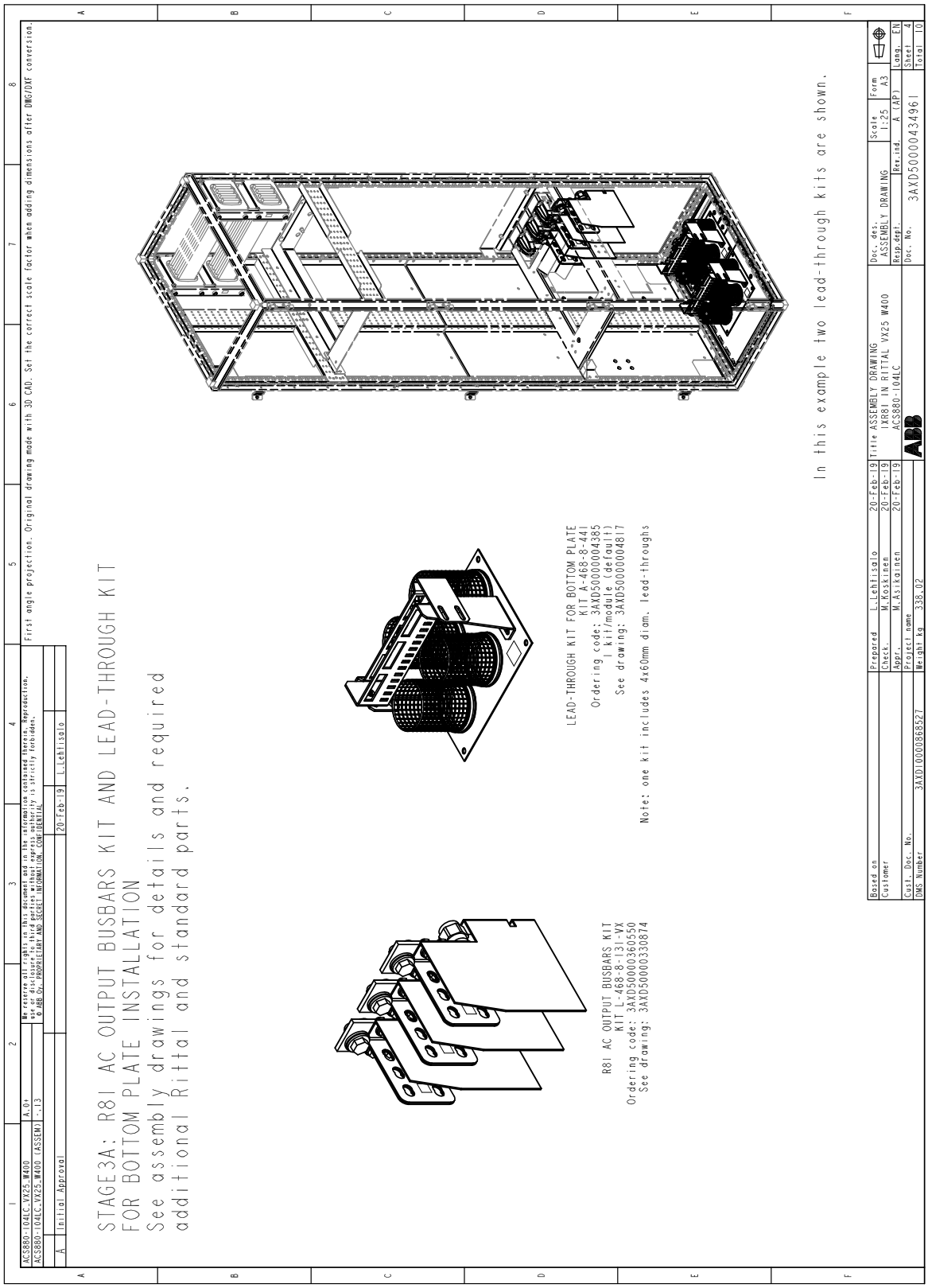
Stage 1: Installation of common parts



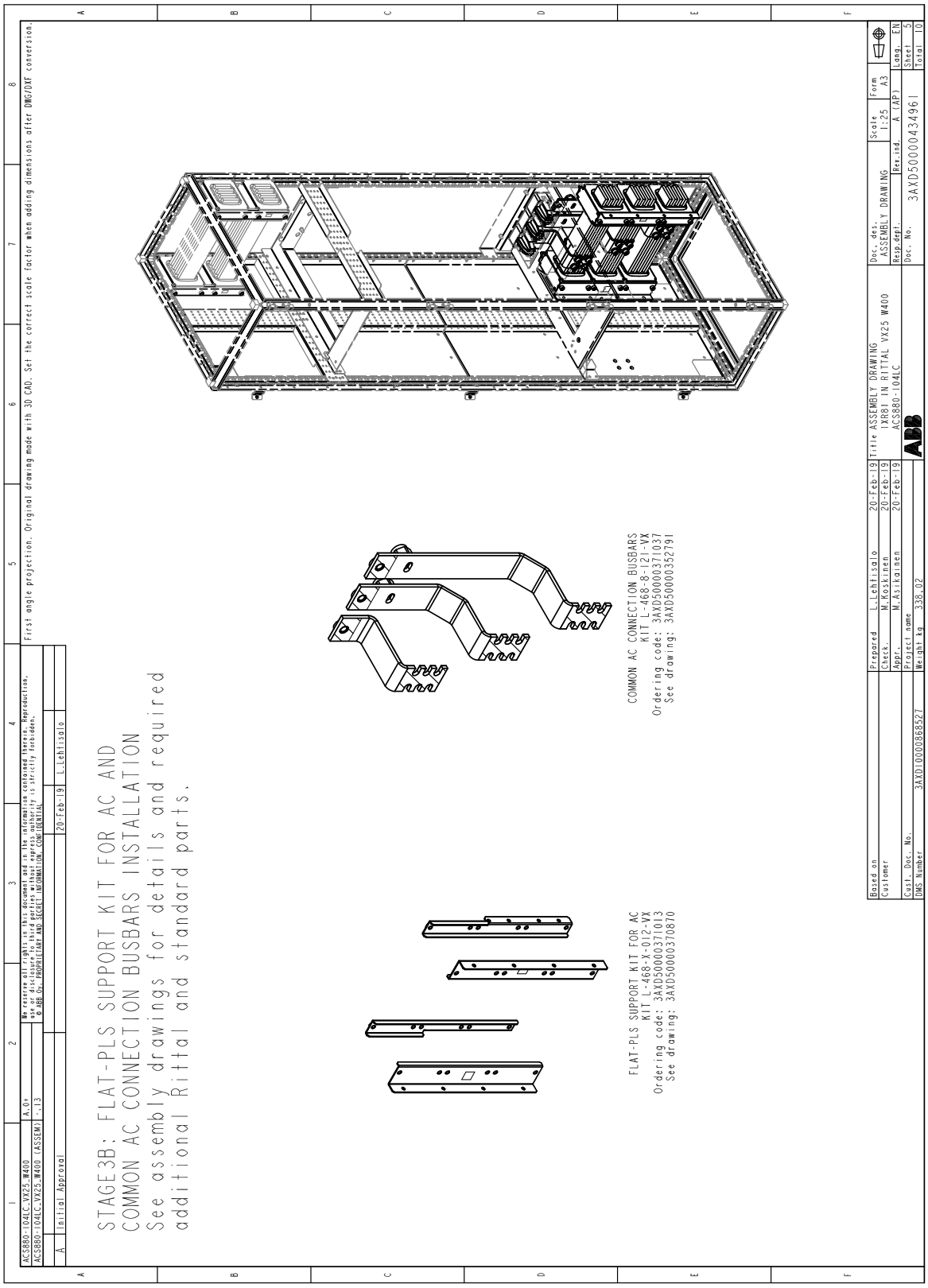
Stage 2: Installation of side plates, module mounting mechanics and quick connector



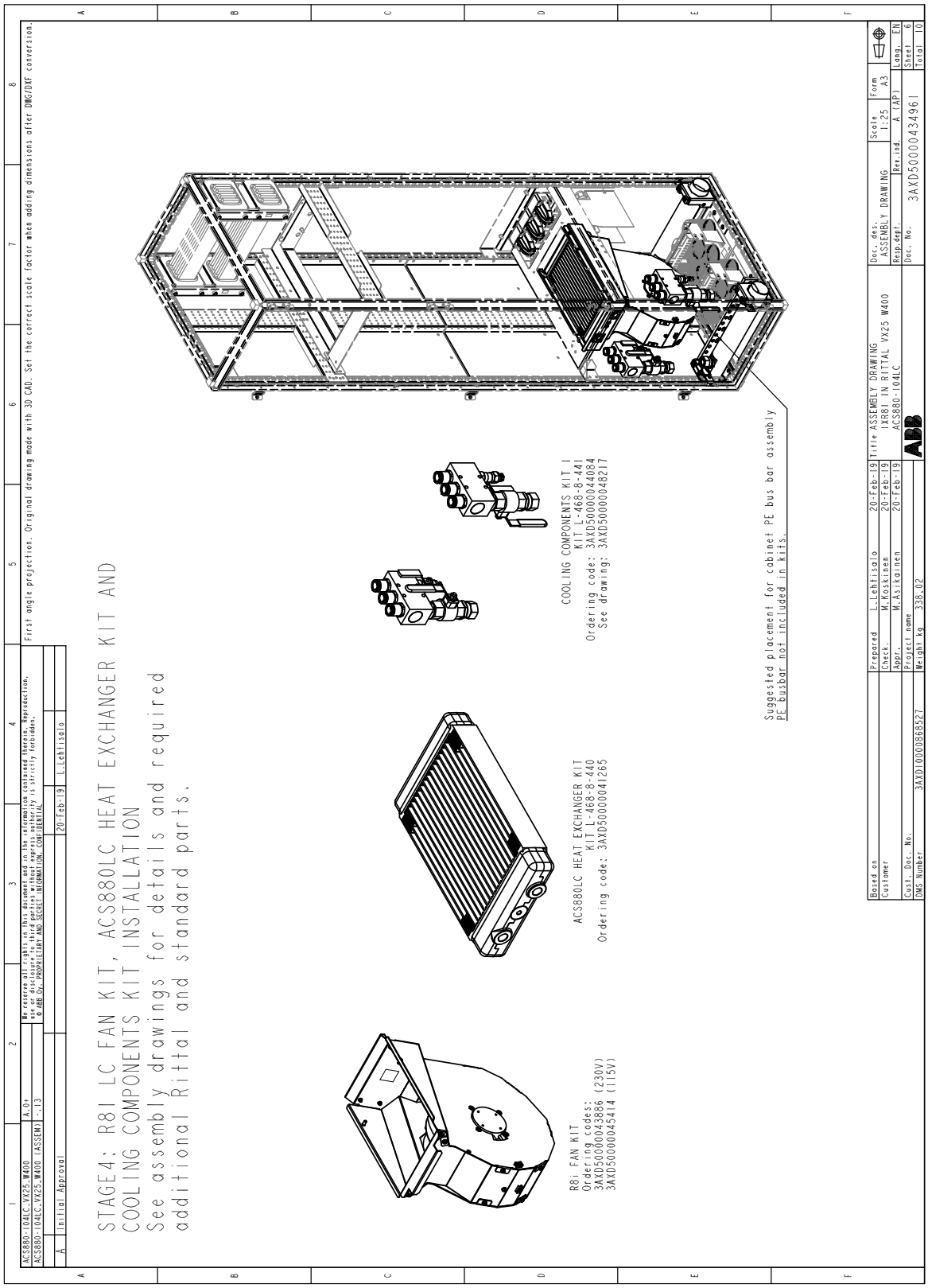
Stage 3A: Installation of output terminals (for cabling) and cable entries



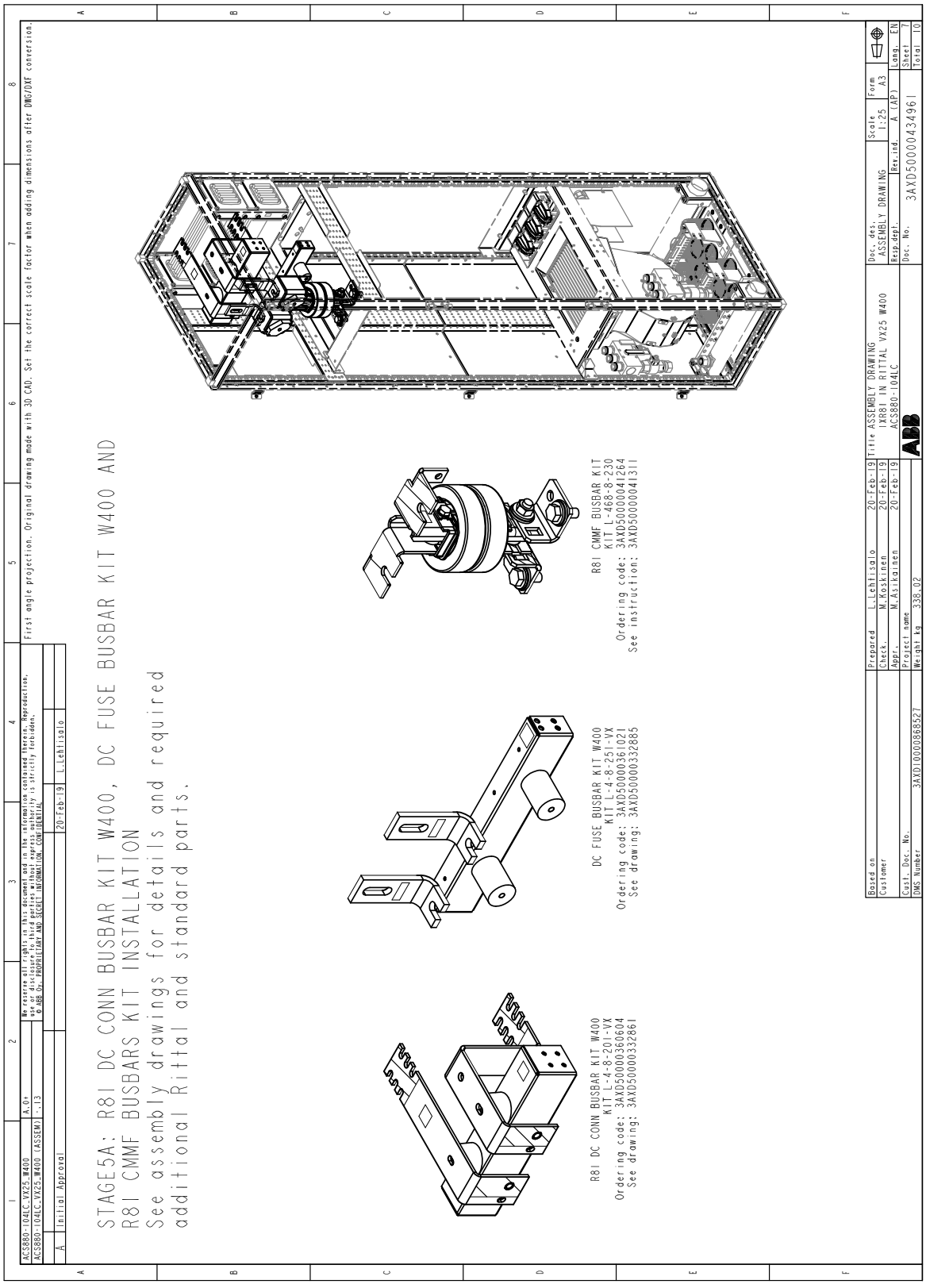
Stage 3B: Installation of AC busbars (for common AC bus)



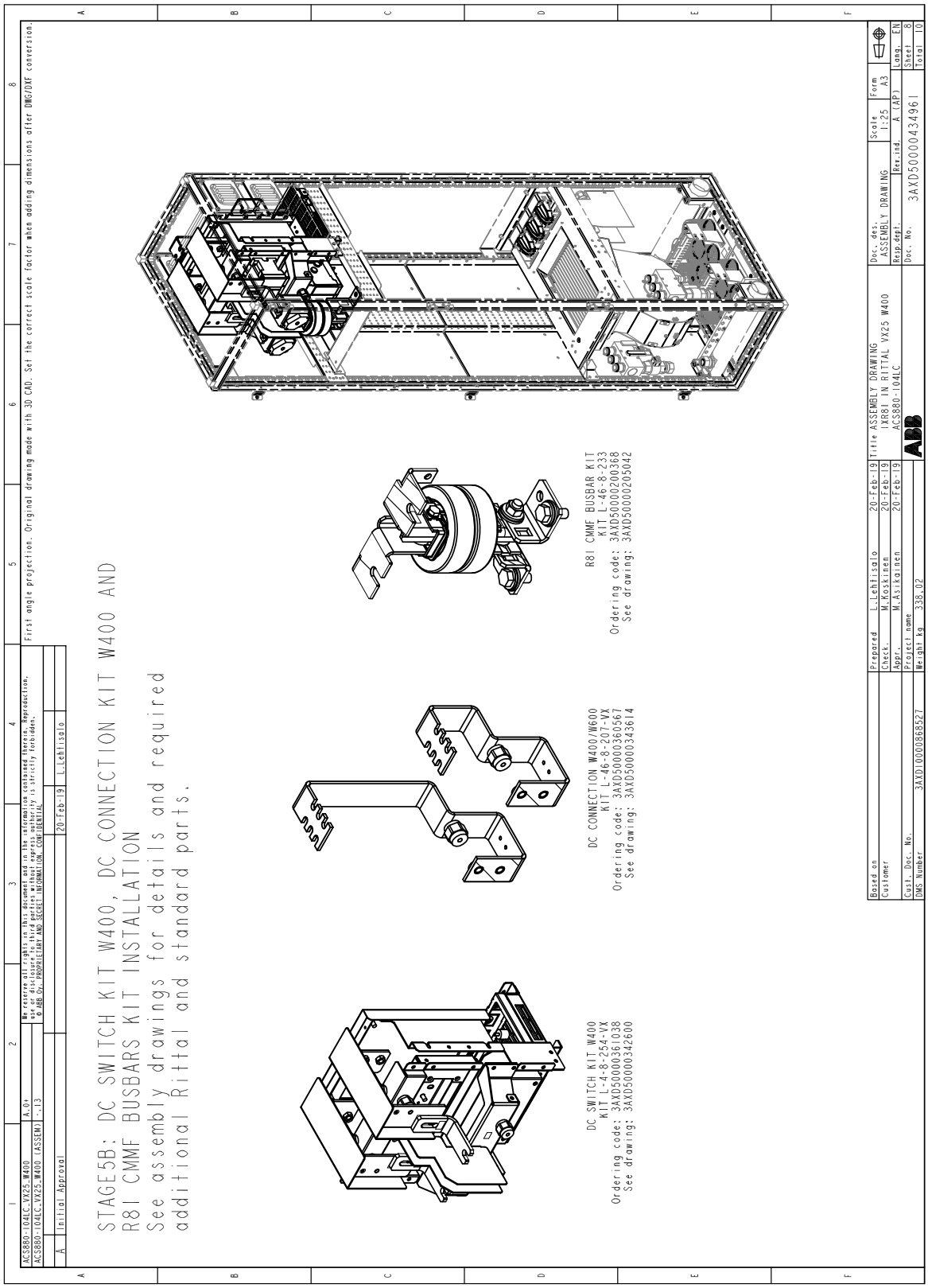
Stage 4: Installation of cooling components and PE busbar



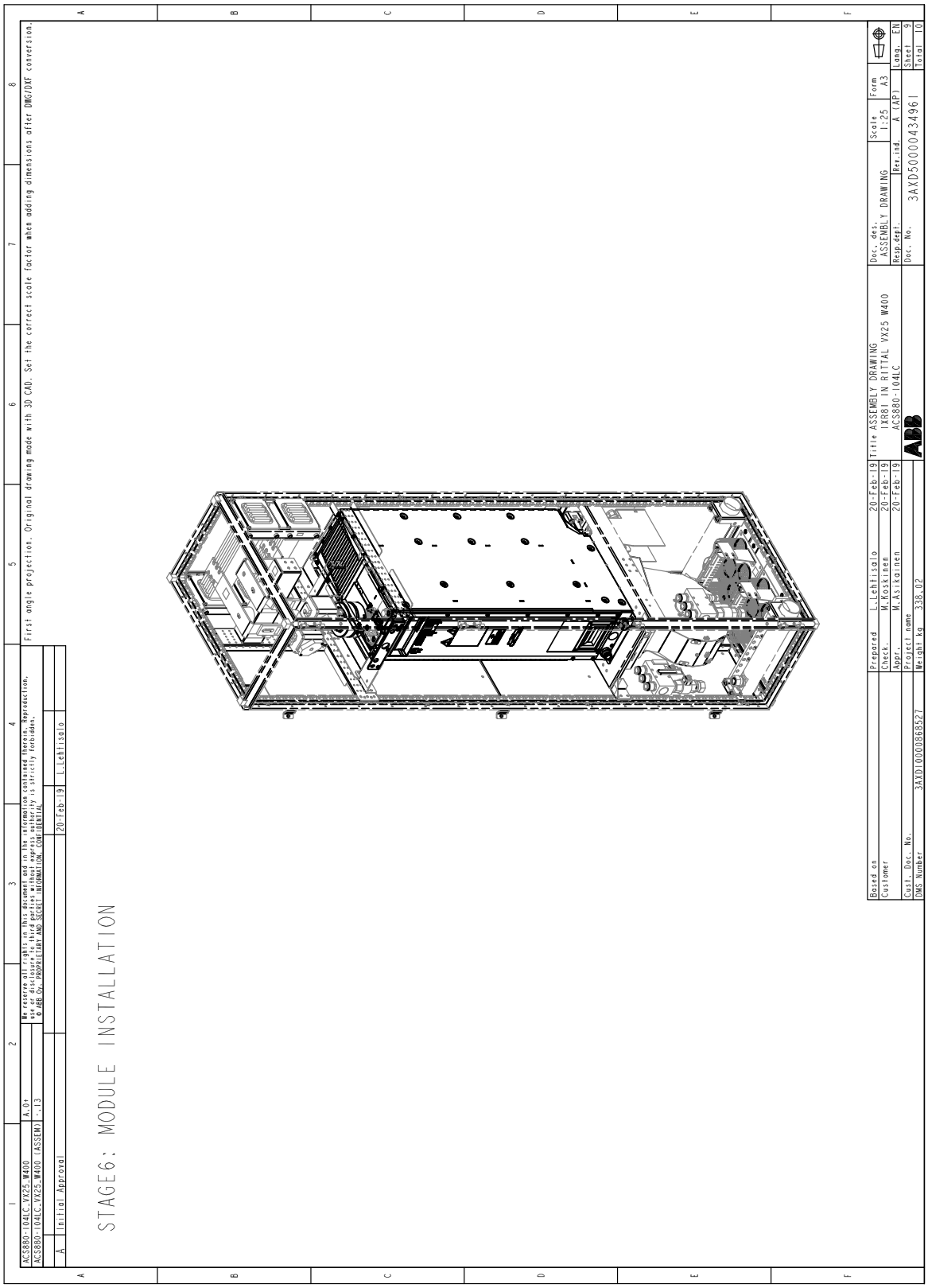
Stage 5A: Installation of DC busbars (units without DC switch)



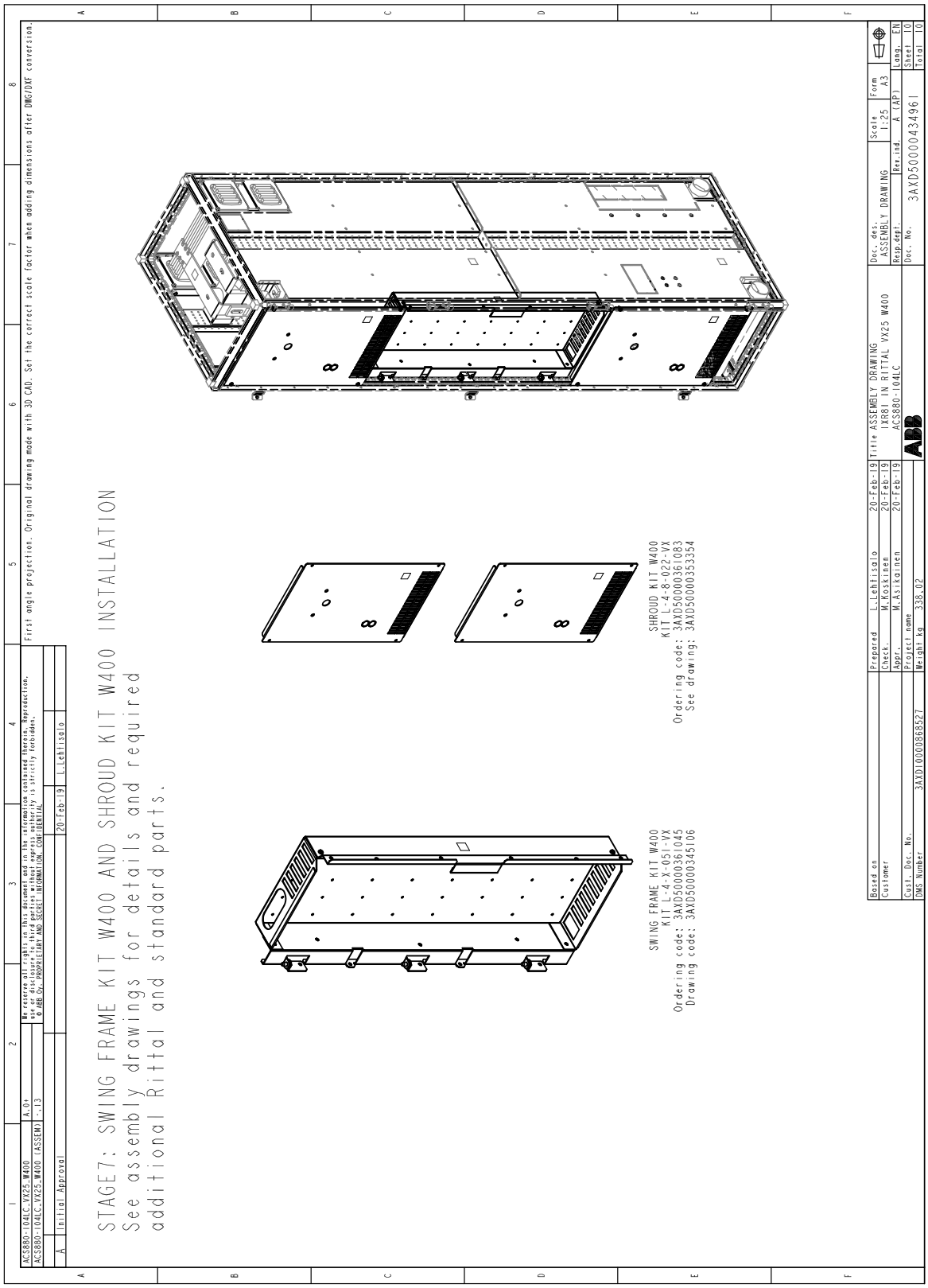
Stage 5B: Installation of DC switch and busbars



Stage 6: Installation of module

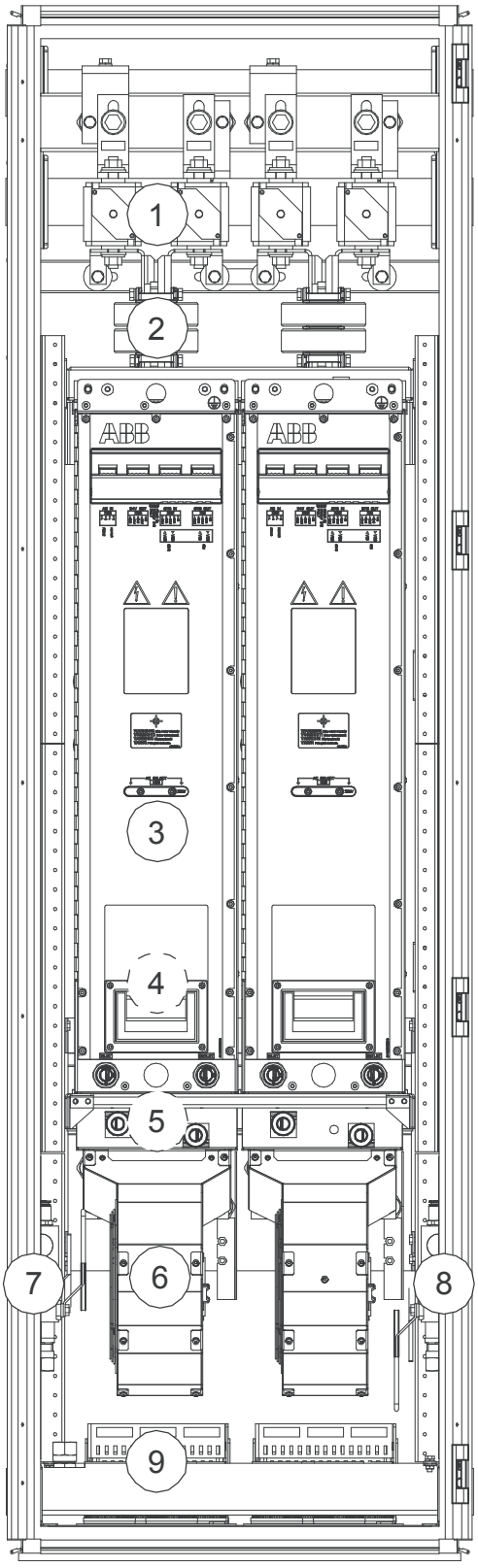


Stage 7: Installation of swing-out frame and shrouding



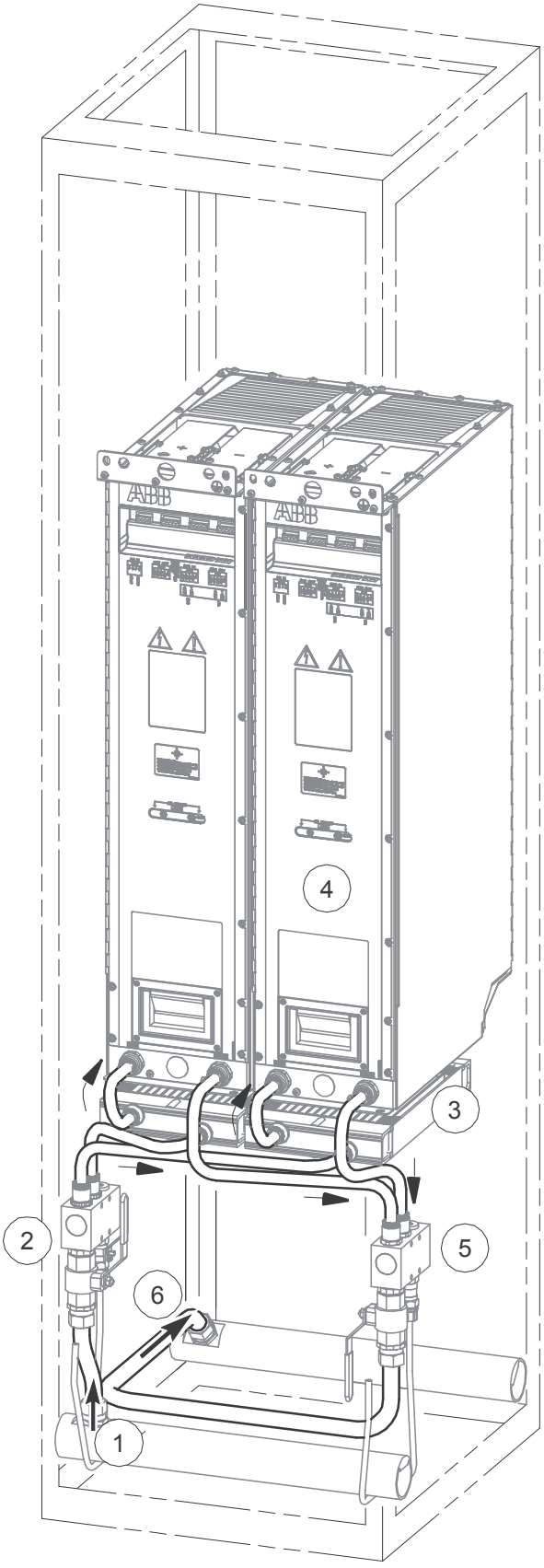
Two R8i modules in a 600 mm wide Rittal VX25 enclosure

Layout drawing



No.	Description
1	DC fuses (DC switch can alternatively be installed)
2	Common mode filters
3	Inverter module
4	Output busbars (located behind module)
5	Heat exchanger (between module and cooling fan)
6	Cooling fan
7	Inlet manifold with stop and drain valves
8	Outlet manifold with stop and drain valves
9	Cable entries

Pipe routing example

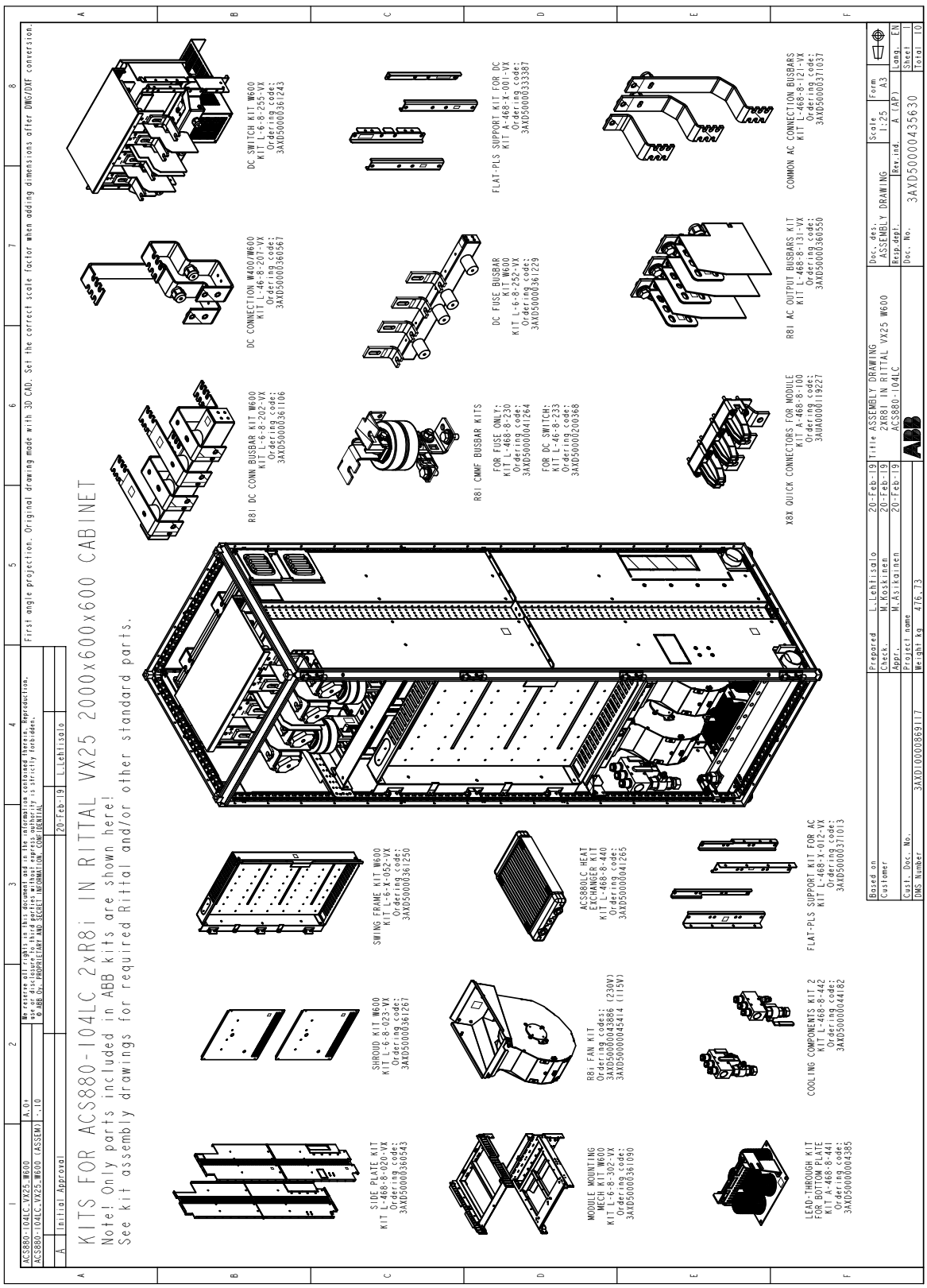


No.	Description
1	Coolant in
2	Inlet manifold with stop and drain valves
3	Heat exchanger
4	Inverter module
5	Outlet manifold with stop and drain valves
6	Coolant out

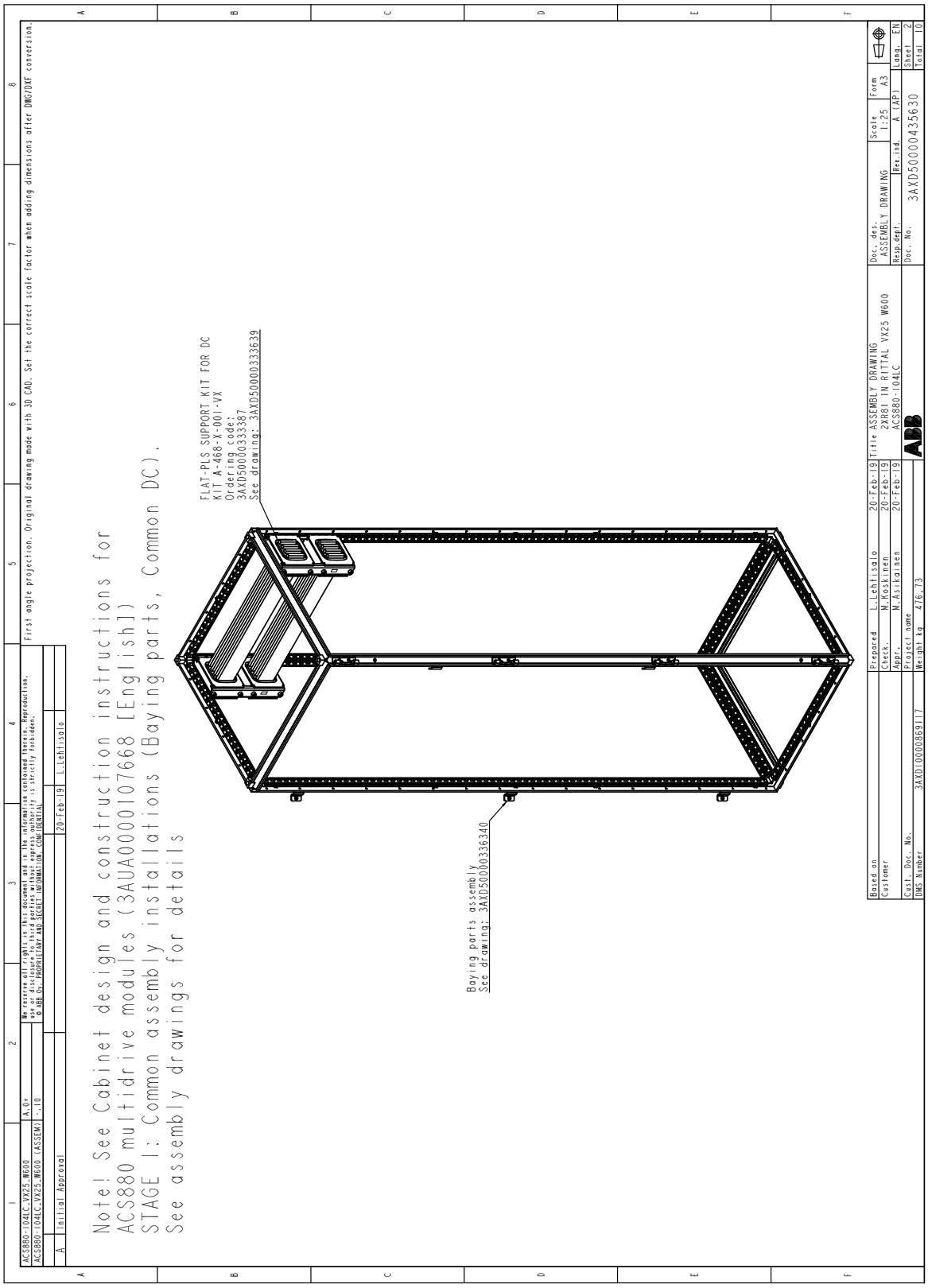
Installation stages

No.	Installation stage	Instruction code	Kit code	Kit ordering code
1	Baying parts	3AXD50000336340	-	-
	DC bus support kit	3AXD50000333639	A-468-X-001-VX	3AXD50000333387
2	Side plates	3AXD50000327591	L-468-8-020-VX	3AXD50000360543
	Module mounting mechanics	3AXD50000330201	L-6-8-302-VX	3AXD50000361090
	Quick connector	-	A-468-8-100	3AUA0000119227
3A	AC output terminals (for cabling)	3AXD50000330874	L-468-8-131-VX	3AXD50000360550
	Cable entry	3AXD50000004817	L-468-8-441	3AXD50000004385
3B	Common AC bus support kit	3AXD50000370870	L-468-X-012-VX	3AXD50000371013
	AC output busbars (for connection to common AC bus)	3AXD50000352791	L-468-8-121-VX	3AXD50000371037
4	Cooling fans	-	-	3AXD50000043886 / 3AXD50000045414
	Heat exchangers	-	L-468-8-440	3AXD50000041265
	Coolant distribution manifolds	3AXD50000048258	L-468-8-442	3AXD50000044182
	PE busbar	-	-	-
5A	DC busbars (for configuration without DC switch)	3AXD50000332229	L-6-8-202-VX	3AXD50000361106
		3AXD50000332106	L-6-8-252-VX	3AXD50000361229
		3AXD50000041311	L-468-8-230	3AXD50000041264
5B	DC switch and busbars	3AXD50000338740	L-6-8-255-VX	3AXD50000361243
		3AXD50000343614	L-46-8-207-VX	3AXD50000360567
		3AXD50000205042	L-46-8-233	3AXD50000200368
6	Module installation	-	-	-
7	Swing-out frame	3AXD50000345069	L-6-X-052-VX	3AXD50000361250
	Shrouding	3AXD50000353521	L-6-8-023-VX	3AXD50000361267

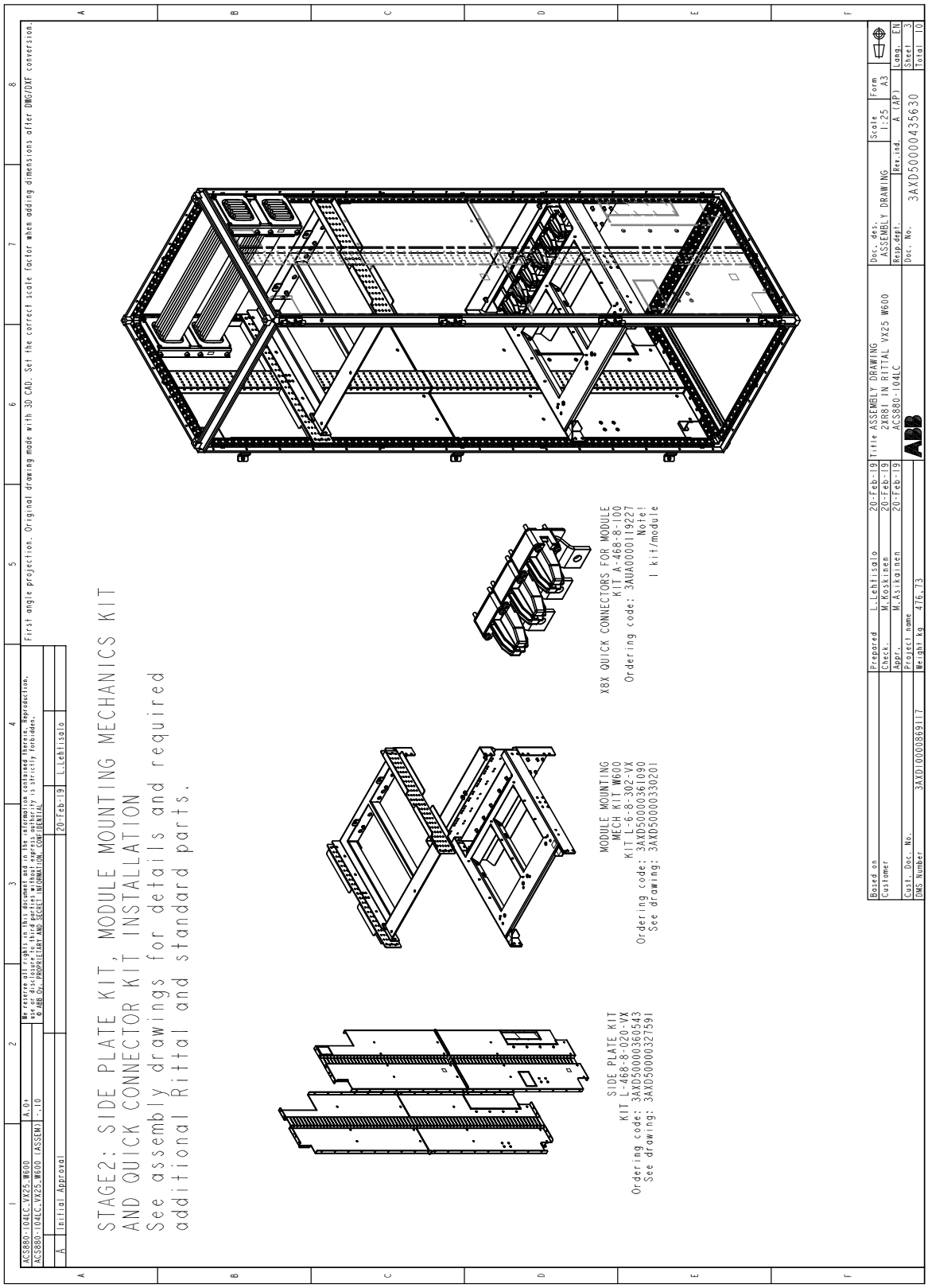
Overview of kits



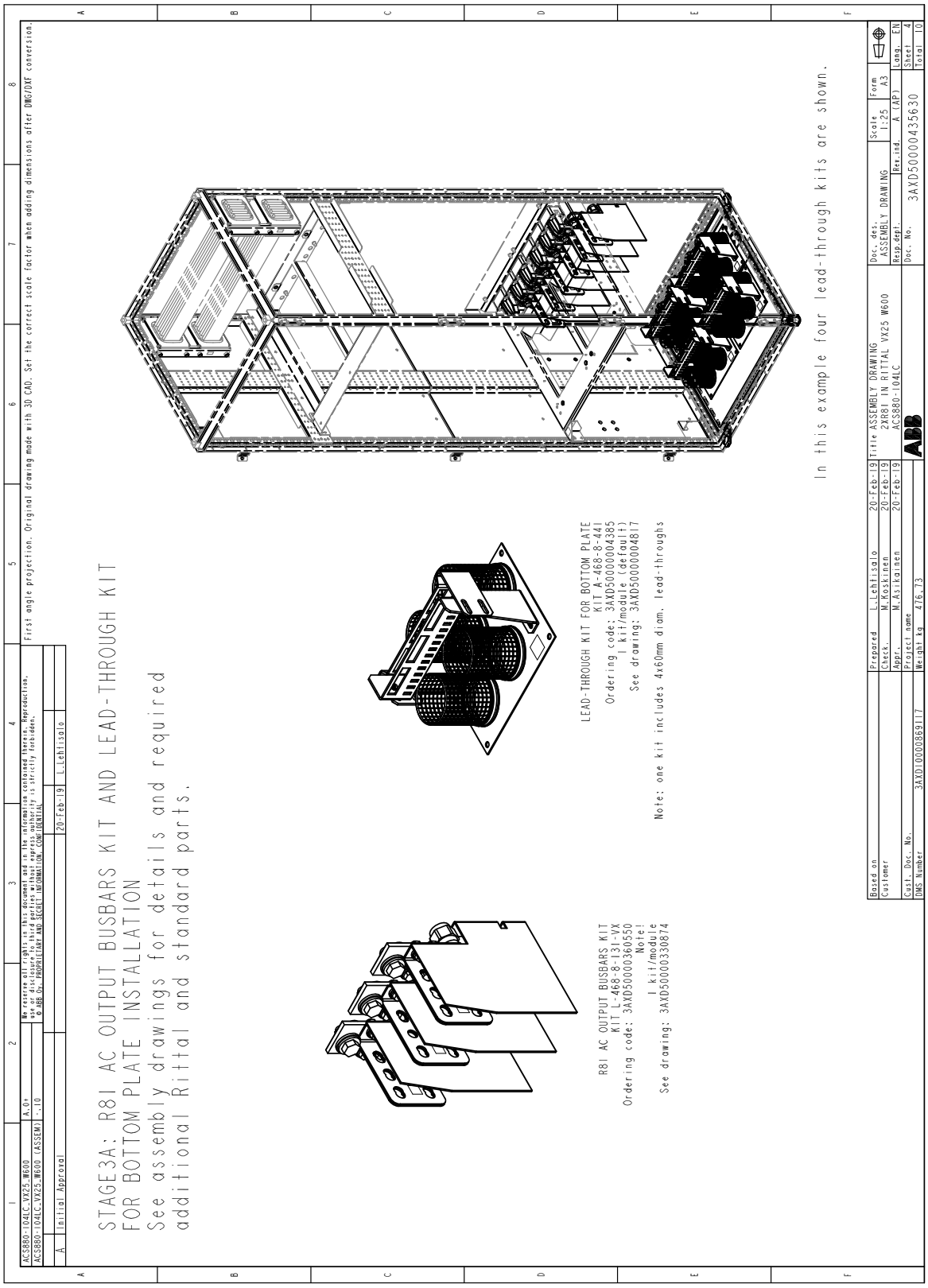
Stage 1: Installation of common parts



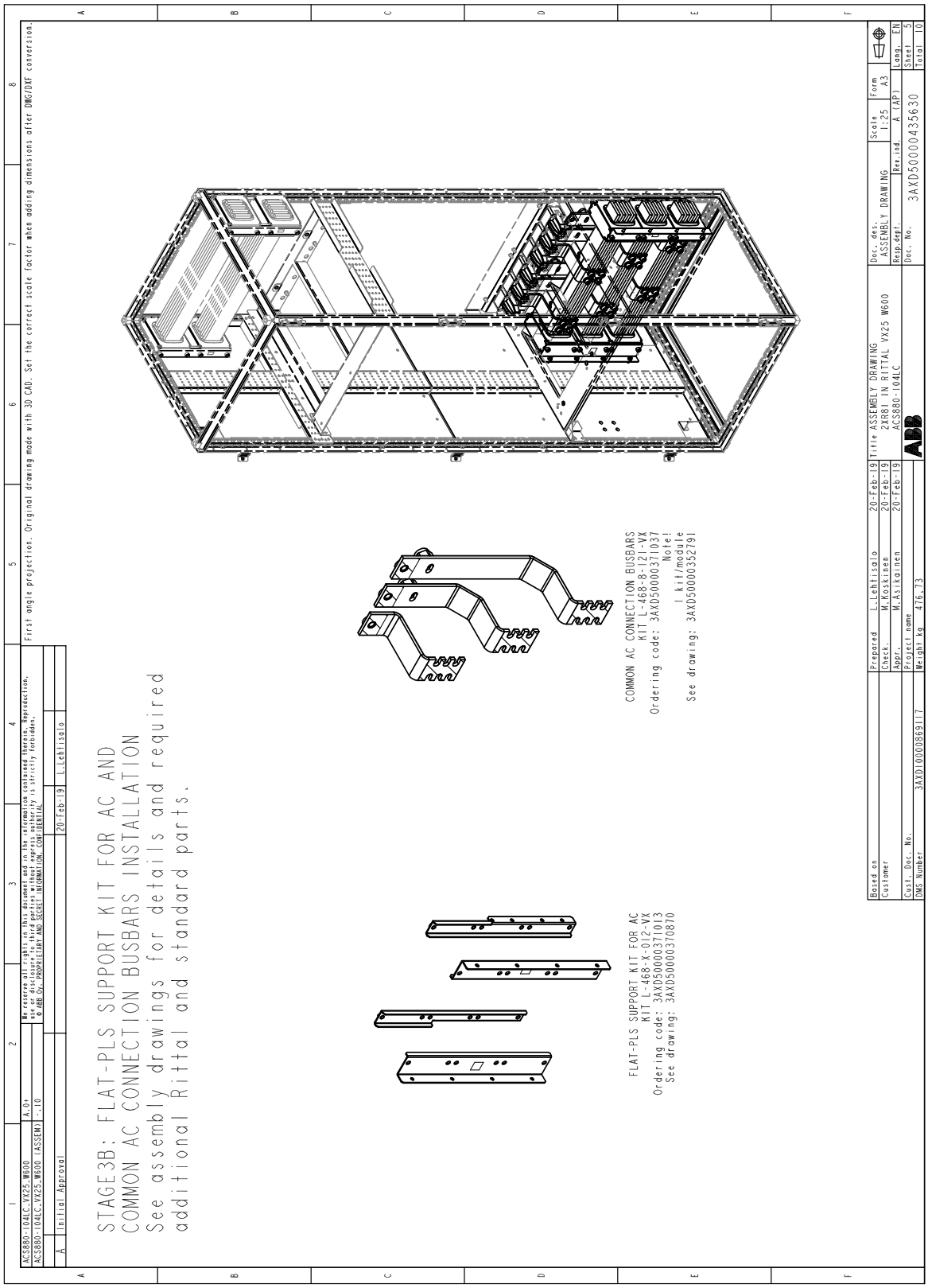
Stage 2: Installation of side plates, module mounting mechanics and quick connector



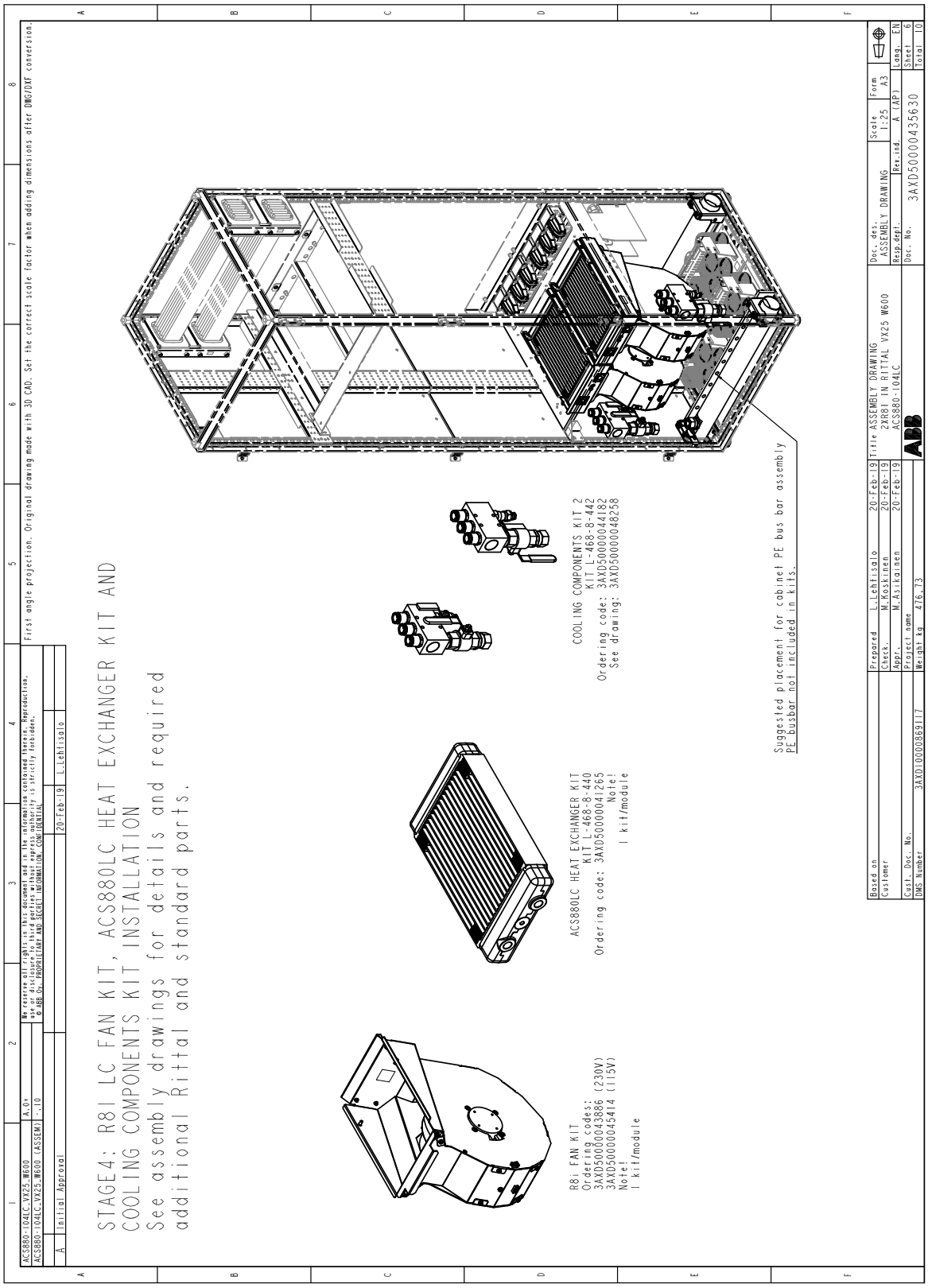
Stage 3A: Installation of output terminals (for cabling) and cable entry



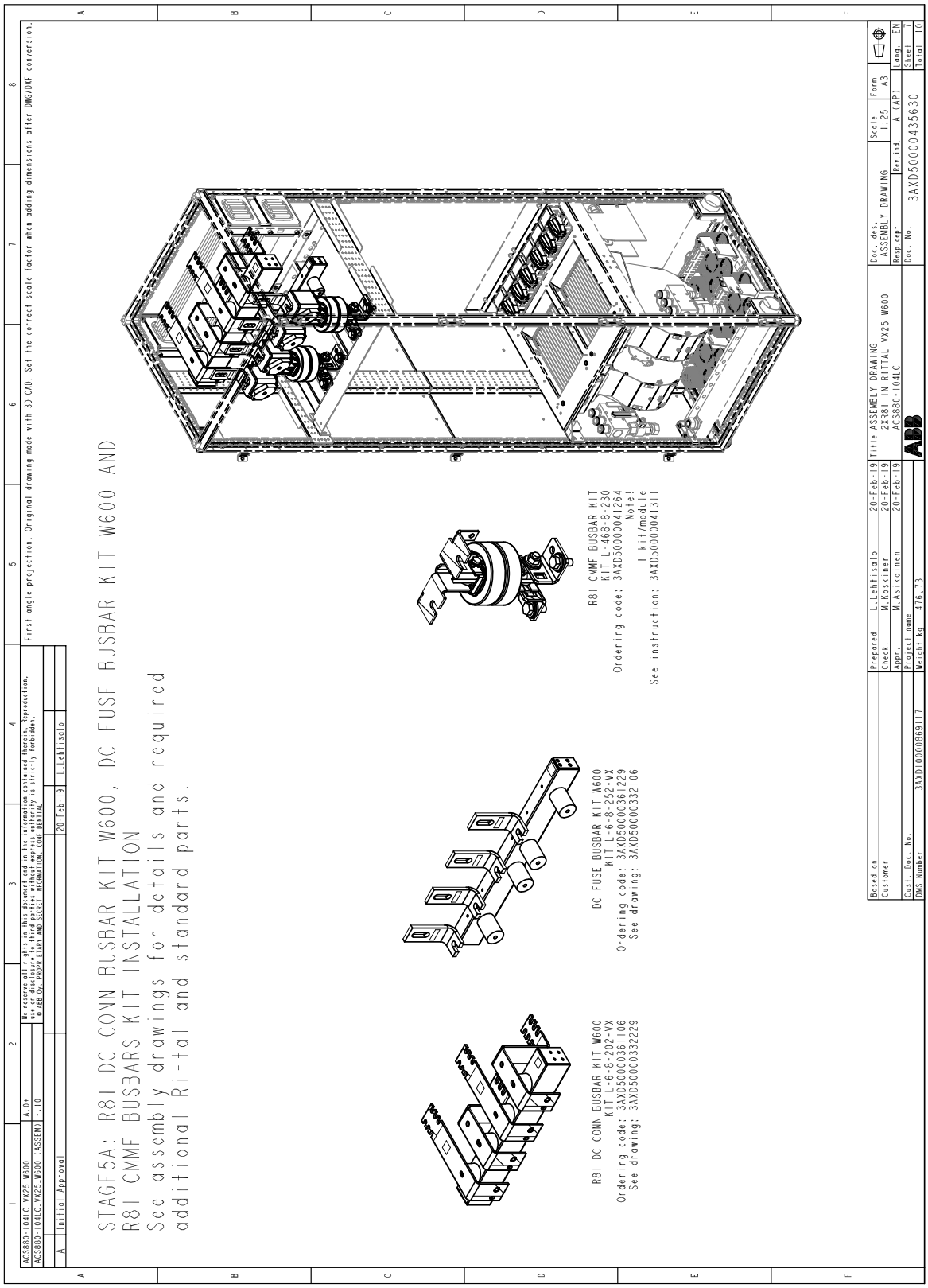
Stage 3B: Installation of AC busbars (for common AC bus)



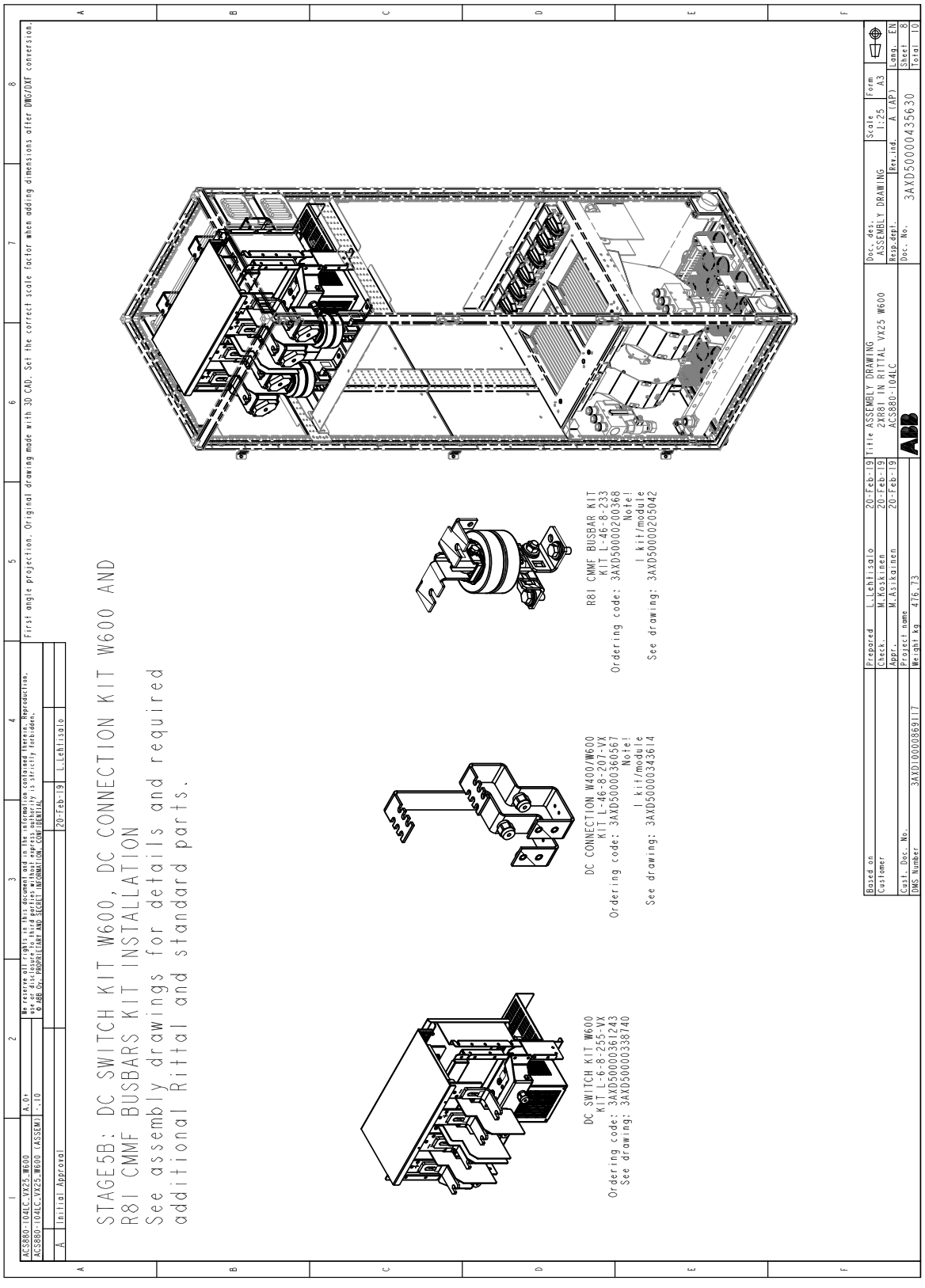
Stage 4: Installation of cooling components and PE busbar



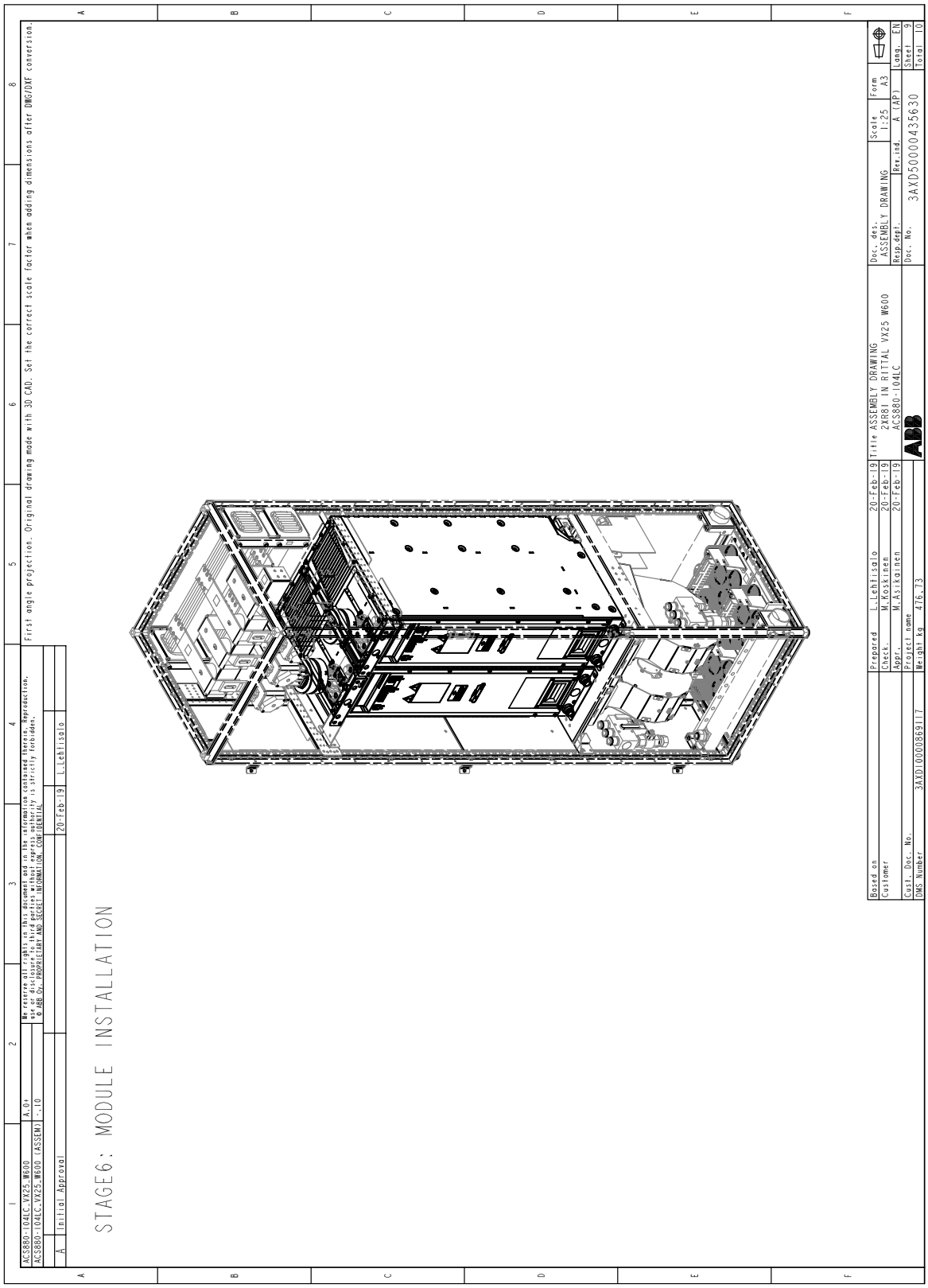
Stage 5A: Installation of DC busbars (units without DC switch)



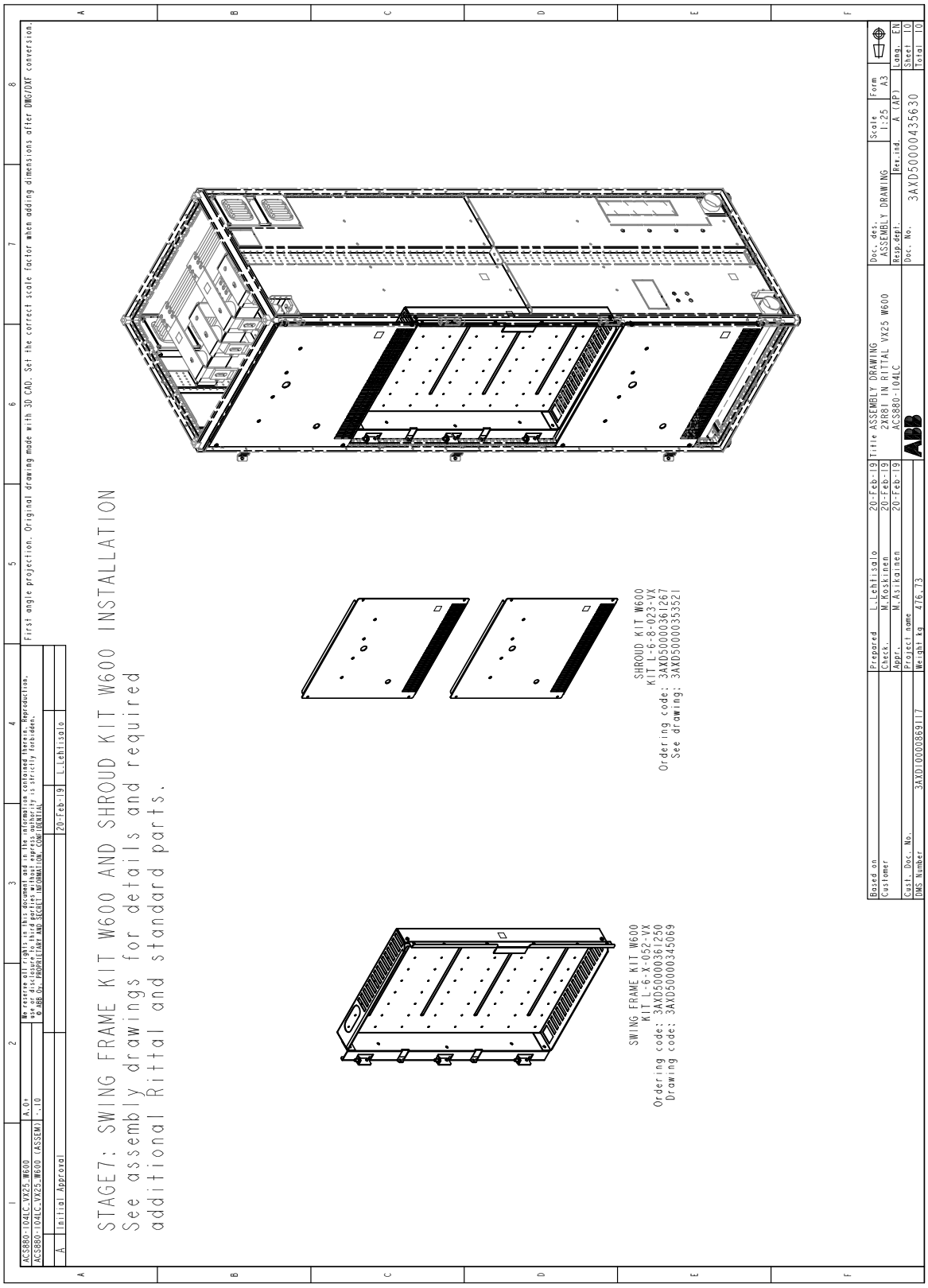
Stage 5B: Installation of DC switch and busbars



Stage 6: Installation of module

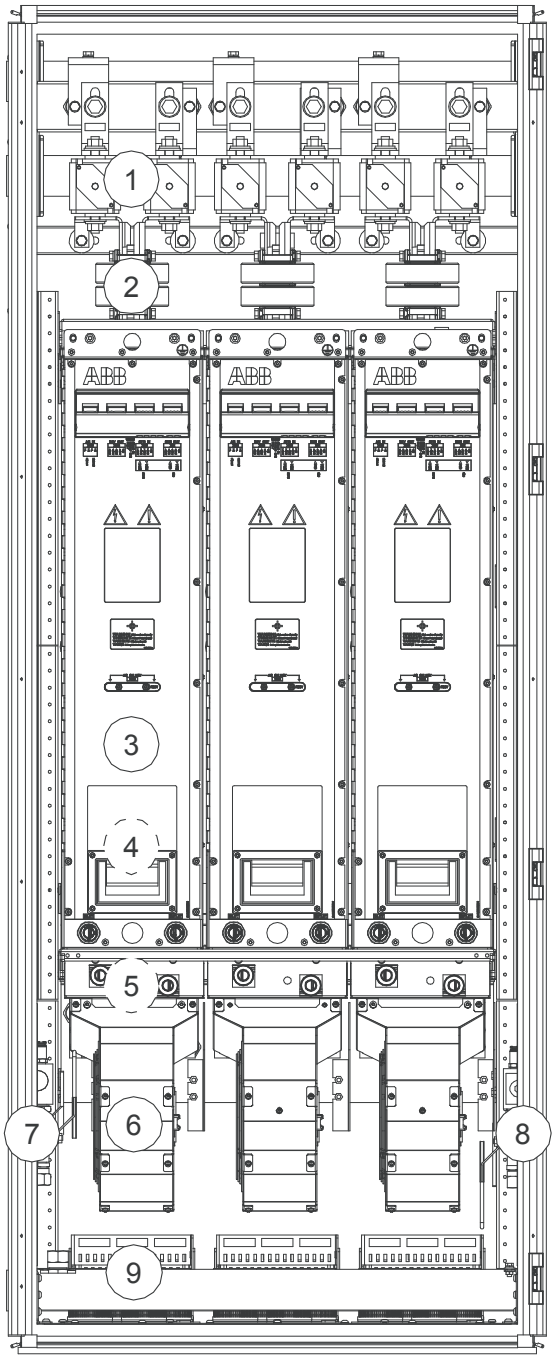


Stage 7: Installation of swing-out frame and shrouding



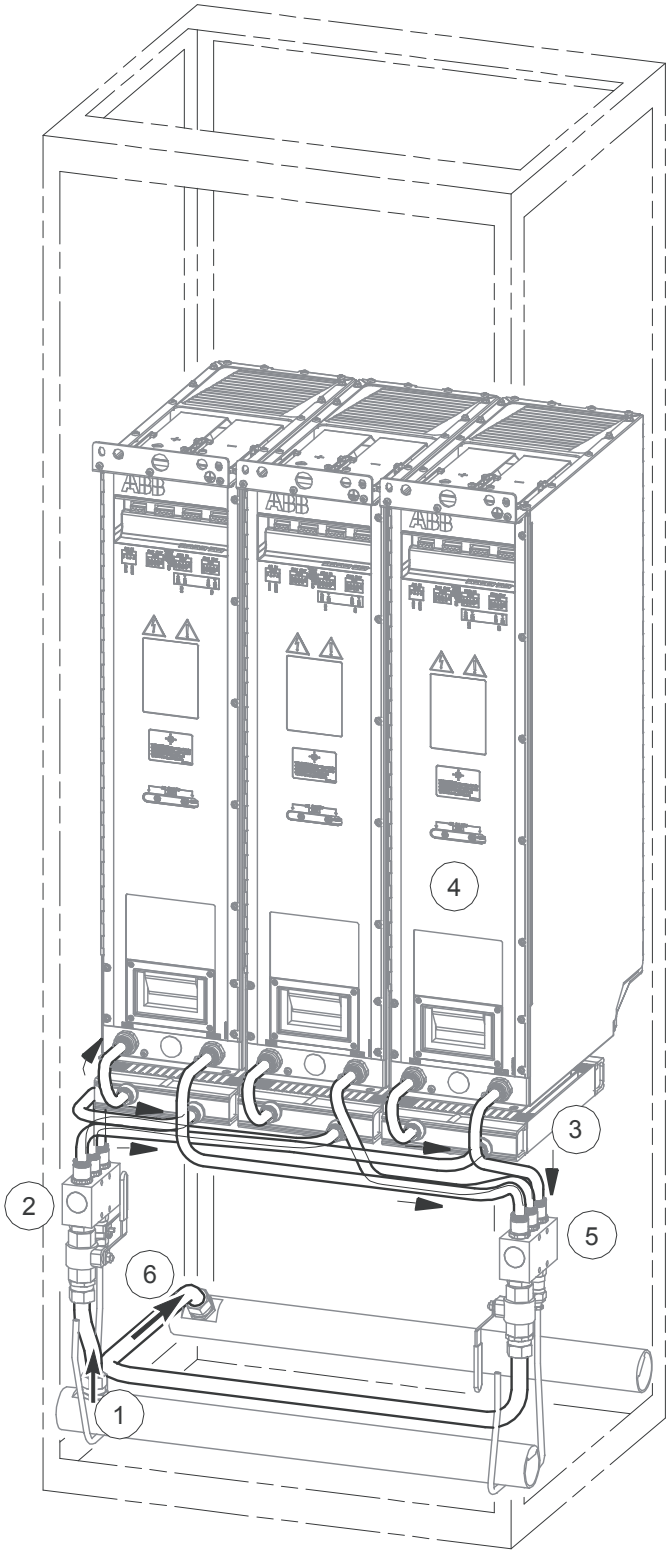
Three R8i modules in a 800 mm wide Rittal VX25 enclosure

Layout drawing



No.	Description
1	DC fuses (DC switch can alternatively be installed)
2	Common mode filters
3	Inverter module
4	Output busbars (located behind the module)
5	Heat exchanger (between module and cooling fan)
6	Cooling fan
7	Inlet manifold with stop and drain valves
8	Outlet manifold with stop and drain valves
9	Cable entries

Pipe routing example

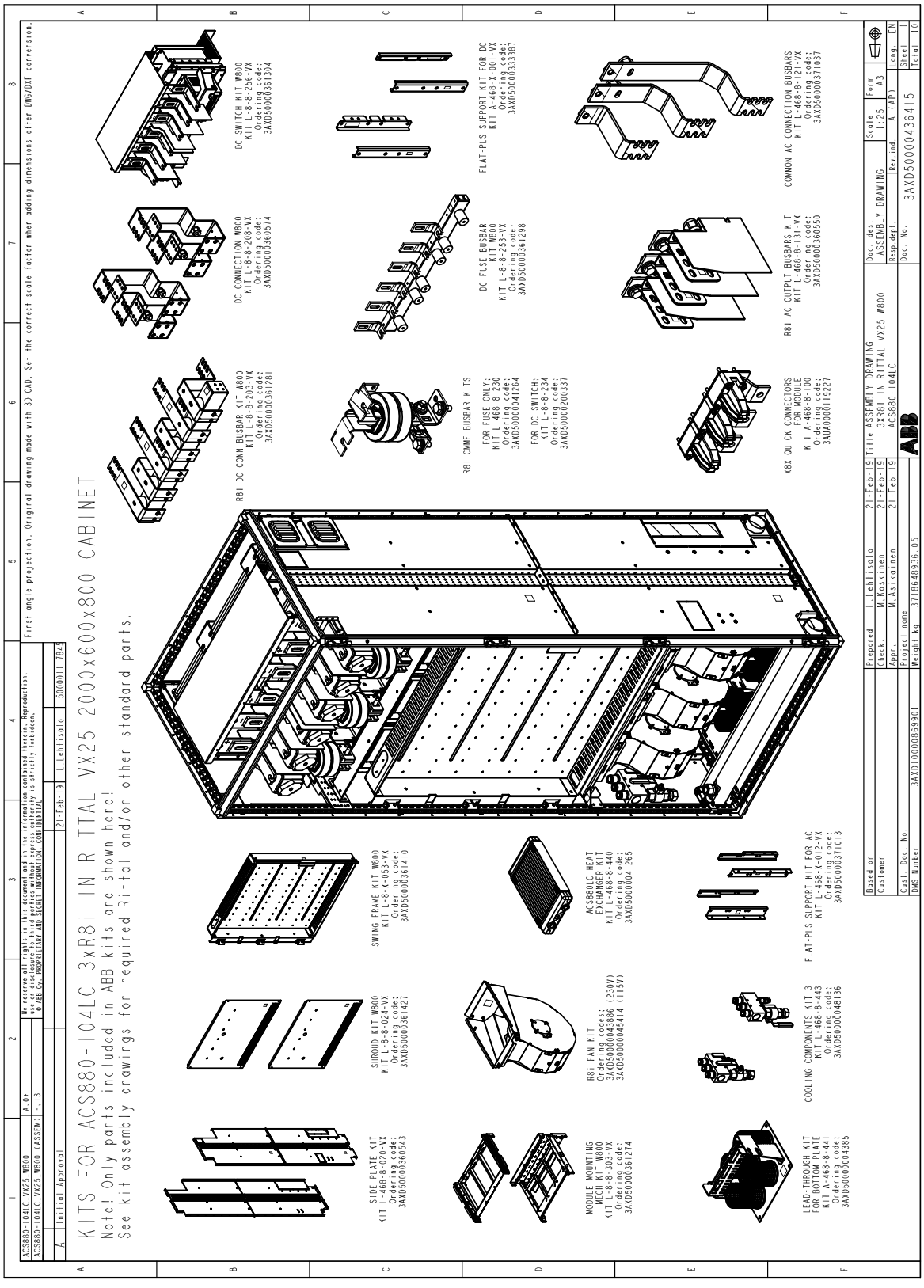


No.	Description
1	Coolant in
2	Inlet manifold with stop and drain valves
3	Heat exchanger
4	Inverter module
5	Outlet manifold with stop and drain valves
6	Coolant out

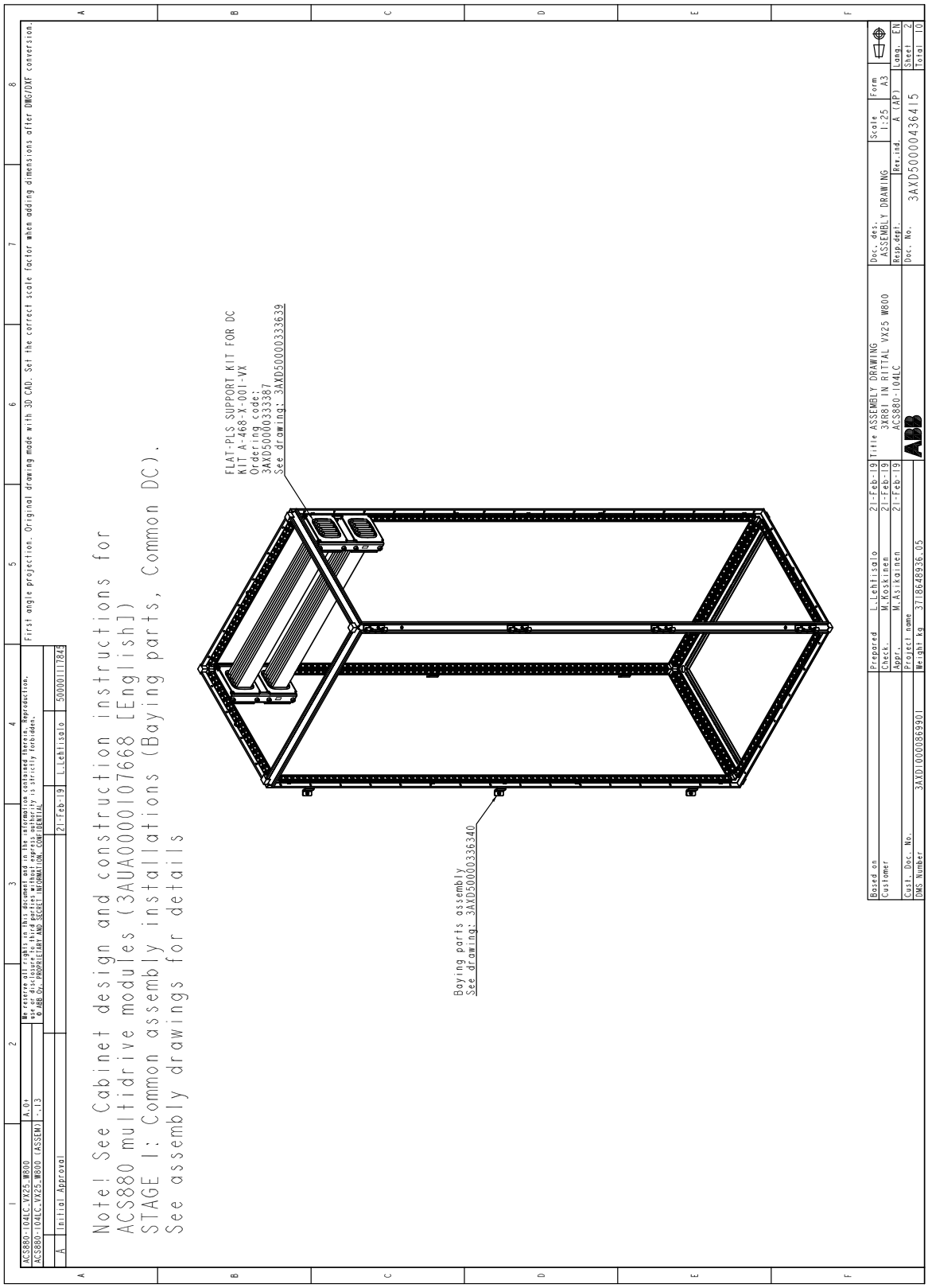
Installation stages

No.	Installation stage	Instruction code	Kit code	Kit ordering code
1	Baying parts	3AXD50000336340	-	-
	DC bus support kit	3AXD50000333639	A-468-X-001-VX	3AXD50000333387
2	Side plates	3AXD50000327591	L-468-8-020-VX	3AXD50000360543
	Module mounting mechanics	3AXD50000329502	L-8-8-303-VX	3AXD50000361274
	Quick connector	-	A-468-8-100	3AUA0000119227
3A	AC output terminals (for cabling)	3AXD50000330874	L-468-8-131-VX	3AXD50000360550
	Cable entry	3AXD50000004817	L-468-8-441	3AXD50000004385
3B	Common AC bus support kit	3AXD50000370870	L-468-X-012-VX	3AXD50000371013
	AC output busbars (for connection to common AC bus)	3AXD50000352791	L-468-8-121-VX	3AXD50000371037
4	Cooling fan	-	-	3AXD50000043886 / 3AXD50000045414
	Heat exchanger	-	L-468-8-440	3AXD50000041265
	Coolant distribution manifolds	3AXD50000048283	L-468-8-443	3AXD50000048136
	PE busbar	-	-	-
5A	DC busbars (for configuration without DC switch)	3AXD50000331567	L-8-8-203-VX	3AXD50000361281
		3AXD50000331765	L-8-8-253-VX	3AXD50000361298
		3AXD50000041311	L-468-8-230	3AXD50000041264
5B	DC switch and busbars	3AXD50000336999	L-8-8-256-VX	3AXD50000361304
		3AXD50000344185	L-8-8-208-VX	3AXD50000360574
		3AXD50000205226	L-8-8-234	3AXD50000200337
6	Module installation	-	-	-
7	Swing-out frame	3AXD50000345106	L-4-X-051-VX	3AXD50000361045
	Shrouding	3AXD50000353354	L-4-8-022-VX	3AXD50000361083

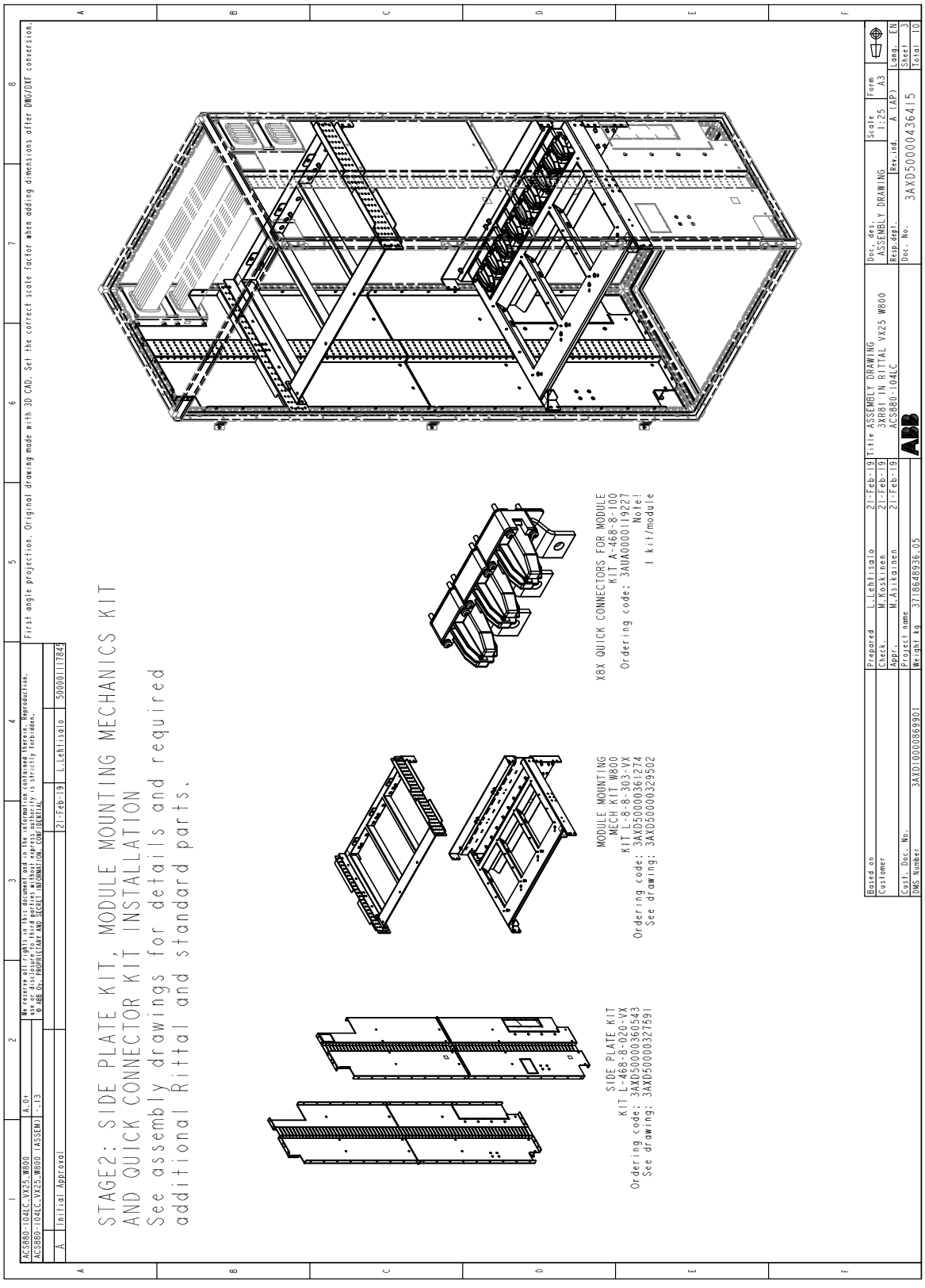
Overview of kits



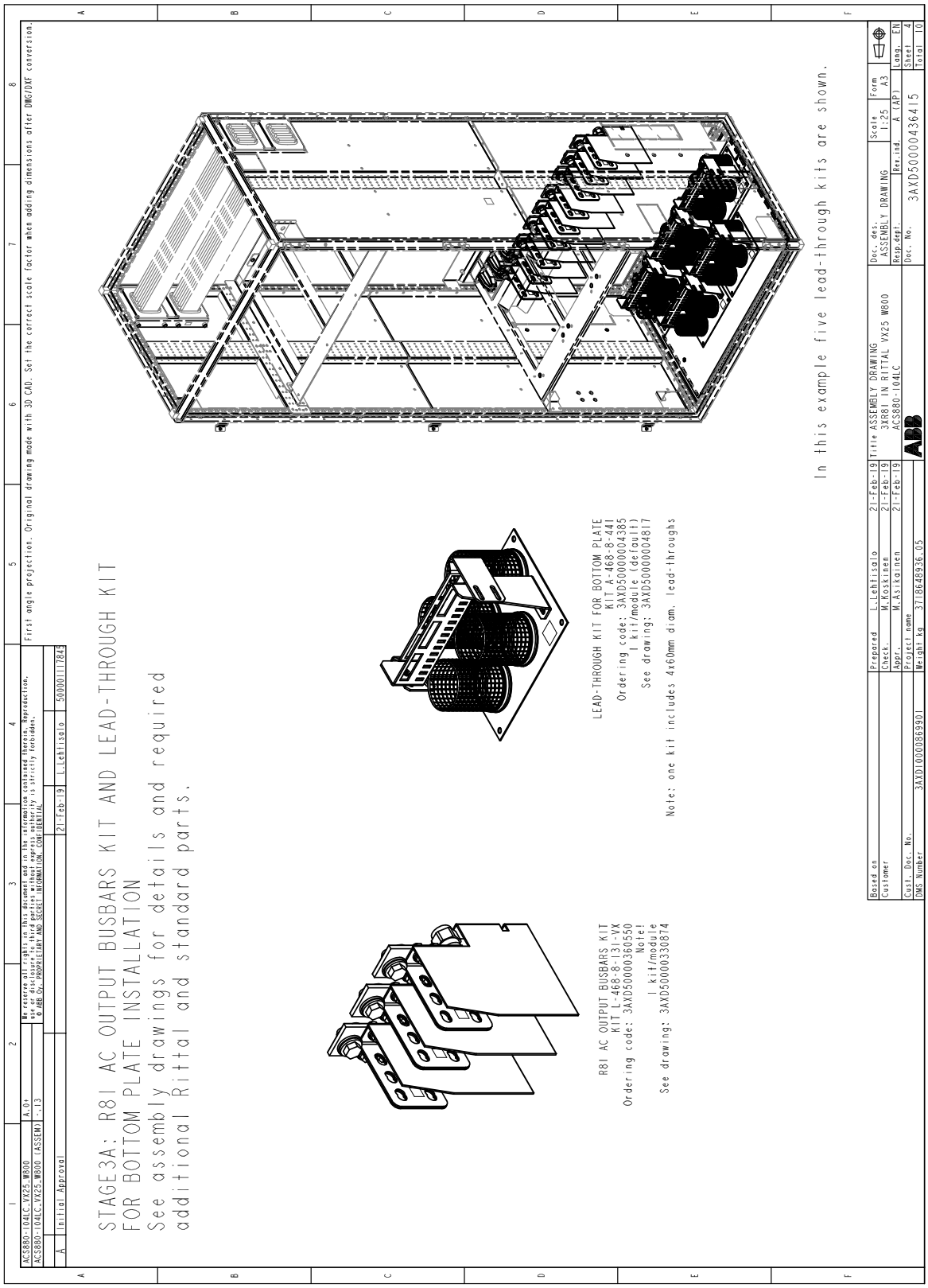
Stage 1: Installation of common parts



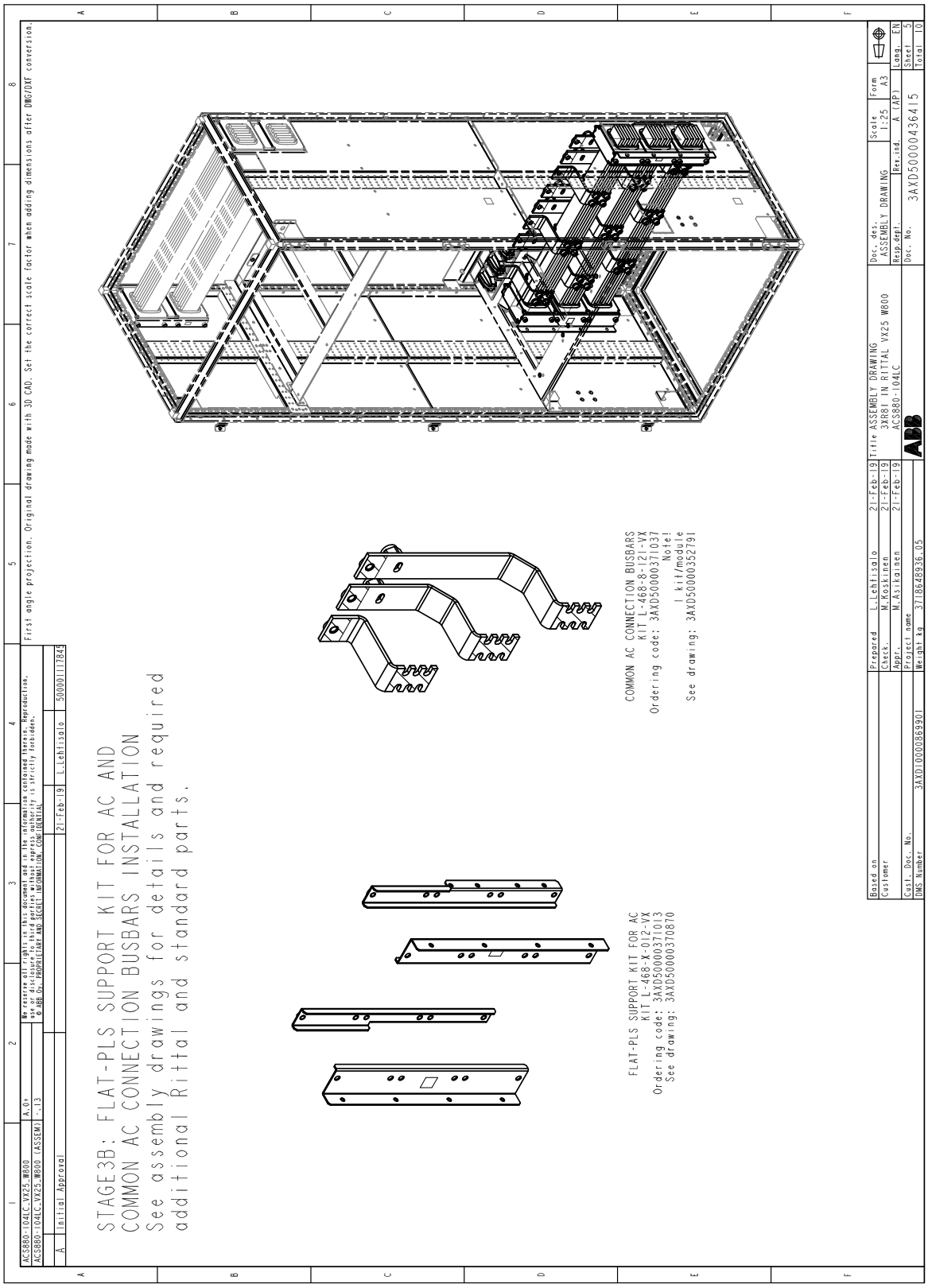
Stage 2: Installation of side plates, module mounting mechanics and quick connector



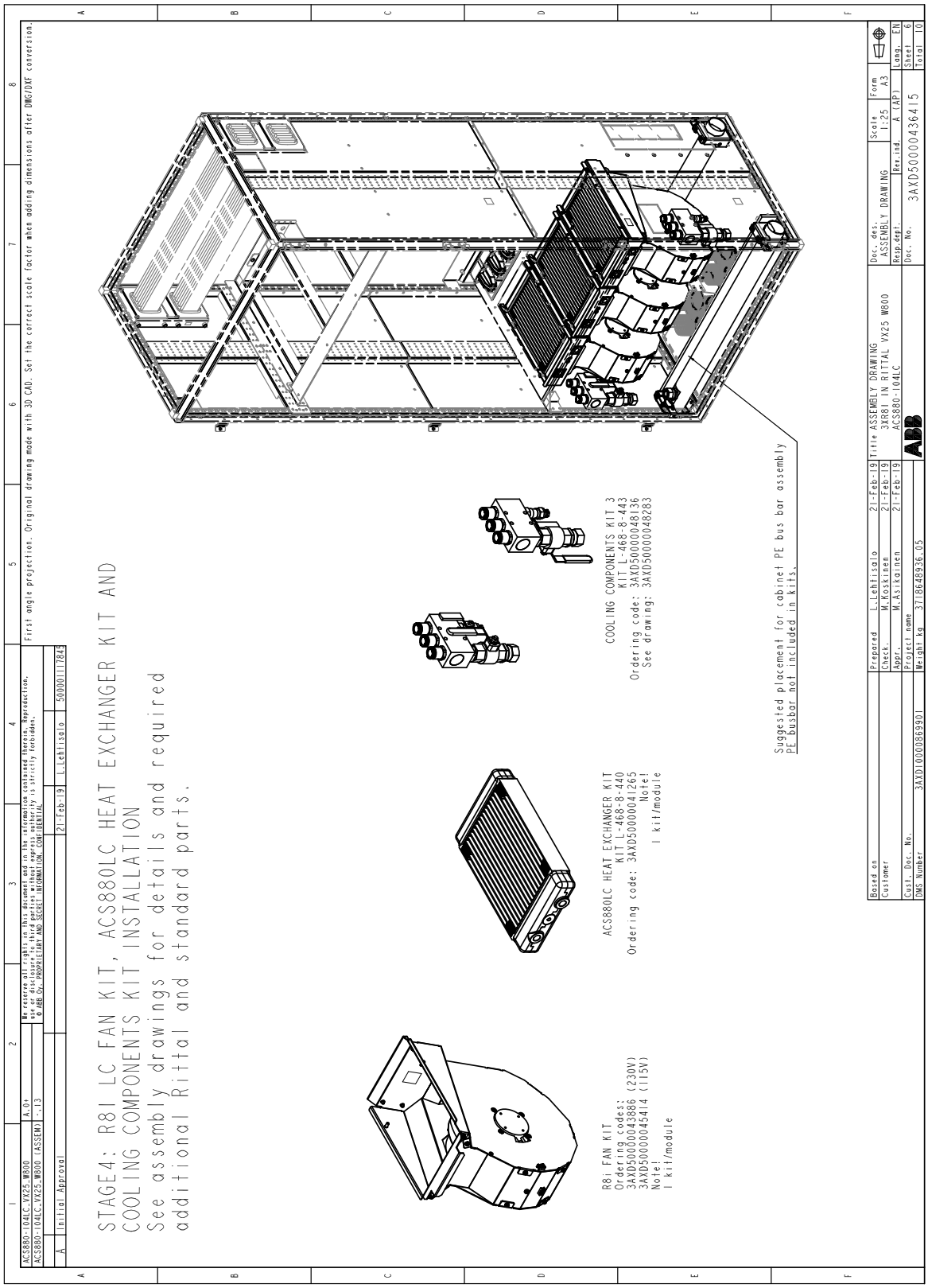
Stage 3A: Installation of output terminals (for cabling) and cable entry



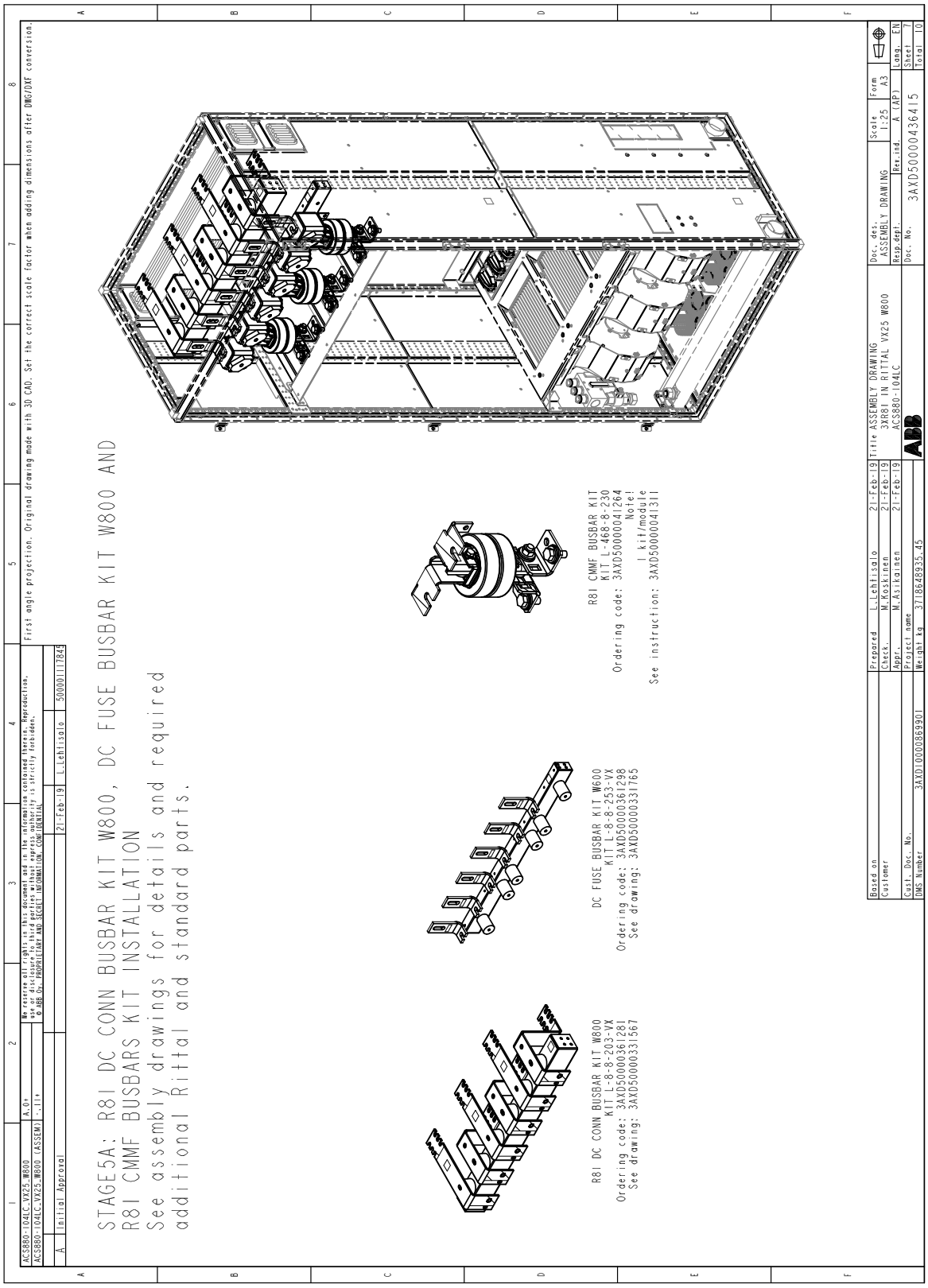
Stage 3B: Installation of AC busbars (for common AC bus)



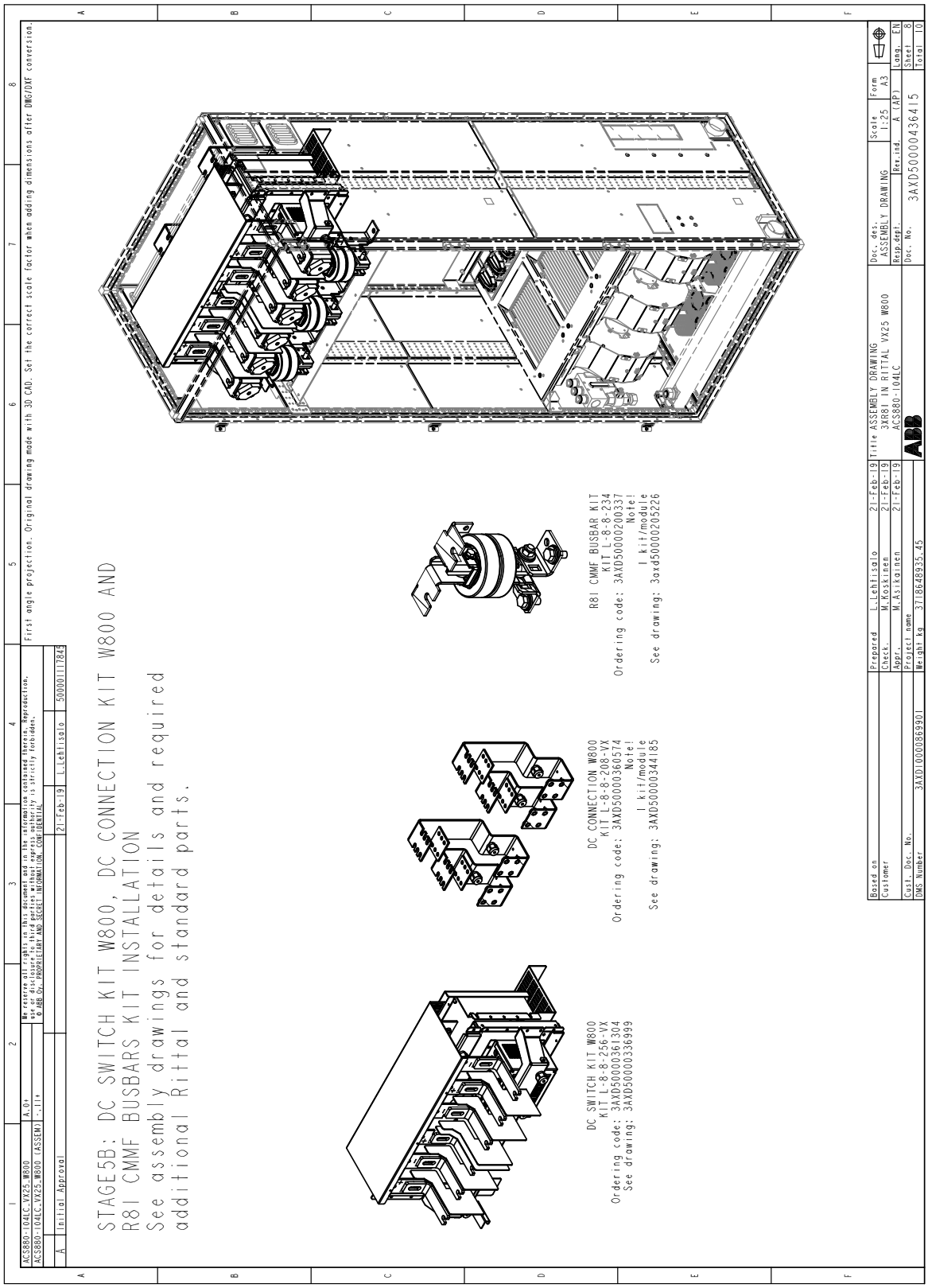
Stage 4: Installation of cooling components



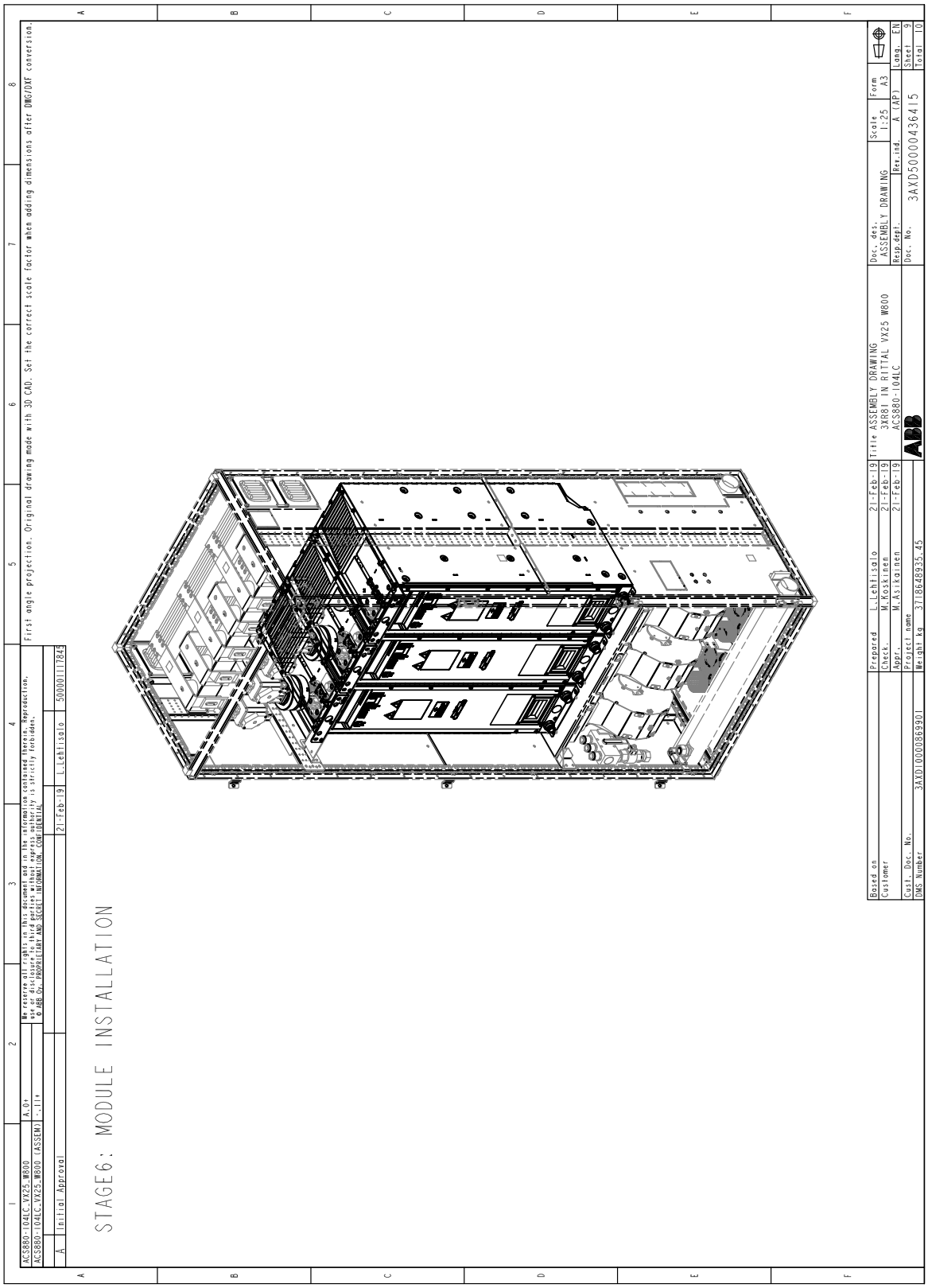
Stage 5A: Installation of DC busbars (units without DC switch)



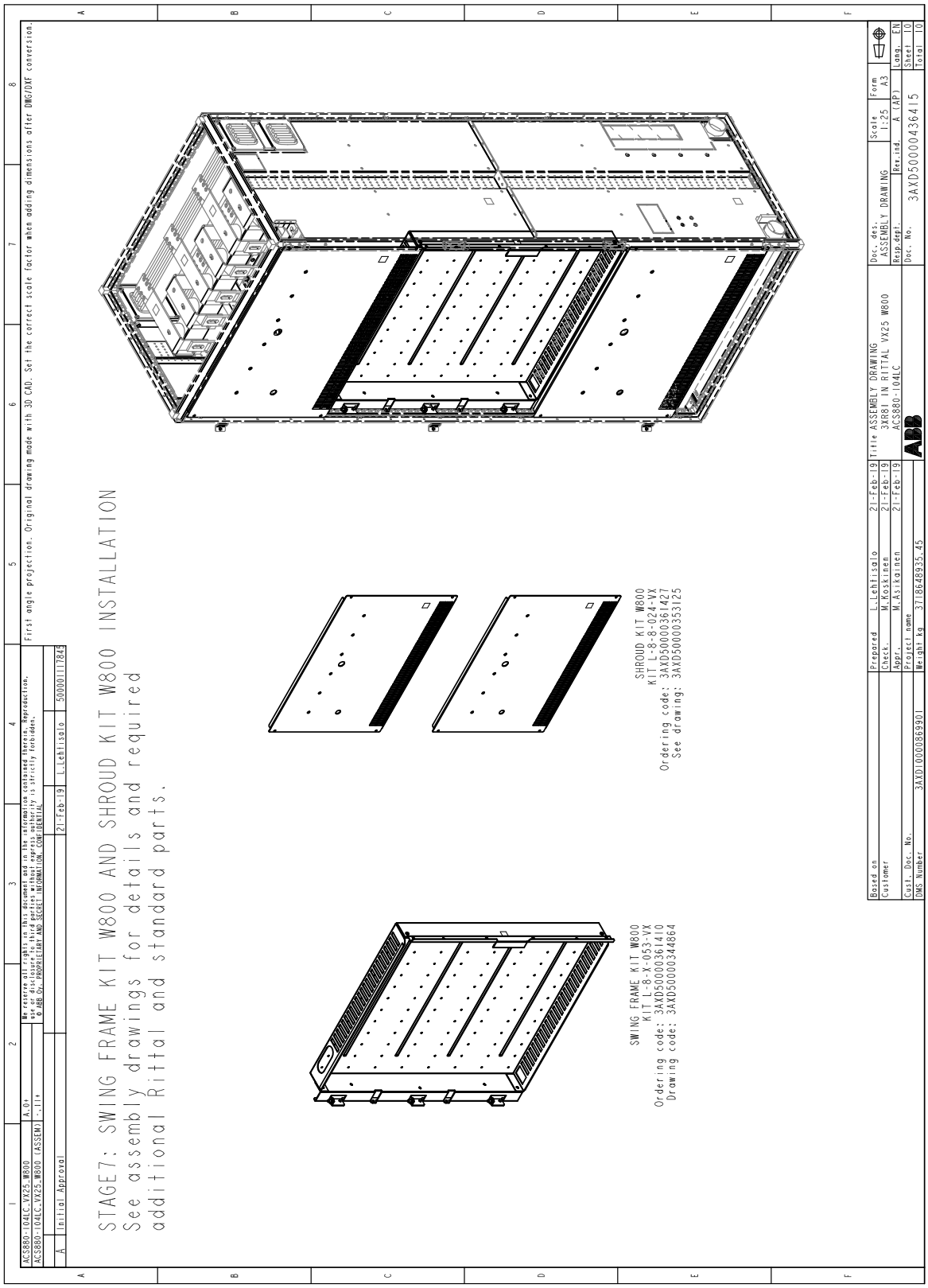
Stage 5B: Installation of DC switch and busbars



Stage 6: Installation of module

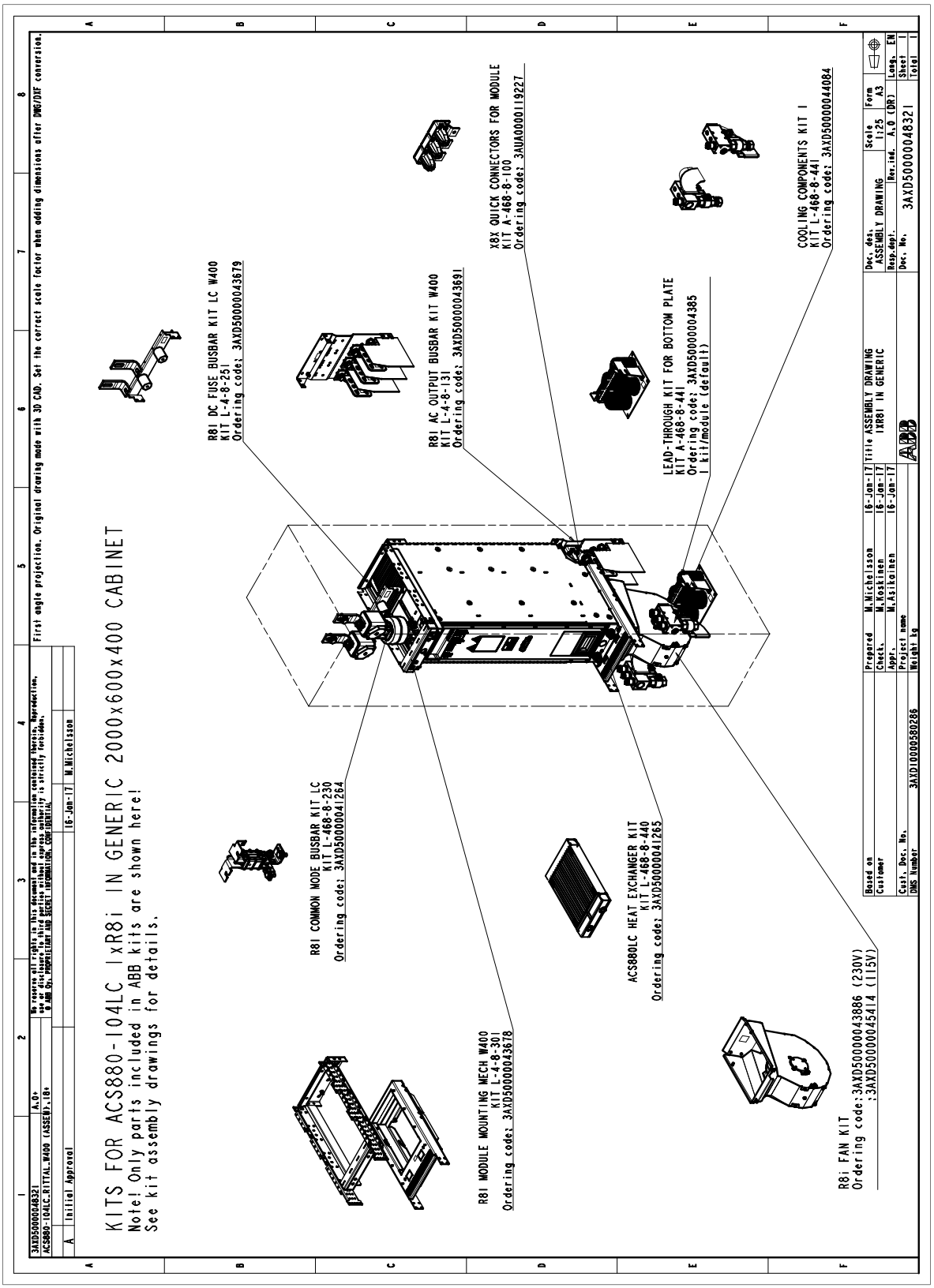


Stage 7: Installation of swing-out frame and shrouding



One R8i module in a 400 mm wide generic enclosure

Parts to be installed	Instruction code	Kit code	Kit ordering code
Bottom plate	3AXD50000004817	A-468-8-441	3AXD50000004385
Cooling component kit	3AXD50000048217	L-468-8-441	3AXD50000044084
AC busbars	3AUA0000118667	A-468-8-100	3AUA0000119227
	3AXD50000043742	L-4-8-131	3AXD50000043691
Module mounting mechanics and cooling components	-	-	3AXD50000043886 / 3AXD50000045414
		L-468-8-440	3AXD50000041265
DC busbars	3AXD50000043729	L-4-8-251	3AXD50000043679
	3AXD50000041311	L-468-8-230	3AXD50000041264
Inverter module	-	-	-
Shrouding	-	-	-


KITS FOR ACS880-104LC 1xR8i IN GENERIC 2000x600x400 CABINET
Note! Only parts included in ABB kits are shown here!
See kit assembly drawings for details.
R8I DC FUSE BUSBAR KIT LC W400
KIT L-4-8-251
Ordering code: 3AXD50000043679
R8I AC OUTPUT BUSBAR KIT W400
KIT L-4-8-131
Ordering code: 3AXD50000043691
X8X QUICK CONNECTORS FOR MODULE
KIT A-468-8-100
Ordering code: 3AUA0000119227
LEAD-THROUGH KIT FOR BOTTOM PLATE
KIT A-468-8-441
Ordering code: 3AXD50000004385
1 kit/module (default)
COOLING COMPONENTS KIT I
KIT L-468-8-441
Ordering code: 3AXD50000044084
R8I COMMON MODE BUSBAR KIT LC
KIT L-468-8-230
Ordering code: 3AXD50000041264
R8I MODULE MOUNTING MECH W400
KIT L-4-8-301
Ordering code: 3AXD50000043678
ACS880LC HEAT EXCHANGER KIT
KIT L-468-8-440
Ordering code: 3AXD50000041265
R8i FAN KIT
Ordering code:3AXD50000043886 (230V)
:3AXD50000045414 (115V)
3AXD50000048321
A.0+
ACS880-104LC_RITTAL_W400 (ASSEM),10+
Initial Approval
16-Jan-17
M.Michelsson
Prepared
Check.
Appr.
Project name
Weight kg
M.Nicholsson
M.Koskinen
M.Asikainen
16-Jan-17
Based on
Customer
Cust. Doc. No.
DMS Number
3AXD10000580286
Title ASSEMBLY DRAWING
1XR8I IN GENERIC
Doc. des.
ASSEMBLY DRAWING
Rep.Appr.
Doc. No.
3AXD50000048321
Scale
1:25
Form
A3
Rev.ind.
A.0 (DR)
Lang.
EN
Sheet
1
Total
1

Two R8i modules in a 600 mm wide generic enclosure

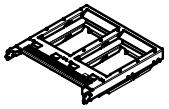
Parts to be installed	Instruction code	Kit code	Kit ordering code
Bottom plate	3AXD50000004817	A-468-8-441	3AXD50000004385
Cooling component kit	3AXD50000048258	L-468-8-442	3AXD50000044182
AC busbars	3AUA0000118667	A-468-8-100	3AUA0000119227
	3AXD50000041888	L-6-8-132	3AXD50000041733
Module mounting mechanics and cooling components	3AXD50000041836	L-6-8-302	3AXD50000041710
	-	-	3AXD50000043886 / 3AXD50000045414
		L-468-8-440	3AXD50000041265
DC busbars	3AXD50000041842	L-6-8-252	3AXD50000041731
	3AXD50000041311	L-468-8-230	3AXD50000041264
Inverter modules	-	-	-
Shrouding	-	-	-

A	Initial Approval	16-Jan-17	M.Michelsson

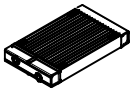
KITS FOR ACS880-104LC 2xR8i IN GENERIC 2000x600x600 CABINET

Note! Only parts included in ABB kits are shown here!
See kit assembly drawings for details.

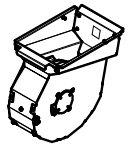
R8I MODULE MOUNTING MECH W600
KIT L-6-8-302
Ordering code: 3AXD50000041710



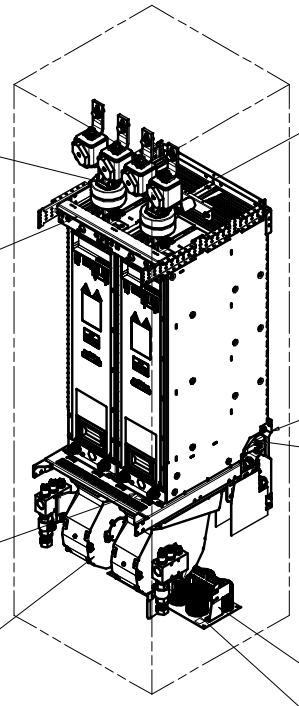
R8I COMMON MODE BUSBAR KIT LC
KIT L-468-8-230
Ordering code: 3AXD50000041264
1 pcs/module

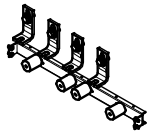


ACS880LC HEAT EXCHANGER KIT
KIT L-468-8-440
Ordering code: 3AXD50000041265
1 pcs/module

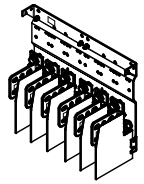


R8i FAN KIT
Ordering code:3AXD50000043886 (230V)
:3AXD50000045414 (115V)





R8I DC FUSE BUSBAR KIT LC W600
KIT L-6-8-252
Ordering code: 3AXD50000041731



R8I AC OUTPUT BUSBAR KIT W600
KIT L-6-8-132
Ordering code: 3AXD50000041733

X8X QUICK CONNECTORS FOR MODULE
KIT A-468-8-100
Ordering code: 3AUA0000119227
1 pcs/module

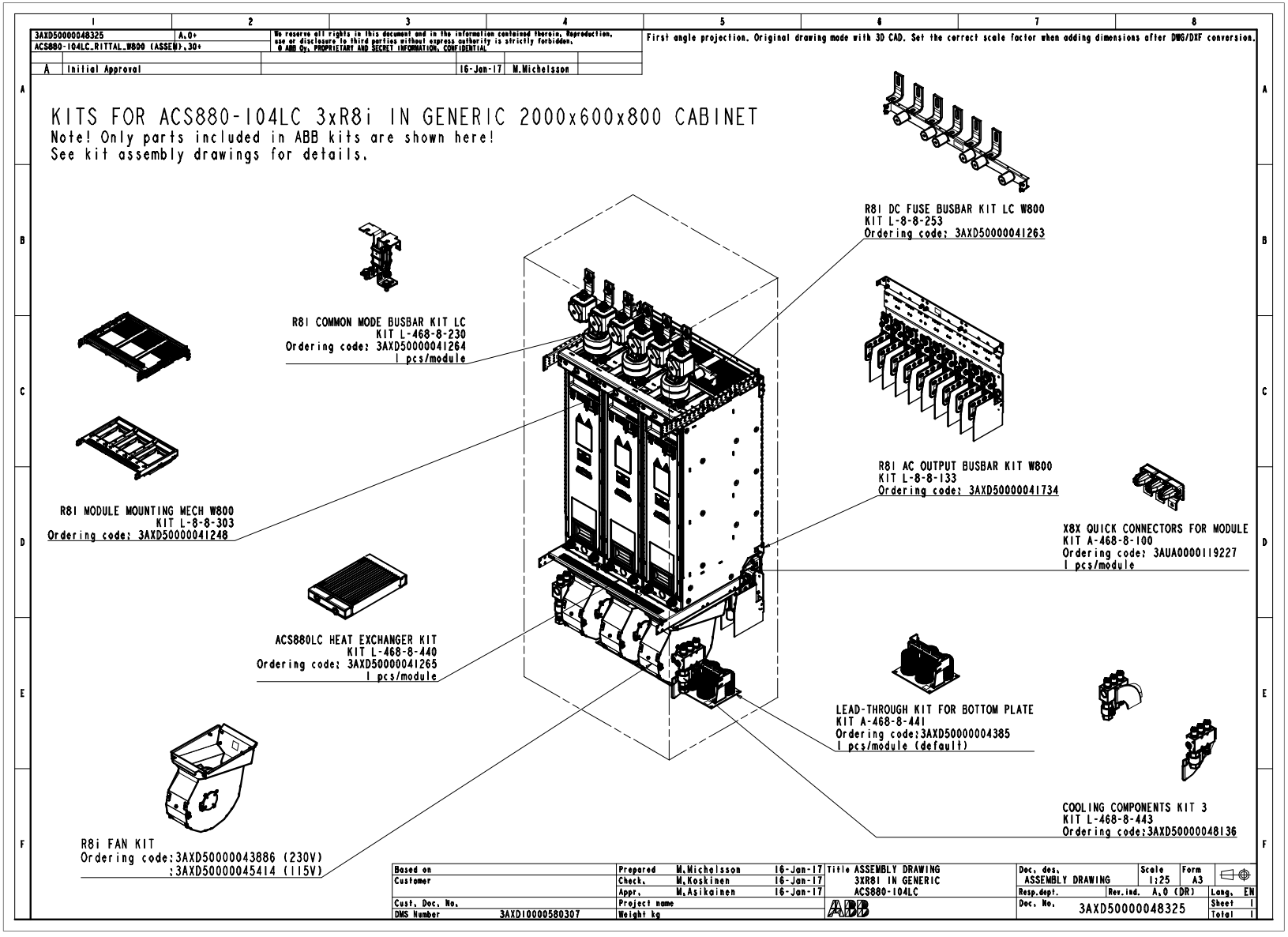
LEAD-THROUGH KIT FOR BOTTOM PLATE
KIT A-468-8-441
Ordering code:3AXD50000004385
1 pcs/module (default)

COOLING COMPONENTS KIT 2
KIT L-468-8-442
Ordering code: 3AXD50000044182

Based on		Prepared	M.Michelsson	16-Jan-17	Title ASSEMBLY DRAWING	Doc. des. ASSEMBLY DRAWING	Scale 1:25 / Form A3
Customer		Check.	M.Koskinen	16-Jan-17	2XR8I IN GENERIC		
		Appr.	M.Asikainen	16-Jan-17	ACS880-104LC	Resp.dept.	Rev.ind. A.0 (DR) / Lang. EN
Cust. Doc. No.		Project name				Doc. No. 3AXD50000048333	Sheet 1
DMS Number	3AXD10000580289	Weight kg					Total 1

Three R8i modules in a 800 mm wide generic enclosure

Parts to be installed	Instruction code	Kit code	Kit ordering code
Bottom plate	3AXD50000004817	A-468-8-441	3AXD50000004385
Cooling component kit	3AXD50000048283	L-468-8-443	3AXD50000048136
AC busbars	3AUA0000118667	A-468-8-100	3AUA0000119227
	3AXD50000041909	L-8-8-133	3AXD50000041734
Module mounting mechanics and cooling components	3AXD50000041461	L-8-8-303	3AXD50000041248
	-	-	3AXD50000043886 / 3AXD50000045414
		L-468-8-440	3AXD50000041265
DC busbars	3AXD50000041448	L-8-8-253	3AXD50000041263
	3AXD50000041311	L-468-8-230	3AXD50000041264
Inverter modules	-	-	-
Shrouding	-	-	-


3AXD50000048325 A.0+
ACS880-104LC_RITTAL_W800 (ASSEM).30+
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First angle projection. Original drawing made with 3D CAD. Set the correct scale factor when adding dimensions after DWG/DXF conversion.
A Initial Approval 16-Jan-17 M.Michelsson
KITS FOR ACS880-104LC 3xR8i IN GENERIC 2000x600x800 CABINET
Note! Only parts included in ABB kits are shown here!
See kit assembly drawings for details.
R8i DC FUSE BUSBAR KIT LC W800
KIT L-8-8-253
Ordering code: 3AXD50000041263
R8i COMMON MODE BUSBAR KIT LC
KIT L-468-8-230
Ordering code: 3AXD50000041264
1 pcs/module
R8i MODULE MOUNTING MECH W800
KIT L-8-8-303
Ordering code: 3AXD50000041248
R8i AC OUTPUT BUSBAR KIT W800
KIT L-8-8-133
Ordering code: 3AXD50000041734
X8X QUICK CONNECTORS FOR MODULE
KIT A-468-8-100
Ordering code: 3AUA0000119227
1 pcs/module
ACS880LC HEAT EXCHANGER KIT
KIT L-468-8-440
Ordering code: 3AXD50000041265
1 pcs/module
LEAD-THROUGH KIT FOR BOTTOM PLATE
KIT A-468-8-441
Ordering code:3AXD50000004385
1 pcs/module (default)
R8i FAN KIT
Ordering code:3AXD50000043886 (230V)
:3AXD50000045414 (115V)
COOLING COMPONENTS KIT 3
KIT L-468-8-443
Ordering code:3AXD50000048136
Based on
Customer
Cust. Doc. No.
DMS Number 3AXD10000580307
Prepared M.Michelsson 16-Jan-17
Check. M.Koskinen 16-Jan-17
Appr. M.Asikainen 16-Jan-17
Project name
Weight kg
Title ASSEMBLY DRAWING
3XR8I IN GENERIC
ACS880-104LC
Doc. des. ASSEMBLY DRAWING
Scale 1:25
Form A3
Resp.dept.
Rev.ind. A.0 (DR)
Lang. EN
Doc. No. 3AXD50000048325
Sheet 1
Total 1

5

Electrical installation

Contents of this chapter

This chapter describes the electrical installation of the modules.

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

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

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

Safety and liability

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

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

Electrical safety precautions

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

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

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

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

1. Keep the cabinet doors closed when the drive is powered. With the doors open, a risk of a potentially fatal electric shock, arc flash or high-energy arc blast exists.
2. Clearly identify the work location and equipment.
3. Disconnect all possible voltage sources. Lock out and tag out.
   - Open the main disconnecting device of the drive.
   - Open the charging switch if present.
   - Open the disconnector of the supply transformer. (The main disconnecting device in the drive cabinet does not disconnect the voltage from the AC input power busbars of the drive cabinet.)
   - If the drive is equipped with a DC/DC converter unit (optional): Open the DC switch/disconnector ([Q11], option +F286) of the DC/DC converter. Open the disconnecting device of the energy storage connected to the DC/DC converter unit (outside the drive cabinet).
   - Open the auxiliary voltage switch-disconnector (if present), and all other possible disconnecting devices that isolate the drive from dangerous voltage sources.
   - In the liquid cooling unit (if present), open the motor protective circuit breaker(s) of the cooling pumps.
   - If you have a permanent magnet motor connected to the drive, disconnect the motor from the drive with a safety switch or by other means.
   - Make sure that re-connection is not possible. Lock out and tag out.
   - 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.
4. Protect any other energized parts in the work location against contact.
5. Take special precautions when close to bare conductors.
6. Measure that the installation is de-energized. If the measurement requires removal or disassembly of shrouding or other cabinet structures, obey the local laws and regulations applicable to live working (including – but not limited to – electric shock and arc protection).
   - Use a multimeter with an impedance greater than 1 Mohm.
   - Make sure that the voltage between the drive input power terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V.
   - Make sure that the voltage between the drive DC busbars (+ and -) and the grounding (PE) busbar is close to 0 V.
   - If you have a permanent magnet motor connected to the drive, 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.

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

General notes

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 drive system

WARNING!
Do not make 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.

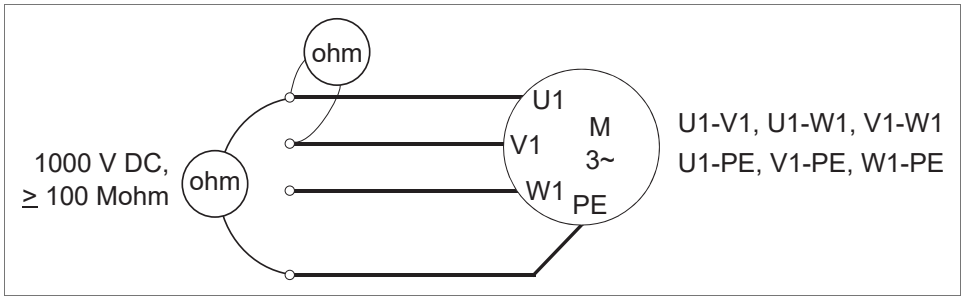
Checking the insulation of the motor and motor cable

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 electrician, do not do installation or maintenance work.

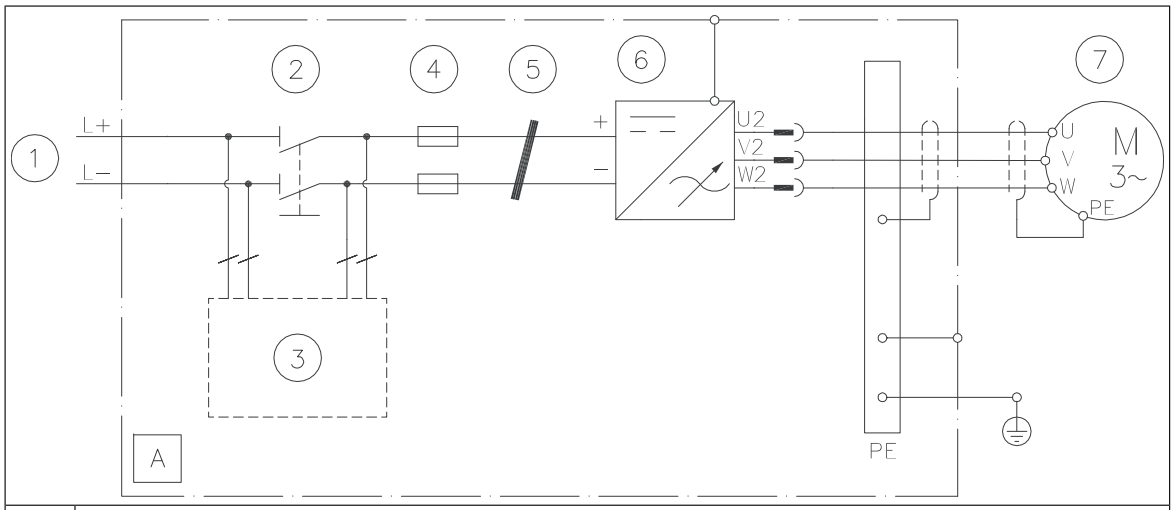
1. Stop the drive and do the steps in section *Electrical safety precautions (page 82)* before you start the work.
2. Check that the motor cable is disconnected from the drive output terminals.
3. Measure the insulation resistance between the phase conductors and then between each phase conductor and the Protective Earth conductor. Use a measuring voltage of 1000 V DC. The insulation resistance of an ABB motor must exceed 100 Mohm (reference value at 25 °C [77 °F]). For the insulation resistance of other motors, consult the manufacturer’s instructions.

Note:
Moisture inside the motor casing reduces the insulation resistance. If moisture is suspected, dry the motor and repeat the measurement.



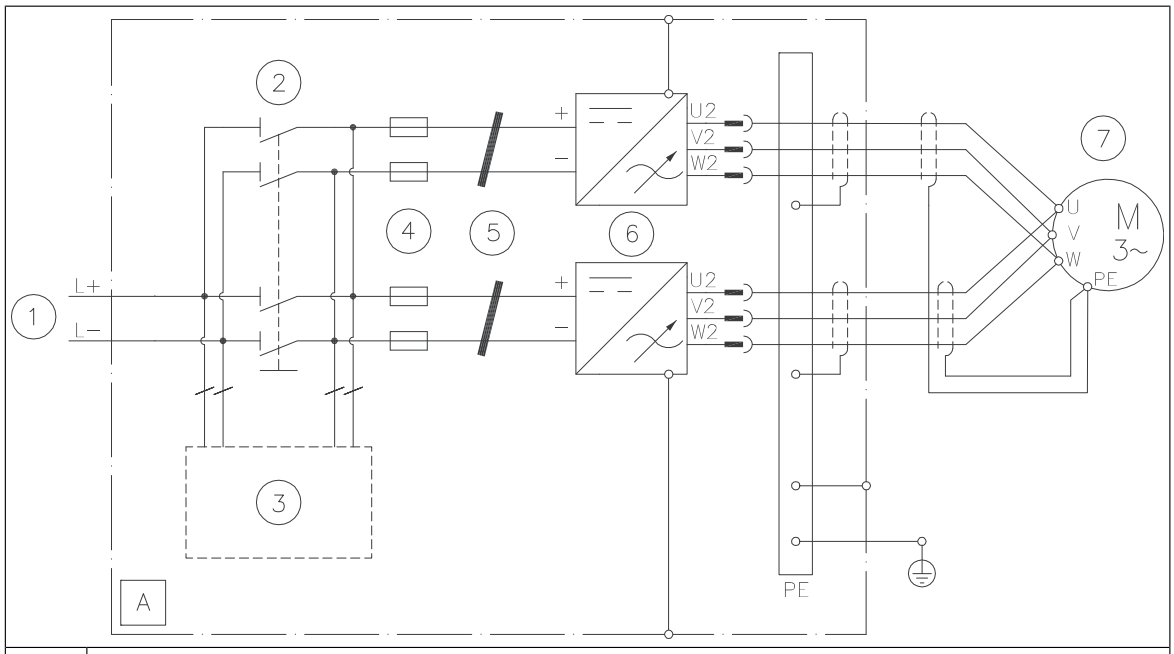
Power connections - Frame R8i

R8i inverter module



A	Inverter cubicle
1	DC supply
2	DC switch/disconnector
3	Charging circuit (fuses, resistors, charging controller)
4	DC fuses
5	Common mode filter
6	Inverter module
7	Motor

2×R8i inverter unit



A	Inverter cubicle
1	DC supply
2	DC switch/disconnector
3	Charging circuit (fuses, resistors, charging controller)
4	DC fuses
5	Common mode filters
6	Inverter modules
7	Motor

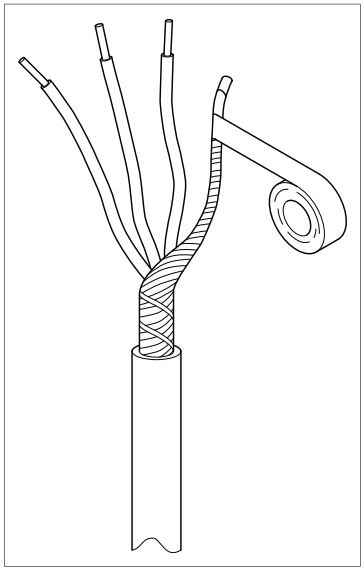
Connection procedure

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.

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

   Note:
   - If the cabinet frame is painted (such as with Rittal enclosures), it is important to make sure that a good galvanic connection to ground (PE busbar) is achieved. You can, for example, remove the paint from the connection points and use star washers.
   - The connection to ground merely through the mounting screws and the cabinet chassis is not always good enough. To ensure the continuity of the protective bonding circuit, you can connect the modules to the cabinet PE busbar with a copper busbar or cable. The inductance and impedance of the PE conductor must be rated according to permissible touch voltage appearing under fault conditions (so that the fault point voltage will not rise excessively when a ground fault occurs).
     See *Electrical planning instructions for ACS880 liquid-cooled multidrive cabinets and modules* [3AXD50000048634 (English)].

2. Run the output (motor) cable into the cubicle through a cable gland or grommet. 360° grounding of the cable shield is recommended to suppress interference. In case a grounding cable gland is available, remove the outer jacket of the cable where it passes through the cable gland.
3. Cut the output cable to suitable length and strip the ends of the individual conductors.
4. Twist the shield strands of the output cable together to form a separate conductor and wrap tape around it as shown.

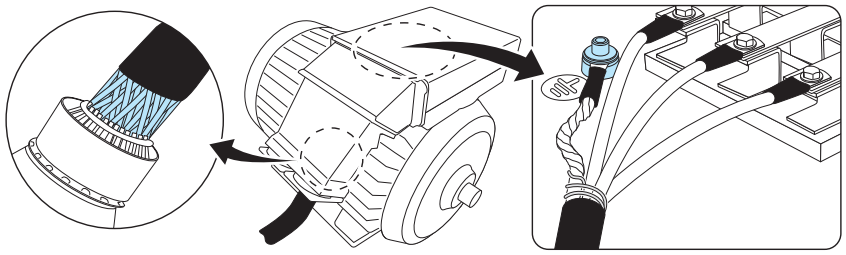


5. Crimp suitable cable lugs to the conductors as well as the twisted shield. Connect the phase conductors to the output busbars. Connect the cable shield to a PE busbar.

6. Secure the cables inside and outside the cabinet mechanically.
7. Tighten the cable gland if present.

Grounding the motor cable shield at the motor end

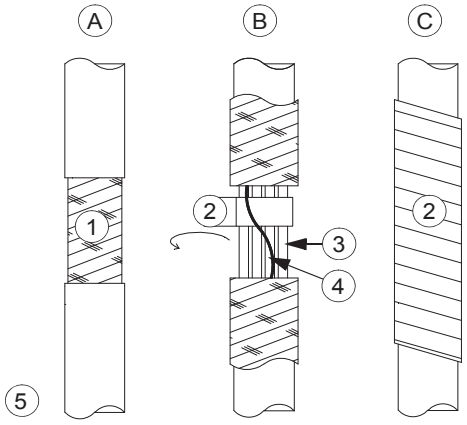
For minimum radio-frequency interference, ground the cable shield 360 degrees at the cable entry of the motor terminal box.



Connecting the control cables - All frame sizes

For technical data and default I/O connections of the inverter control unit, refer to chapter Control unit.

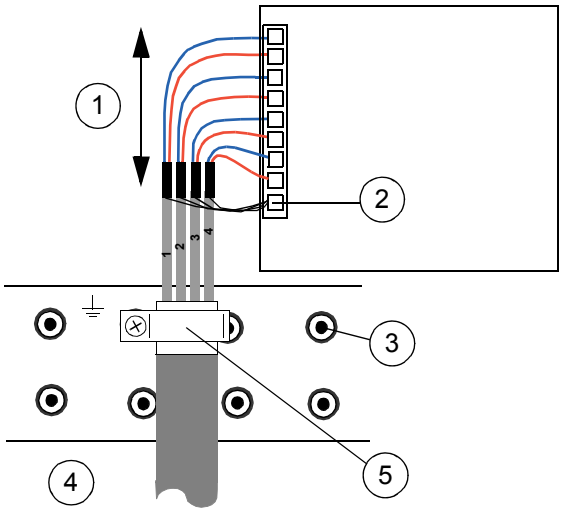
1. In the cabinet, remove shrouding wherever necessary to allow access to the cable entries and any trunking inside the cubicle.
2. Run the control cables into the cubicle. If possible, arrange for a 360° grounding of the cable shield at the cable entry.
   If the outer surface of the shield is non-conductive,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



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

3. Run the cables to the control unit of the inverter (or other connection point) using cable trunking wherever possible.
4. (Only when running the cable to the inverter module) The inverter control units have a clamp plate attached. Remove the outer sheathing of the cable at one of the clamps on the plate. Tighten the clamp onto the bare cable shield.
5. Cut the cables to suitable length.

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



1	Keep as short as possible
2	SHIELD*
3	If no dedicated “shield” connector is provided, ground the inner cable shields to the chassis.
4	At the other end of the cable, leave the shield unconnected, or connect it to ground via a capacitor with a value of a few nanofarads.
5	Where grounding clamps are not available, twist the shield strands into a bundle, crimp a lug terminal onto it and fasten the lug to the chassis. Secure the cable into place with eg. cable ties.

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

Installing optional modules

Installation of I/O extension and fieldbus adapter modules

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

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

1. Repeat the steps described in section *Electrical safety precautions (page 82)*.
2. Ensure by measuring that the I/O terminals of the control unit (especially the relay output terminals) are safe.
3. Insert the module into a free option module slot on the control unit.
4. Fasten the module. For instructions, see the documentation of the optional module.
5. Connect the necessary wiring to the module following the instructions given in the documentation of the module.
6. Tighten the grounding screw to a torque of 0.8 N·m.

   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.

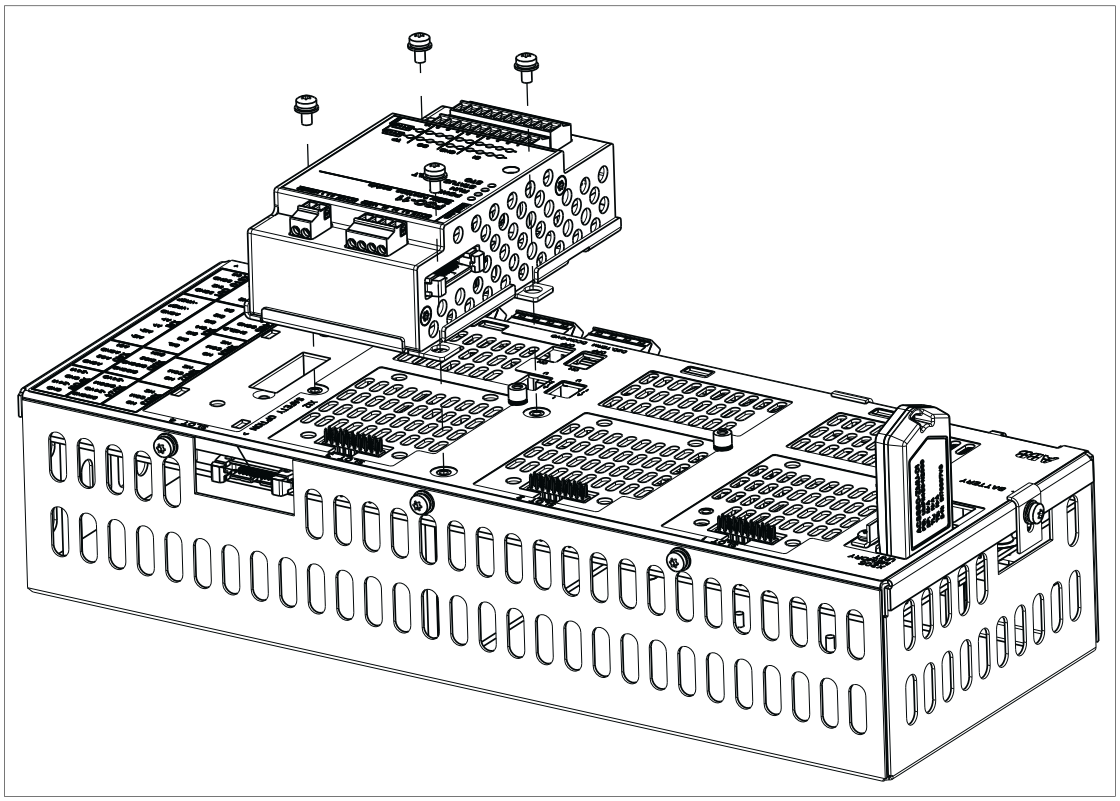
Installation of an FSO-xx safety functions module

Installation of an FSO-xx safety functions module onto BCU

WARNING!
Read the safety instructions given in *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048633 [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.)

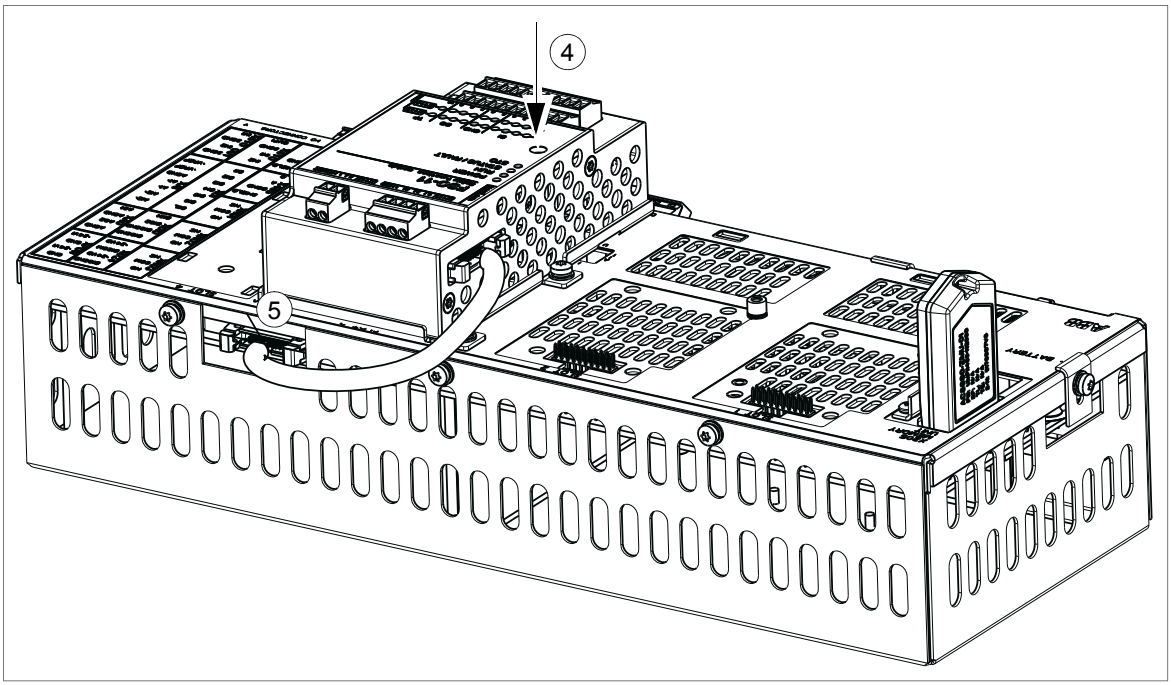
1. Stop the inverter unit and do the steps in section *Electrical safety precautions (page 82)* before you start the work.
2. The FSO-xx comes with alternative bottom plates for mounting on different units. For mounting on the BCU, the mounting points should be located at the long edges of the module 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.

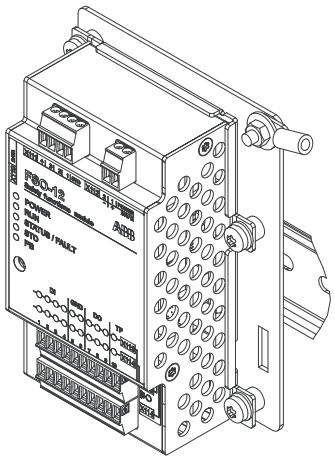


Installation of FSO-xx beside the control unit

To reserve the slots of the control unit for other modules, you can install the FSO-xx separate from the control unit using mounting kit 3AXD50000025495. The kit contains the parts for mounting the FSO-xx either onto a DIN rail nearby the control unit. The kit also contains longer cables for connecting the FSO-xx to the control unit.

Refer to instruction 3AXD50000025583 for installation details.

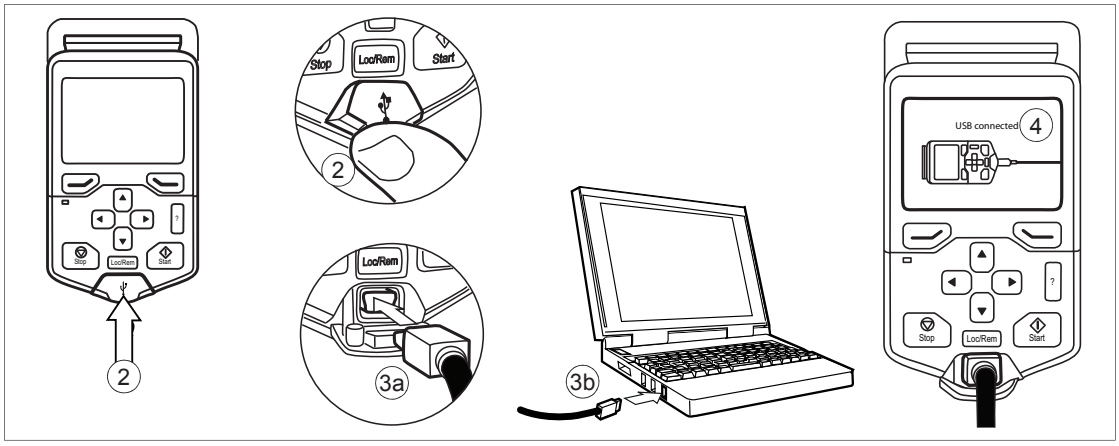
Mounting on DIN rail



Connecting a PC

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

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



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

Panel bus (Control of several inverter 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.

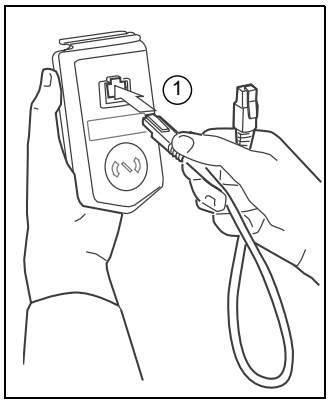
- With drives that have the panel mounted on the front cover, move the terminating switch into the outer position.
- With an FDPI-02 module, move termination switch S2 into the TERMINATED position.

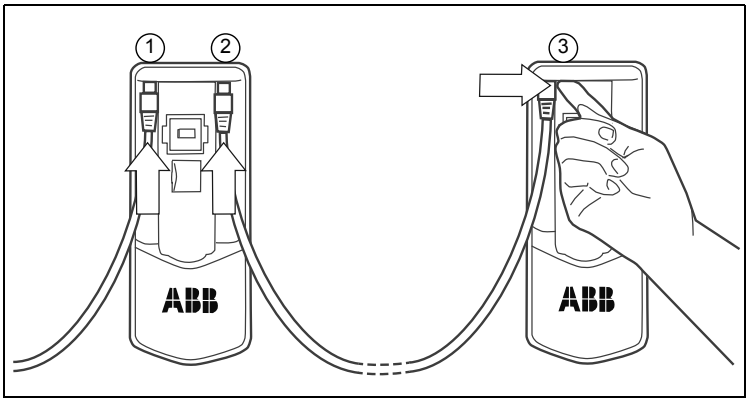
Make sure that bus termination is off on all other drives.

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.

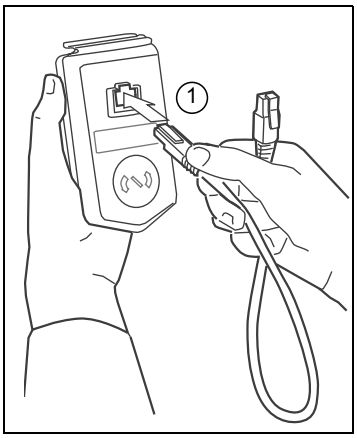
If a PC is connected to the control panel, the drives on the panel bus are automatically displayed in the Drive composer tool.

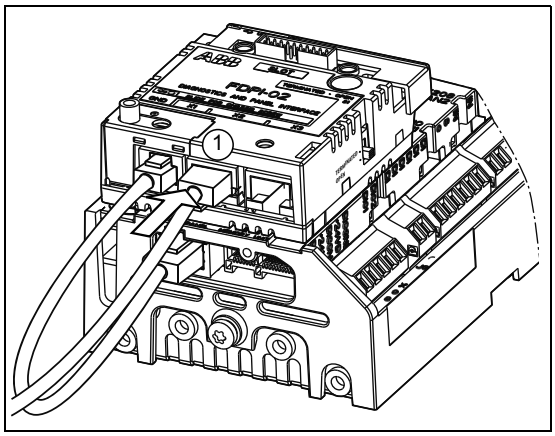
With twin connectors in the control panel holder:

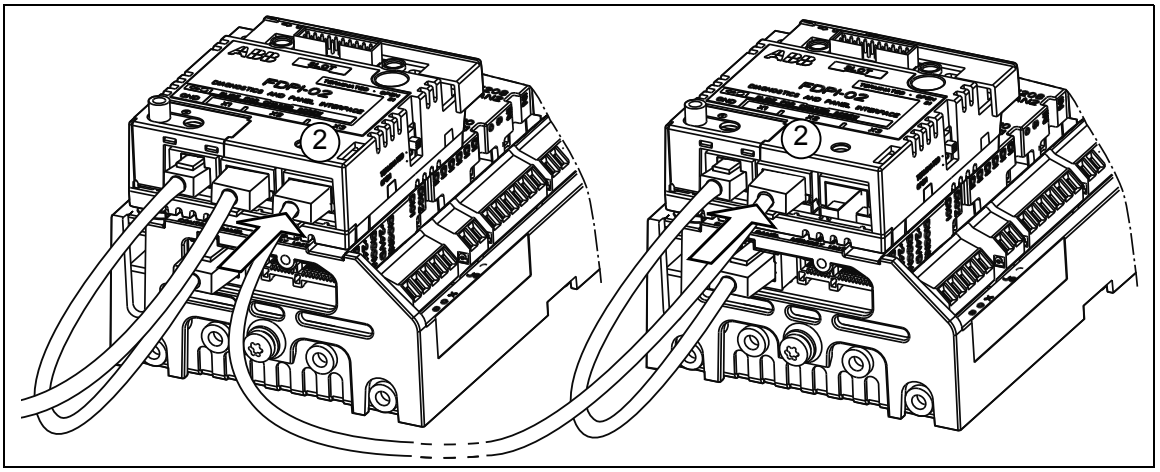


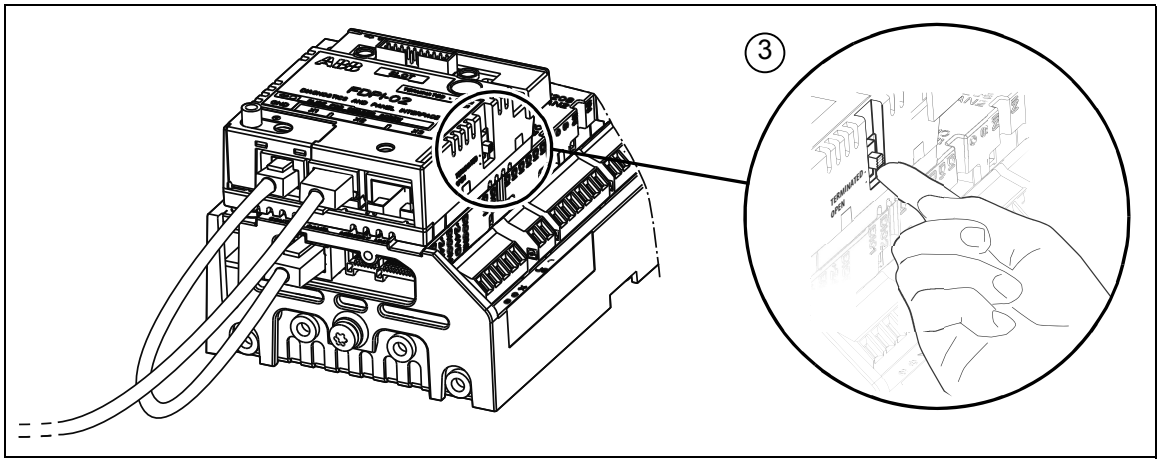


With FDPI-02 modules:









6

Installation checklist of the drive

Contents of this chapter

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

Checklist

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

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

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

WARNING!
Stop the drive and do the steps in section *Electrical safety precautions (page 82)* before you start the work.

Make sure that …	☑
The ambient operating conditions meet the drive ambient conditions specification, and enclosure rating (IP code or UL enclosure type).	☐
The supply voltage matches the nominal input voltage of the drive. See the type designation label.	☐
The drive cabinet has been attached to floor, and if necessary due to vibration etc, also by its top to the wall or roof.	☐
If the drive is connected to a network other than a symetrically grounded TN-S system: Check the compatibility. See the electrical installation instructions in the supply unit manual.	☐
The enclosures of the equipment in the cabinet have proper galvanic connection to the cabinet protective earth (ground) busbar; The connection surfaces at the fastening points are bare (unpainted) and the connections are tight, or separate grounding conductors have been installed.	☐

Make sure that …	☑
The main circuit connections inside the drive cabinet correspond to the circuit diagrams.	☐
The control unit has been connected. See the circuit diagrams.	☐
Appropriate AC fuses and main disconnector have been installed.	☐
There is an adequately sized protective earth (ground) conductor between the drive and the switchboard, the conductor has been connected to appropriate terminal, and the terminal has been tightened to the proper torque. Proper grounding has also been measured according to the regulations.	☐
The input power cable has been connected to the appropriate terminals, the phase order is right, and the terminals have been tightened to the proper torque.	☐
There is an adequately sized protective earth (ground) conductor between the motor and the drive, and the conductor has been connected to appropriate terminal, and the terminal has been tightened to the proper torque. (Pull on the conductors to check.). Proper grounding has also been measured according to the regulations.	☐
The motor cable has been connected to the appropriate terminals, the phase order is right, and the terminals have been tightened to the proper torque.	☐
The motor cable has been routed away from other cables.	☐
No power factor compensation capacitors have been connected to the motor cable.	☐
The control cables have been connected to the appropriate terminals, and the terminals have been tightened to the proper torque.	☐
If a drive bypass connection will be used: The direct-on-line contactor of the motor and the drive output contactor are either mechanically and/or electrically interlocked, ie, cannot be closed simultaneously. A thermal overload device must be used for protection when bypassing the drive. Refer to local codes and regulations.	☐
There are no tools, foreign objects or dust from drilling inside the drive.	☐
Cover(s) of the motor connection box are in place. Cabinet shrouds are in place and doors are closed.	☐
The motor and the driven equipment are ready for start.	☐
The coolant connections between cubicles (if any) and to the cooling circuit are tight.	☐
If the drive is equipped with a cooling unit: Refer to the cooling unit documentation for specific tasks.	☐

7

Start-up

Contents of this chapter

This chapter contains the start-up procedure of the inverter.

Note:
These instructions do not cover all possible cabinet constructions. 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. Read the complete safety instructions and repeat the steps described in section Electrical safety precautions. The complete safety instructions are 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.

Note:
The customer is fully responsible for implementing and testing the functional safety circuits according to the relevant legislation and acceptance testing regulations. The functional safety option manuals give examples on implementing the safety circuits in ACS880 multidrives. For information on the Safe torque off functions, see chapter The Safe torque off function.

Start-up procedure

Tasks	☑
Safety	
WARNING! Obey the safety instructions during the start-up procedure. See *Safety instructions for ACS880 multidrive cabinets and modules* (3AUA0000102301 [English]) and section Electrical safety precautions.	☐
Checks/Settings with no voltage connected	
Check the mechanical and electrical installation. See Installation checklist.	☐
Make sure that the insulation resistance of the assembly has been checked. See Checking the insulation of the assembly.	☐
The supply unit of the drive system has been set up according to the instructions in its manuals.	☐
The supply unit is off, and the drive system has been isolated from the supply network.	☐
Check that any circuit breakers and protection switches in the cooling fan supply circuit are closed. Refer to the circuit diagrams.	☐
Check the following data for each inverter unit and note down any deviations from delivery documents.	
• Motor, pulse encoder and cooling fan rating plate data correspond to the values in the motor list.	☐
• Motor temperature method: Pt100, PTC, KTY84, other?	☐
• Motor fan of separately ventilated motors. Check the current, the overcurrent protection setting and the functioning of the fan output control circuit.	☐
• Direction of motor rotation.	☐
• Maximum and minimum speeds, fixed speeds.	☐
• Speed scaling factor, gear ratio, roll diameter, etc.	☐
• Acceleration and deceleration times.	☐
• Inertia compensation.	☐
• Operating modes, stop mode, emergency stop mode, etc.	☐
Starting and checking the cooling system	
Fill up and bleed the internal cooling circuit. Start the cooling unit up. See section Filling up and bleeding the internal cooling circuit.	☐
Check the cooling system for leaks. Make sure that cooling circuit joints at the shipping split joining cubicles are tight and that all drain valves have been closed.	☐
Make sure that the coolant can flow freely in all cubicles. Make sure that the drive system cools down.	☐
Connecting voltage to the auxiliary circuits	
Disconnect any auxiliary voltage (230 or 115 V AC) cables that lead from the terminal blocks to the outside of the equipment and have not yet been checked. Also disconnect any uncompleted wiring.	☐
Disconnect the communication link between the drive system and any overriding system.	☐
Make sure the main contactor/breaker cannot be switched on inadvertently by remote control.	☐

Tasks	☑
Be ready to trip the main breaker of the supply transformer in case something abnormal occurs.	☐
Ensure all cabinet doors are closed.	☐
Close the main breaker of the supply transformer. This will energize the input terminals of the drive system.	☐
Close the auxiliary voltage switch (if present).	☐
Checks with auxiliary voltage connected	
Check that the cooling fans rotate freely in the right direction, and the air flows upwards. **Note:** Depending on the wiring of the drive system, it may be necessary to have the supply unit powered before the fans are started. If so, check the cooling fans after powering the supply unit.	☐
Set the parameters for each inverter unit. Refer to the firmware manual and/or start-up guide of the control program. You can also use the start-up assistant if available in the particular control program. In addition to the parameter settings required by the application, make the following settings:	
• Set *31.23 Wiring or earth fault* to “No action”.	☐
• Set *95.04 Control board supply* according to how the inverter control unit is powered.	☐
• Edit *95.09 Fuse switch control* if necessary (ie. with R8i modules without a DC switch/disconnector and charging controller).	☐
• With parallel-connected R8i modules, select the inverter unit type in parameter *95.31 Parallel type configuration*. You can filter the list using parameter *95.30*.	☐
• Reboot the control unit either by cycling the power, or by parameter *96.08 Control board boot*.	☐
Powering up the inverter unit	
Close the cabinet doors.	☐
Make sure that it is safe to connect voltage to the drive system. Ensure that: • nobody is working on the unit or circuits that have been wired from outside into the cabinets • cover of the motor terminal box is on.	☐
Close the main disconnecting device of the drive system. **WARNING!** When connecting voltage to the supply unit, the DC busbars will become live, as will all the inverters connected to the DC bus. **WARNING!** Inverter units with a DC switch-disconnector: Some types of inverter module may be energized through a charging circuit even when the DC switch-disconnector is open or the DC fuses are removed. Inverter units without a DC switch-disconnector: If the inverter unit only has DC fuses without a switch fuse, all the inverter units with the DC fuses in place will be energized when the main breaker/contactor closes. To prevent this, remove the fuses from the inverter units which are to remain unenergized before connecting voltage. When the main breaker/contactor of the supply unit is closed (DC busbars are live), never remove or insert the DC fuses of an inverter unit.	☐
Inverter units equipped with DC switch-disconnector (or fuse disconnectors): Close the DC switch/disconnector (or fuse disconnectors) of the inverter units that are to be powered up.	☐

Tasks	☑
WARNING! Before closing the main contactor/air circuit breaker, make sure that sufficient inverter power is connected to the intermediate (DC) bus. As a rule of thumb, • the sum power of the inverters connected must be at least 30% of the sum power of all inverters • the sum power of the inverters connected must be at least 30% of the rated power of the brake unit ($P_{br.max}$) (if present). If the above-mentioned rules are not followed, the DC fuses of the connected inverter units may blow, or the brake chopper (if present) may be damaged.	☐
Close the main contactor (or breaker) of the supply unit. The DC bus is now powered, along with all inverters that are connected to it.	☐
Checks with voltage connected to the inverter unit	
Complete the pending ID (motor identification) run. Refer to the firmware manual and/or start-up guide of the control program. **WARNING!** Make sure the motor can be started and rotated as required by the selected ID run mode (parameter *99.13 ID run requested*).	☐
Check the rotation direction of the motor.	☐
Check the operation of the pulse encoder (if present). Refer to the user manual of the pulse encoder interface module.	☐
Check the functioning of the emergency stop function from each operating location.	☐
Validate the Safe torque off function. Refer to chapter The Safe torque off function, section Start-up including acceptance test. **WARNING!** The safety functions cannot be considered safe until they are validated.	☐
Validate any other safety functions (Emergency stop, Prevention of unexpected start-up, etc.) according to the appropriate procedures. **WARNING!** The safety functions cannot be considered safe until they are validated.	☐
Control from an overriding system	
Disconnect all voltages from the drive system.	☐
Connect the communication link between the overriding system and the inverter unit.	☐
Power up the drive system.	☐
Check the start/stop functions.	☐
Check the references received from the overriding system.	☐
Check the warning/fault words.	☐
Check the reaction of the inverter unit in case of a communication break.	☐
Check the updating intervals of the communication.	☐

Tasks	☑
Check any other relevant points.	☐

8

Maintenance

Contents of this chapter

This chapter instructs how to maintain the inverter module and how to interpret its fault conditions. The information is valid for ACS880-104LC inverter modules and the cabinet construction examples presented in this manual.

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 converter. The complete safety instructions are given in *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048633 [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/drivesservices). 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	…
Coolant														
Checking coolant antifreeze concentration		P	P	P	P	P	P	P	P	P	P	P	P	
Checking coolant quality			P		P		P		P		P		P	
Coolant draining and replacement							R						R	
Cooling fan														
Cooling fan (underneath each inverter module), 230 V										R				
Cooling fan (underneath each inverter module), 115 V							R						R	
Batteries														
Control unit battery							R						R	
Control panel battery										R				
Connections and environment														
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
Inspections														
Checking tightness of cable and busbar terminals. Tightening if needed.		I	I	I	I	I	I	I	I	I	I	I	I	I
Checking ambient conditions (dustiness, corrosion, temperature)		I	I	I	I	I	I	I	I	I	I	I	I	I
Checking coolant pipe connections		I	I	I	I	I	I	I	I	I	I	I	I	I
														3AXD10000578918 F

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.

Cooling system

For instructions on coolant replacement and checking the cooling system, see chapter Internal cooling circuit.

Cabinet

Cleaning the interior of the cabinet

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

WARNING!
Use a vacuum cleaner with an antistatic hose and nozzle, and wear a grounding wristband. Otherwise an electrostatic charge might build up and damage the circuit boards.

1. Stop the drive and do the steps in section *Electrical safety precautions (page 82)* 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.

Power connections

Retightening the power connections

WARNING!
Read the safety instructions given in *Safety instructions for ACS880 liquid-cooled multidrive cabinets and modules* (3AXD50000048633 [English]). Ignoring the instructions can cause physical injury or death, or damage to the equipment.

1. Repeat the steps described in section Electrical safety precautions.
2. Check the tightness of the cable connections. Use the tightening torques given in section Tightening torques. See also Dimension drawings.

Cooling fans

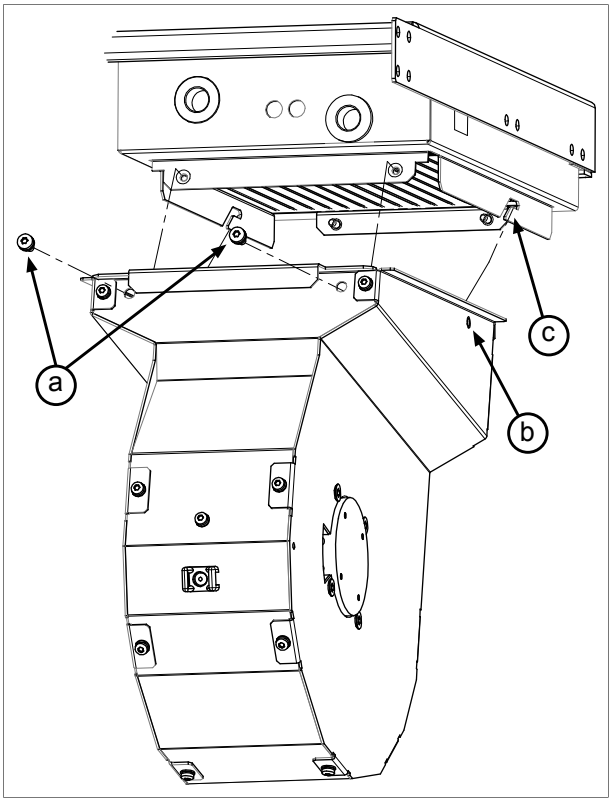
The life span of the cooling fan depends on the running time of the fan, ambient temperature and dust concentration. See the firmware manual for the actual signal which indicates the running time of the cooling fan. Reset the running time signal after fan replacement.

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

Frame R8i fan replacement

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

1. Repeat the steps described in section *Electrical safety precautions (page 82)*.
2. Remove any shrouding in front of the cooling fan.
3. Disconnect the fan wiring.
4. Undo the two retaining screws (a).
5. Pull the fan outwards to separate it from the heat exchanger housing.
6. Install new fan in reverse order. Align the guide pins (b) at the rear of the fan cowling with the slots (c) in the module bottom guide, then reinstall the retaining screws (a).



Inverter module

Replacing an inverter module

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

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

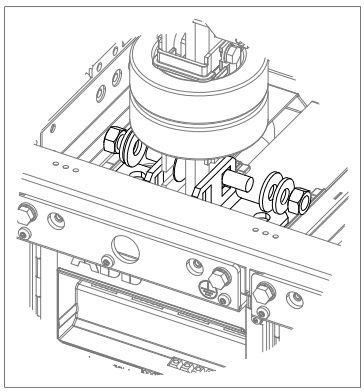
WARNING!
Make sure that the replacement module has exactly the same type code as the old module.

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

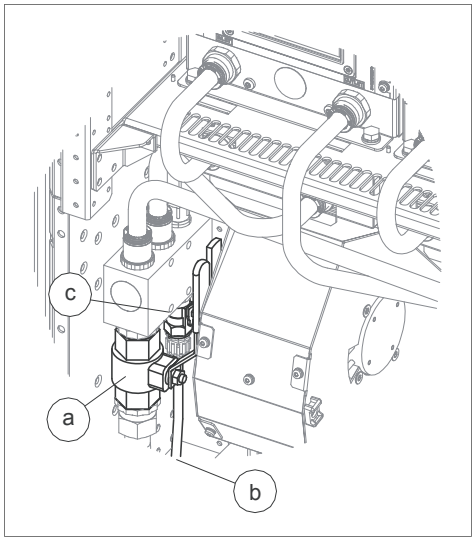
WARNING!
Use the required personal protective equipment. Wear protective gloves and long sleeves. Some parts have sharp edges.

Removing the module

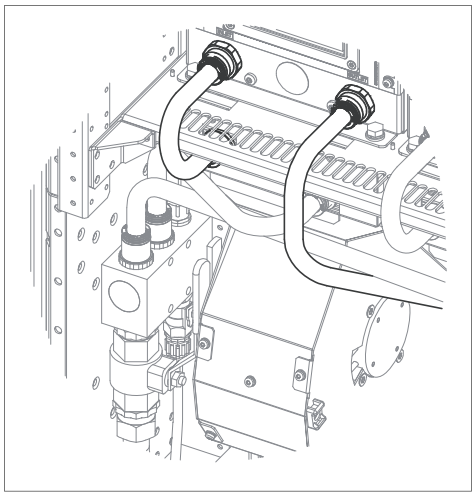
1. Repeat the steps described in section Electrical safety precautions.
2. Remove the shrouding in front of the module.
3. Undo the locking screws of the swing-out frame (if present) and open it.
4. Unplug the wiring from the module and move it aside. Use cable ties to keep the wiring out of the way.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



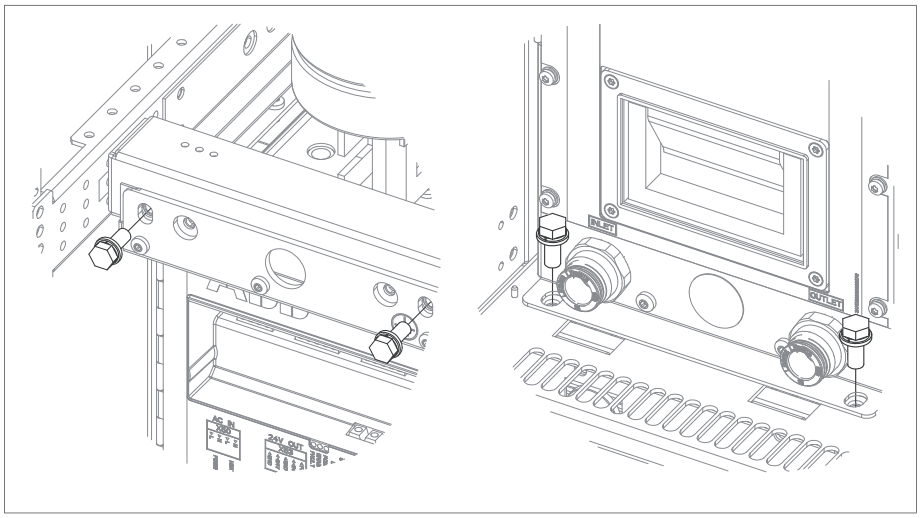
6. Close the inlet valve (a) and outlet valve (located on the right-hand side of the cubicle) valves. Lead the drain hoses (b, on both sides of the cubicle) into a suitable container. Open the drain valves (c, on both sides of the cubicle). This will drain all modules in the cubicle.



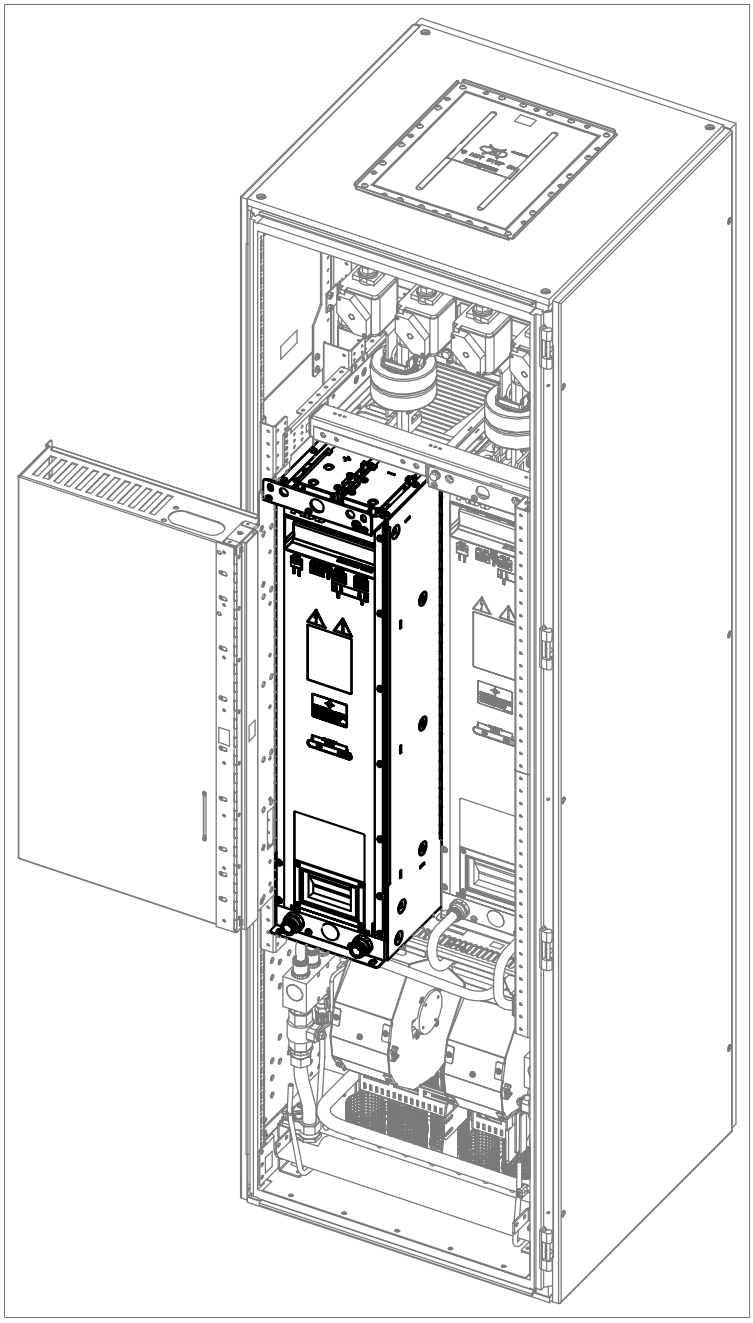
7. After the module has drained, disconnect the piping from the module.



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



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



Reinstalling the module

1. Push the module carefully into its bay.
2. Fasten the retaining screws at the top and the bottom of the module.
3. Reinstall the DC busbars at the top of the module.
4. Reconnect the coolant pipes to the module.
5. Reconnect the control wiring to the module.
6. Fill up the cooling system. For instructions, see section *Filling up and bleeding the internal cooling circuit*.

7. Close the swing-out frame (if present). Reinstall all shrouds removed earlier.

Control panel

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

Cleaning the control panel

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

Replacing the control panel battery

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

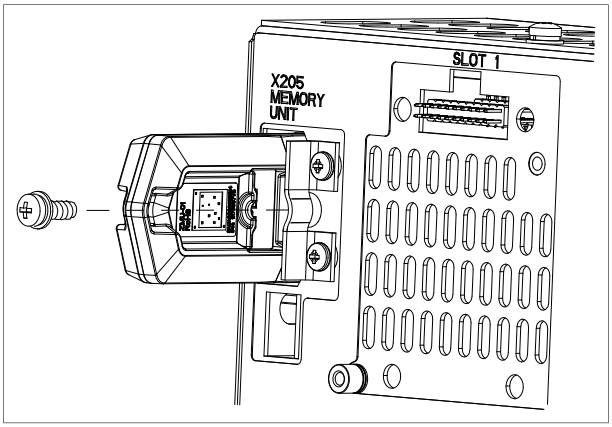
Control unit

Replacing the memory unit

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

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

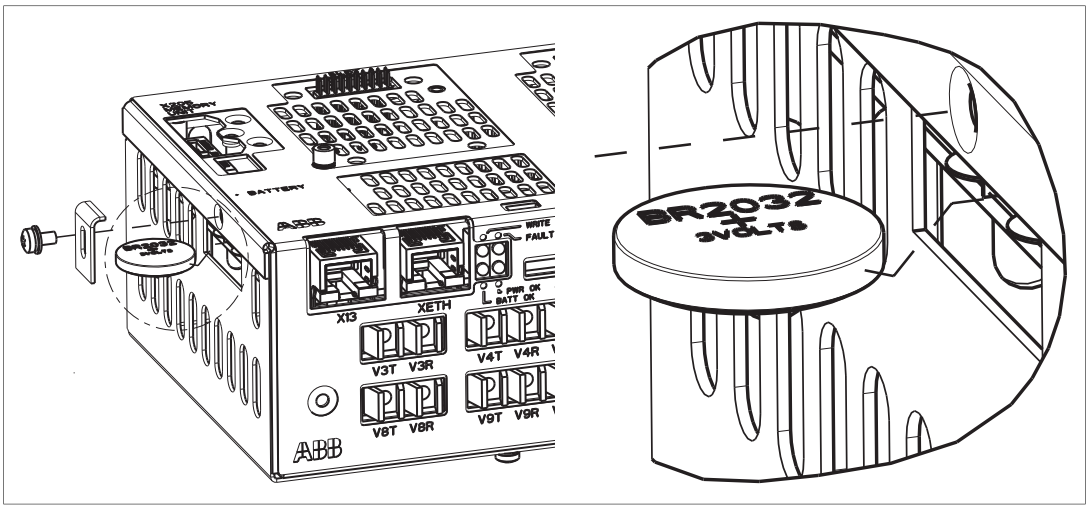
1. Stop the drive and do the steps in section *Electrical safety precautions (page 82)* before you start the work.
2. Make sure that the control unit is not powered.
3. Undo the fastening screw and pull the memory unit out.
4. Install a memory unit in reverse order.



Replacing the BCU control unit battery

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

1. Stop the drive and do the steps in section *Electrical safety precautions (page 82)* before you start the work.
2. Undo the fastening screw and remove the battery
3. Replace the battery with a new BR2032 battery.
4. Dispose of the old battery according to local disposal rules or applicable laws.
5. Set the real-time clock.



Capacitors

The DC circuit of the power modules of the drive contain several electrolytic capacitors. Their lifespan depends on the operating time of the drive, loading and ambient temperature. Capacitor life can be prolonged by lowering the ambient temperature.

Capacitor failure is usually followed by damage to the unit and an input cable fuse failure, or a fault trip. Contact ABB if capacitor failure is suspected. Replacements are available from ABB. Do not use other than ABB specified spare parts. Contact an ABB service representative for spare parts and repair services.

Reforming the capacitors

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

If the drive module has been stored for one to three years, turn on the mains power for 30 minutes without load, then continue as usual.

If the drive module has been stored for less than a year, continue as usual.

LED indications

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

Control panel and panel platform/holder LEDs

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

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

R8i module LEDs

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

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

9

Ordering information

Contents of this chapter

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

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

Note:

- This chapter only lists the installation accessories available from ABB. All other parts must be sourced from a third party (such as Rittal) by the system integrator. For a listing, refer to the kit-specific installation instructions available at https://sites-apps.abb.com/sites/lvacdrivesengineeringsupport/content. For access, contact your local ABB representative.
- Parts that are labeled suitable for generic enclosures are not designed for any specific enclosure system. These parts are intended as a basis for further engineering, and may require additional parts to be fully usable.

  Installation accessories designed for generic enclosures are in fact designed for an inside width of 50 mm less than the nominal width of the enclosure. For example, a mechanical kit intended for 800 mm wide generic enclosure is designed for an inside width of 750 mm, and will not fit a 800 mm wide Rittal VX25 enclosure.

Kit code key

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

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

- x = cooling method
  - A = air-cooled (some of these kits are also used with liquid-cooled drives)
  - L = liquid-cooled
- w = cabinet width
  - 4 = 400 mm
  - 6 = 600 mm
  - 8 = 800 mm
- s = module frame size / sizes
  - 1 = R1i
  - 2 = R2i
  - 3 = R3i
  - 4 = R4i
  - 5 = R5i
  - 6 = R6i/D6D
  - 7 = R7i/D7D/D7T
  - 8 = R8i/D8D/D8T
  - X = any, or not defined.
- yyy = consecutive numbering
  - 001…099 = Kits related to cabinets, for example, adapter plates

001…019	Common AC- and DC-related kits
020…049	Cabinet mechanics kits
050…059	Swing frame kits

  - 100…199 = Kits related to AC connection, for example, busbars

100…129	Kits with connection to AC
130…149	Kits with connection to module
150…199	Other kits related to AC connection

  - 200…299 = Kits related to DC connection, for example, busbars

200…229	Kits with connection to common DC
230…249	Kits with connection to module
250…299	Other kits related to DC connection

  - 300…399 = Kits related to module installation, for example, mechanical supports

300…330	Module supporting kits, basic mechanical support
350…379	Shroud kits

- 400…499 = Other kits

  400…419 Fan kits

  420…439 Air guides

  440…459 Cooling circuit kits

- VX = Kit specifically designed for the Rittal VX25 enclosure system. Many kits without this designation are also used with the VX25 system.

Frame R8i and multiples

Inverter modules

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

Inverter unit		Modules used	
Type	**Frame size**	**Qty**	**Ordering code (for options see below)**
U_N = 690 V			
ACS880-104LC-0390A-7	R8i	1	ACS880-104LC-0390A-7+E205
ACS880-104LC-0430A-7	R8i	1	ACS880-104LC-0430A-7+E205
ACS880-104LC-0480A-7	R8i	1	ACS880-104LC-0480A-7+E205
ACS880-104LC-0530A-7	R8i	1	ACS880-104LC-0530A-7+E205
ACS880-104LC-0600A-7	R8i	1	ACS880-104LC-0600A-7+E205
ACS880-104LC-0670A-7	R8i	1	ACS880-104LC-0670A-7+E205
ACS880-104LC-0750A-7	R8i	1	ACS880-104LC-0750A-7+E205
ACS880-104LC-0850A-7	R8i	1	ACS880-104LC-0850A-7+E205
ACS880-104LC-1030A-7	2×R8i	2	ACS880-104LC-0530A-7+E205
ACS880-104LC-1170A-7	2×R8i	2	ACS880-104LC-0600A-7+E205
ACS880-104LC-1310A-7	2×R8i	2	ACS880-104LC-0670A-7+E205
ACS880-104LC-1470A-7	2×R8i	2	ACS880-104LC-0750A-7+E205
ACS880-104LC-1660A-7	2×R8i	2	ACS880-104LC-0850A-7+E205
ACS880-104LC-1940A-7	3×R8i	3	ACS880-104LC-0670A-7+E205
ACS880-104LC-2180A-7	3×R8i	3	ACS880-104LC-0750A-7+E205
ACS880-104LC-2470A-7	3×R8i	3	ACS880-104LC-0850A-7+E205
ACS880-104LC-2880A-7	4×R8i	4	ACS880-104LC-0750A-7+E205
ACS880-104LC-3260A-7	4×R8i	4	ACS880-104LC-0850A-7+E205

Ordering code format	Option codes
[Module type] +code [+code] … For example, **ACS880-104LC-0480A-7 +E205**	**+E205**: Internal du/dt filtering. Standard with 690 V modules.

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

- An ACS-AP-x control panel is required for the commissioning of an ACS880 drive system, even if the Drive composer PC tool is used. See section ACS-AP-W control panel below.
- Inverter control unit (see section Inverter control unit below)
- Fiber optic cabling from control unit to each inverter module (see section Fiver optic cables below)
- Common mode filters - see section DC-side components
- Quick connector - see section AC-side components

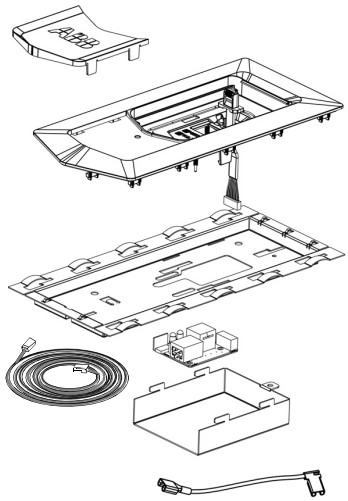
The other parts listed in this chapter for this frame size

- may be required by the application (such as a DC switch/disconnector), or
- make the installation or use of the module easier.

Control panel

The control panel is not included with the module but must be ordered separately. One control panel is required for the commissioning of an ACS880 drive system, even if the Drive composer PC tool is used.

The control panel can be flush mounted on the cabinet door with the help of a door mounting kit. For more information on the control panel, see *ACX-AP-x assistant control panels user's manual* (3AUA0000085685 [English]).

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

The door mounting kit contains:

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

Control electronics

Inverter control unit

One BCU-0x control unit is required per inverter unit. The type of the control unit depends on the number of inverter modules as shown below. The control unit delivered with a memory unit containing the ACS880 primary control program, optionally with application programmability, For availability of other control programs, contact your local ABB representative.

Frame size	Control unit type	Application programmability	Ordering code
R8i, 2×R8i	BCU-02	No	3AXD50000003417
		*Yes	3AXD50000011540
3×R8i…6×R8i	BCU-12	No	3AXD50000006340
		*Yes	3AXD50000011541
*Application programmability using function block based on the IEC 61131-3 standard. For more information, see Programming manual: Drive application programming (IEC 61131-3) (3AUA0000127808 [English]).			

Note:
Fiber optic communication with another control unit (such as that of the supply unit) requires an RDCO-0x DDCS communication module. For more information, see *RDCO-0x DDCS communication option modules* (3AFE64492209 [English]).

Fiber optic cables

Each frame R8i module is connected to the inverter control unit with a pair of fiber optic cables.

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

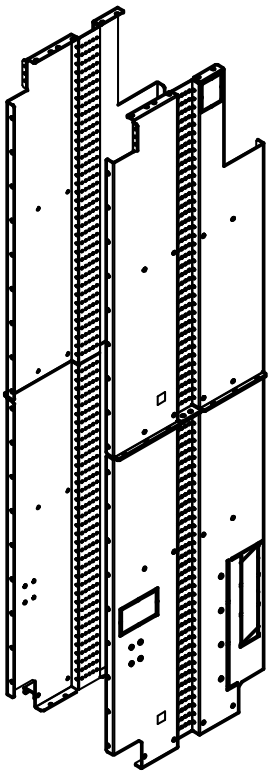
Length	Kit type designation	Ordering code
2 m	NLWC-02	58988821
3 m	NLWC-03	58948233
5 m	NLWC-05	58948250
7 m	NLWC-07	58948268
10 m	NLWC-10	58948276

Mechanical installation accessories

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

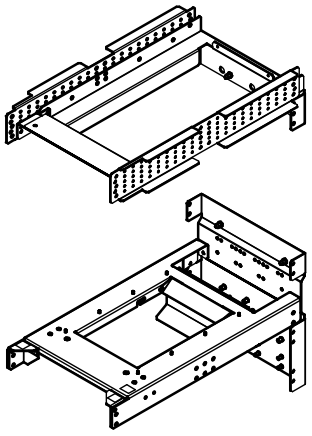
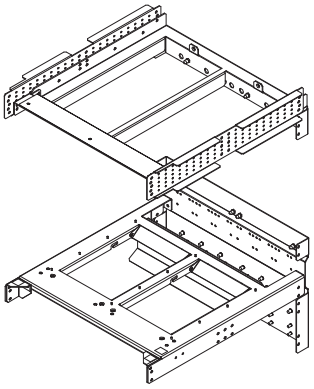
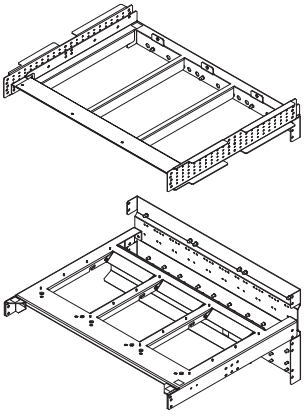
Side plate kit

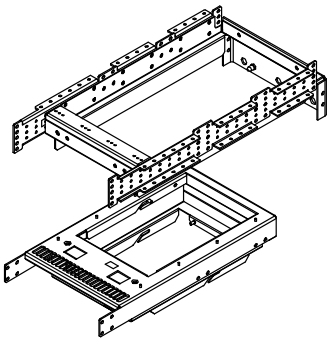
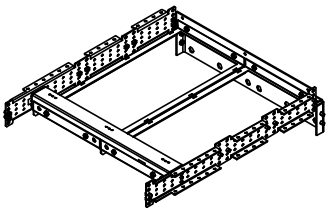
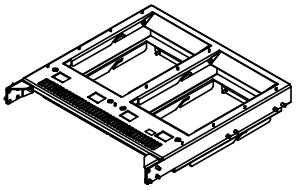
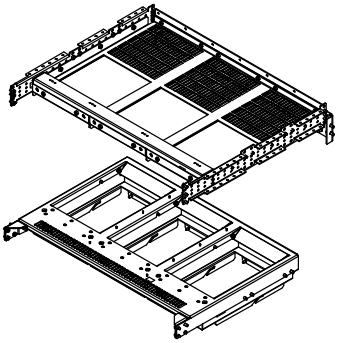
These parts attach to the left-hand and right-hand sides of the VX25 enclosure frame and act as a mounting base for the module guides.

Used with…	Qty	Ordering code	Kit code	Illustration
400/600/800 mm VX25 enclosure	1	3AXD50000360543	L-468-8-020-VX	 Instruction code: 3AXD50000327591

Module top/bottom guides

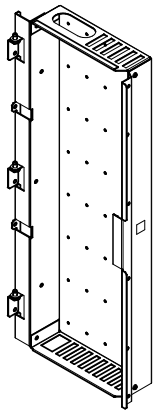
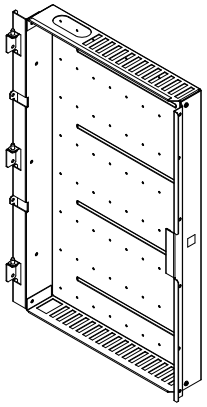
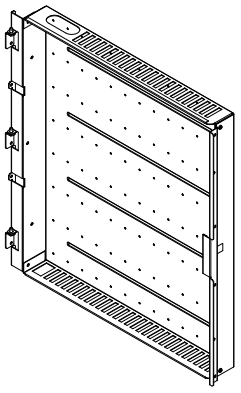
This kit contains the frames that support the module at the top and the bottom.

Used with…	Qty	Ordering code	Kit code	Illustration
400 mm VX25 enclosure	1	3AXD50000360598	L-4-8-301-VX	 Instruction code: 3AXD50000330461
600 mm VX25 enclosure	1	3AXD50000361090	L-6-8-302-VX	 Instruction code: 3AXD50000330201
800 mm VX25 enclosure	1	3AXD50000361274	L-8-8-303-VX	 Instruction code: 3AXD50000329502

Used with…	Qty	Ordering code	Kit code	Illustration
400 mm generic enclosure	1	3AXD50000043678	L-4-8-301	 Instruction code: 3AXD50000043726
600 mm generic enclosure	1	3AXD50000041710	L-6-8-302	  Instruction code: 3AXD50000041836
800 mm generic enclosure	1	3AXD50000041248	L-8-8-303	 Instruction code: 3AXD50000041461

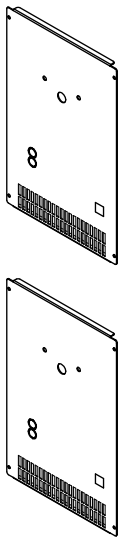
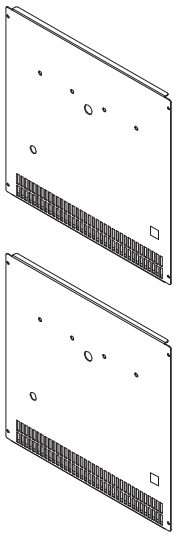
Swing-out frame

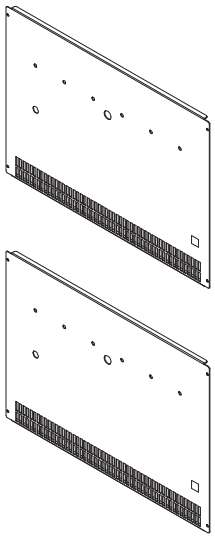
The swing-out frame is a hinged compartment that can be used as a mounting base for eg. control electronics and auxiliary voltage circuit components.

Used with…	Qty	Ordering code	Kit code	Illustration
400 mm VX25 enclosure	1	3AXD50000361045	L-4-X-051-VX	 Instruction code: 3AXD50000345106
600 mm VX25 enclosure	1	3AXD50000361250	L6-X-052-VX	 Illustration code: 3AXD50000345069
800 mm VX25 enclosure	1	3AXD50000361410	L-8-X-053-VX	 Instruction code: 3AXD50000344864

Shrouding

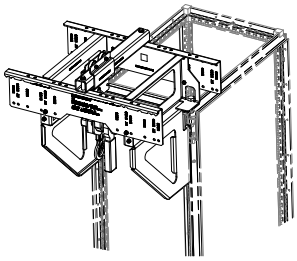
This kit contains the shrouds, as well as the necessary brackets and screws, to cover the top and bottom parts of the cubicle.

Frame size	Qty	Ordering code	Kit code	Illustration
400 mm VX25 enclosure	1	3AXD50000361083	L-4-8-022-VX	 Instruction code: 3AXD50000353354
600 mm VX25 enclosure	1	3AXD50000361267	L-6-8-023-VX	 Instruction code: 3AXD50000353521

Frame size	Qty	Ordering code	Kit code	Illustration
800 mm VX25 enclosure	1	3AXD50000361427	L-8-8-024-VX	 Instruction code: 3AXD50000353125

Lifting device

The lifting device is designed for maneuvering a frame R8i module when installing it into (or extracting it from) the Rittal VX25 enclosure.

Used with…	Qty	Ordering code	Kit code	Illustration
R8i	1	3AXD50000439997	-	 Instruction code: 3AXD50000439409, 3AXD50000210268

DC-side components

Frame R8i modules are connected to the DC bus through fuses. The design presented in this manual has flush-end fuse blocks bolted to the DC busbars.

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

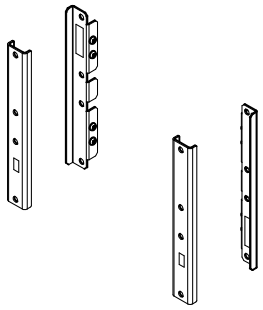
Note:
A separate capacitor charging circuit must be designed and installed by the customer if the inverter unit is directly connected to the DC bus and the supply unit of the system does not have a charging capability.

The common mode filters are mounted onto the busbars that connect to the DC input of the inverter module.

DC bus installation parts (for Rittal VX25 enclosures)

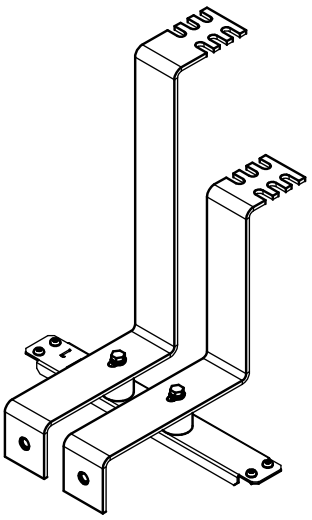
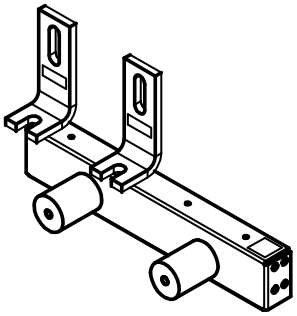
The brackets in this kit act as a mounting base for the busbar supports of the Rittal Flat-PLS DC bus and ensure its correct placement and alignment inside the cabinet line-up.

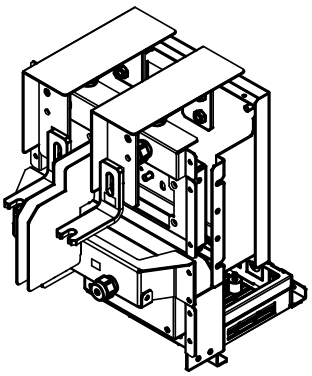
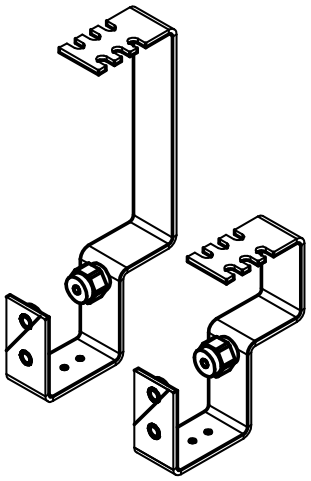
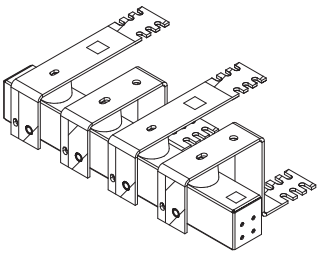
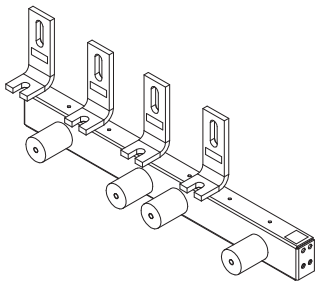
Note:
The designs presented in this manual for Rittal VX25 enclosures employ the Rittal Flat-PLS busbar system. Make sure that the current carrying capability of the busbars is not exceeded at any point of the drive system.

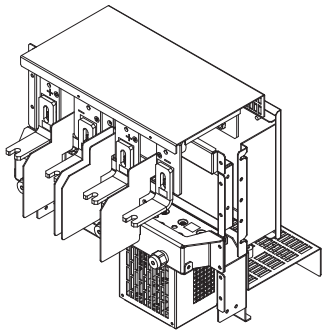
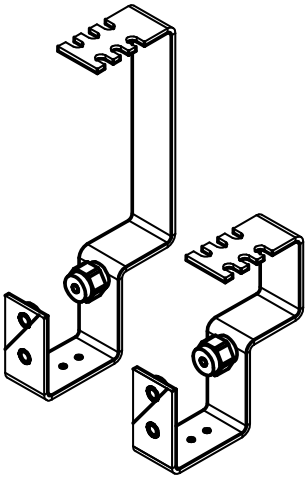
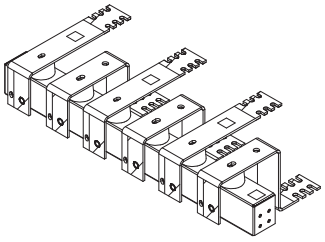
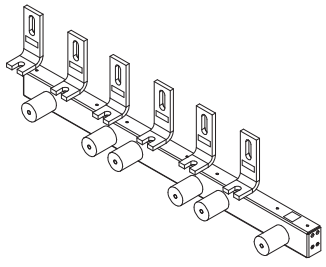
Used with …	Qty	Ordering code	Kit code	Illustration
400/600/800 mm VX25 enclosure	1 kit per cubicle	3AXD50000333387	A-468-X-001-VX	 Instruction code: 3AXD50000333639

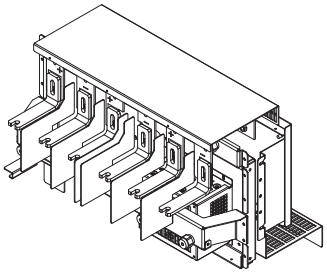
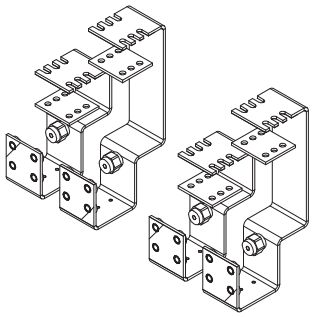
DC connection parts 1 of 2 (for Rittal VX25 enclosures)

These parts connect the Flat-PLS busbars to the DC fuses.

Used with…	Qty	Ordering code	Kit code	Illustration
400 mm VX25 enclosure without DC switch	1	3AXD50000360604	L-4-8-201-VX	 Instruction code: 3AXD50000332861
	1	3AXD50000361021	L-4-8-251-VX	 Instruction code: 3AXD50000332885

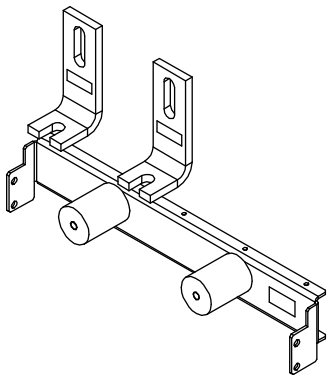
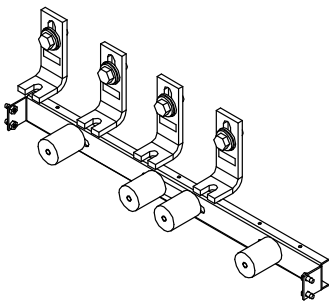
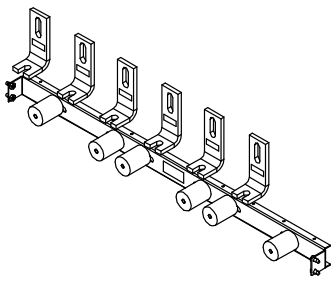
Used with…	Qty	Ordering code	Kit code	Illustration
400 mm VX25 enclosure with DC switch	1	3AXD50000361038	L-4-8-254-VX	 Instruction code: 3AXD50000342600
	1	3AXD50000360567	L-46-8-207-VX	 Instruction code: 3AXD50000343614
600 mm VX25 enclosure without DC switch	1	3AXD50000361106	L-6-8-202-VX	 Instruction code: 3AXD50000332229
	1	3AXD50000361229	L-6-8-252-VX	 Instruction code: 3AXD50000332106

Used with…	Qty	Ordering code	Kit code	Illustration
600 mm VX25 enclosure with DC switch	1	3AXD50000361243	L-6-8-255-VX	 Instruction code: 3AXD50000338740
	2	3AXD50000360567	L-46-8-207-VX	 Instruction code: 3AXD50000343614
800 mm VX25 enclosure without DC switch	1	3AXD50000361281	L-8-8-203-VX	 Instruction code: 3AXD50000331567
	1	3AXD50000361298	L-8-8-253-VX	 Instruction code: 3AXD50000331765

Used with…	Qty	Ordering code	Kit code	Illustration
800 mm VX25 enclosure with DC switch	1	3AXD50000361304	L-8-8-256-VX	 Instruction code: 3AXD50000336999
	1	3AXD50000360574	L-8-8-208-VX	 Instruction code: 3AXD50000344185

DC connection parts 1 of 2 (for generic enclosures)

These parts provide the DC connection between the DC input (busbars or otherwise) and the DC fuses.

Used with…	Qty	Ordering code	Kit code	Illustration
400 mm generic enclosure	1	3AXD50000043679	L-4-8-251	 Instruction code: 3AXD50000043729
600 mm generic enclosure	1	3AXD50000041731	L-6-8-252	 Instruction code: 3AXD50000041842
800 mm generic enclosure	1	3AXD50000041263	L-8-8-253	 Instruction code: 3AXD50000041448

DC switch/disconnector kits (for Rittal VX25 enclosures)

Used with…	Switch type Handle type	Qty	Ordering code	Instruction code
Frame R8i with DC switch/disconnect-or	OT1600E11 OHB150J12P	1	3AXD50000227037	3AXD50000330720
Frame 2×R8i with DC switch/disconnect-or	OT1600E22 OHB274J12	1	3AXD50000227044	
Frame 3×R8i with DC switch/disconnect-or	OT2500E22 OHB274J12	1	3AXD50000227051	

The kit contains the following components:

- DC switch (type indicated in table)
- Operating handle (type indicated in table)
- OXP12X395 operating shaft
- OA1G10 and OA3G01 auxiliary contacts
- OTZT4A and PDAL2/24DC interlocks
- OHZX10 alignment ring.

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

Used with…	Switch type	Qty	Ordering code	Instruction code
Frames R8i and 2×R8i with DC switch/disconnect-or	OS160GD04F	1	3AXD50000226801	3AXD50000450978
Frame 3×R8i with DC switch/disconnect-or	OS200DZ22F	1	3AXD50000227020	

The kit contains the following components:

- Charging switch (type indicated in table) with terminal shrouds
- OHB65J6 operating handle
- OXP6X290 operating shaft
- 2 pcs of OA3G01 auxiliary contacts
- BSFC-12C charging controller
- 170M2676 fuses
- OHZX10 alignment ring.

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

Charging resistors (for units with DC switch/disconnector)

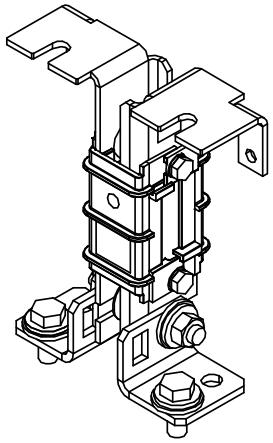
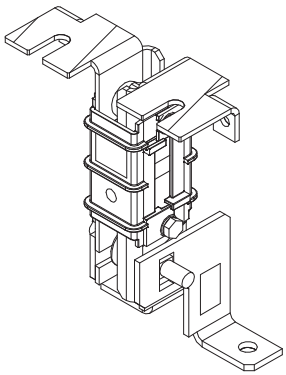
Used with…	Qty	Ordering code	Type
Frame R8i with DC switch/disconnector	4	10028531	ZRF 30/165 S 33R
Frame 2×R8i with DC switch/disconnector	6		
Frame 3×R8i with DC switch/disconnector	8		

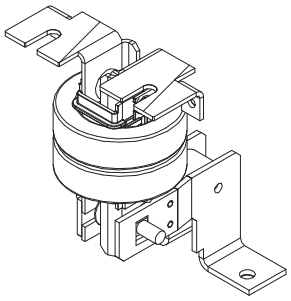
DC fuses (IEC)

Unit type ACS880-104LC-	Qty	Ordering code	Fuse		
			Type (Bussmann)	Data	Size
0390A-7	2	63919128	170M6546	800 A, 1250 V	3
0430A-7	2	63919128	170M6546	800 A, 1250 V	3
0480A-7	2	63919381	170M6547	900 A, 1100 V	3
0530A-7	2	63916749	170M6548	1000 A, 1100 V	3
0600A-7	2	68736021	170M6549	1100 A, 1000 V	3
0670A-7	2	63919462	170M6500	1250 A, 1100 V	3*
0750A-7	2	3AUA0000086673	170M6501	1400 A, 1100 V	3*
0850A-7	2	3AUA0000086673	170M6501	1400 A, 1100 V	3*
1030A-7	4	63916749	170M6548	1000 A, 1100 V	3
1170A-7	4	68736021	170M6549	1100 A, 1000 V	3
1310A-7	4	63919462	170M6500	1250 A, 1100 V	3*
1470A-7	4	3AUA0000086673	170M6501	1400 A, 1100 V	3*
1660A-7	4	3AUA0000086673	170M6501	1400 A, 1100 V	3*
1940A-7	6	63919462	170M6500	1250 A, 1100 V	3*
2180A-7	6	3AUA0000086673	170M6501	1400 A, 1100 V	3*
2470A-7	6	3AUA0000086673	170M6501	1400 A, 1100 V	3*
2880A-7	8	3AUA0000086673	170M6501	1400 A, 1100 V	3*
3260A-7	8	3AUA0000086673	170M6501	1400 A, 1100 V	3*

DC connection parts 2 of 2 (for Rittal VX25 or generic enclosures)

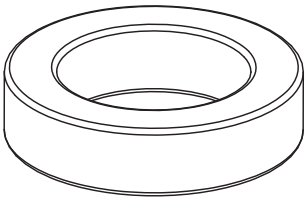
These parts connect the DC fuses to the inverter module.

Used with	Qty	Ordering code	Kit code	Illustration
All VX25 and generic enclosures (without DC switch)	1 per module	3AXD50000041264	L-468-8-230	 Instruction code: 3AXD50000041311 **Note:** Filters to be ordered separately
400 mm and 600 mm VX25 enclosures (with DC switch)	1 per module	3AXD50000200368	L-46-8-233	 Instruction code: 3AXD50000205042 **Note:** Filters to be ordered separately

Used with	Qty	Ordering code	Kit code	Illustration
800 mm VX25 enclosures (with DC switch)	3	3AXD50000200337	L-8-8-234	 Instruction code: 3AXD50000205226 **Note:** Filters to be ordered separately

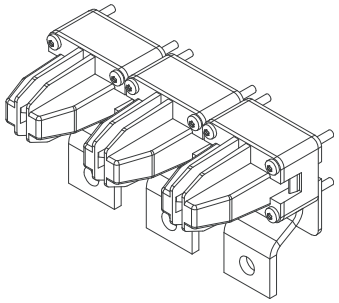
Common mode filters

Common mode filtering reduces bearing currents and is required for electromagnetic compatibility (EMC). The filtering is implemented by installing two toroidal cores onto the DC busbars.

Used with	Qty	Ordering code	Kit code	Illustration
All enclosure types	2 per module	3AUA0000032859	-	 Instruction code: 3AXD50000005734

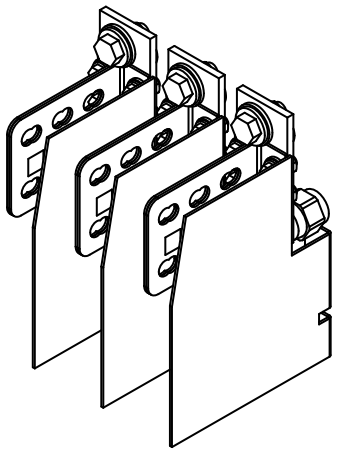
AC-side components

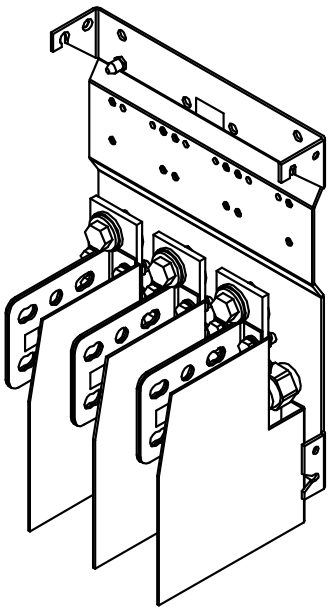
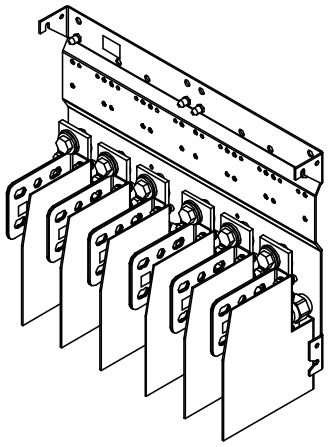
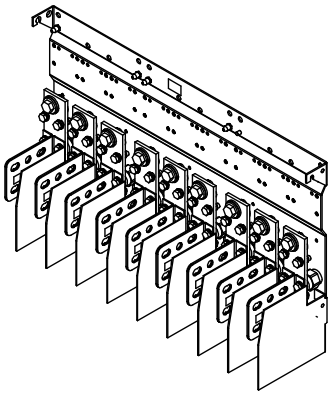
Quick connector

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

Output busbars

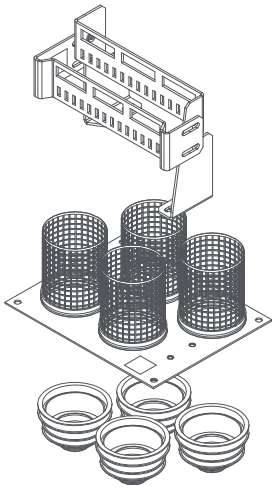
This kit contains busbars that attach to the quick connector, and the terminals for the motor cables. Note that the kits for multiple modules have no built-in interconnections, so each module in the same cubicle must be separately (and identically) cabled to the motor.

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

Used with	Qty	Ordering code	Kit code	Illustration
400 mm generic enclosure	1	3AXD50000043691	L-4-8-131	 Instruction code: 3AXD50000043742
600 mm generic enclosure	1	3AXD50000041733	L-6-8-132	 Instruction code: 3AXD50000041888
800 mm generic enclosure	1	3AXD50000041734	L-8-8-133	 Instruction code: 3AXD50000041909

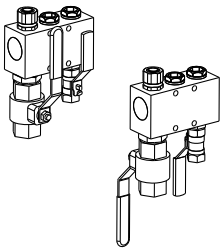
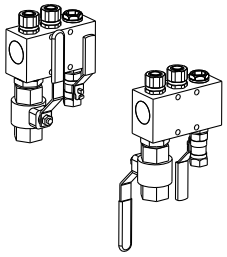
Cable entry kit

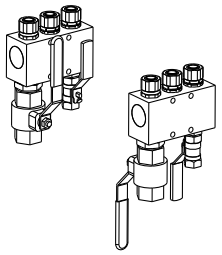
Cable entry kit, to be installed on the bottom plate of the enclosure, contains four 60 mm diameter inlets for cables with grommets, wire meshing for 360° grounding, and a strain relief bracket.

Used with …	Qty	Ordering code	Kit code	Illustration
All enclosure types	1 (minimum) kit for a module	3AXD50000004385	A-468-8-441	 Instruction code: 3AXD50000004817

Cooling system parts

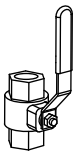
Coolant distribution manifold kits

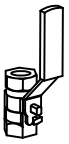
Enclosure	Qty	Ordering code	Kit code	Illustration
400 mm VX25 and generic enclosure (1 module)	1	3AXD50000044084	L-468-8-441	 Instruction code: 3AXD50000048217
600 mm VX25 and generic enclosure (2 modules)	1	3AXD50000044182	L-468-8-442	 Instruction code: 3AXD50000048258

Enclosure	Qty	Ordering code	Kit code	Illustration
800 mm VX25 and generic enclosure (3 modules)	1	3AXD50000048136	L-468-8-443	 Instruction code: 3AXD50000048283

The manifold kits contain:

 Inlet and outlet manifolds

 Inlet and outlet valves

 Drain valves

 Nipples for connecting the valves to manifolds

 Connectors for PA piping

 Plugs for unused piping connectors

 Chokes for flow limitation – not used with the ACS880-104LC.

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

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

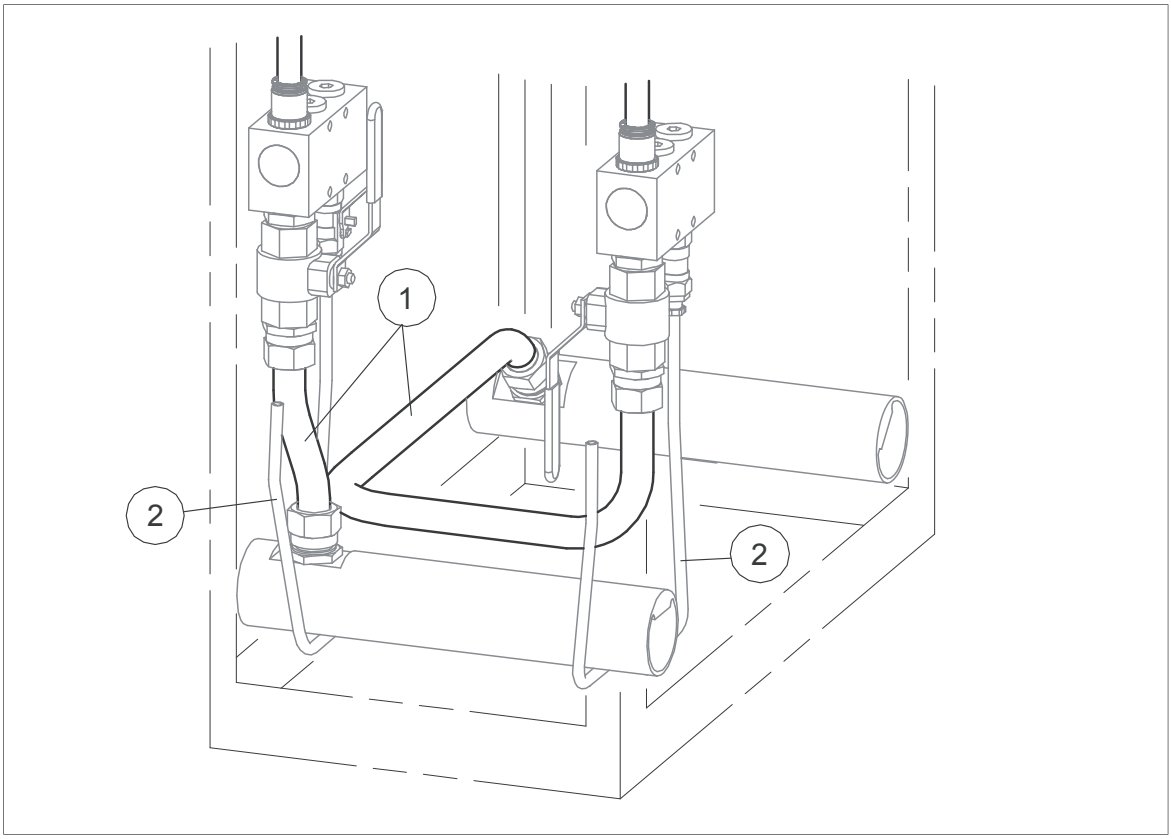
Note:
The inlet and outlet valves have an R3/4" internal thread. The drain valves have an R3/8" internal thread.

Piping

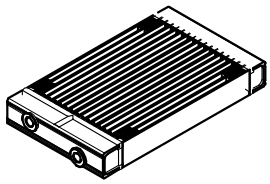
The PA (polyamide) pipe can be used for all piping inside the cubicle between the manifolds.

Component		Ordering code
PA pipe	**Data**	
PA pipe	50 m, PA12P40, 16/13 mm	3AXD50000047488

Note:
The piping between the manifolds and main pipes (1), and drain pipes (2) are not part of the offering.



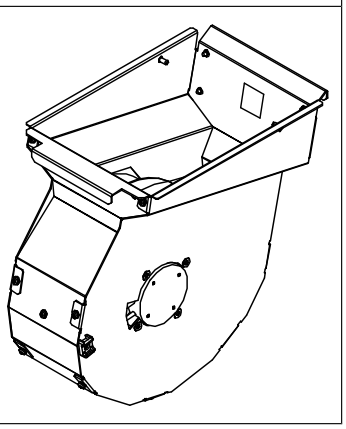
Heat exchanger

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

Cooling fan

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

The fan is selected according to the auxiliary voltage.

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

Miscellaneous

CIO-01 I/O module

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

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

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

10

Internal cooling circuit

Contents of this chapter

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

Applicability

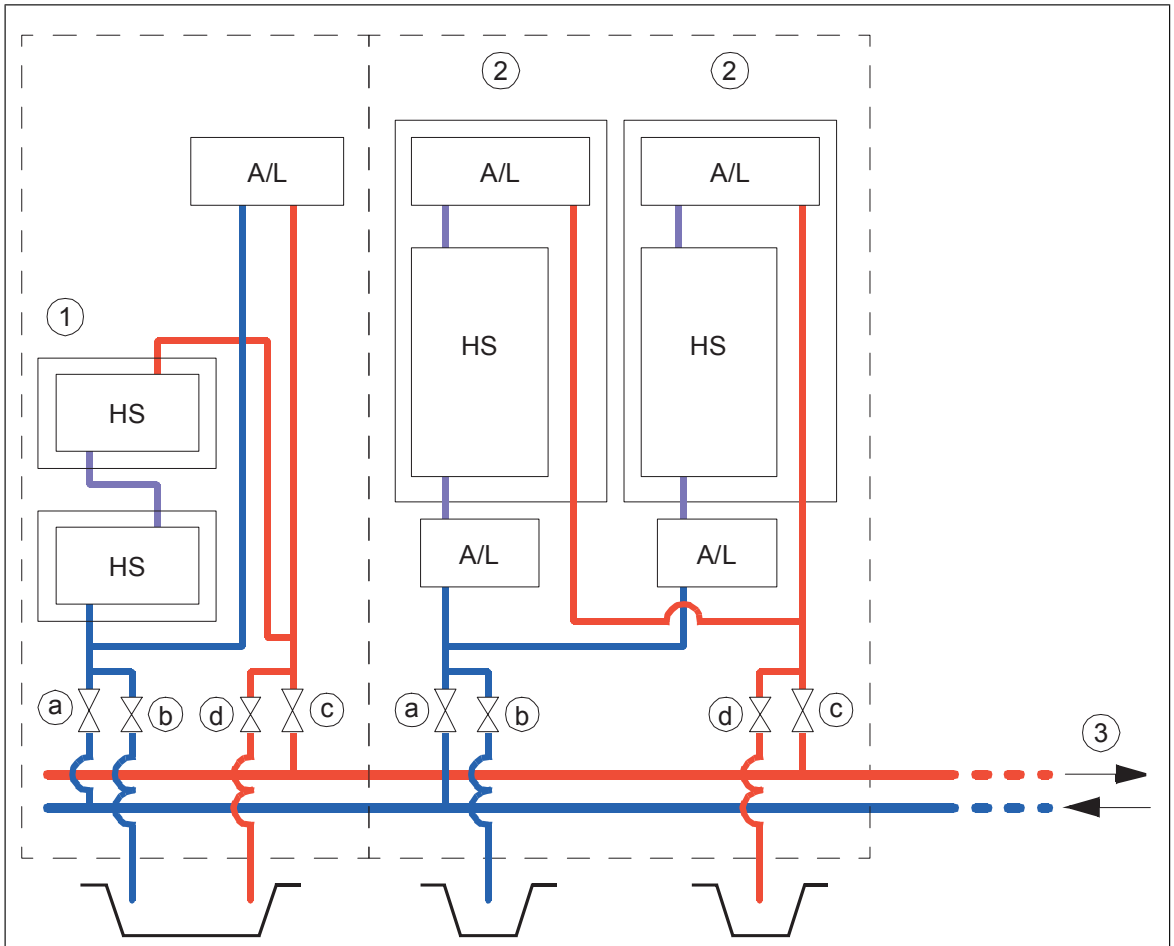
The information in this chapter is applicable to cabinet-built ACS880 liquid-cooled drives. Except where otherwise indicated, the information is also applicable to drives built out of ACS880 liquid-cooled multidrive modules.

Internal cooling system

Note: This section describes cabinet-built, liquid-cooled ACS880 drives. The information in this section can be used as guidelines for building a drive system out of ACS880 liquid-cooled modules.

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

The following diagram shows the coolant pipe connections in a drive system consisting of a supply unit and an inverter unit.



1	Supply modules
2	Inverter modules
3	To/From cooling unit
A/L	Air-to-liquid heat exchanger
HS	Heat sink
a	Inlet valve
b	Inlet-side drain valve
c	Outlet valve
d	Outlet-side drain valve

The coolant used with ACS880 liquid-cooled drive systems is Antifrogen® L 25% or 50% water mixture. See *Coolant specification (page 148)*.

Connection to a cooling unit

Connection to an ACS880-1007LC cooling unit

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

Connection to a custom cooling unit

General requirements

Equip the system with an expansion tank to damp pressure rise due to volume changes when the temperature varies. Equip the system with a pump that provides a nominal flow and pressure. Keep the pressure within the limits specified in *Technical data (page 148)*. Install a pressure regulator to make sure that the maximum permissible operating pressure is not exceeded.

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

The materials that can be used are listed in *Cooling circuit materials (page 150)*.

Coolant temperature control

The temperature of the coolant in the internal cooling circuit must be kept within the limits specified in *Technical data (page 148)*. Note that the minimum temperature is dependent on ambient temperature and relative humidity.

Filling up and bleeding the internal cooling circuit

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

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

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

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

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

Drive line-ups with a custom cooling unit

Note:

- In filling up the system, the drain valves in the line-up are used only to vent the air from the circuit so that it can be displaced by the coolant. The actual bleeding of the circuit must be done via an external bleed valve installed at the highest point of the cooling circuit. The most practical location for the valve is usually near or at the cooling unit.
- Observe the instructions given by the manufacturer of the cooling unit. Pay special attention to filling up and bleeding the pumps properly as they may be damaged if operated when dry.
- Draining coolant into the sewer system is not allowed.

1. Open the bleed valve at the cooling unit.
2. Open the inlet valve and the outlet-side drain valve of one cubicle. Keep the outlet valve and the inlet-side drain valve closed.
3. Attach a hose to the outlet-side drain valve and lead it into a suitable container.
4. Fill the circuit with coolant. For coolant specification, see *Coolant specification (page 148)*.

   Note: To minimize foaming, do not exceed the filling flow rate of 5 l/min (1.3 US gallon/min).

5. As the piping and modules in the cubicle fills up, coolant starts to flow from the hose. Let some coolant flow out, then close the drain valve.
6. Close the inlet valve.
7. Repeat steps 2 to 6 for all cubicles in the line-up.
8. Open the inlet and outlet valves in all cubicles. Let any air remaining in the system out through the bleed valve at the cooling unit.
9. Close the bleed valve at the cooling unit.
10. Continue to fill in coolant until a base pressure of 100…150 kPa is achieved.
11. Open the bleed valve of the pump to let out any air.
12. Re-check the pressure and add coolant if necessary.

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

Draining the internal cooling circuit

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

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

1. Attach hoses to each drain valve in the cubicle to be drained. Lead the hoses into a suitable container. Make sure the ends of the hoses are not immersed in coolant at any point so that air can displace the coolant in the system.
2. Open the drain valves. Wait until all coolant has drained.

   Note: Draining coolant into the sewer system is not allowed.

3. If required, dry the piping with compressed oil-free air of less than 6 bar.
4. If the drive is to be stored in temperatures below 0 °C (32 °F),
   - dry the cooling circuit with air,
   - fill the cooling circuit with coolant specified under *Coolant specification (page 148)*.
   - drain the cooling circuit again.

Maintenance intervals

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

Technical data

Coolant specification

Coolant type

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

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

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

WARNING!
The warranty does not cover damage occurring from use of improper coolant.

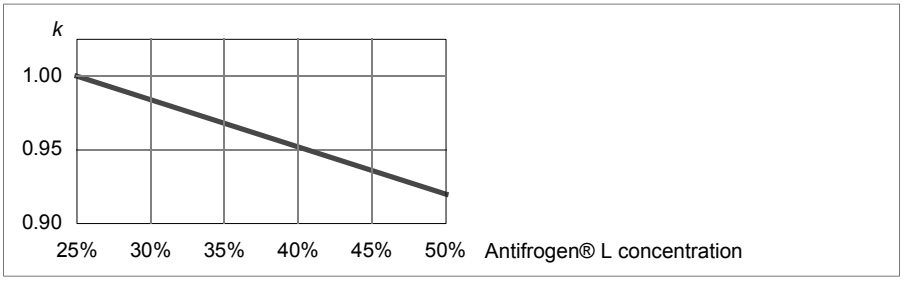
Temperature limits

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

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

The higher the concentration of heat transfer fluid, the higher the viscosity of the coolant. This results in a higher pressure loss in the system. See *Pressure limits (page 150)*.

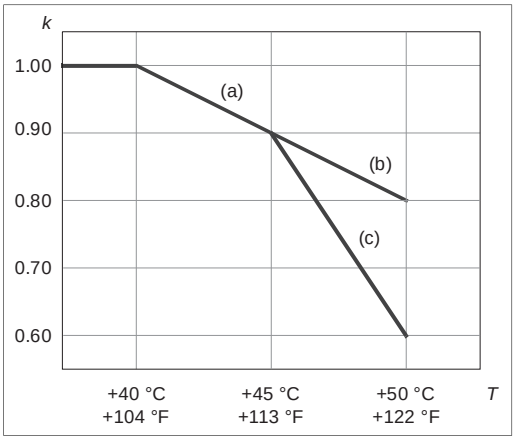
The nominal current ratings of drive system modules apply to an Antifrogen® L / water solution of 25/75% (volume). With the Antifrogen® L concentration between 25% and 50%, the drive output current must be derated by 1/3 percentage point per 1 p.p. increase in Antifrogen® L concentration. The drawing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



Incoming coolant temperature:

- 0…40 °C (32…104 °F): no drive output current derating required
- 40…45 °C (104…113 °F): drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (a).
- 45…50 °C (113…122 °F):
  - If components with a maximum operating temperature of 55 °C (131 °F) are installed in the same space as the drive modules, drive output current must be derated by 6 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (c).
  - If there are no components with a maximum operating temperature of 55 °C (131 °F) installed in the same space as the drive modules, drive output current must be derated by 2 percentage points per 1 °C (1.8 °F) temperature increase, as shown by curve (b).

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



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

T_{air} (°C)	Min. $T_{coolant}$ (°C)				
	RH = 95%	RH = 80%	RH = 65%	RH = 50%	RH = 40%
5	4.3	1.9	-0.9	-4.5	-7.4

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

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

Pressure limits

Base pressure: 100 … 150 kPa (recommended); 200 kPa (maximum). “Base pressure” denotes the pressure of the system compared with the atmospheric pressure when the cooling circuit is filled with coolant.

Air counterpressure in the expansion tank: 40 kPa

Design pressure (PS): 600 kPa

Nominal pressure difference (between main in/out lines): 120 kPa with 25/75% (volume) coolant solution, 150 kPa with 50/50% (volume) coolant solution. This has to be taken into account when dimensioning the liquid cooling circuit.

Maximum pressure difference (between main in/out lines): 200 kPa

Coolant flow rate limits

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

Cooling circuit materials

Materials used in the internal cooling circuit are listed below. These are also the only materials that can be used in the external cooling circuit.

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

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

- rubber gasketing NBR (nitrile rubber).

WARNING!
If connecting external piping to the internal cooling circuit, use only materials that are specified above. Copper, brass or bronze must not be used under any circumstances. Even minor dissolution of copper can cause copper precipitation on aluminum and subsequent galvanic corrosion. The liquid cooling system must not contain any zinc (eg. galvanized pipes).

If the plant incorporates normal iron pipes or cast iron accessories (eg. motor housings), a cooling unit with a heat exchanger (such as the ACS880-1007LC) must be used to separate the systems.

11

Technical data

Contents of this chapter

This chapter contains the technical specifications of the inverter modules and associated components.

Ratings

Inverter unit type ACS880-104LC-	Frame size	Input ratings	Output ratings							
			I_{max}	No-overload use			Light-overload use		Heavy-duty use	
		I_1		I_2	P_N	S_N	I_{Ld}	P_{Ld}	I_{Hd}	P_{Hd}
		A	A	A	kW	kVA	A	kW	A	kW
U_N = 690 V										
0390A-7	R8i	439	590	390	355	466	374	355	292	250
0430A-7	R8i	484	650	430	400	514	413	355	322	250
0480A-7	R8i	540	720	480	450	574	461	400	359	315
0530A-7	R8i	596	800	530	500	633	509	450	396	355
0600A-7	R8i	675	900	600	560	717	576	560	449	400
0670A-7	R8i	754	1010	670	630	801	643	630	501	450
0750A-7	R8i	844	1130	750	710	896	720	710	561	500
0850A-7	R8i	956	1280	850	800	1016	816	800	636	560
1030A-7	2×R8i	1159	1550	1030	1000	1231	989	900	770	710
1170A-7	2×R8i	1316	1760	1170	1100	1398	1123	1100	875	800
1310A-7	2×R8i	1474	1970	1310	1200	1566	1258	1200	980	900
1470A-7	2×R8i	1654	2210	1470	1400	1757	1411	1200	1100	1000
1660A-7	2×R8i	1868	2490	1660	1600	1984	1594	1400	1242	1200
1940A-7	3×R8i	2183	2910	1940	1800	2319	1862	1800	1451	1400
2180A-7	3×R8i	2453	3270	2180	2000	2605	2093	2000	1631	1400
2470A-7	3×R8i	2779	3710	2470	2300	2952	2371	2300	1848	1800
2880A-7	4×R8i	3240	4320	2880	2700	3442	2765	2700	2154	2000
3260A-7	4×R8i	3668	4890	3260	3000	3896	3130	3000	2438	2300

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 (ACS880-104LC-xxxxA-5) and 575 V (ACS880-104LC-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

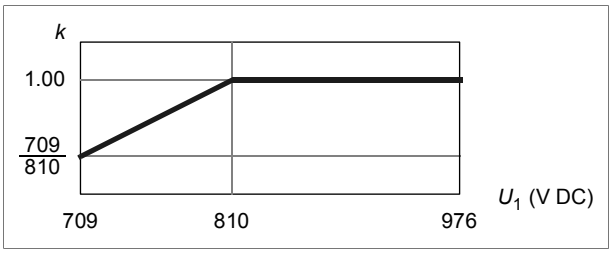
Note:

- The ratings apply at an ambient temperature of 40 °C (104 °F).
- The ratings apply at an ambient temperature of 45 °C (113 °F) and a coolant 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

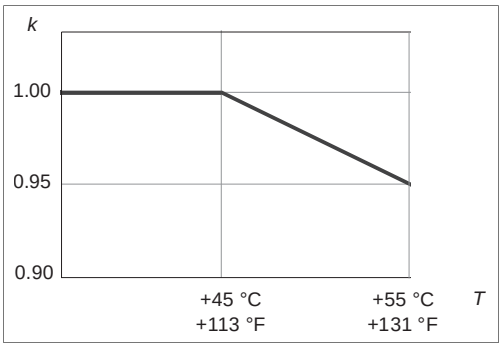
Supply voltage derating

If the DC supply voltage of the inverter module (U_1) is below 810 V (which corresponds to a drive supply voltage of 600 V AC when a diode supply unit is used), the rated output current must be derated by multiplying by U_1/810 (represented by *k* in the diagram).



Ambient temperature derating

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



Coolant temperature derating

See section *Temperature limits (page 148)*.

Antifreeze content derating

See section *Temperature limits (page 148)*.

Altitude derating

At altitudes from 1000 to 4000 m (3281 to 13123 ft) above sea level, the output current derating is 1 percentage point for every added 100 m (328 ft). For example, the derating factor for 1500 m (4921 ft) is 0.95.

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

Switching frequency derating

In the switching frequency range of 3.0 to 7.5 kHz, the output current is derated by 8 percentage points per each kHz. For example, the derating factor for 5 kHz is 0.84.

Output frequency derating

Below the output frequency of 12 Hz, the output current is derated by 3.5 percentage points per each Hz. For example, the derating factor for 9 Hz is 0.895.

Above the output frequency of 150 Hz, the output current is derated by 1 percentage point per each 10 Hz. For example, the derating factor for 175 Hz is 0.975.

Cooling characteristics

Inverter unit type ACS880-104LC-	Power loss		Coolant volume		Coolant flow rate	Pressure loss
	into coolant	into air surrounding cabinet	modules + heat exchangers	cabinet piping		
	W	W	l (US qt)	l (US qt)	l/min (US gal/min)	kPa
U_N = 690 V						
0390A-7	5000	100	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0430A-7	5500	100	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0480A-7	6200	200	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0530A-7	7000	200	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0600A-7	8000	200	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0670A-7	9200	200	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0750A-7	10500	300	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
0850A-7	12400	300	1.9 (2.0)	2.4 (2.5)	16 (4.2)	120
1030A-7	13600	300	3.8 (4.0)	4.0 (4.2)	32 (8.5)	120
1170A-7	15600	400	3.8 (4.0)	4.0 (4.2)	32 (8.5)	120
1310A-7	17900	500	3.8 (4.0)	4.0 (4.2)	32 (8.5)	120
1470A-7	20600	500	3.8 (4.0)	4.0 (4.2)	32 (8.5)	120
1660A-7	24200	600	3.8 (4.0)	4.0 (4.2)	32 (8.5)	120
1940A-7	26500	700	5.7 (6.0)	5.7 (6.0)	48 (12.5)	120
2180A-7	30600	800	5.7 (6.0)	5.7 (6.0)	48 (12.5)	120
2470A-7	36000	900	5.7 (6.0)	5.7 (6.0)	48 (12.5)	120
2880A-7	40400	1000	7.6 (8.0)	8.0 (8.5)	64 (17)	120
3260A-7	47500	1200	7.6 (8.0)	8.0 (8.5)	64 (17)	120

Modules used, noise, DC capacitance

Inverter unit type ACS880-104LC-	Inverter modules used		Noise level*	DC capacitance
	Qty	Type ACS880-104LC-	dB(A)	µF
U_N = 690 V				
0390A-7	1	0390A-7	63	6000
0430A-7	1	0430A-7	63	6000
0480A-7	1	0480A-7	63	6000
0530A-7	1	0530A-7	63	6000
0600A-7	1	0600A-7	63	9000
0670A-7	1	0670A-7	63	9000
0750A-7	1	0750A-7	63	9000
0850A-7	1	0850A-7	63	9000
1030A-7	2	0530A-7	66	12000
1170A-7	2	0600A-7	66	18000
1310A-7	2	0670A-7	66	18000
1470A-7	2	0750A-7	66	18000
1660A-7	2	0850A-7	66	18000
1940A-7	3	0670A-7	68	27000
2180A-7	3	0750A-7	68	27000
2470A-7	3	0850A-7	68	27000
2880A-7	4	0750A-7	69	36000
3260A-7	4	0850A-7	69	36000

*Measured in a typical ABB (ACS880-107LC) cabinet installation.

Dimensions and weights

The weights of the ACS880-104LC modules are shown below. For the dimensions, see chapter Dimension drawings.

Module type	Weight	
	kg	lbs
ACS880-104LC-0390A-7 … -0530A-7	59	130
ACS880-104LC-0600A-7 … -0850A-7	63	139

Free space requirements

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

For an example, see layout drawings.

Allowable mounting orientations

Frame R8i module:

- Upright
- On left-hand side (viewed from the front)

Typical power cable sizes

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

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

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

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

Input power (DC) connection

Voltage (U_1)	ACS880-104LC-xxxxx-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
Input terminals	M12, maximum intrusion into module 20 mm (0.8”). Torque: 70 N·m (52 lbf·ft). See also chapter Dimension drawings.

Motor (AC) connection

Motor types	Asynchronous AC induction motors, permanent magnet synchronous motors and AC induction servomotors, ABB synchronous reluctance (SynRM) motors
Voltage (U_2)	0 to AC supply voltage of drive, 3-phase symmetrical, U_{max} at field weakening point
Frequency	0…500 Hz • For higher operational output frequencies, please contact your local ABB representative. • Operation outside the range of 12…150 Hz requires derating. See section *Derating (page 155)*.
Current	See section *Ratings (page 154)*.
Switching frequency	3 kHz (typical)
Maximum motor cable length	500 m (1640 ft) **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.
Output terminals	Frame R8i Quick connector. See also chapter Dimensions. Busbars to quick connector: M12. Torque: 70 N·m (52 lbf·ft) Busbars to support insulators: M8. Torque: 9 N·m (6.5 lbf·ft) Cables to busbars: M12. Torque: 70 N·m (52 lbf·ft) See also section *One R8i module in a 400 mm wide Rittal VX25 enclosure (page 35)*

Control connections

See chapter Control unit.

Coolant connections

16 mm, for polyamide (PA) pipe.

Efficiency

Approximately 98% at nominal power level

Degree of protection

IP00

Optical components

The specifications of the optic cable are as follows:

- Storage temperature: -55 … +85 °C
- Installation temperature: -20 … +70 °C
- Maximum short-term tensile force: 50 N
- Minimum short-term bend radius: 25 mm
- Minimum long-term bend radius: 35 mm
- Maximum long-term tensile load: 1 N
- 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 respectively.

Ambient conditions

The unit is to be used in a heated indoor controlled environment.			
	Operation installed for stationary use	**Storage** in protective package	**Transportation** in protective package
Altitude above sea level	0…4000 m (13123 ft)* Output derated above 1000 m (3281 ft). See section Altitude derating. *Neutral-grounded TN and TT network systems, non-corner-grounded IT network systems. Corner-grounded TN, TT and IT network systems up to 600 V.	-	-
Air temperature	0 … +45 °C (+32 … +113 °F), no condensation allowed. Output derated in the range +45 … +55 °C (+113 … +131 °F).	-40 … +70 °C (-40 … +158 °F)	-40 … +70 °C (-40 … +158 °F)

Relative humidity	Maximum 95%, no condensation allowed	Maximum 95%, no condensation allowed	Maximum 95%, no condensation allowed
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases.		
Contamination	IEC/EN 60721-3-3:2002: Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use of weather protected locations	IEC 60721-3-1	IEC 60721-3-2
Chemical gases	Class 3C2	Class 1C2	Class 2C2
Solid particles	Class 3S1	Class 1S3 (packing must support this, otherwise 1S2)	Class 2S2
	No conductive dust allowed.		
Vibration	IEC 61800-5-1 IEC 60068-2-6:2007, EN 60068-2-6:2008 Environmental testing Part 2: Tests -Test Fc: Vibration (sinusoidal) 10 … 57 Hz, max. 0.075 mm amplitude 57 … 150 Hz 1 *g* Tested in a typical cabinet assembly according to: Max. 1 mm (0.04 in.) (peak value, 5 … 13.2 Hz), max. 0.7 *g* (13.2 … 100 Hz) sinusoidal	IEC/EN 60721-3-1:1997	IEC/EN 60721-3-1:1997
Shock IEC 60068-2-27:2008, EN 60068-2-27:2009 Environmental testing - Part 2-27: Tests - Test Ea and guidance: Shock	Not allowed	With packing max. 100 m/s^2 (330 ft./s^2) 11 ms	With packing max. 100 m/s^2 (330 ft./s^2) 11 ms

Materials

Module housing	• Zinc coated steel sheet • Front plate covered with Lexan 8B35 polycarbonate film, color PMS 1C Cool Gray and PMS Process Black (frame R8i)
Liquid cooling system	See *Cooling circuit materials (page 150)*
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinctive
Package	• Plywood base, corrugated cardboard, PET straps. • Product wrapping: polyethylene sheet or VCI protection bag
Disposal	The main parts of the drive can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated. Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and large electrolytic capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. Contact your local ABB distributor for further information on environmental aspects and recycling instructions for professional recyclers. End of life treatment must follow international and local regulations.

Standards

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

Markings

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

Auxiliary power consumption

Control equipment

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

Cooling fans

Frame size	U_N V AC	f Hz	I_{cont} A	Type
R8i	200…240	50/60	1.4	R3G225-RE07-03
	100…130	50/60	2.4	R3G225-RE19-22

Definitions

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

Fuse data

Flush-end fuse blocks used with 690 V units

Rating	Class	Example	Power loss at I_n	Clearing I^2t		Size	U_n
A rms			W	A^2s	V		V
800	aR	Bussmann 170M6546	125	995000	1000	3	1250 (IEC) 1300 (UL)
900	aR	Bussmann 170M6547	130	1500000	1000	3	1100 (IEC)
1000	aR	Bussmann 170M6548	135	2150000	1000	3	1100 (IEC)
1100	aR	Bussmann 170M6549	140	2800000	1000	3	1100 (IEC)
1250	aR	Bussmann 170M6500	145	3950000	1000	3*	1100 (IEC)
1400	aR	Bussmann 170M6501	150	6000000	1000	3*	1100 (IEC)

Tightening torques

For Rittal components, use the torques given in the Rittal assembly documentation.

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

Electrical connections

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

Mechanical connections

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

Insulation supports

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

Cable lugs

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

Disclaimers

Generic disclaimer

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

Cybersecurity disclaimer

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

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Control units of the drive

Contents of this chapter

This chapter

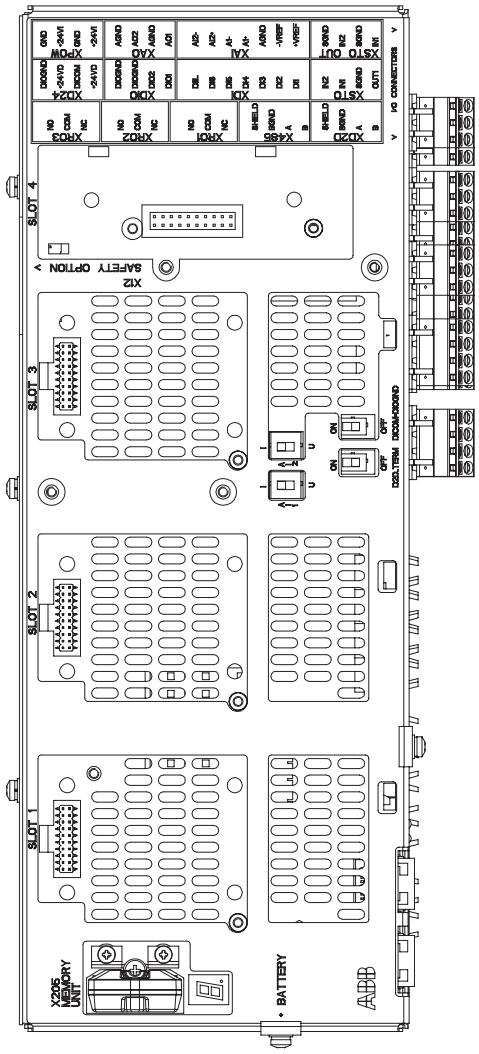
- describes the connections of the control unit(s) used in the drive,
- contains the specifications of the inputs and outputs of the control unit(s).

General

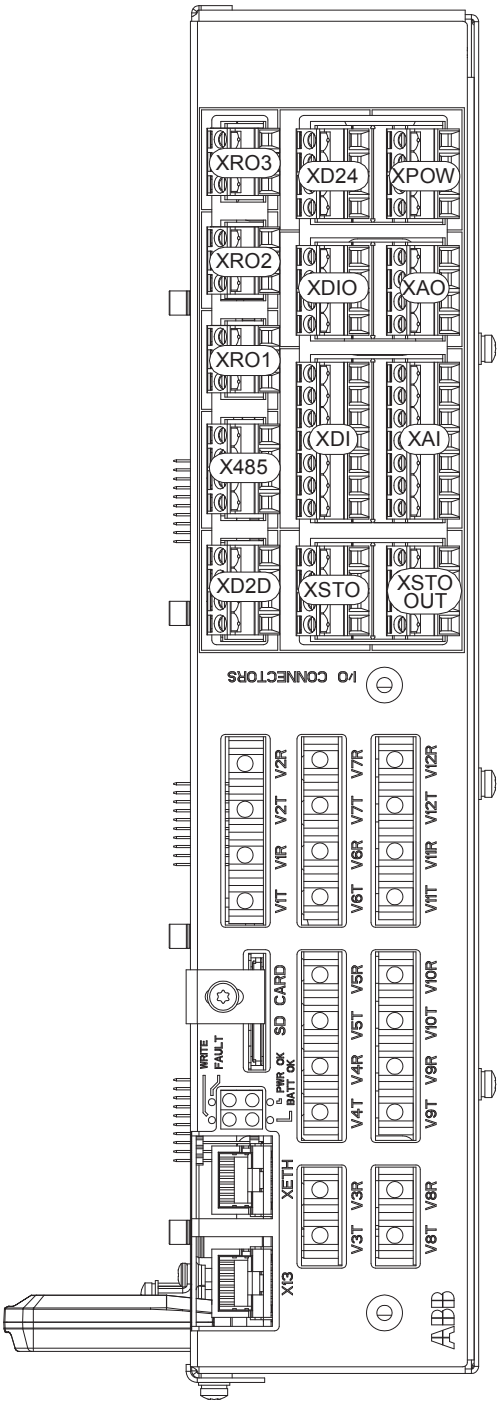
The BCU-x2 control unit is used with frame size R8i and multiples. The BCU-x2 consists of a BCON-12 control board (and a BIOC-01 I/O connector board and power supply board) built in a metal housing. The control unit is connected to the inverter module(s) by fiber optic cables.

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.

BCU-x2 control unit layout and connections



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



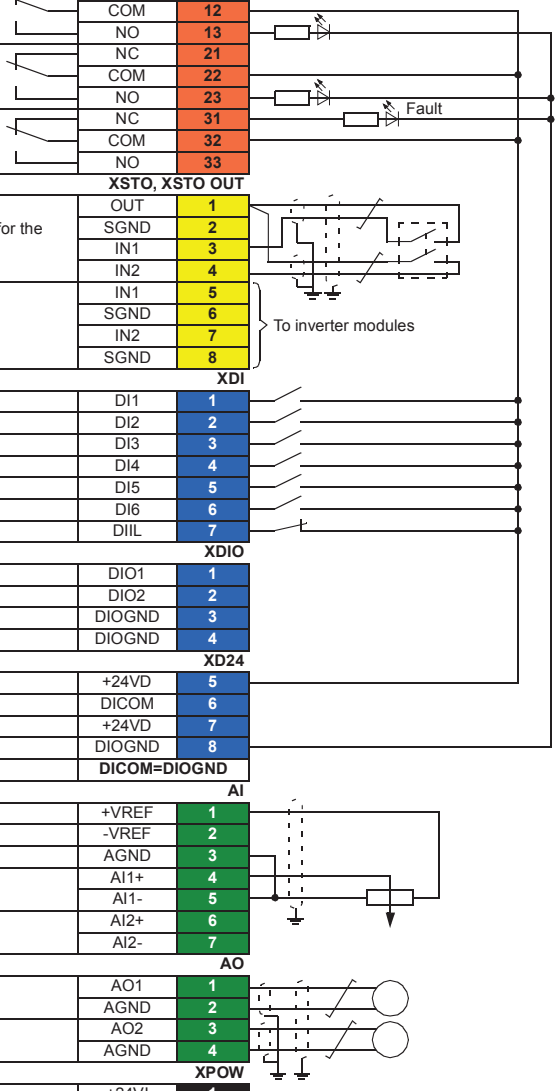
	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs, Digital input interlock (DIIL)
XDIO	Digital input/outputs
XD2D	Drive-to-drive link
XD24	+24 V output (for digital inputs)
XETH	Ethernet port – Not in use
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay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

Default I/O diagram of the 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.

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

Drive-to-drive link		**XD2D**
Drive-to-drive link [1]	B	1
	A	2
	BGND	3
	Shield	4
RS485 connection		**X485**
Not in use	B	5
	A	6
	BGND	7
	Shield	8
Relay outputs		**XRO1…XRO3**
Ready 250 V AC / 30 V DC 2 A	NC	11
	COM	12
	NO	13
Running 250 V AC / 30 V DC 2 A	NC	21
	COM	22
	NO	23
Faulted(-1) 250 V AC / 30 V DC 2 A	NC	31
	COM	32
	NO	33
Safe torque off		**XSTO, XSTO OUT**
Safe torque off input. Both circuits must be closed for the drive to start. [2]	OUT	1
	SGND	2
	IN1	3
	IN2	4
Safe torque off output to inverter modules [2]	IN1	5
	SGND	6
	IN2	7
	SGND	8
Digital inputs		**XDI**
Stop (0) / Start (1)	DI1	1
Forward (0) / Reverse (1)	DI2	2
Reset	DI3	3
Acceleration & deceleration select [3]	DI4	4
Constant speed 1 select (1 = on) [4]	DI5	5
By default not in use.	DI6	6
Run enable [5]	DIIL	7
Digital input/outputs		**XDIO**
Output: Ready	DIO1	1
Output: Running	DIO2	2
Digital input/output ground	DIOGND	3
Digital input/output ground	DIOGND	4
Auxiliary voltage output		**XD24**
+24 V DC 200 mA [6]	+24VD	5
Digital input ground	DICOM	6
+24 V DC 200 mA [6]	+24VD	7
Digital input/output ground	DIOGND	8
Ground selection switch [7]		**DICOM=DIOGND**
Analog inputs, reference voltage output		**AI**
10 V DC, R_L 1…10 kohm	+VREF	1
-10 V DC, R_L 1…10 kohm	-VREF	2
Ground	AGND	3
Speed reference 0(2)…10 V, R_{in} > 200 kohm [8]	AI1+	4
	AI1-	5
By default not in use. 0(4)…20 mA, R_{in} = 100 ohm [9]	AI2+	6
	AI2-	7
Analog outputs		**AO**
Motor speed rpm 0…20 mA, R_L < 500 ohm	AO1	1
	AGND	2
Motor current 0…20 mA, R_L < 500 ohm	AO2	3
	AGND	4
External power input		**XPOW**
24 V DC, 2.05 A Two supplies can be connected for redundancy.	+24VI	1
	GND	2
	+24VI	3
	GND	4
Safety functions module connection		**X12**
Control panel connection		**X13**
Memory unit connection		**X205**



Notes:

1) See section *The XD2D connector (page 176)*.

2) See chapter *The Safe torque off function (page 181)*.

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 176)*.

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 180)*.
DICOM=DIOGND ON: DICOM connected to DIOGND. OFF: DICOM and DIOGND separate.

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

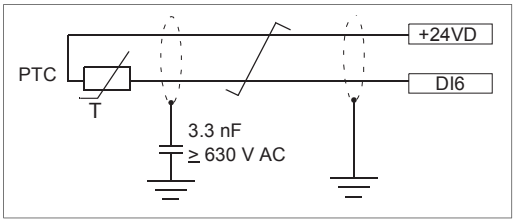
9) Current [0(4)…20 mA, R_{in} = 100 ohm] or voltage [0(2)…10 V, R_{in} > 200 kohm] input selected by switch AI2. Change of setting requires reboot of control unit.

External power supply for the control unit (XPOW)

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

DI6 as a PTC sensor input

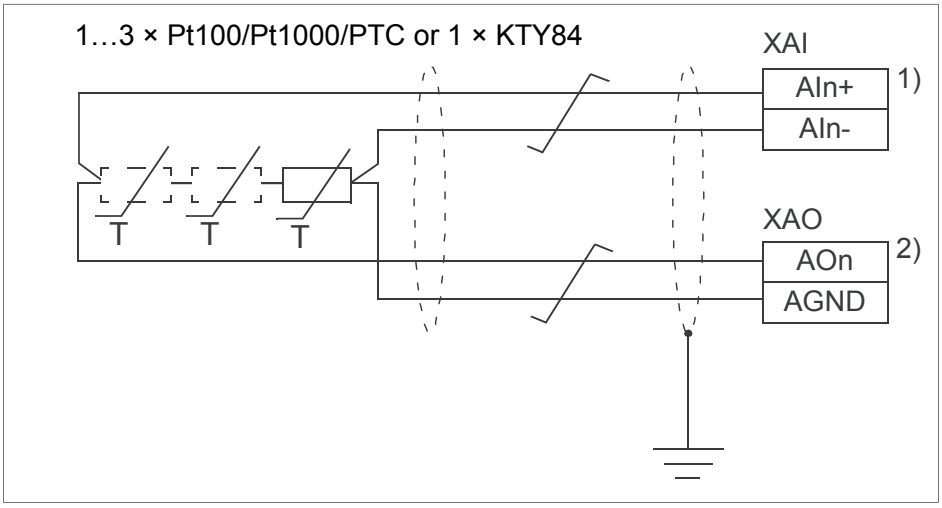
A PTC sensor can be connected to this input for motor temperature measurement as follows. The sensor can alternatively be connected to FEN-xx encoder interface module. At the sensor end of the cable, leave the shields unconnected or ground them indirectly via a high-frequency capacitor with a few nanofarads,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



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

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

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



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

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

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

DIIL input

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

Note:
This input is NOT SIL or PI certified.

The XD2D connector

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

- basic master/follower communication with one master drive and multiple followers,
- fieldbus control through the embedded fieldbus interface (EFB), or

- drive-to-drive (D2D) communication implemented by application programming.

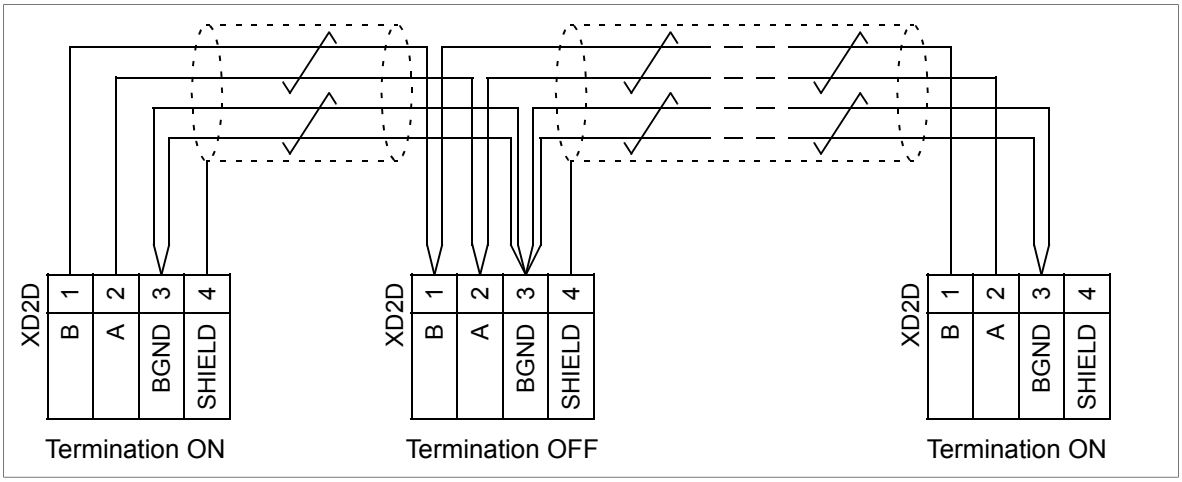
See the firmware manual of the drive for the related parameter settings.

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

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

The following diagram shows the wiring between control units.

BCU-x2



Safe torque off (XSTO, XSTO OUT)

See chapter *The Safe torque off function (page 181)*.

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

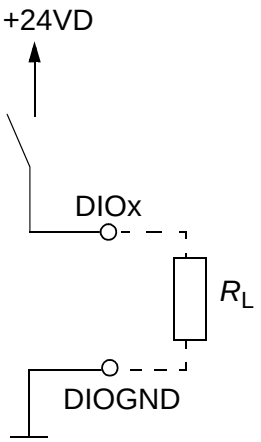
FSO-xx safety functions module connection (X12)

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

SDHC memory card slot

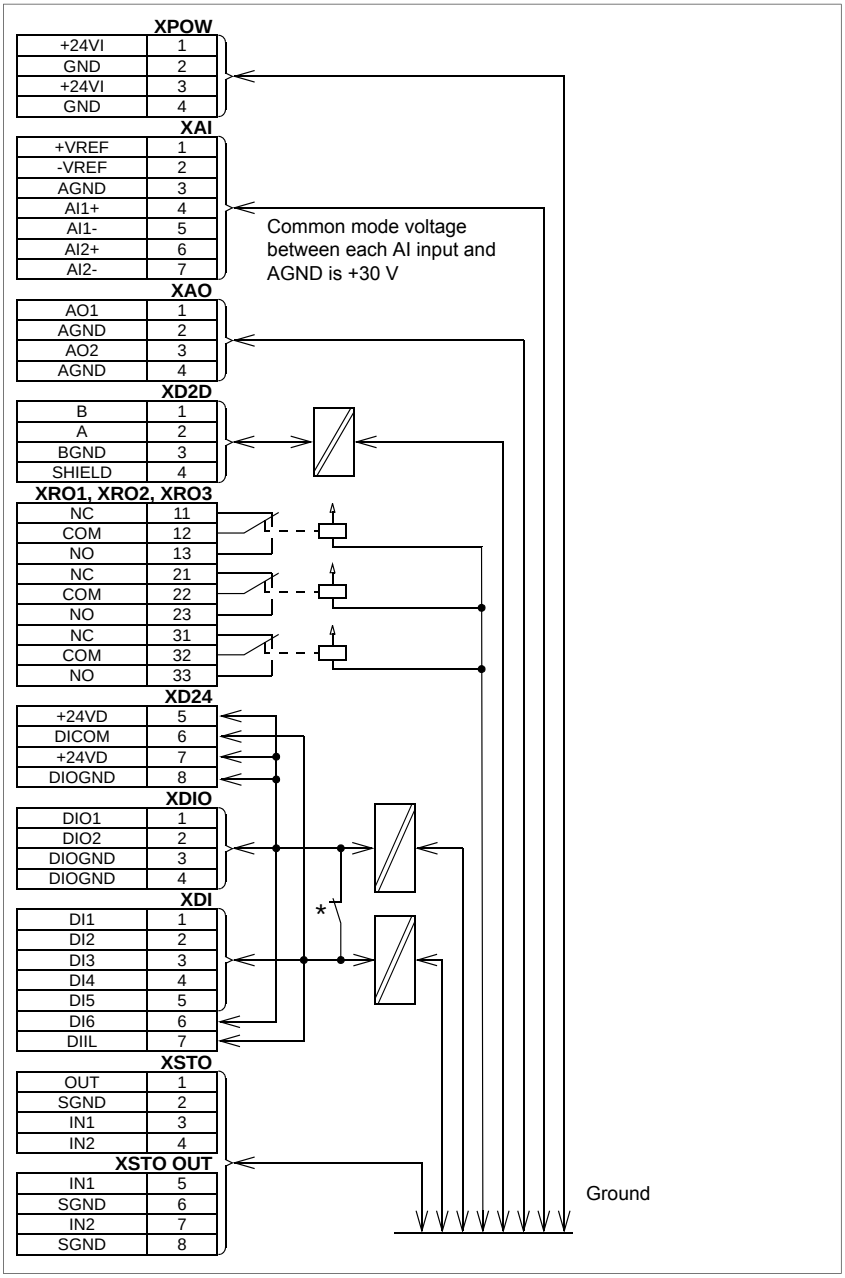
The BCU-x2 has an on-board data logger that collects real-time data from the power modules to help fault tracing and analysis. The data is stored onto the SDHC memory card inserted into the SD CARD slot and can be analyzed by ABB service personnel.

Connector data

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

Analog inputs AI1 and AI2 (XAI:4 … XAI:7). Current/voltage input mode selection by switches	Connector pitch 5 mm, wire size 2.5 mm^2 Current input: –20…20 mA, R_{in} = 100 ohm Voltage input: –10…10 V, R_{in} > 200 kohm Differential inputs, common mode range ±30 V Sampling interval per channel: 0.25 ms Hardware filtering: 0.25 ms, adjustable digital filtering up to 8 ms Resolution: 11 bit + sign bit Inaccuracy: 1% of full scale range
Analog outputs AO1 and AO2 (XAO)	Connector pitch 5 mm, wire size 2.5 mm^2 0…20 mA, R_{load} < 500 ohm Frequency range: 0…500 Hz Resolution: 11 bit + sign bit Inaccuracy: 2% of full scale range
XD2D connector	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: RS-485 Termination by switch
RS-485 connection (X485)	Connector pitch 5 mm, wire size 2.5 mm^2 Physical layer: RS-485
Safe torque off connection (XSTO)	Connector pitch 5 mm, wire size 2.5 mm^2 Input voltage range: -3…30 V DC Logic levels: “0” < 5 V, “1” > 17 V. **Note:** For the unit to start, both connections must be “1”. This applies to all control units (including drive, inverter, supply, brake, DC/DC converter etc. control units), but true Safe torque off functionality is only achieved through the XSTO connector of the drive/inverter control unit. Current consumption: 66 mA (continuous) per STO channel per R8i module EMC (immunity) according to IEC 61326-3-1 See also chapter *The Safe torque off function (page 181)*.
Safe torque off output (XSTO OUT)	Connector pitch 5 mm, wire size 2.5 mm^2 To STO connector of inverter module.
Control panel connection (X13)	Connector: RJ-45 Cable length < 3 m
Ethernet connection (XETH)	Connector: RJ-45 This connection is not supported by the firmware.
SDHC memory card slot (SD CARD)	Memory card type: SDHC Maximum memory size: 4 GB
The terminals of the control unit fulfill the Protective Extra Low Voltage (PELV) requirements. The PELV requirements of a relay output are not fulfilled if a voltage higher than 48 V is connected to the relay output.	

BCU-x2 ground isolation diagram



*Ground selector (DICOM=DIOGND) settings

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

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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

The Safe torque off function can be used, for example, to 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	*Safety of machinery – Electrical equipment of machines – Part 1: General requirements*
IEC 61000-6-7:2014	*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*

Standard	Name
IEC 61326-3-1:2017	*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*
IEC 61508-1:2010	*Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 1: General requirements*
IEC 61508-2:2010	*Functional safety of electrical/electronic/programmable electronic safety-related systems – Part 2: Requirements for electrical/electronic/programmable electronic safety-related systems*
IEC 61511-1:2016	*Functional safety – Safety instrumented systems for the process industry sector*
IEC 61800-5-2:2016 EN 61800-5-2:2007	*Adjustable speed electrical power drive systems – Part 5-2: Safety requirements – Functional*
IEC 62061:2005 + A1:2012 + A2:2015 EN 62061:2005 + AC:2010 + A1:2013 + A2:2015	*Safety of machinery – Functional safety of safety-related electrical, electronic and programmable electronic control systems*
EN ISO 13849-1:2015	*Safety of machinery – Safety-related parts of control systems – Part 1: General principles for design*
EN ISO 13849-2:2012	*Safety of machinery – Safety-related parts of control systems – Part 2: Validation*

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 liquid-cooled multidrive cabinets and modules* (3AXD50000048634 [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 and 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”.

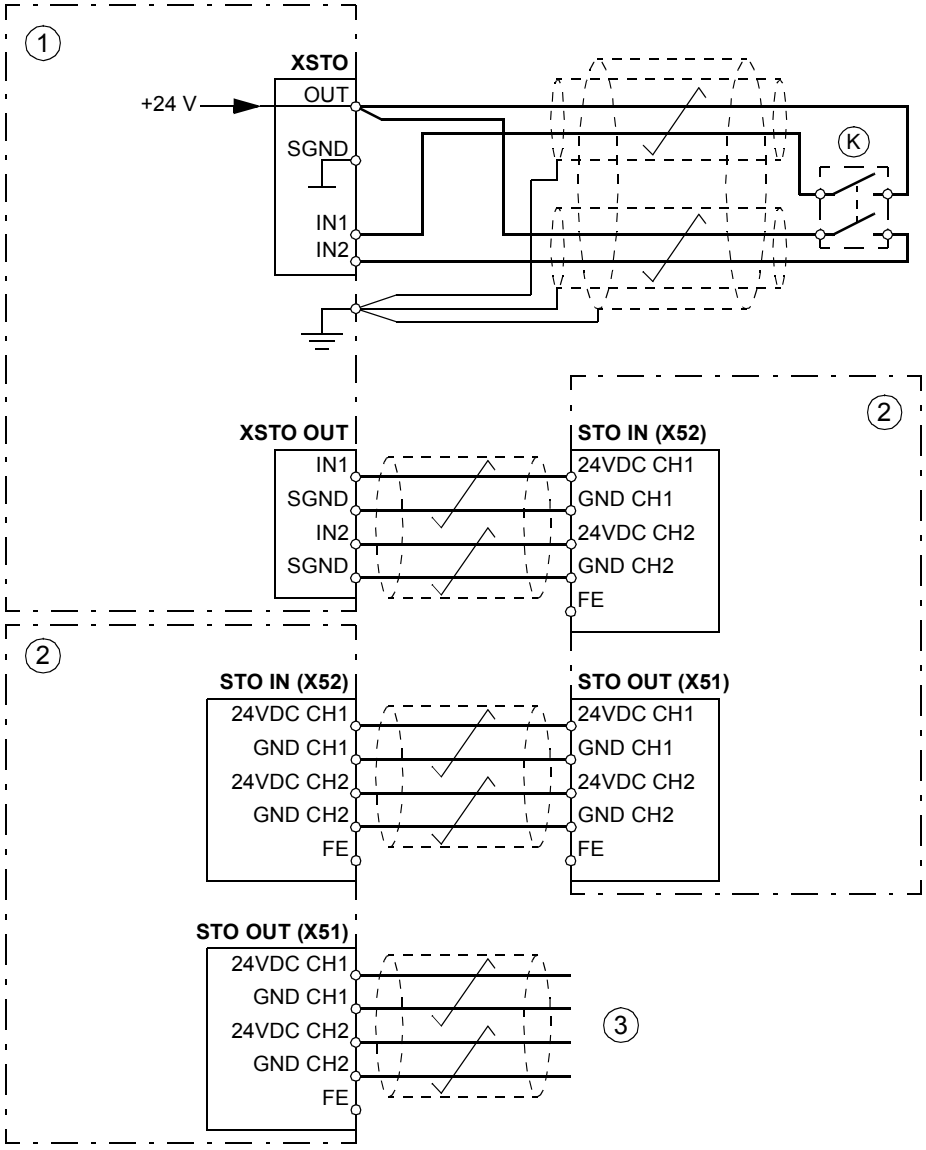
The pulse tolerance of the input channels is 1 ms.

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.

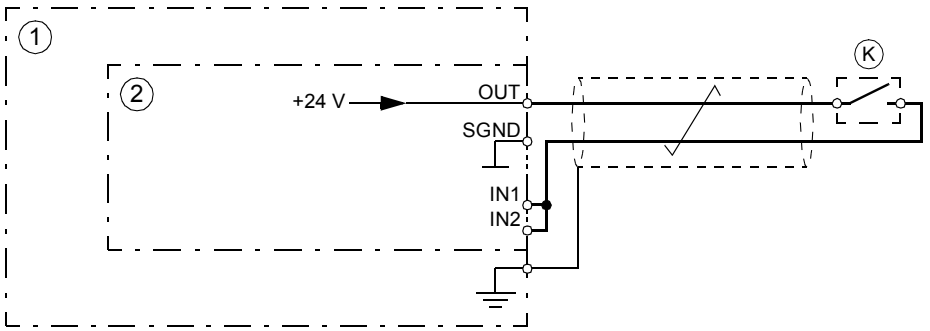
Dual-channel connection with internal power supply

Frame R8i and multiples



1	Inverter control unit
2	Inverter module(s)
3	To remaining inverter modules
K	Activation switch

Single-channel connection of activation switch



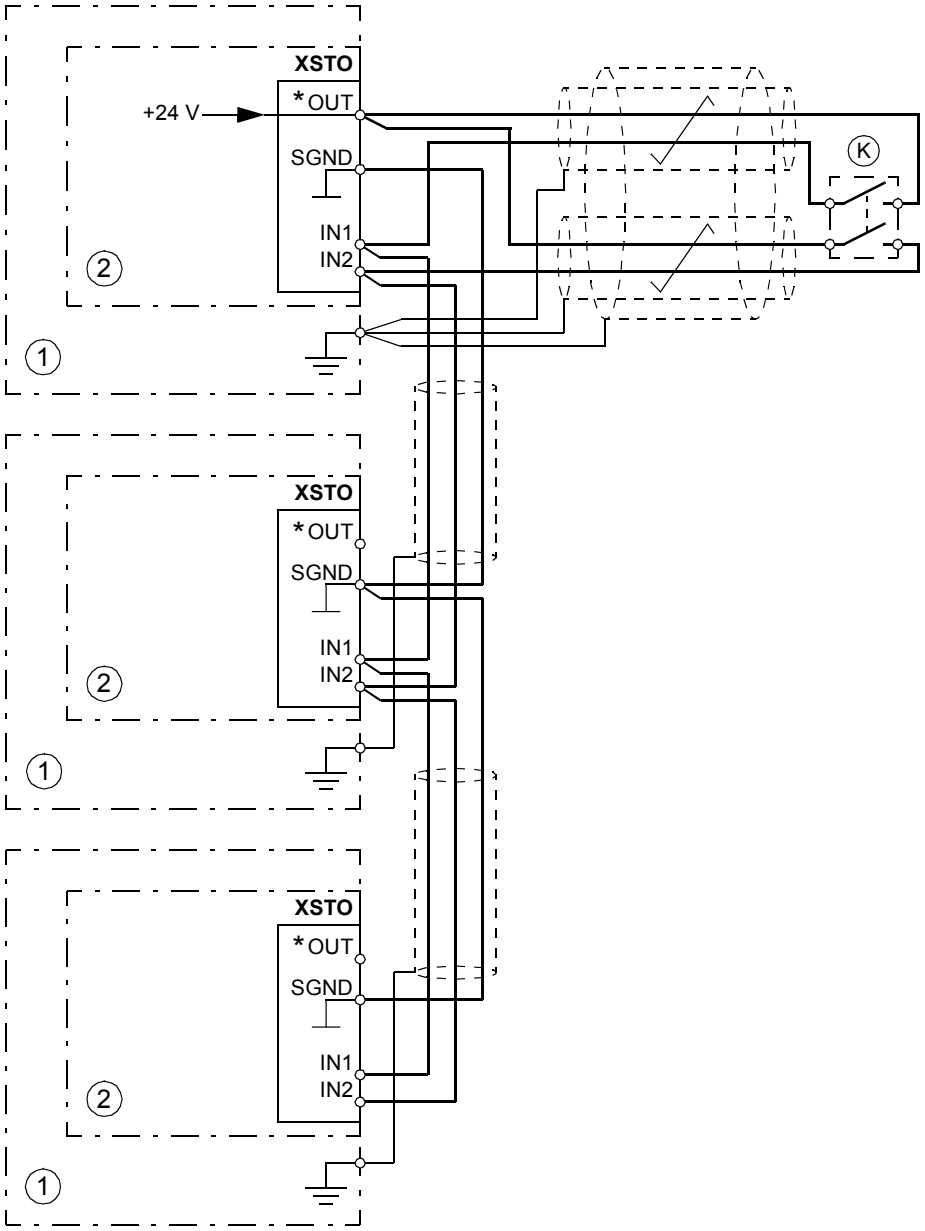
Note:

- 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

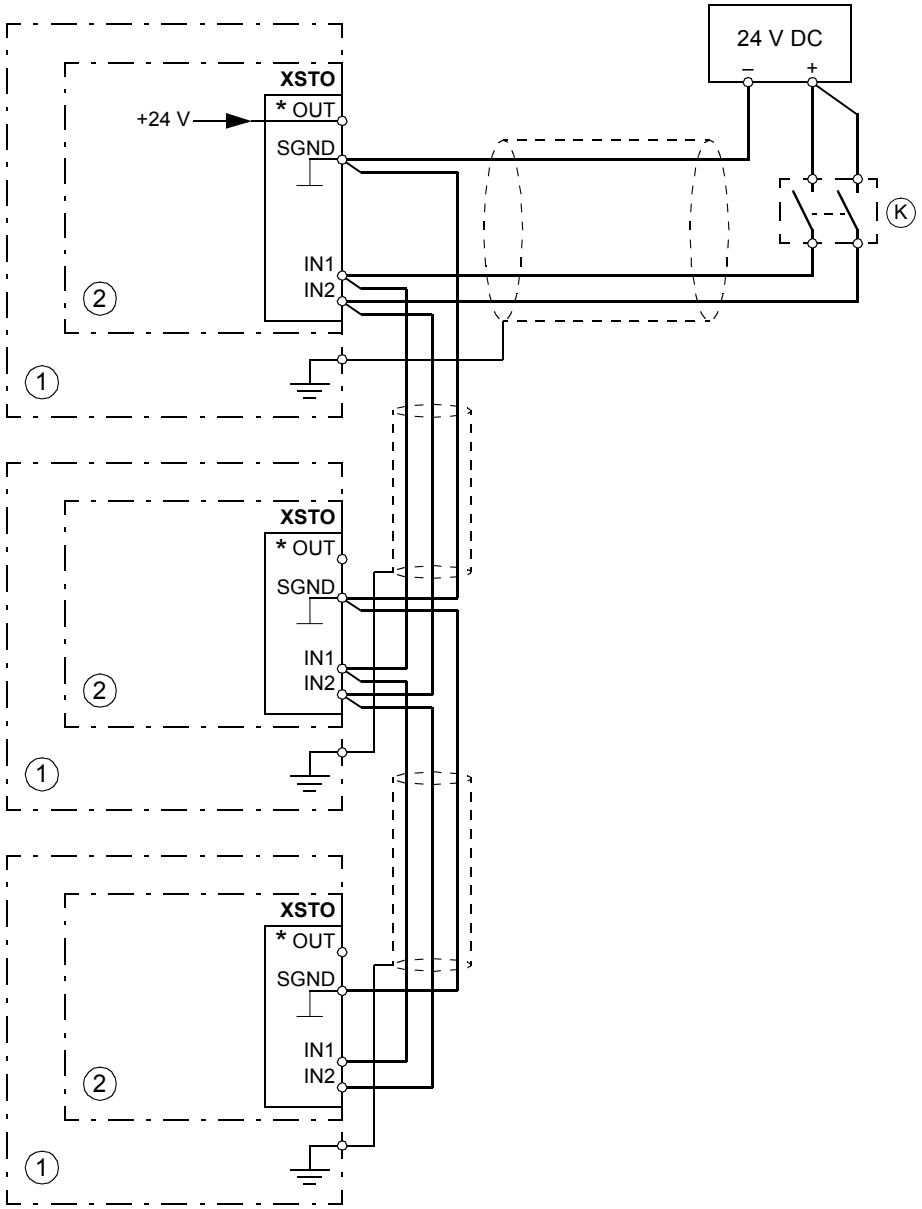
Multiple drives

Internal power supply



1	Drive/Inverter unit
2	Control unit
K	Activation switch
* Terminal designation may vary depending on drive/inverter unit type	

External power supply



1	Drive/Inverter unit
2	Control unit
K	Activation switch

* Terminal designation may vary depending on drive/inverter unit type

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* (refer to 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 drive 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 an FSO-xx safety functions module or an FPTC-0x module is installed, refer to its documentation.

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

Action	☑
WARNING! Follow the safety instructions. If you ignore them, injury or death, or damage to the equipment can occur.	☐
Ensure that the inverter can be run and stopped freely during start-up.	☐
Stop the inverter (if running), switch the input power off and isolate the inverter from the power line using a disconnector.	☐
Check the STO circuit connections against the wiring diagram.	☐
Close the disconnector and switch the power on.	☐

Action	☑
Test the operation of the STO function when the motor is stopped. • Give a stop command for the inverter (if running) and wait until the motor shaft is at a standstill. Ensure that the inverter operates as follows: • 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.	☐
Test the operation of the STO function when the motor is running. • Start the inverter and ensure 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. • Ensure 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.	☐
Test the operation of the failure detection of the inverter. The motor can be stopped or running. • 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 *FA81 Safe Torque Off 1 loss* 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 *FA82 Safe Torque Off 2 loss* 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.	☐
Document and sign the acceptance test report which verifies that the safety function is safe and accepted for operation.	☐

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* (refer to 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 reseting 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 180/2*p* 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 194)*. 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 189)*.

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, follow the test given in section *Acceptance test procedure (page 189)*.

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)
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
3AXD10000078136 F													

- The following temperature profile is used in safety value calculations:
  - 670 on/off cycles per year with ΔT = 71.66 °C
  - 1340 on/off cycles per year with ΔT = 61.66 °C
  - 30 on/off cycles per year with ΔT = 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 B 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: 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 (%)

Abbr.	Reference	Description
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.

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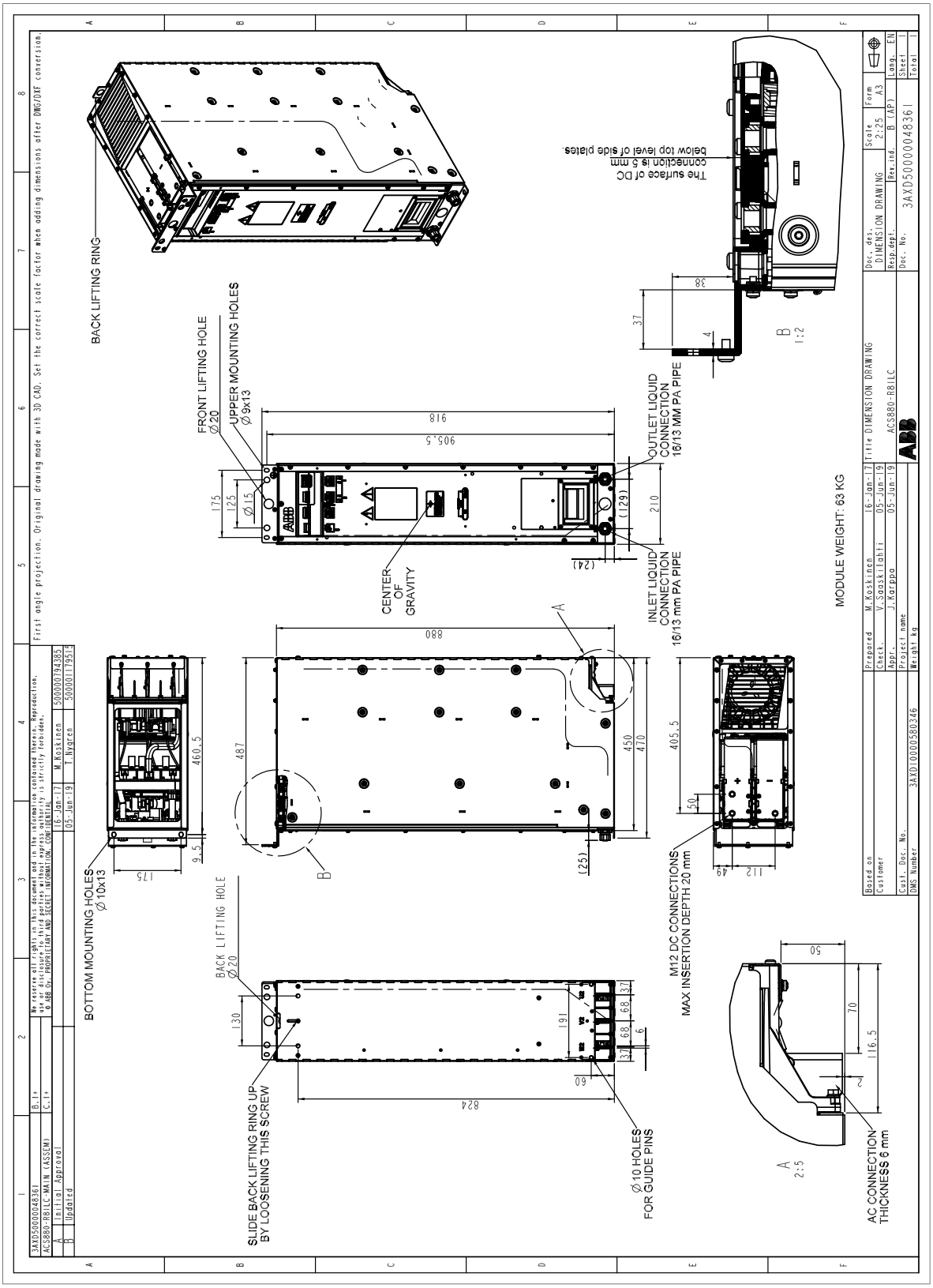
Dimension drawings

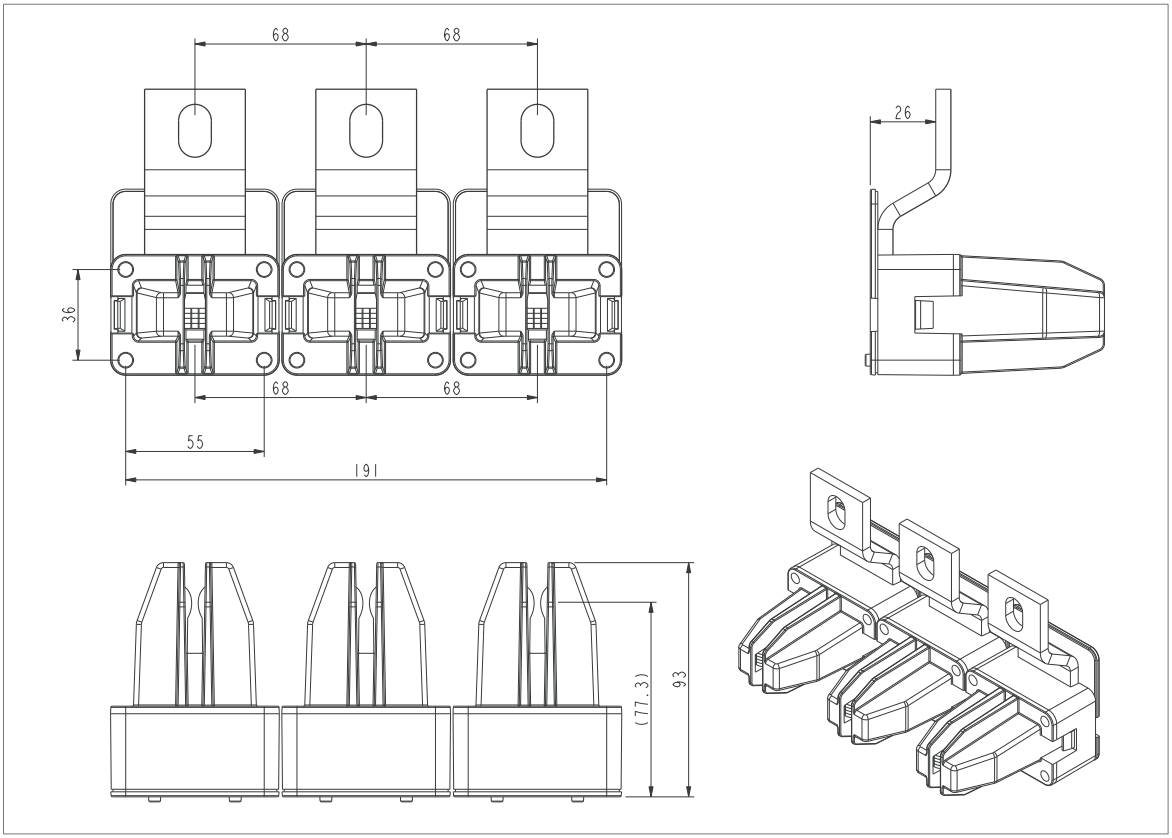
Contents of this chapter

This chapter contains dimension drawings of the ACS880-104LC inverter modules as well as auxiliary components. Dimensional drawings of most installation accessories are available from ABB on request.

Frame R8i inverter module

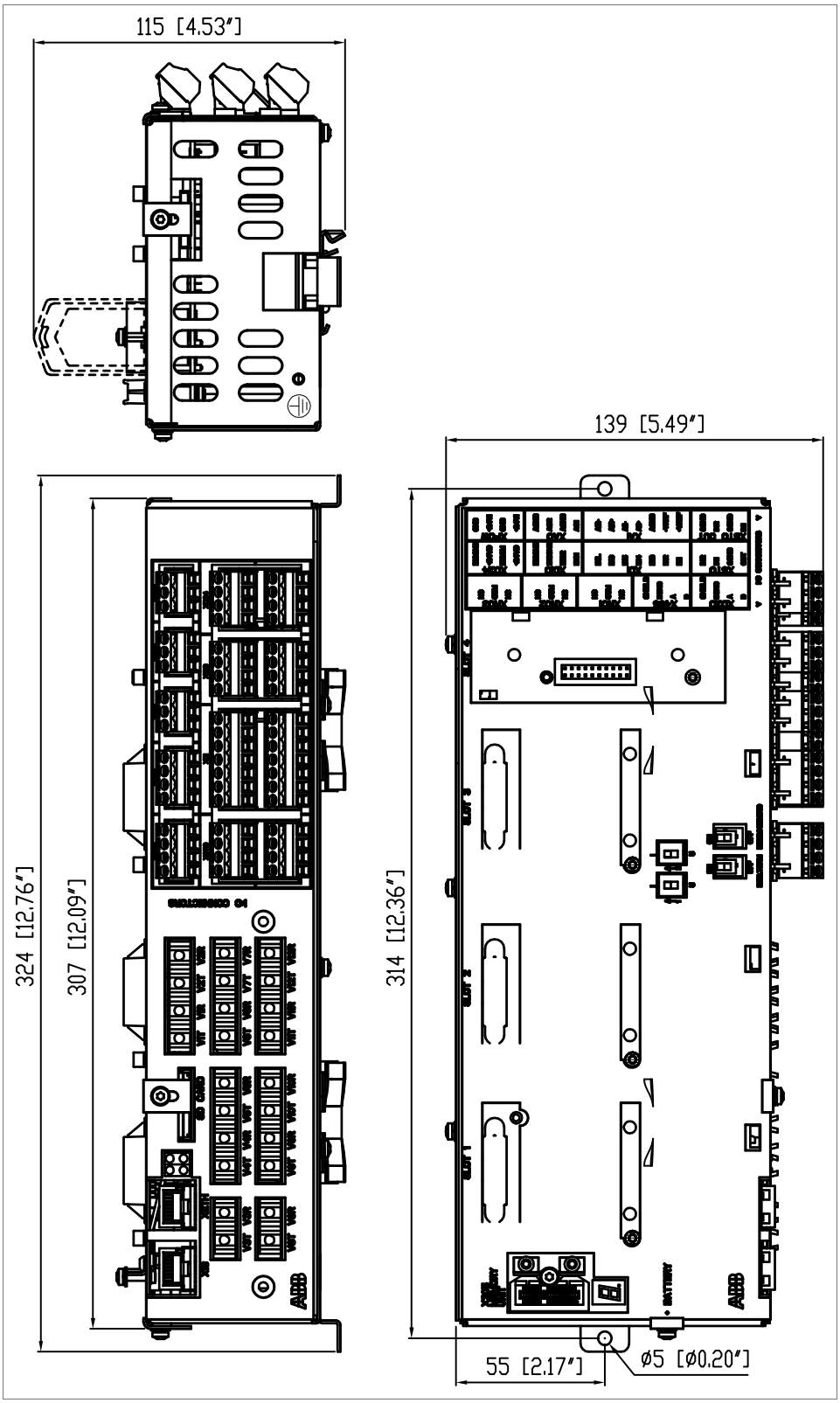


Quick connector

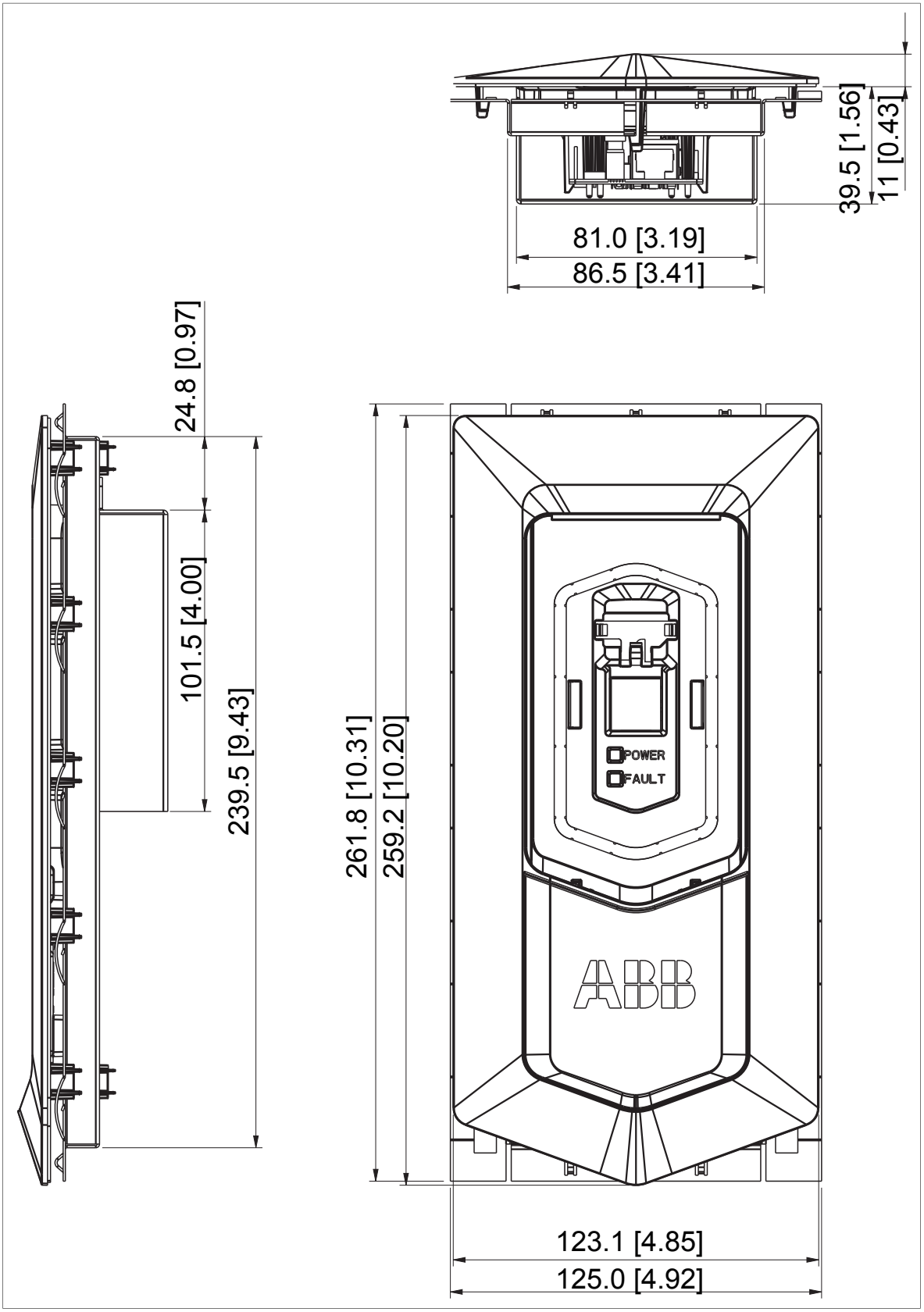


Control electronics

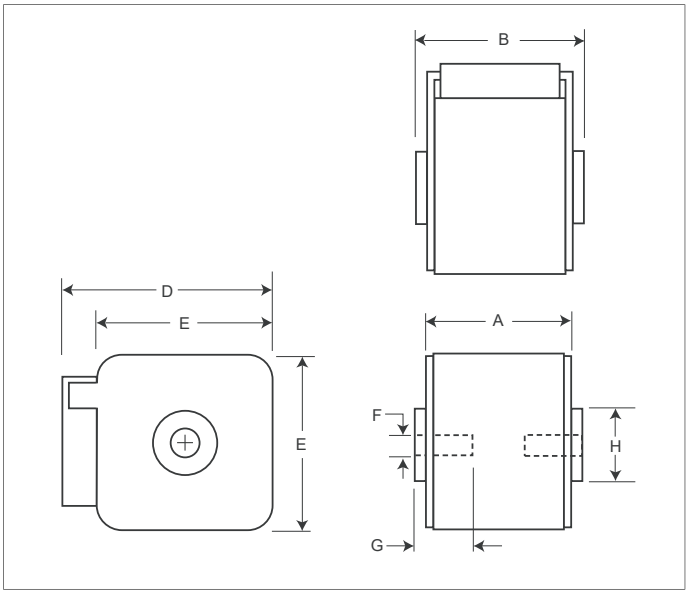
BCU control unit



DPMP-01 door mounting kit



DC fuse blocks (Bussmann)

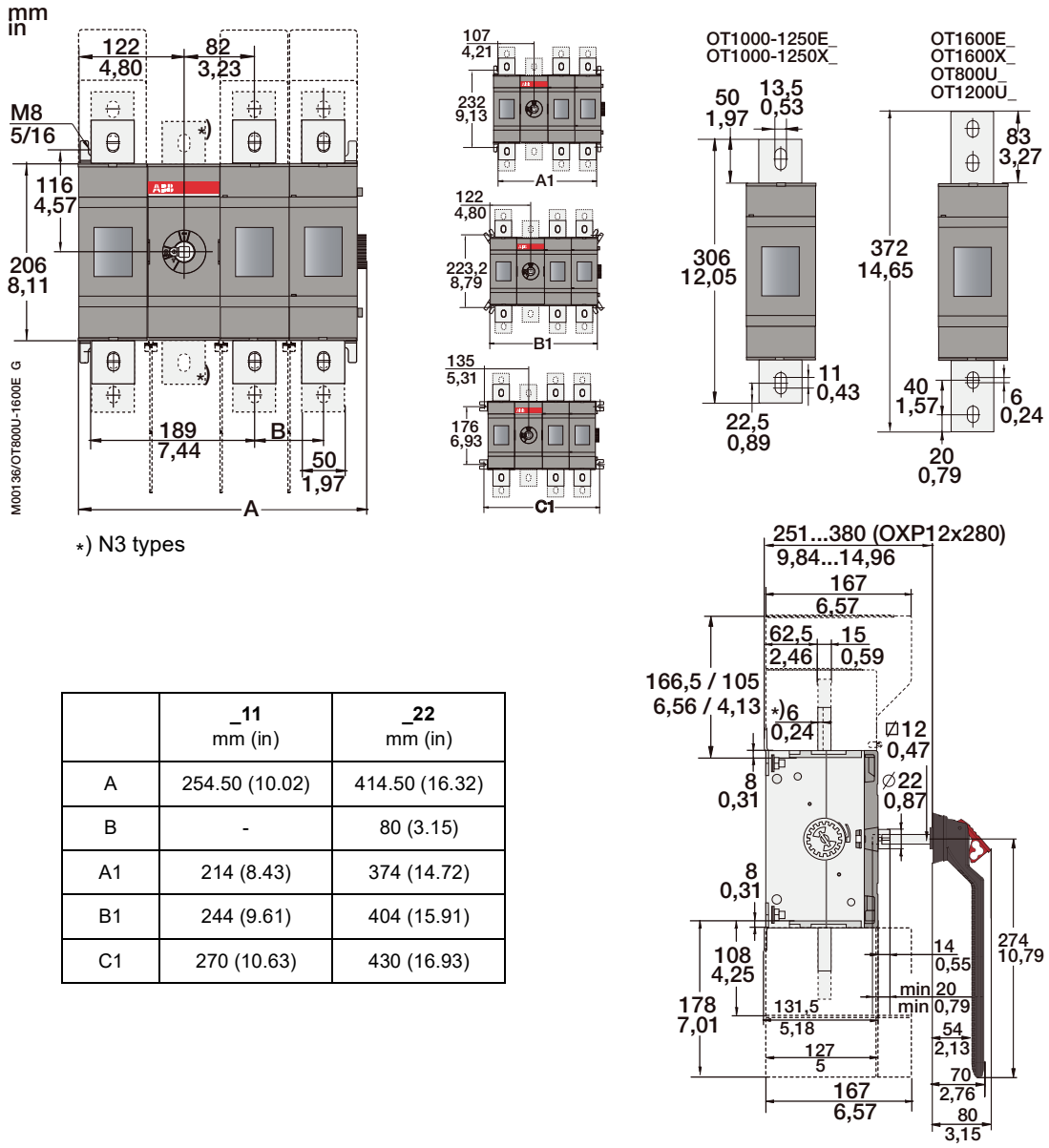


1000…1250 V fuses (as used with 690 V units)							
Size	**A** mm (inch)	**B** mm (inch)	**D** mm (inch)	**E** mm (inch)	**F**	**G** mm (inch)	**H** mm (inch)
3	81 (3.19)	83 (3.27)	92 (3.62)	76 (2.99)	M12	10 (0.39)	30 (1.18)
3*	81 (3.19)	91 (3.58)	92 (3.62)	76 (2.99)	M12	10 (0.39)	30 (1.18)

Switchgear and charging components

OT_ DC switch/disconnectors

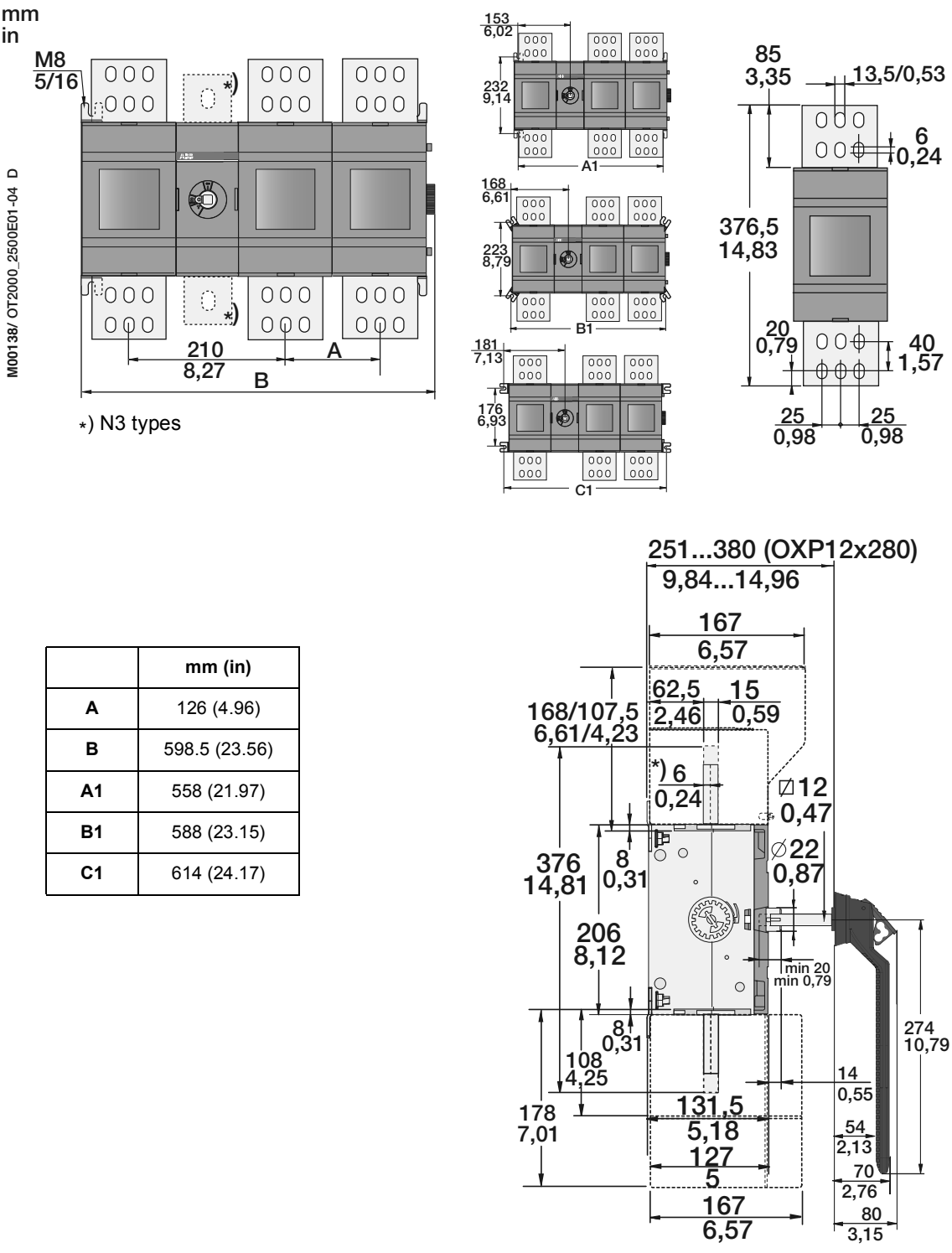
OT1600E11, OT1600E22



*) N3 types

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

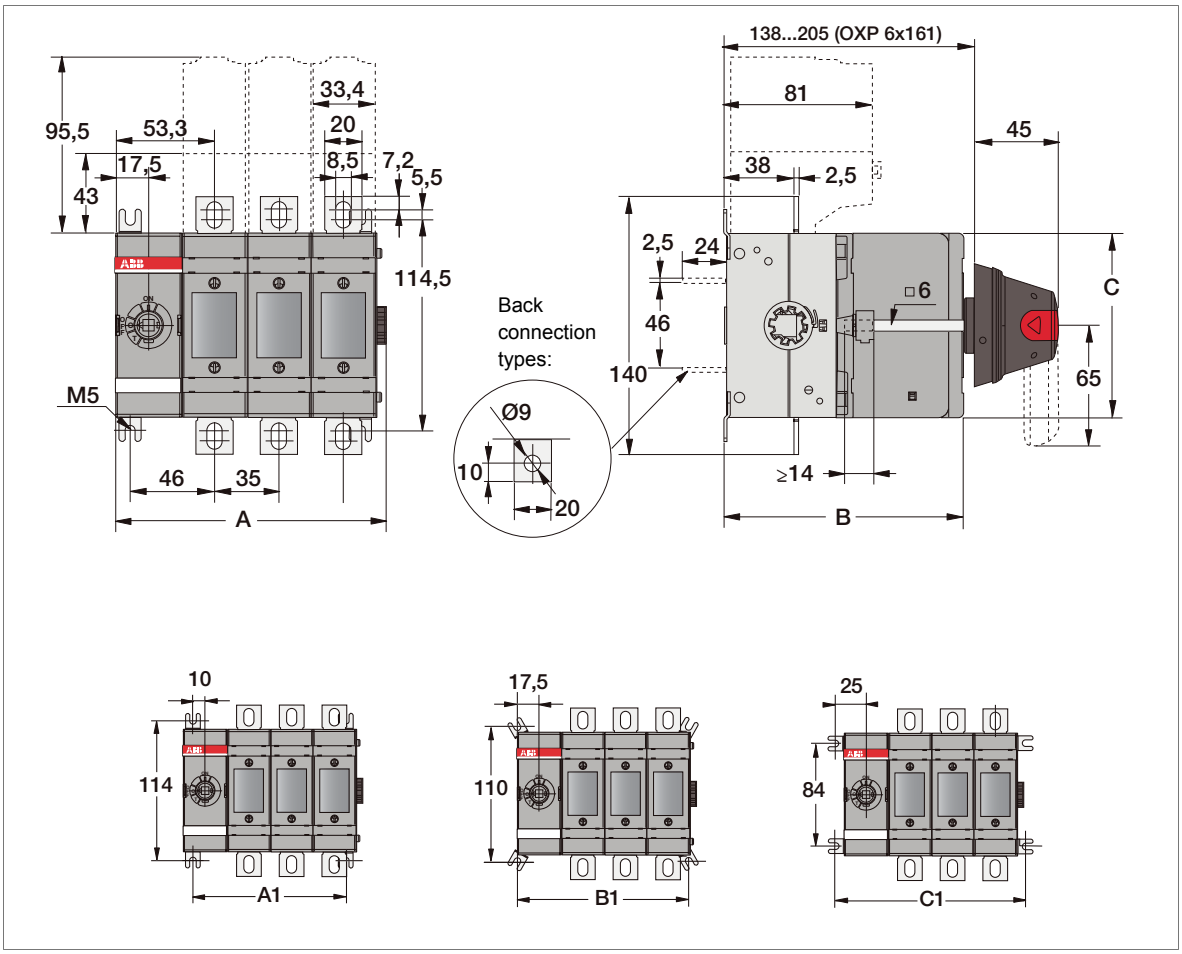
OT2500E22



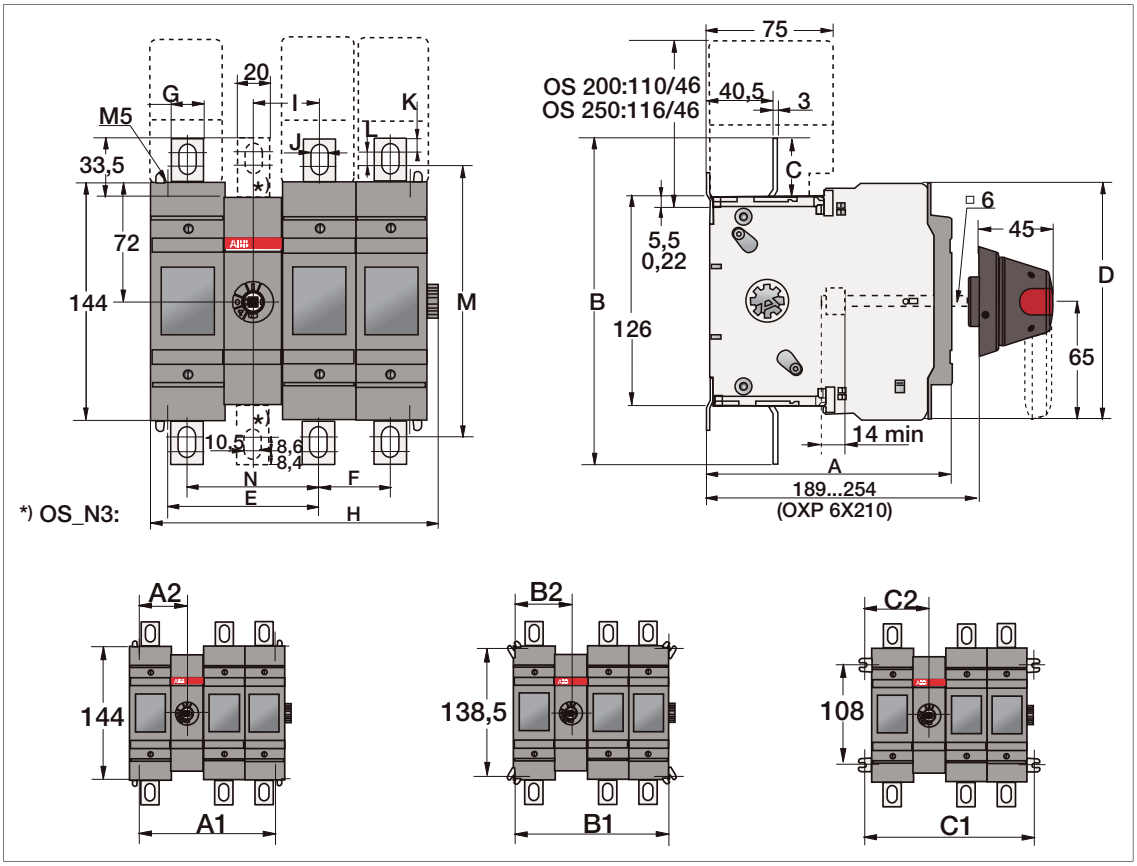
	mm (in)
A	126 (4.96)
B	598.5 (23.56)
A1	558 (21.97)
B1	588 (23.15)
C1	614 (24.17)

OS_ charging switches

OS160GD04F



OS200DZ22F

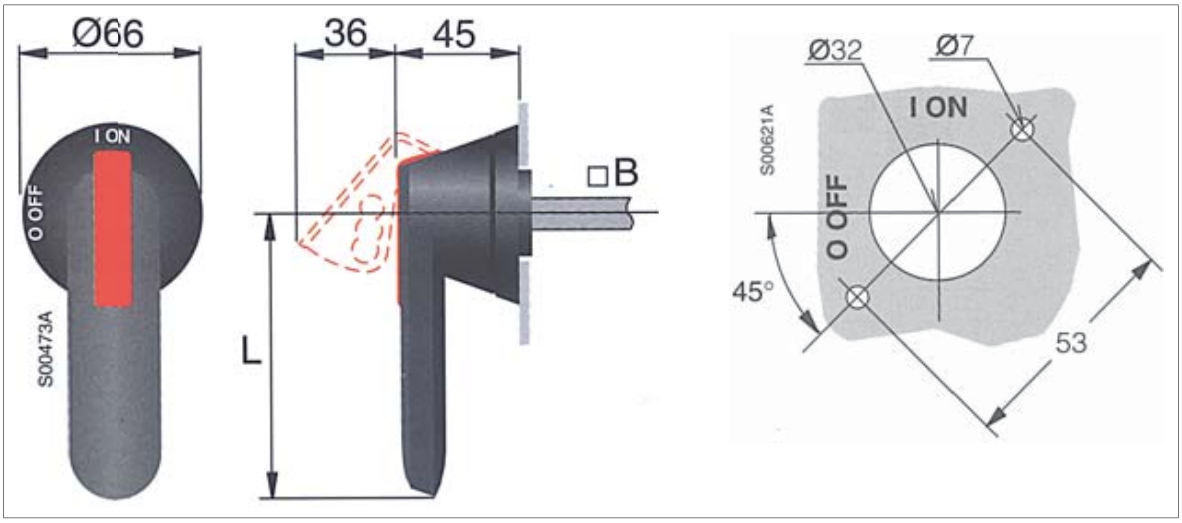


OS200			
D22	**mm (inch)**	**D22**	**mm (inch)**
A	149 (5.87)	**K**	8.4 (0.33)
B	199 (7.83)	**L**	8.6 (0.34)
C	36.5 (1.44)	**M**	165 (6.50)
D	144.5 (5.69)	**N**	80 (3.15)
E	135.5 (5.33)	**A1**	191 (7.52)
F	43.5 (1.71)	**A2**	95.5 (3.76)
G	20 (0.79)	**B1**	210 (8.27)
H	219 (8.62)	**B2**	105 (4.13)
I	40 8 (1.57)	**C1**	227 (8.94)
J	10 (0.39)	**C2**	113.5 (4.47)

OHB_ switch handles

Note: The drawings are not to scale.

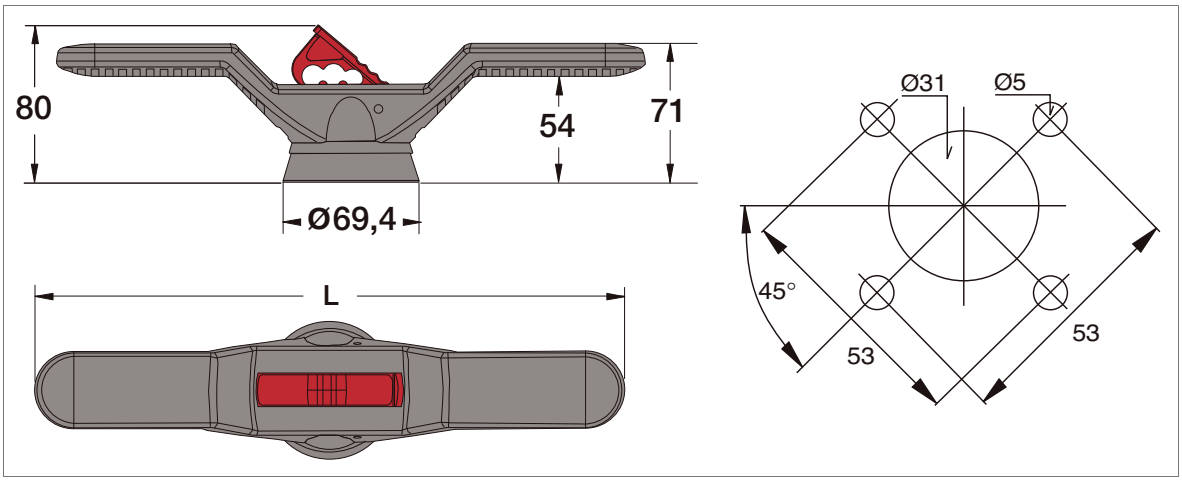
OHB65J6



L = 65 mm

B = 6 × 6 mm

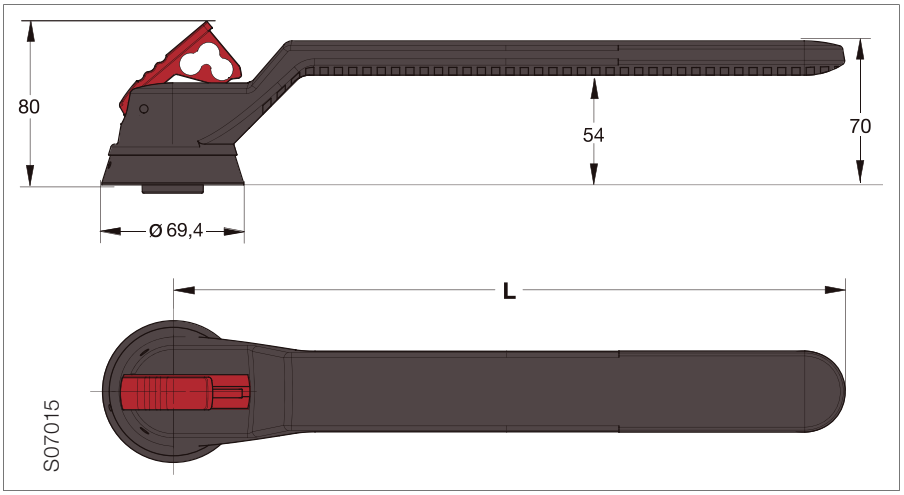
OHB150J12P



L = 300 mm

Shaft: 12 × 12 mm

OHB274J12



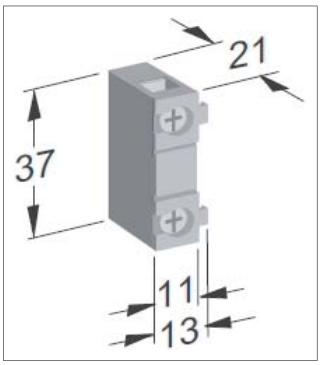
L = 274 mm

Shaft: 12 × 12 mm

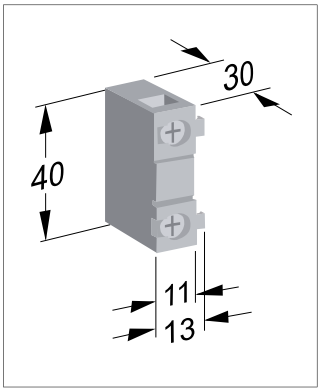
The drilling pattern is the same as OHB65J6.

Auxiliary contacts

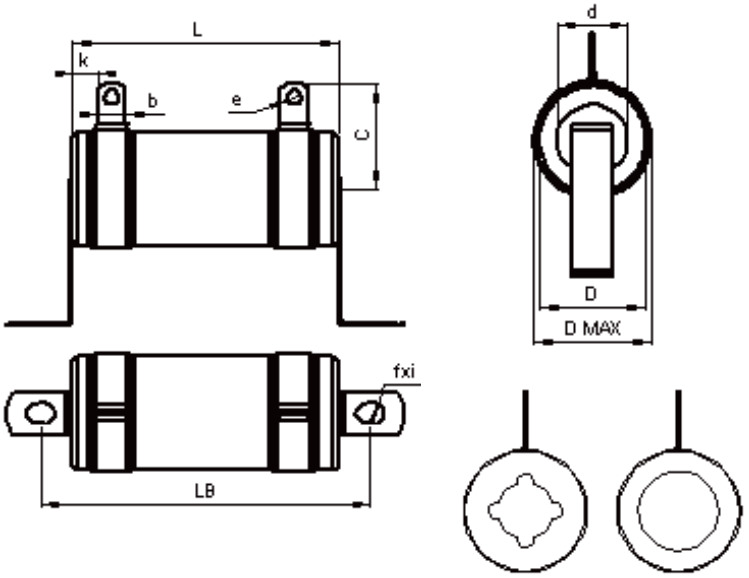
OA1G10



OA3G01

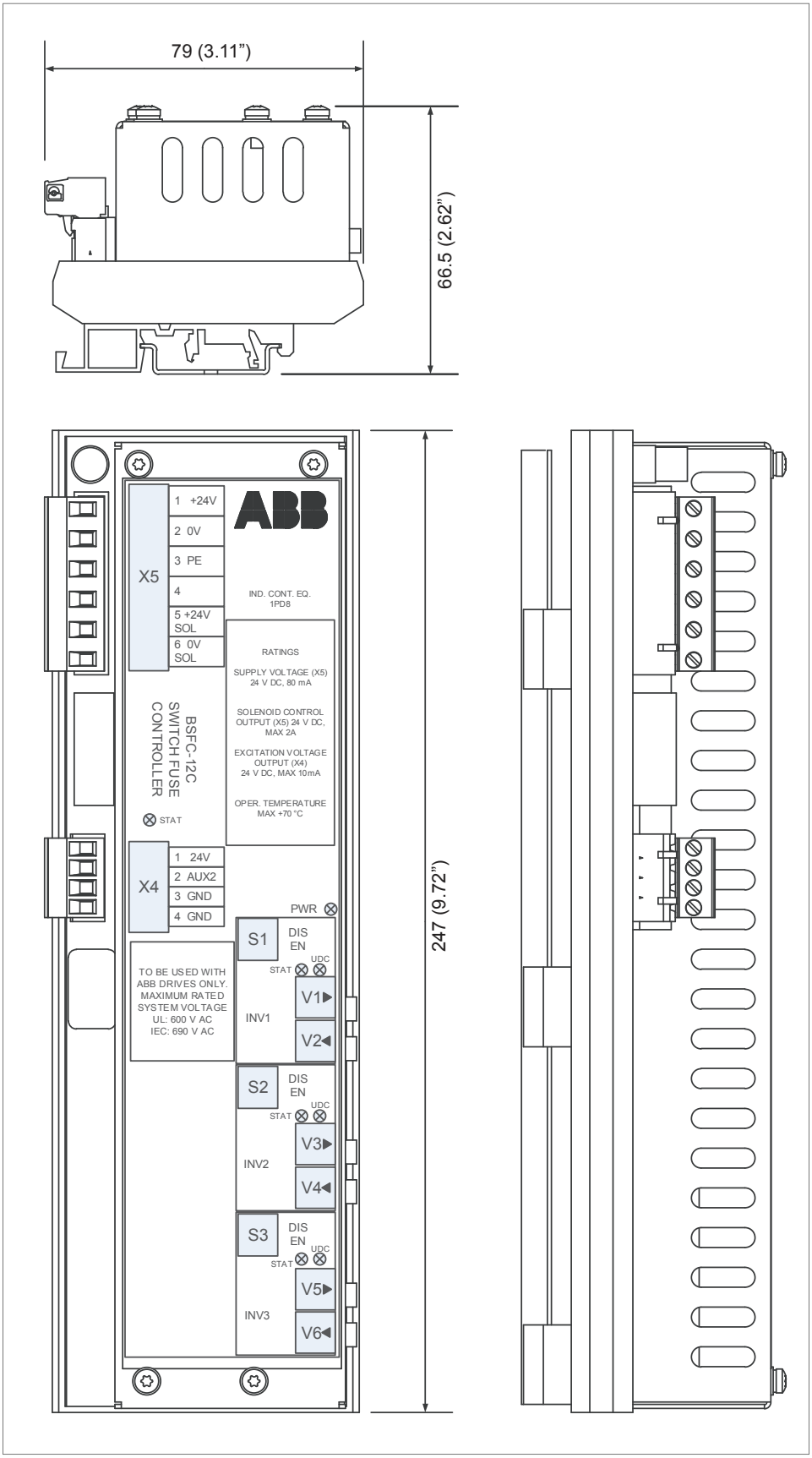


ZRF 30/165 S charging resistor

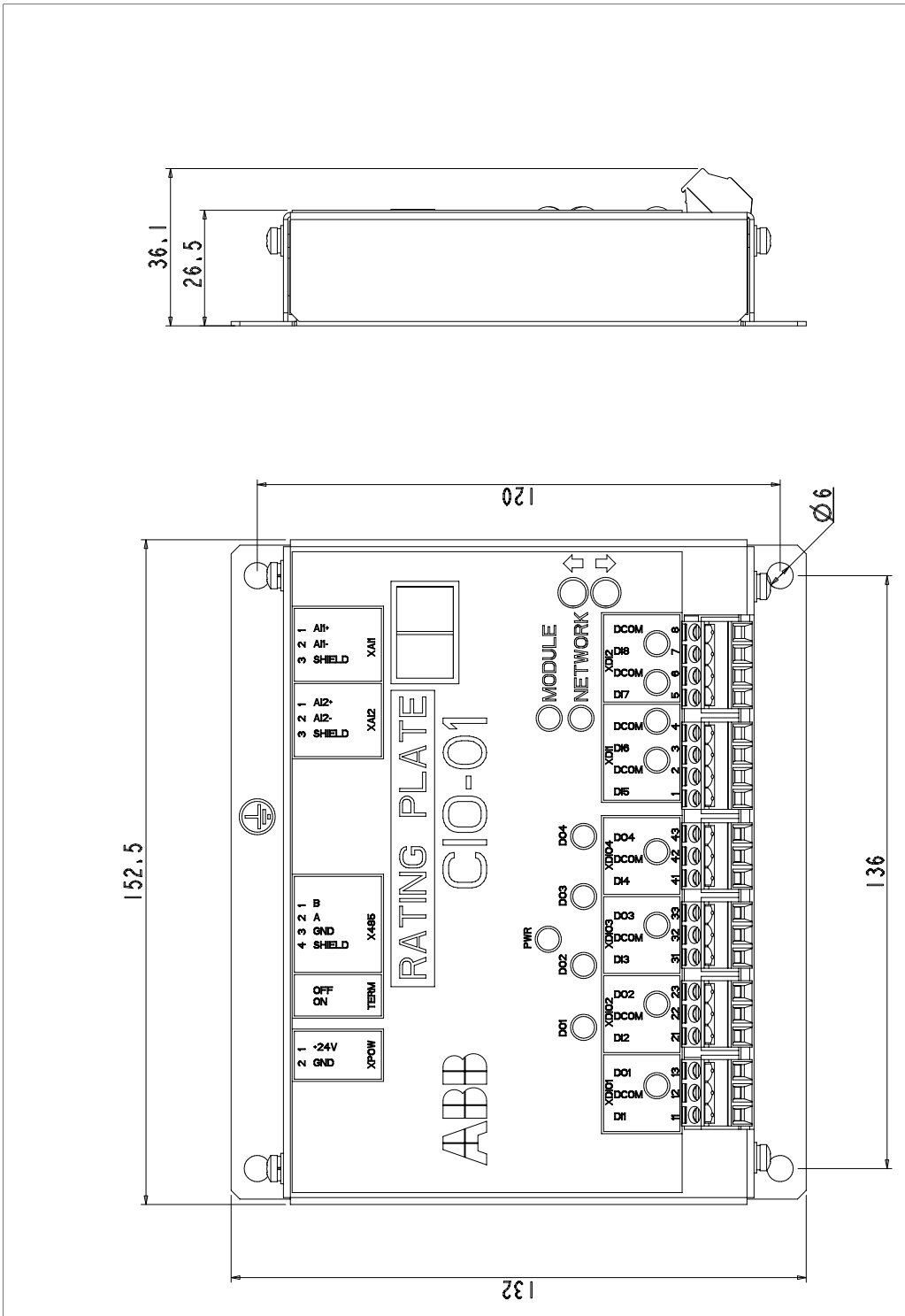


L	165 ±3
LB	183
fxi	5.5 × 8
D MAX	34
k	≥6
e	4.2

BSFC-12C charging controller



CIO-01 I/O module



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Example circuit diagrams

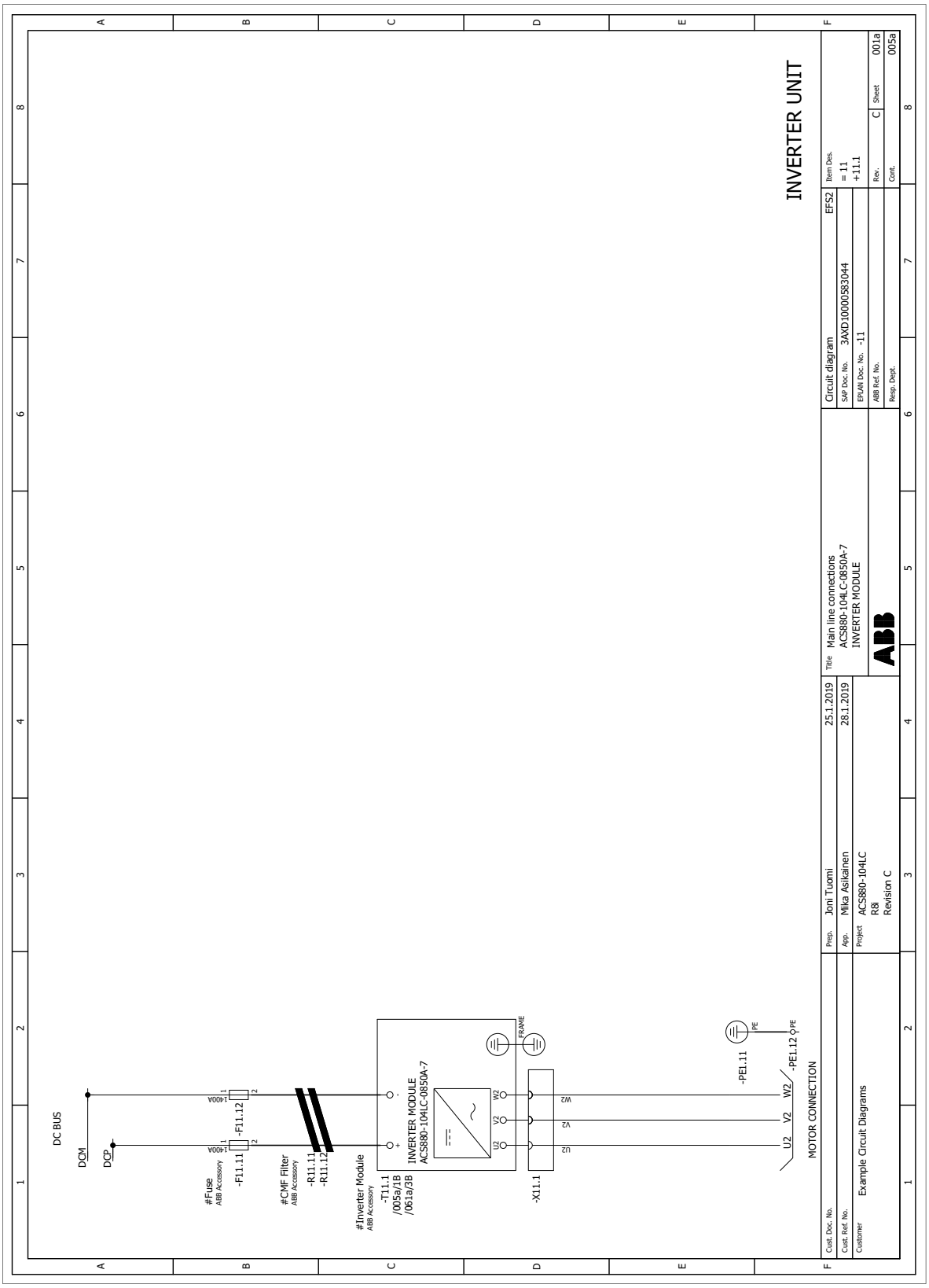
Contents of this chapter

This chapter contains connection diagram examples for the whole inverter unit.

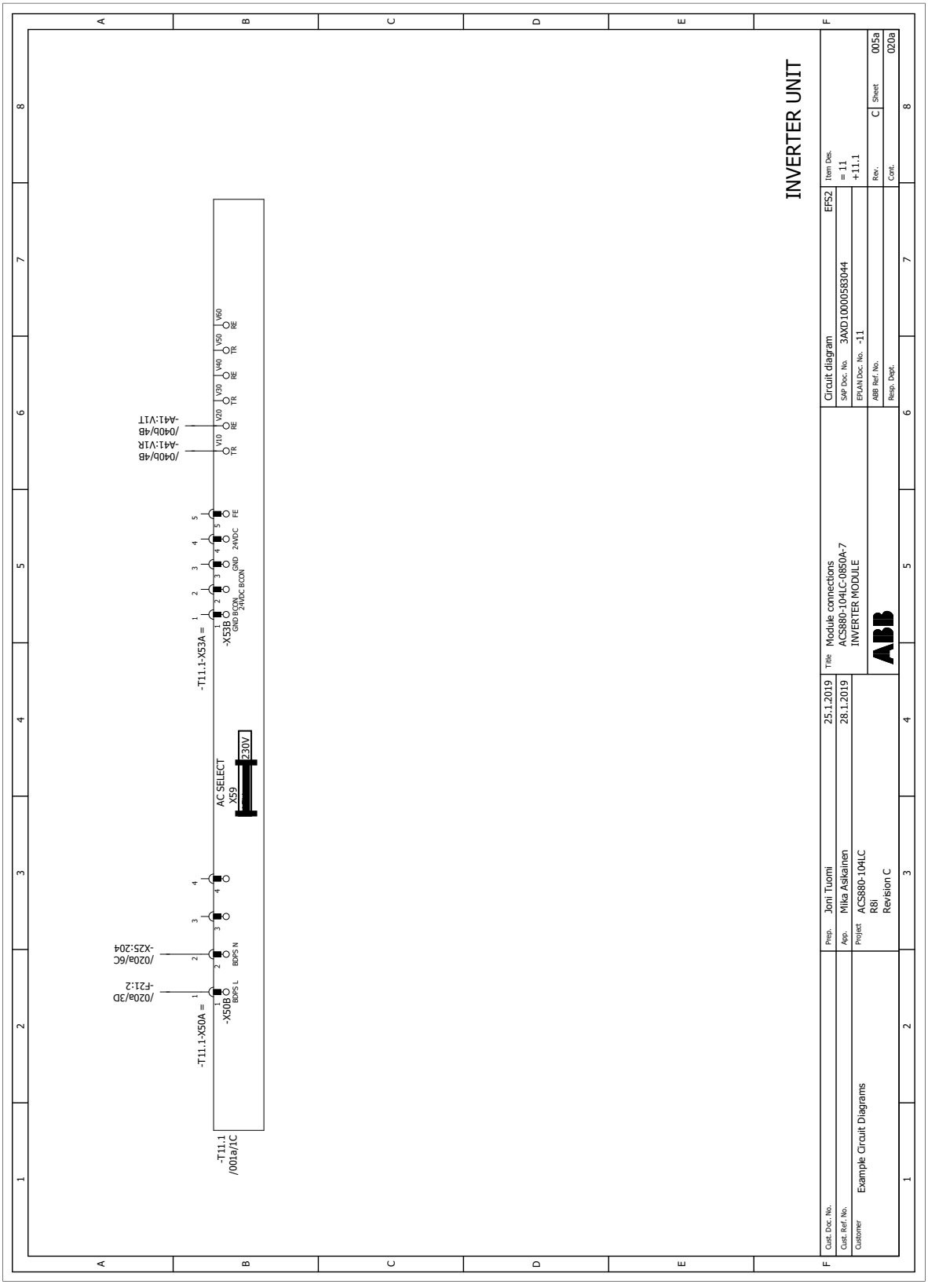
Note:
By default, the Safe torque off (STO) function is not in use, and has been bridged at the factory as shown in the diagrams. For information on implementing the function, see chapter *The Safe torque off function*.

Frame R8i without DC switch/disconnector

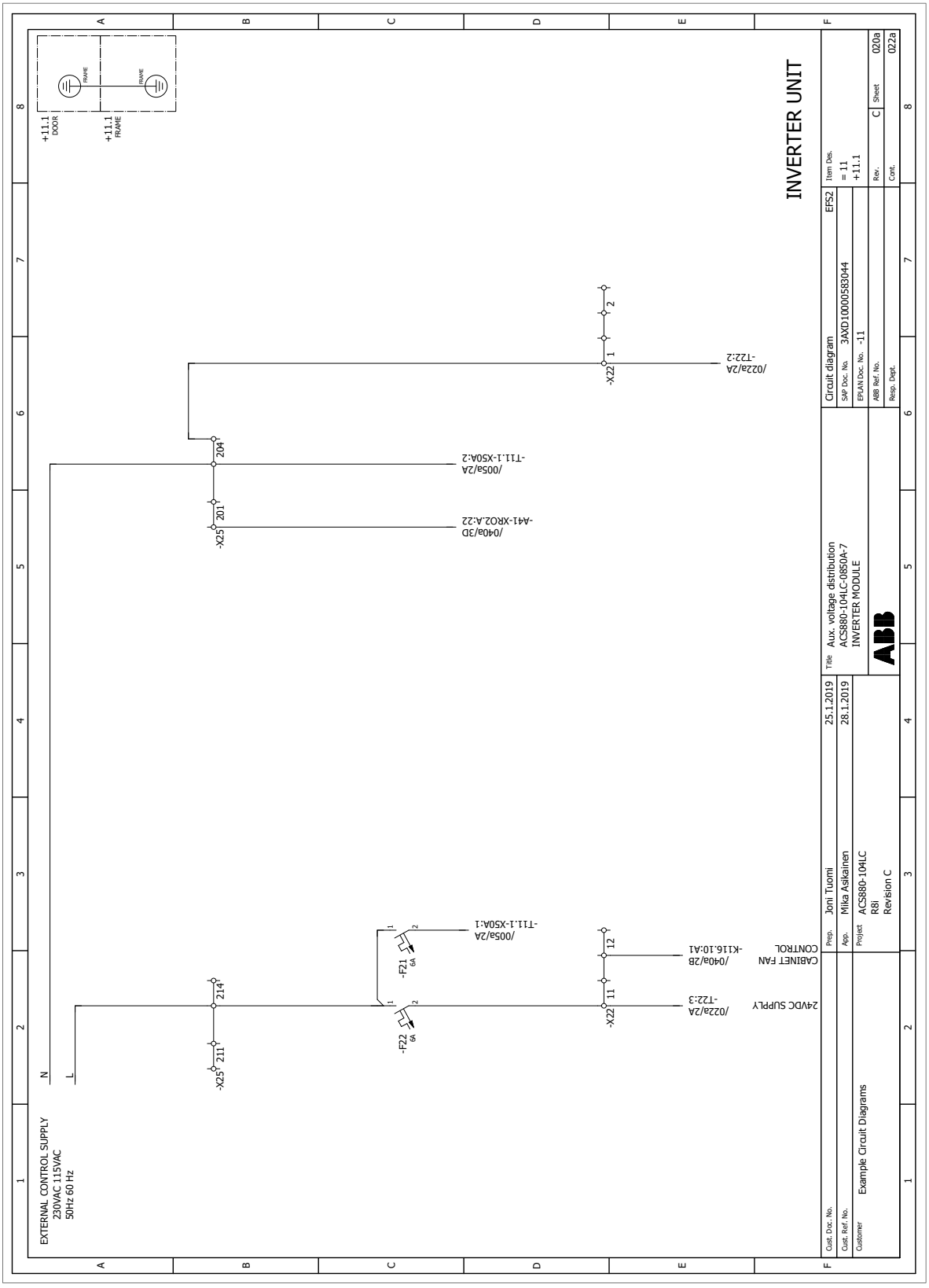
001a



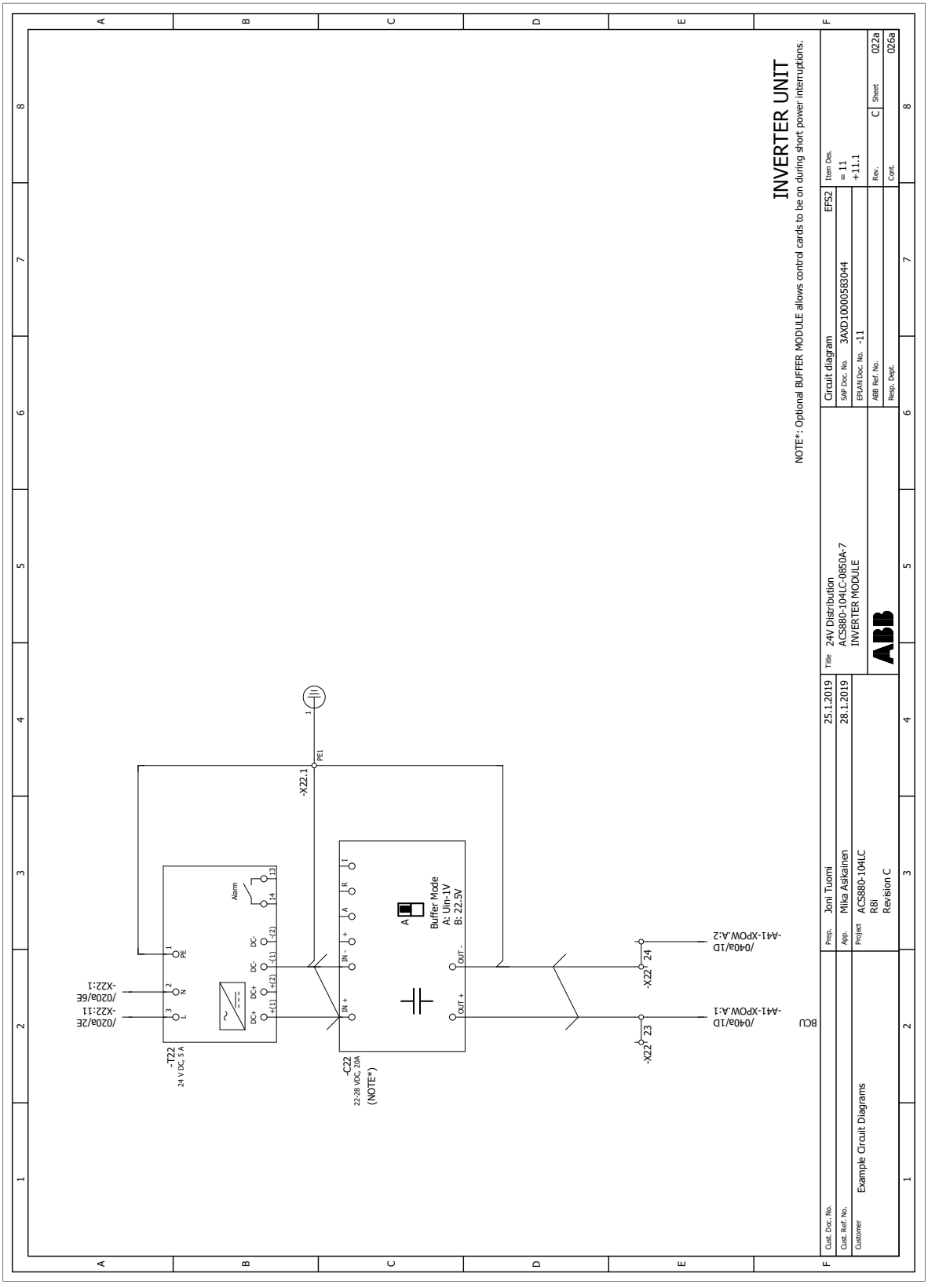
005a


INVERTER UNIT
-T11.1
/001a/1C
-T11.1-X50A =
-X50B
BOPS L
BOPS N
-F21:2
/020a/3D
-X25:204
/020a/6C
AC SELECT
X59
230V
-T11.1-X53A =
-X53B
GND BCON
24VDC BCON
GND
24VDC
FE
V10
V20
V40
V50
V60
TR
RE
-A41:V1T
/040b/4B
-A41:V1R
/040b/4B
Prep. Joni Tuomi 25.1.2019
App. Mika Asikainen 28.1.2019
Project ACS880-104LC
R8i
Revision C
Cust. Doc. No.
Cust. Ref. No.
Customer Example Circuit Diagrams
Title Module connections
ACS880-104LC-0850A-7
INVERTER MODULE
ABB
Circuit diagram EFS2
SAP Doc. No. 3AXD10000583044
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev. C Sheet 005a
Cont. 020a

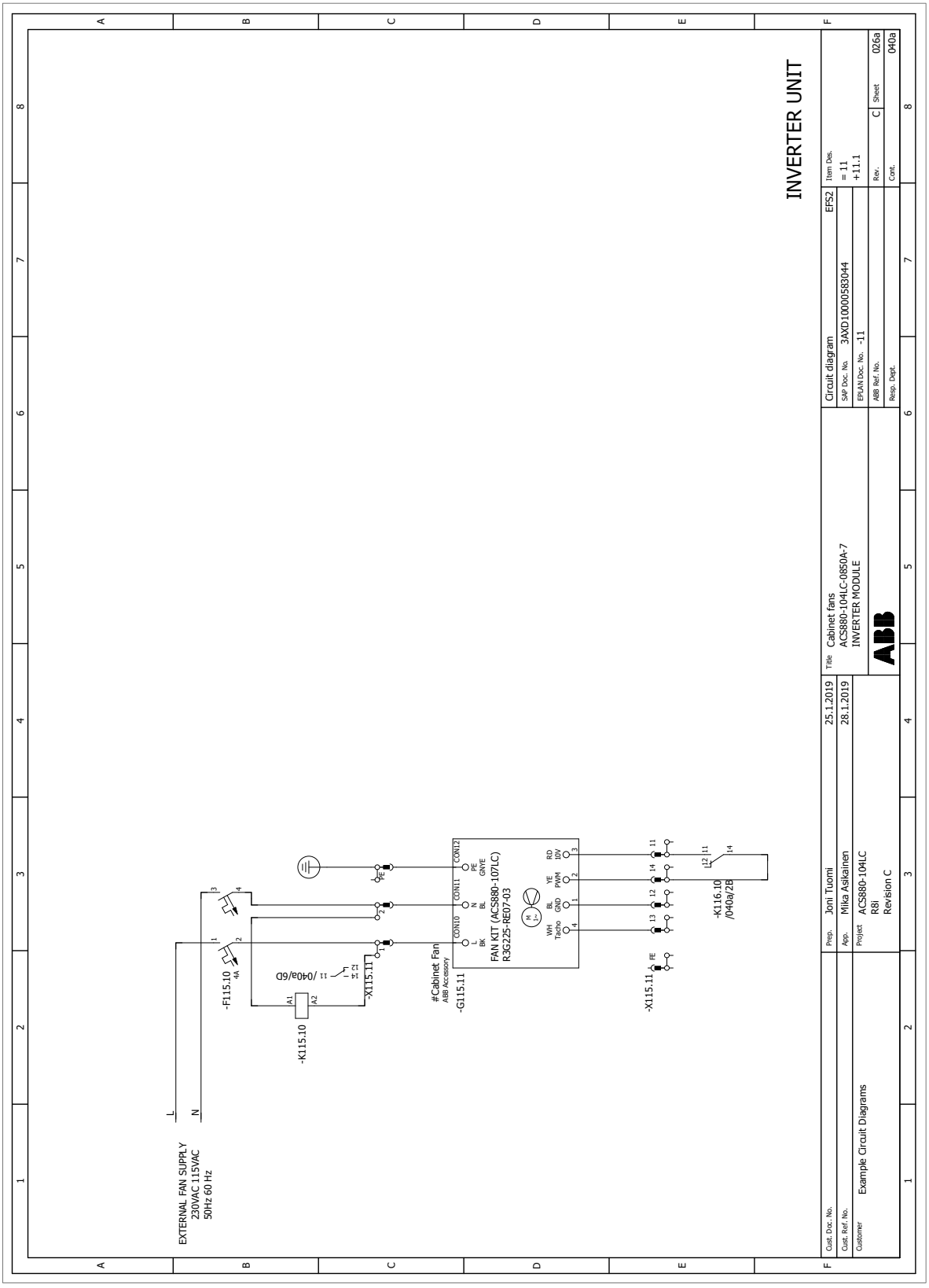
020a


INVERTER UNIT
EXTERNAL CONTROL SUPPLY
230VAC 115VAC
50Hz 60 Hz
+11.1 DOOR
+11.1 FRAME
FRAME
FRAME
N
L
-X25 211
214
-F22 6A
-F21 6A
-T11.1-X50A:1
/005a/2A
-X22 11
12
/022a/2A -T22:3
24VDC SUPPLY
/040a/2B -K116.10:A1
CABINET FAN CONTROL
-X25 201
204
-A41-XRO2.A:22
/040a/3D
-T11.1-X50A:2
/005a/2A
-X22 1
2
/022a/2A -T22:2
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams
Prep. Joni Tuomi 25.1.2019
Appr. Mika Asikainen 28.1.2019
Project ACS880-104LC R8i Revision C
Title Aux. voltage distribution ACS880-104LC-0850A-7 INVERTER MODULE
ABB
Circuit diagram
SAP Doc. No. 3AXD10000583044
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
EFS2
Item Des. = 11 +11.1
Rev. C
Sheet 020a
Cont. 022a

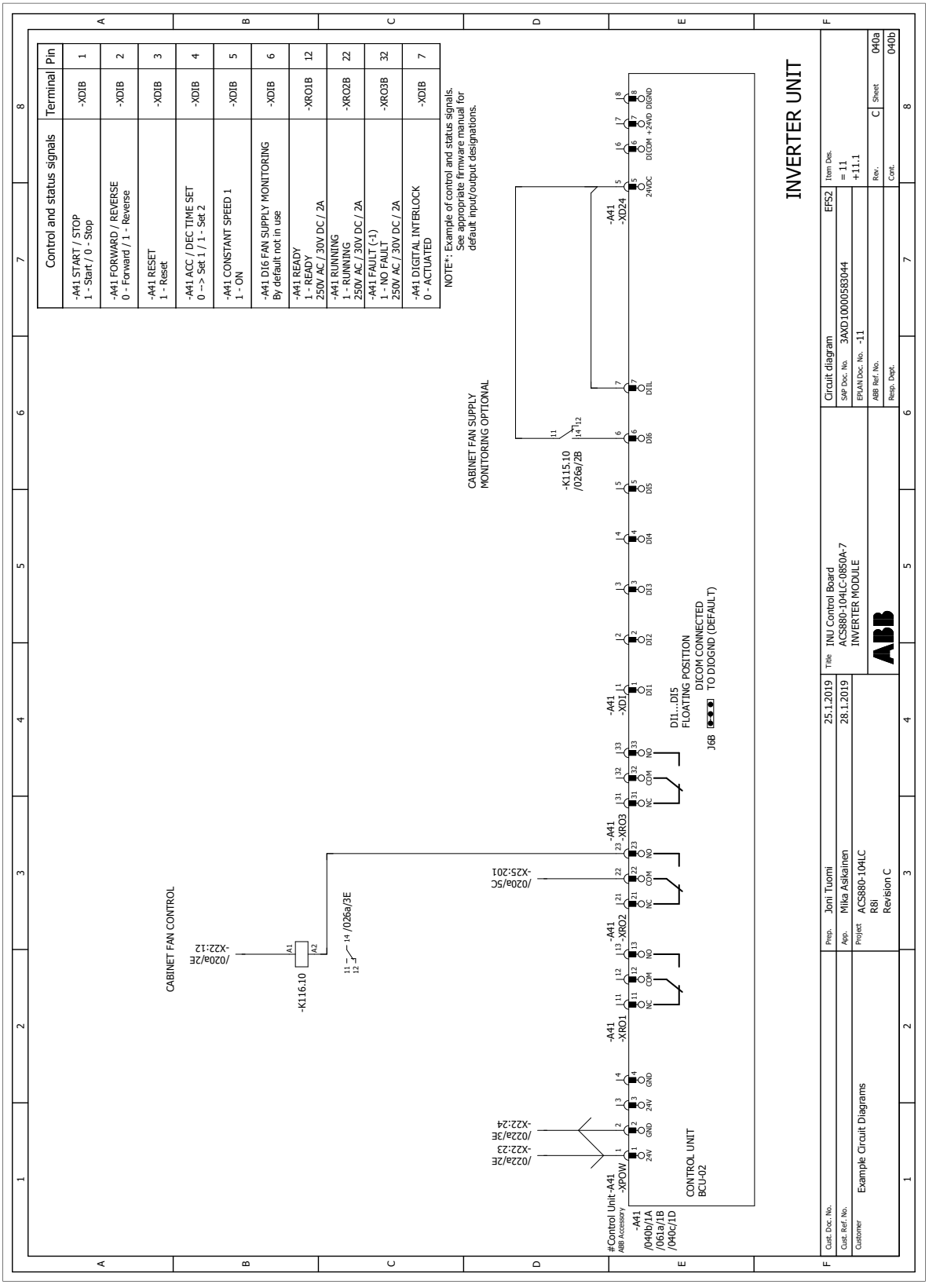
022a


INVERTER UNIT
NOTE*: Optional BUFFER MODULE allows control cards to be on during short power interruptions.
Title 24V Distribution
ACS880-104LC-0850A-7
INVERTER MODULE
Circuit diagram
EFS2
SAP Doc. No. 3AXD10000583044
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev. C
Sheet 022a
Cont. 026a
Prep. Joni Tuomi 25.1.2019
App. Mika Asikainen 28.1.2019
Project ACS880-104LC
R8i
Revision C
Customer Example Circuit Diagrams
Cust. Doc. No.
Cust. Ref. No.
-T22
24 V DC, 5 A
-C22
22-28 VDC, 20A
(NOTE*)
-X22.1
PE1
Alarm
Buffer Mode
A: Uin-1V
B: 22.5V
/020a/2E
-XZ2:11
/020a/6E
-XZ2:1
/040a/1D
-A41-XPOW.A:2
/040a/1D
-A41-XPOW.A:1
-X22 24
-X22 23
BCU

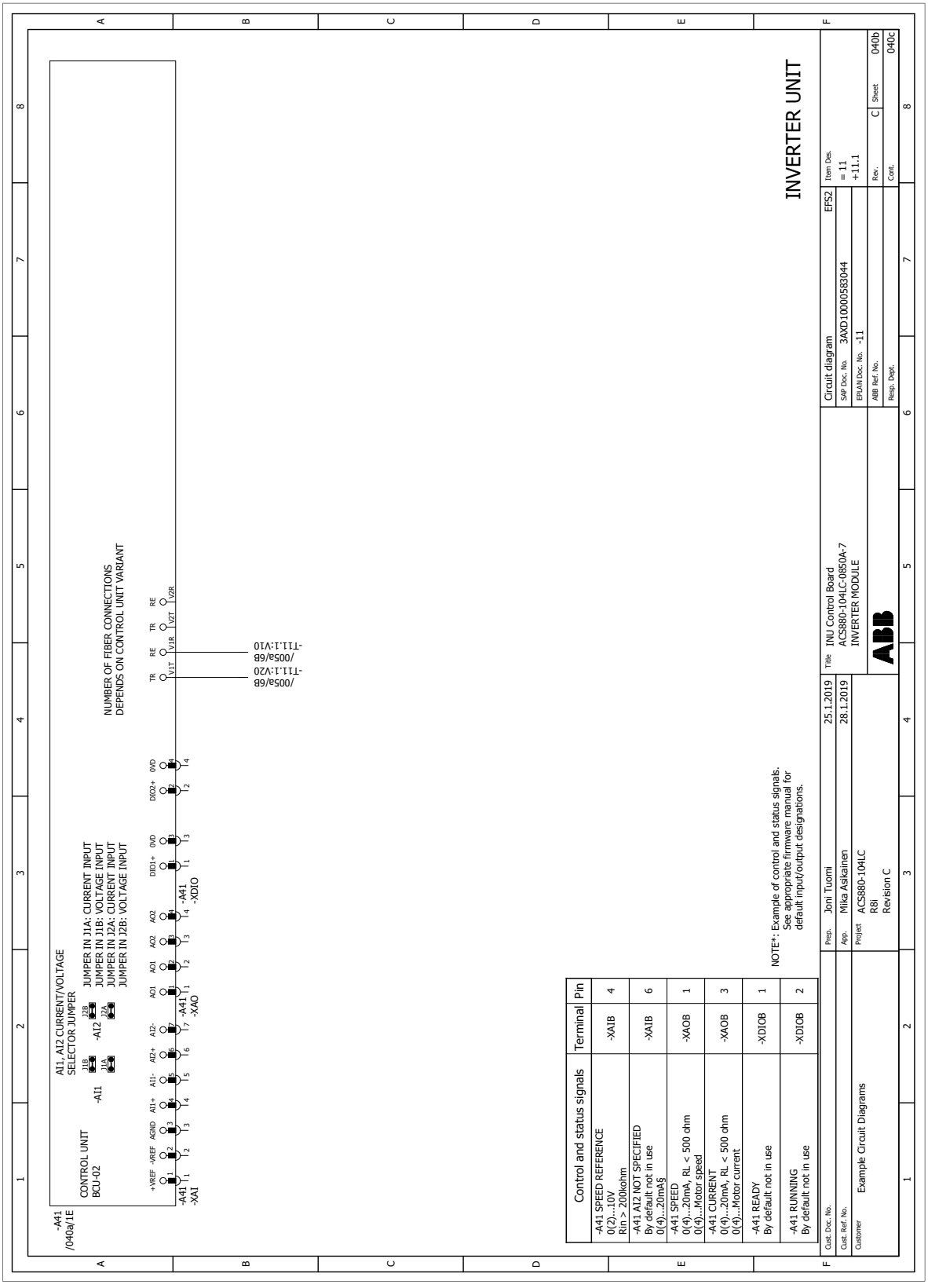
026a


INVERTER UNIT
EXTERNAL FAN SUPPLY
230VAC 115VAC
50Hz 60 Hz
L
N
-F115.10
-K115.10
-X115.11
#Cabinet Fan
ABB Accessory
-G115.11
FAN KIT (ACS880-107LC)
R3G225-RE07-03
-X115.11
-K116.10
/040a/2B
Prep. Joni Tuomi 25.1.2019
Chk. Mika Askainen 28.1.2019
Appr.
Project ACS880-104LC
R8i
Revision C
Customer Example Circuit Diagrams
Cust. Doc. No.
Cust. Ref. No.
Title Cabinet fans
ACS880-104LC-0850A-7
INVERTER MODULE
Circuit diagram
SAP Doc. No. 3AXD10000583044
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
EFS2
Item Des.
= 11
+11.1
Rev. C
Sheet 026a
Cont. 040a

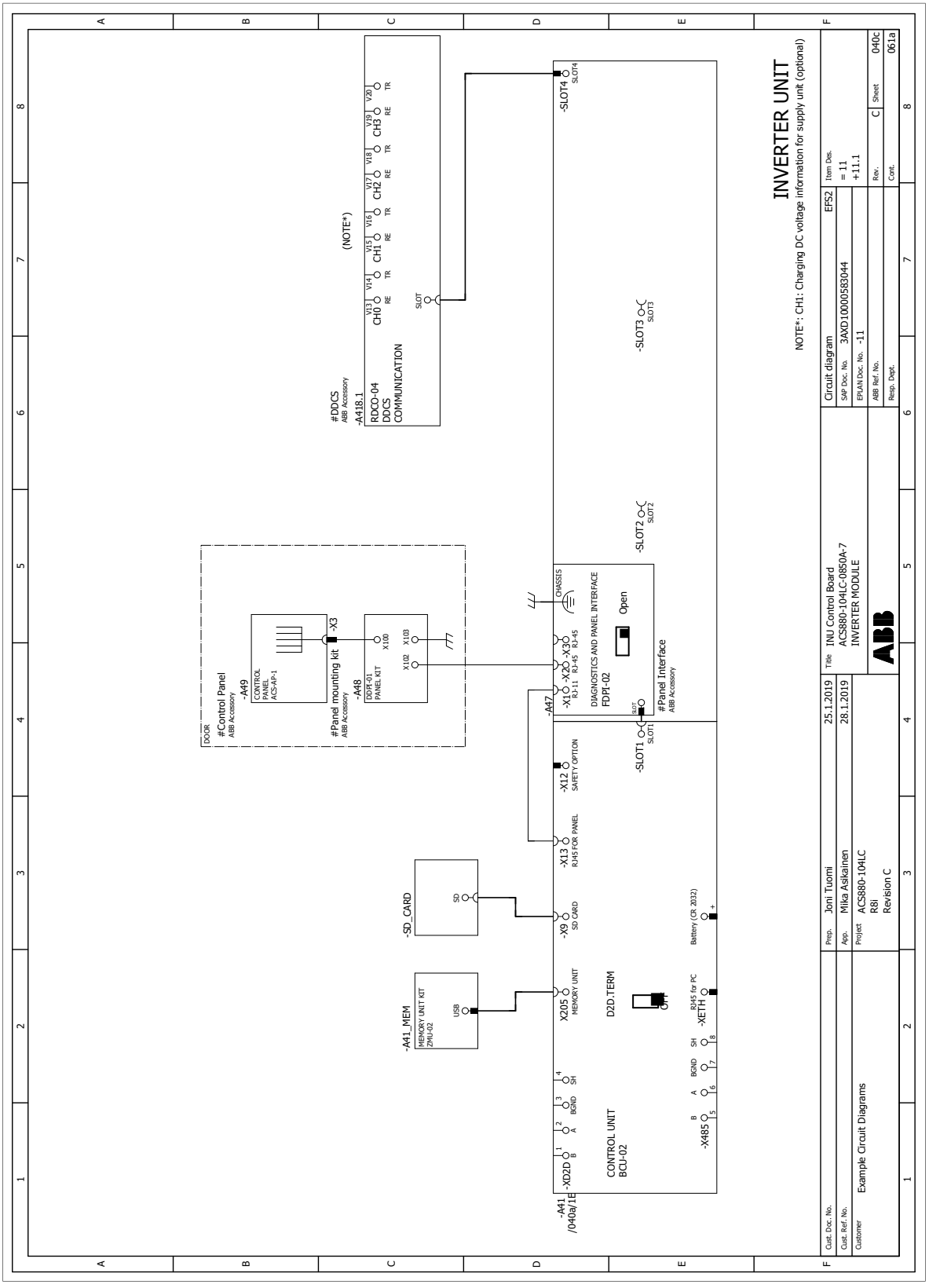
040a


INVERTER UNIT
Control and status signals
Terminal
Pin
-A41 START / STOP
1 - Start / 0 - Stop
-XDIB
1
-A41 FORWARD / REVERSE
0 - Forward / 1 - Reverse
-XDIB
2
-A41 RESET
1 - Reset
-XDIB
3
-A41 ACC / DEC TIME SET
0 --> Set 1 / 1 - Set 2
-XDIB
4
-A41 CONSTANT SPEED 1
1 - ON
-XDIB
5
-A41 DI6 FAN SUPPLY MONITORING
By default not in use
-XDIB
6
-A41 READY
1 - READY
250V AC / 30V DC / 2A
-XRO1B
12
-A41 RUNNING
1 - RUNNING
250V AC / 30V DC / 2A
-XRO2B
22
-A41 FAULT (-1)
1 - NO FAULT
250V AC / 30V DC / 2A
-XRO3B
32
-A41 DIGITAL INTERLOCK
0 - ACTUATED
-XDIB
7
NOTE*: Example of control and status signals.
See appropriate firmware manual for
default input/output designations.
CABINET FAN SUPPLY
MONITORING OPTIONAL
-K115.10
/026a/2B
-A41
-XD24
24VDC
DICOM
+24VD
DIGND
DIIL
DI6
DI5
DI4
DI3
DI2
DI1
-A41
-XDI
DI1...DI5
FLOATING POSITION
DICOM CONNECTED
J6B
TO DIOGND (DEFAULT)
-A41
-XRO3
NC
COM
NO
-A41
-XRO2
-A41
-XRO1
/026a/5C
-X25:201
CABINET FAN CONTROL
-K116.10
/026a/2E
-X22:12
/026a/3E
/026a/2E
-X22:23
/026a/3E
-X22:24
#Control Unit -A41
ABB Accessory
-XPOW
24V
GND
24V
GND
CONTROL UNIT
BCU-02
-A41
/040b/1A
/061a/1B
/040c/1D
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams
Prep.
Joni Tuomi
25.1.2019
App.
Mika Asikainen
28.1.2019
Project
ACS880-104LC
R8i
Revision C
Title
INU Control Board
ACS880-104LC-0850A-7
INVERTER MODULE
ABB
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000583044
EPLAN Doc. No.
-11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev.
C
Sheet
040a
Cont.
040b

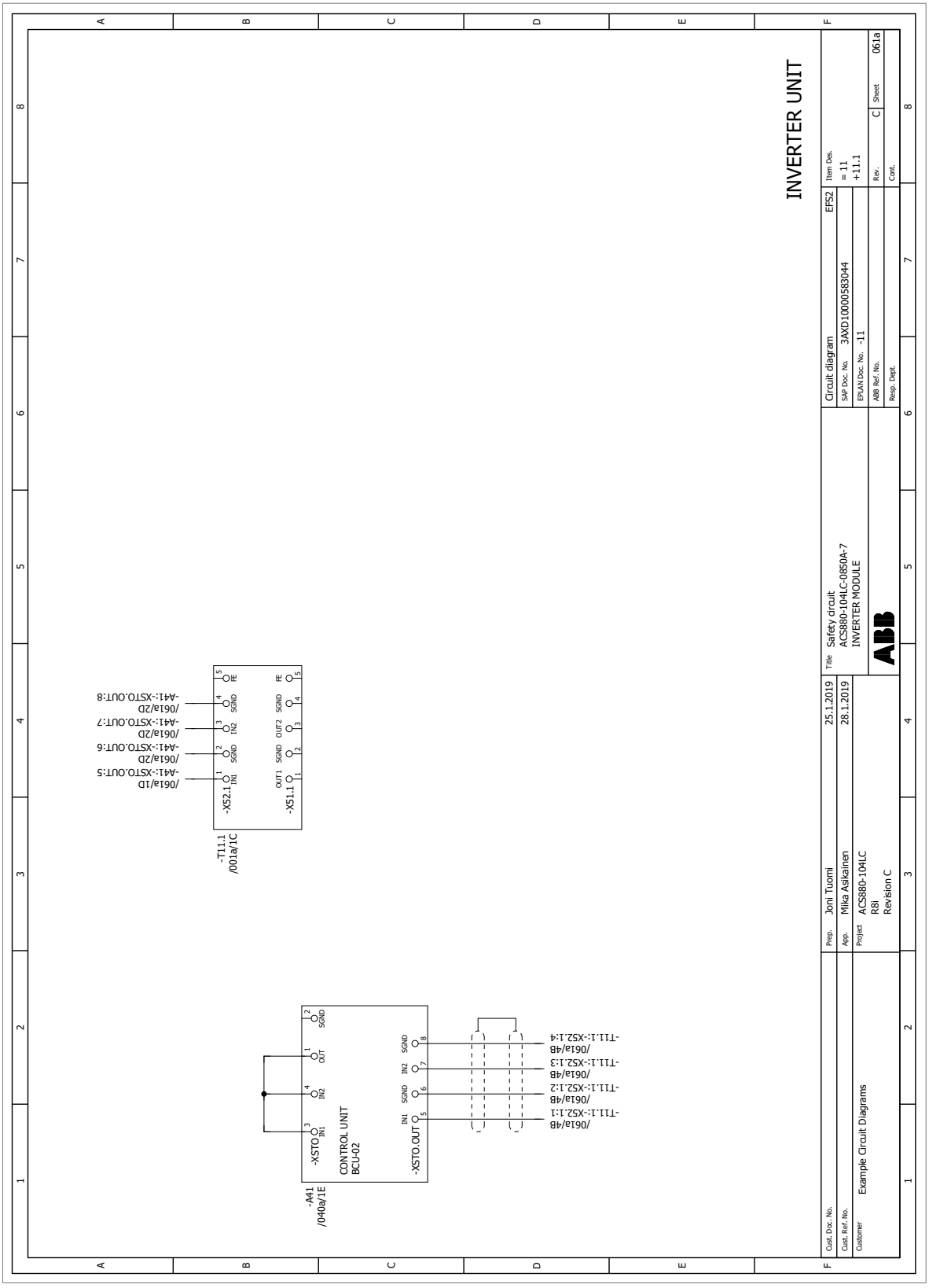
040b


INVERTER UNIT
-A41
/040a/1E
CONTROL UNIT
BCU-02
-AI1
-AI2
AI1, AI2 CURRENT/VOLTAGE
SELECTOR JUMPER
J1B
J1A
J2B
J2A
JUMPER IN J1A: CURRENT INPUT
JUMPER IN J1B: VOLTAGE INPUT
JUMPER IN J2A: CURRENT INPUT
JUMPER IN J2B: VOLTAGE INPUT
NUMBER OF FIBER CONNECTIONS
DEPENDS ON CONTROL UNIT VARIANT
+VREF -VREF AGND AI1+ AI1- AI2+ AI2- AO1 AO2 DIO1+ 0VD DIO2+ 0VD
TR RE TR RE
V1T V1R V2T V2R
-A41
-XA1
-A41
-XAO
-A41
-XDIO
/005a/6B
-TI1.1:V20
/005a/6B
-TI1.1:V10
Control and status signals
Terminal
Pin
-A41 SPEED REFERENCE
0(2)...10V
Rin > 200kohm
-XAIB
4
-A41 AI2 NOT SPECIFIED
By default not in use
0(4)...20mA§
-XAIB
6
-A41 SPEED
0(4)...20mA, RL < 500 ohm
0(4)...Motor speed
-XAOB
1
-A41 CURRENT
0(4)...20mA, RL < 500 ohm
0(4)...Motor current
-XAOB
3
-A41 READY
By default not in use
-XDIOB
1
-A41 RUNNING
By default not in use
-XDIOB
2
NOTE*: Example of control and status signals.
See appropriate firmware manual for
default input/output designations.
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams
Prep.
Joni Tuomi
25.1.2019
Appr.
Mika Asikainen
28.1.2019
Project
ACS880-104LC
R8i
Revision C
Title
INU Control Board
ACS880-104LC-0850A-7
INVERTER MODULE
ABB
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000583044
EPLAN Doc. No.
-11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev.
C
Sheet
040b
Cont.
040c

040c

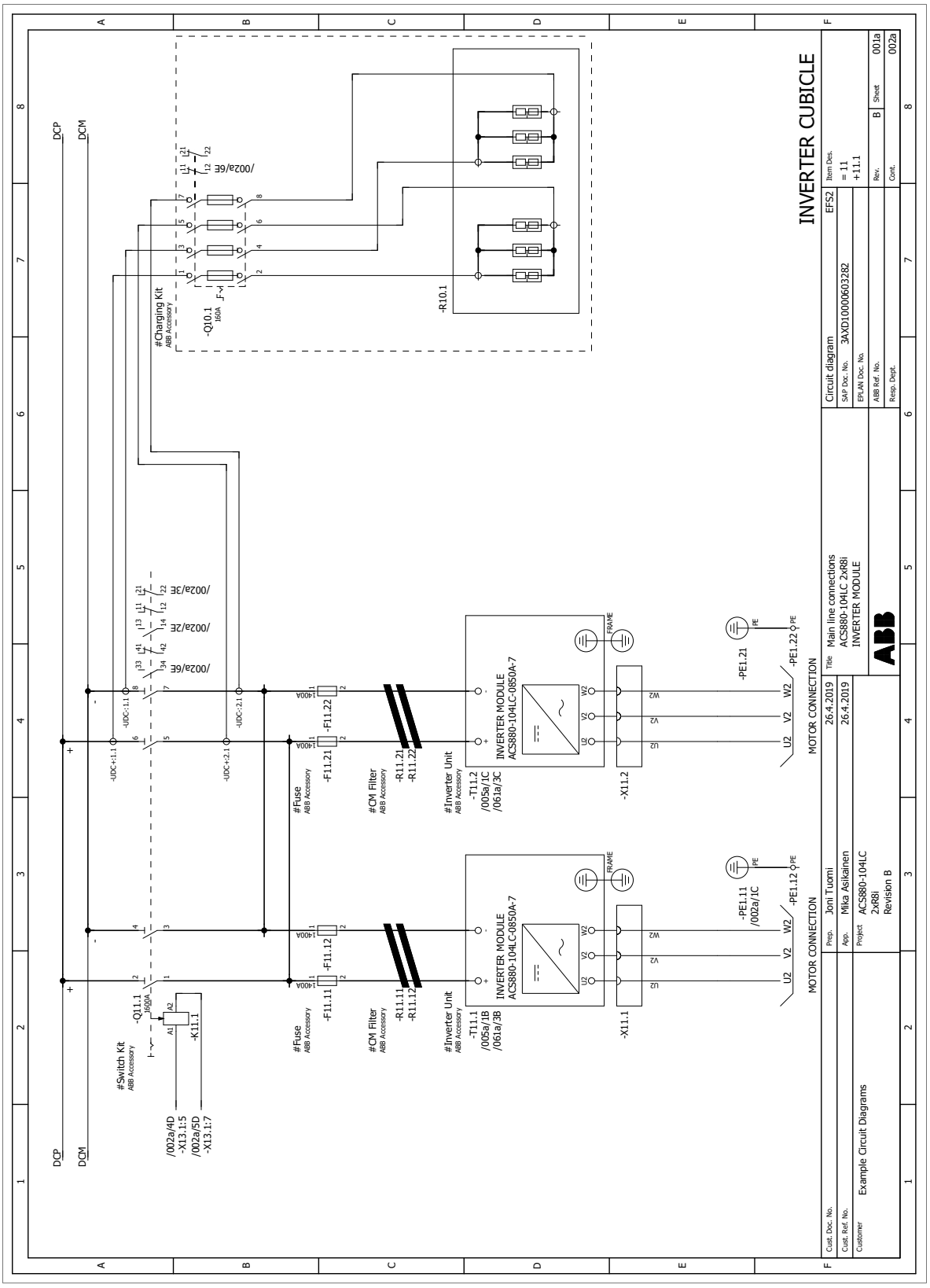

INVERTER UNIT
NOTE*: CH1: Charging DC voltage information for supply unit (optional)
(NOTE*)
#DDCS
ABB Accessory
-A418.1
RDCO-04
DDCS
COMMUNICATION
CH0
CH1
CH2
CH3
SLOT
#Control Panel
ABB Accessory
-A49
CONTROL
PANEL
ACS-AP-1
#Panel mounting kit
ABB Accessory
-A48
DDPC-01
PANEL KIT
-X3
X100
X102
X103
DOOR
-SLOT4
SLOT4
-SLOT3
SLOT3
-SLOT2
SLOT2
-SLOT1
SLOT1
-A47
-X1
-X2
-X30
RJ-11
RJ-45
RJ-45
CHASSIS
DIAGNOSTICS AND PANEL INTERFACE
FDPI-02
Open
#Panel Interface
ABB Accessory
-X12
SAFETY OPTION
-X13
RJ45 FOR PANEL
-X9
SD CARD
-SD_CARD
SD
-A41_MEM
MEMORY UNIT KIT
ZMU-02
USB
X205
MEMORY UNIT
D2D.TERM
OFF
-XETH
RJ45 for PC
Battery (CR 2032)
-X485
-XD2D
CONTROL UNIT
BCU-02
-A41
/040a/1E
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams
Prep.
Joni Tuomi
25.1.2019
App.
Mika Asikainen
28.1.2019
Project
ACS880-104LC
R8i
Revision C
Title
INU Control Board
ACS880-104LC-0850A-7
INVERTER MODULE
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000583044
EPLAN Doc. No.
-11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev.
C
Sheet
040c
Cont.
061a

061a

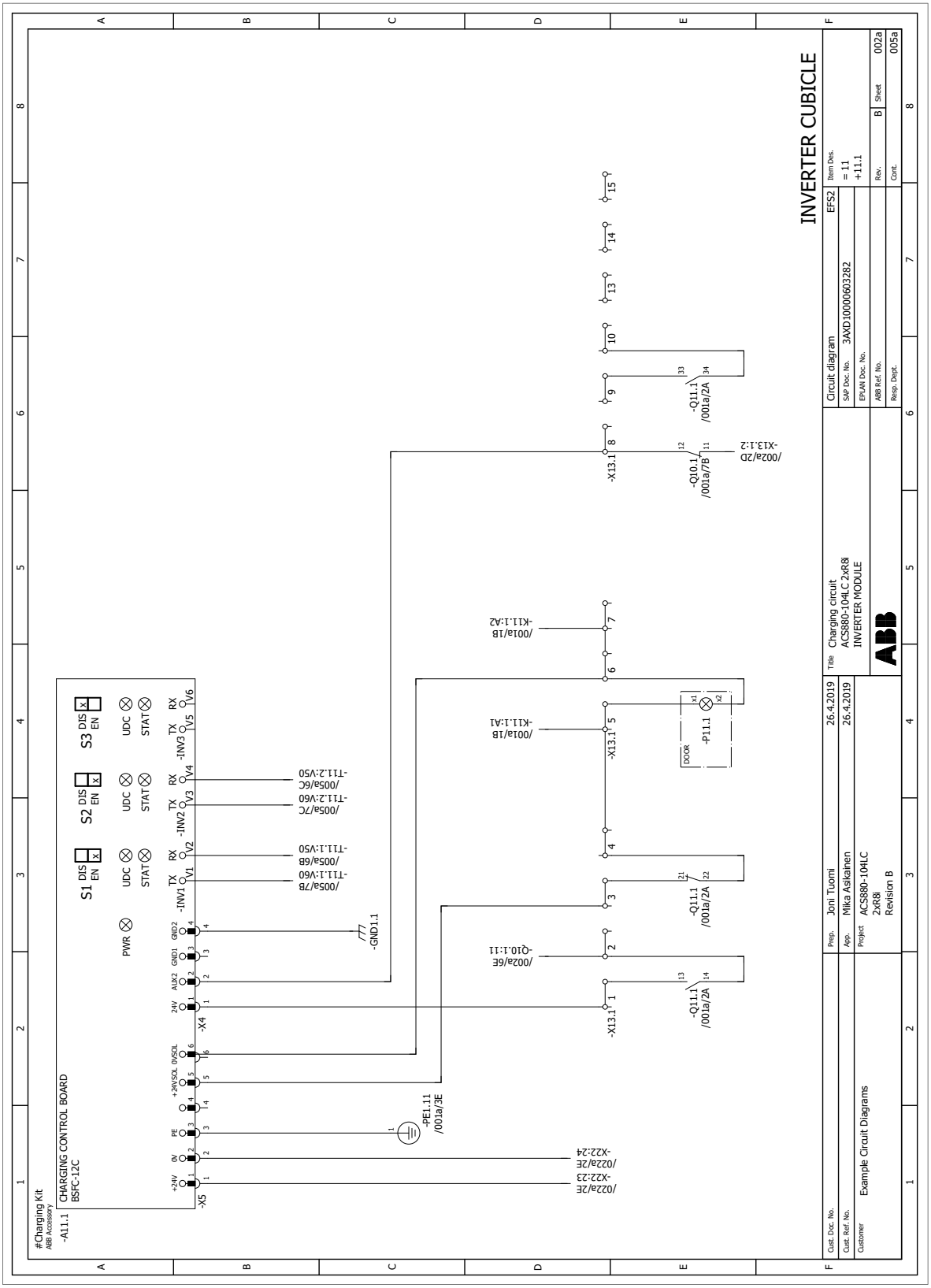

INVERTER UNIT
-T11.1
/001a/1C
-X52.1
-X51.1
-A41
/040a/1E
CONTROL UNIT
BCU-02
-XSTO
-XSTO.OUT
/061a/1D
/061a/2D
/061a/4B
Safety circuit
ACS880-104LC-0850A-7
INVERTER MODULE
Circuit diagram
3AXD10000583044
-11
EFS2
= 11
+11.1
061a
Joni Tuomi
25.1.2019
Mika Asikainen
28.1.2019
ACS880-104LC
R8i
Revision C
Example Circuit Diagrams

Frame 2×R8i with DC switch/disconnector

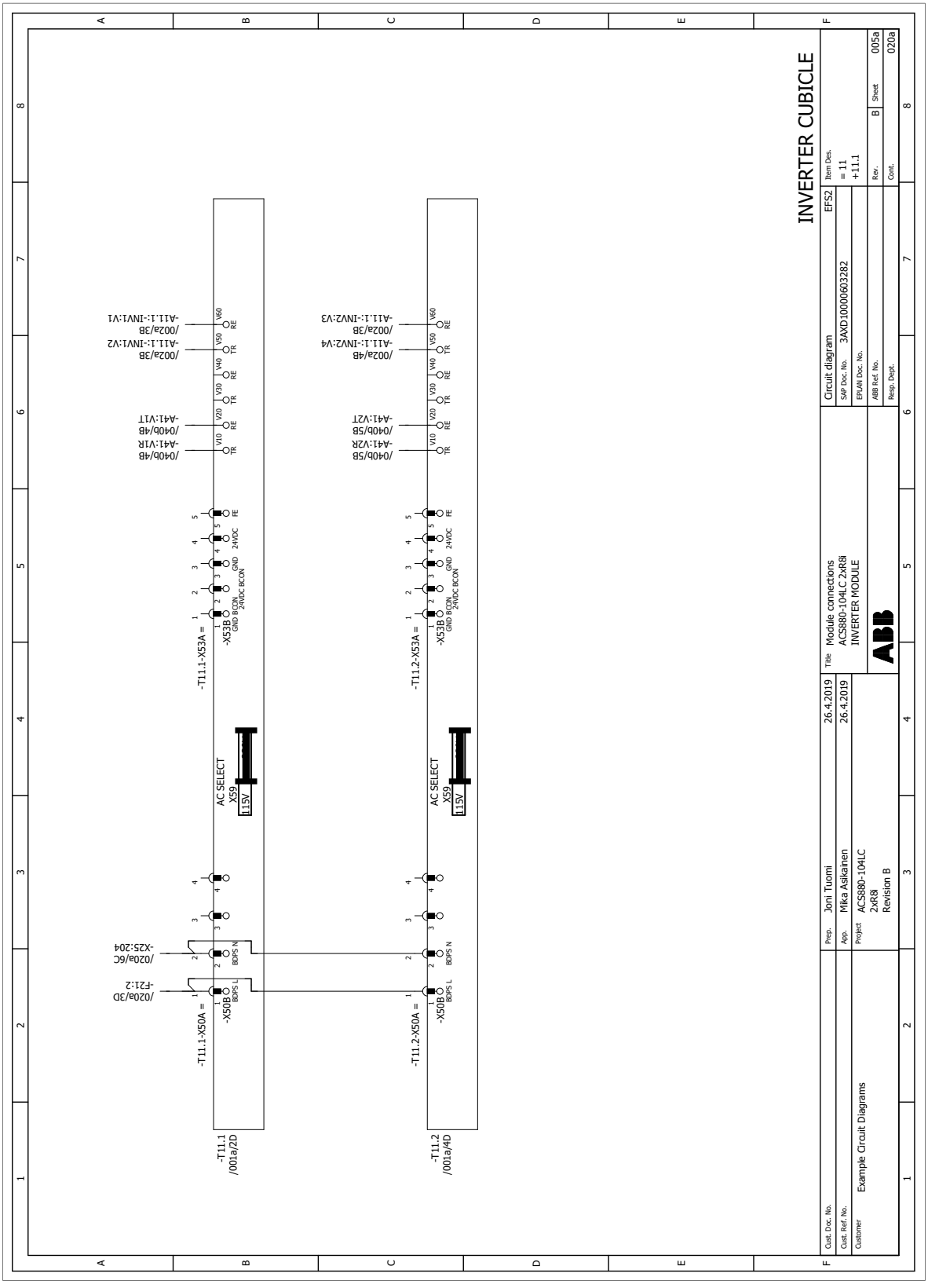
001a



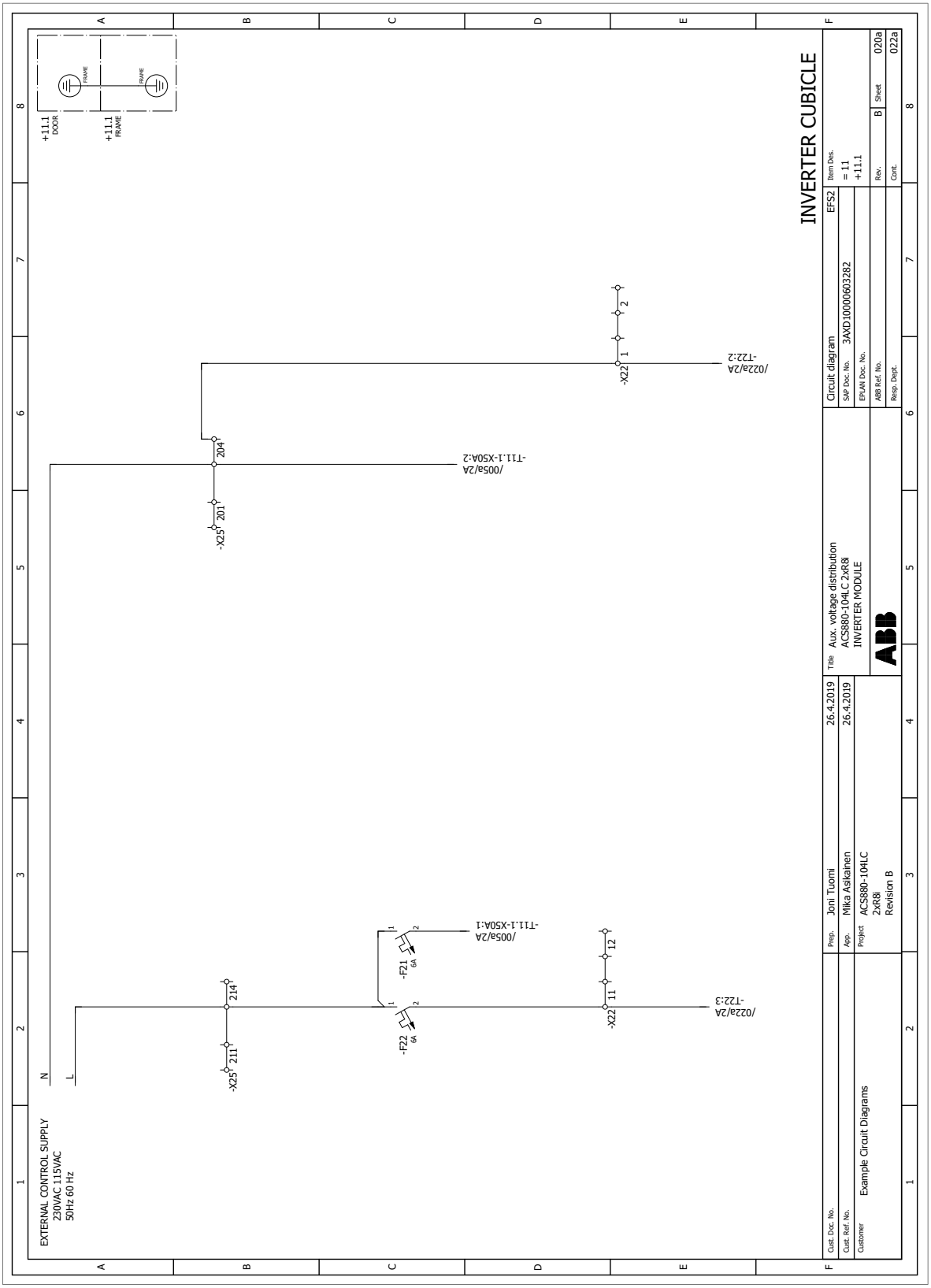
002a


INVERTER CUBICLE
CHARGING CONTROL BOARD
BSFC-12C
-A11.1
#Charging Kit
ABB Accessory
-X5
-X4
-INV1
-INV2
-INV3
S1 DIS EN
S2 DIS EN
S3 DIS EN
PWR
UDC
STAT
-GND1.1
-PE1.11
/001a/3E
-X13.1
-Q11.1
/001a/2A
-Q10.1
/001a/7B
-P11.1
DOOR
-K11.1:A1
-K11.1:A2
-Q10.1:11
-T11.1:V50
-T11.2:V50
-T11.1:V60
-T11.2:V60
-XZ2:24
-XZ2:23
/002a/7E
/002a/6E
/002a/ZD
-X13.1:2
Circuit diagram
EFS2
3AXD10000603282
ACS880-104LC 2xR8i
INVERTER MODULE
Charging circuit
Joni Tuomi
Mika Aslkainen
26.4.2019
ACS880-104LC
2xR8i
Revision B
Example Circuit Diagrams
002a
005a

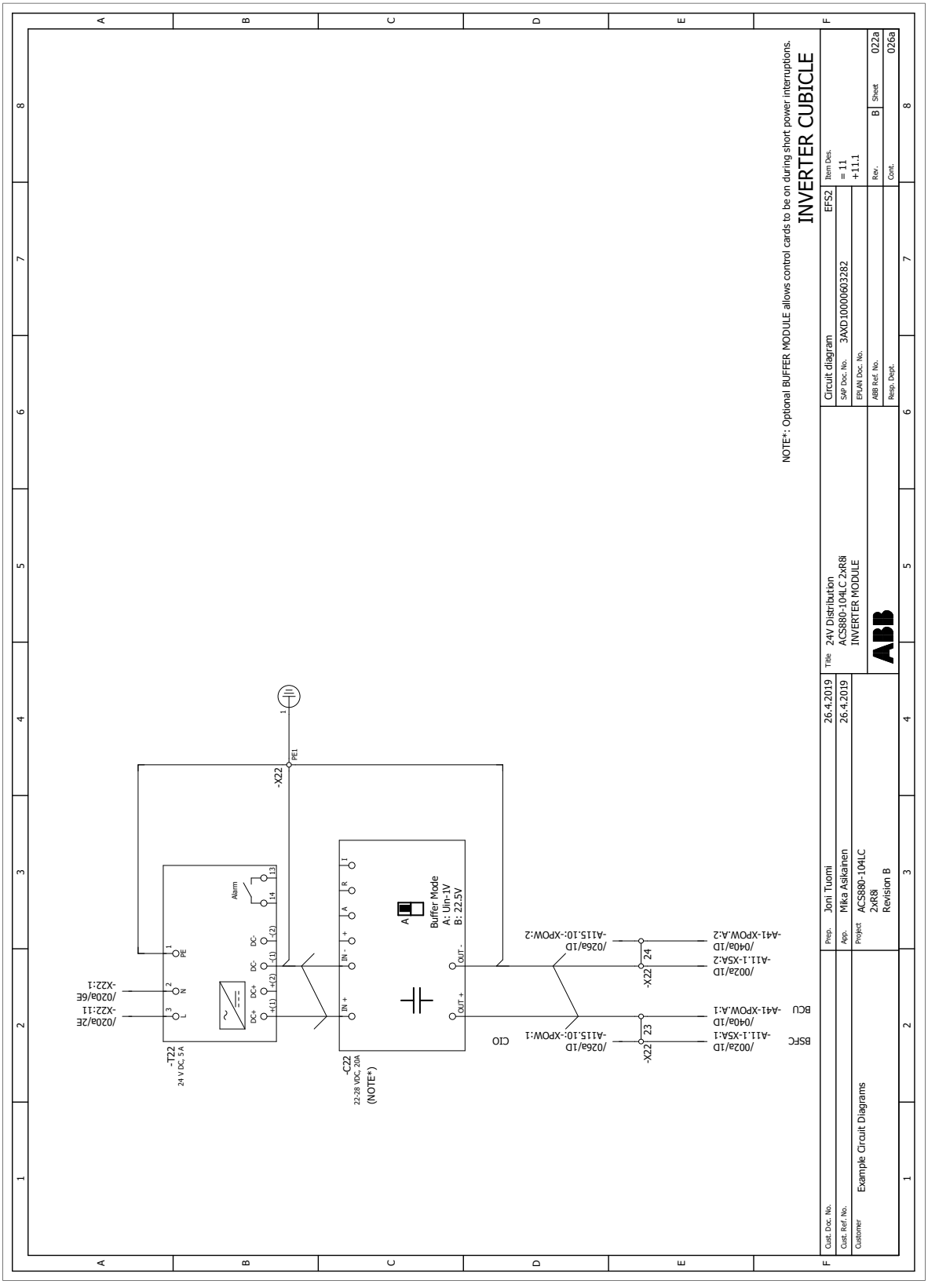
005a


INVERTER CUBICLE
Module connections
ACS880-104LC 2xR8i
INVERTER MODULE
Circuit diagram
3AXD10000603282
EFS2
Item Des.
= 11
+11.1
Sheet 005a
Cont. 020a
Prep. Joni Tuomi 26.4.2019
App. Mika Asikainen 26.4.2019
Project ACS880-104LC 2xR8i Revision B
Example Circuit Diagrams
-T11.1-X53A =
-X53B
-T11.1-X50A =
-X50B
-T11.2-X53A =
-T11.2-X50A =
AC SELECT
X59
115V
-T11.1 /001a/2D
-T11.2 /001a/4D

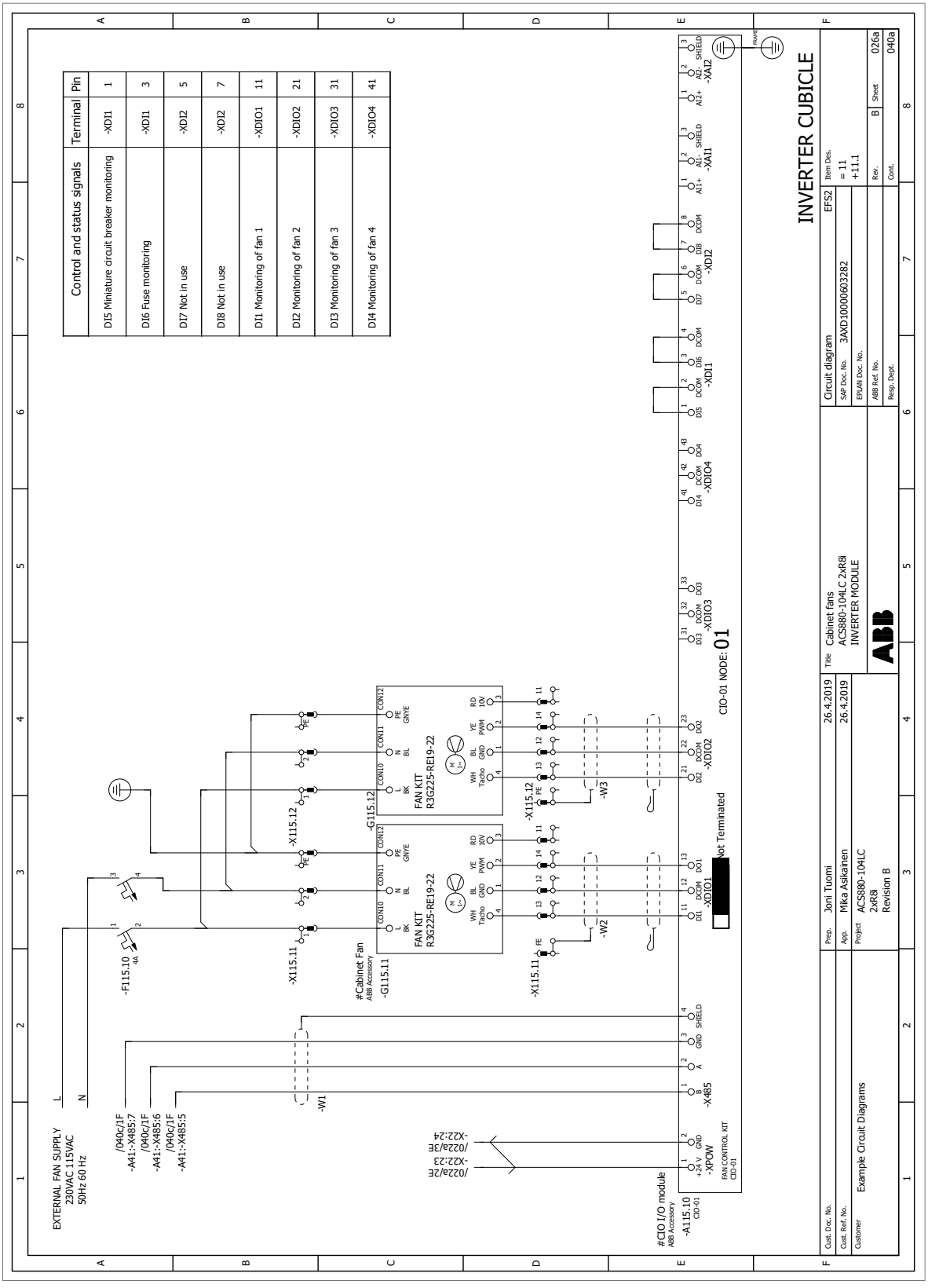
020a


INVERTER CUBICLE
EXTERNAL CONTROL SUPPLY
230VAC 115VAC
50Hz 60 Hz
N
L
+11.1
DOOR
+11.1
FRAME
FRAME
FRAME
-X25
211
214
-F22
6A
-F21
6A
-X22
11
12
/022a/2A
-T22:3
/005a/2A
-T11.1-X50A:1
-X25
201
204
/005a/2A
-T11.1-X50A:2
-X22
1
2
/022a/2A
-T22:2
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000603282
EPLAN Doc. No.
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev.
B
Sheet
020a
Cont.
022a
Title
Aux. voltage distribution
ACS880-104LC 2xR8i
INVERTER MODULE
ABB
Prep.
Joni Tuomi
26.4.2019
App.
Mika Asikainen
26.4.2019
Project
ACS880-104LC
2xR8i
Revision B
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams

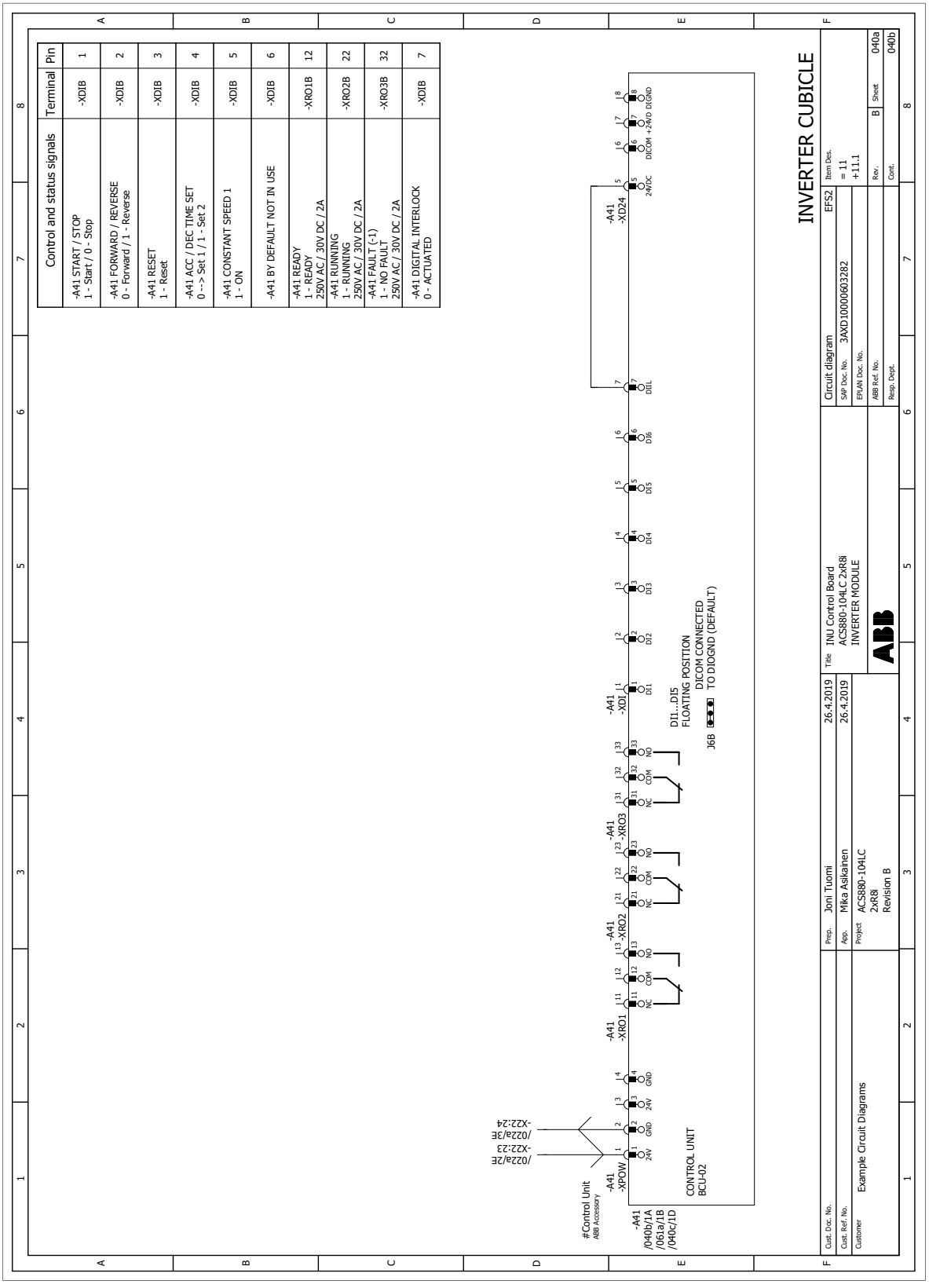
022a


INVERTER CUBICLE
NOTE*: Optional BUFFER MODULE allows control cards to be on during short power interruptions.
Title 24V Distribution ACS880-104LC 2xR8i INVERTER MODULE
Circuit diagram EFS2
SAP Doc. No. 3AXD10000603282
EPLAN Doc. No.
ABB Ref. No.
Resp. Dept.
Item Des. = 11 +11.1
Rev. B Sheet 022a
Cont. 026a
Prep. Joni Tuomi 26.4.2019
App. Mika Asikainen 26.4.2019
Project ACS880-104LC 2xR8i Revision B
Customer Example Circuit Diagrams
Cust. Doc. No.
Cust. Ref. No.
-T22 24 V DC, 5 A
-C22 22-28 VDC, 20A (NOTE*)
-X22
Buffer Mode A: Uin-1V B: 22.5V
Alarm
PE1
/020a/2E -X22:11
/020a/6E -X22:1
/026a/1D -A41-XPOW.A:2
/040a/1D -A11.1-X5A:2
/026a/1D -A41-XPOW.A:1
/040a/1D -A11.1-X5A:1
/026a/1D -A41.10-XPOW:2
/026a/1D -A41.10-XPOW:1
-X22 24
-X22 23
BCU
BSFC
CIO

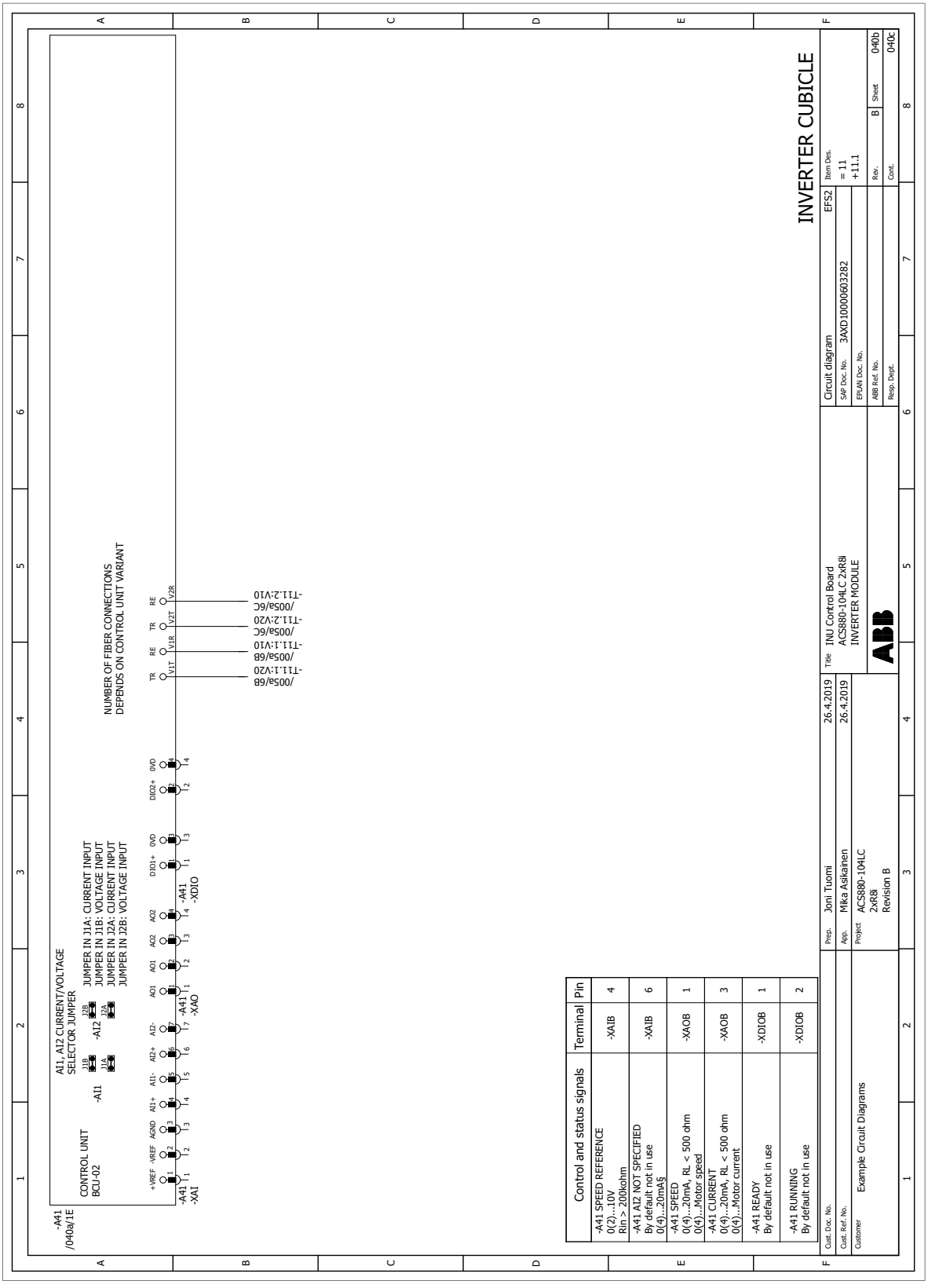
026a


INVERTER CUBICLE
Control and status signals
DI5 Miniature circuit breaker monitoring
DI6 Fuse monitoring
DI7 Not in use
DI8 Not in use
DI1 Monitoring of fan 1
DI2 Monitoring of fan 2
DI3 Monitoring of fan 3
DI4 Monitoring of fan 4
Terminal
Pin
-XDI1
-XDI2
-XDIO1
-XDIO2
-XDIO3
-XDIO4
EXTERNAL FAN SUPPLY
230VAC 115VAC
50Hz 60 Hz
-F115.10
-G115.11
-G115.12
FAN KIT
R3G225-RE19-22
-X115.11
-X115.12
-W1
-W2
-W3
-X485
-XPOW
-A115.10
CIO-01 NODE: 01
Not Terminated
-A41:-X485:7
-A41:-X485:6
-A41:-X485:5
-XZ2:24
-XZ2:23
-A11
-A12
Circuit diagram
EFS2
3AXD10000603282
ACS880-104LC 2xR8i
INVERTER MODULE
Cabinet fans
Example Circuit Diagrams
ACS880-104LC
2xR8i
Revision B
Joni Tuomi
Mika Asikainen
26.4.2019
Sheet
026a
040a

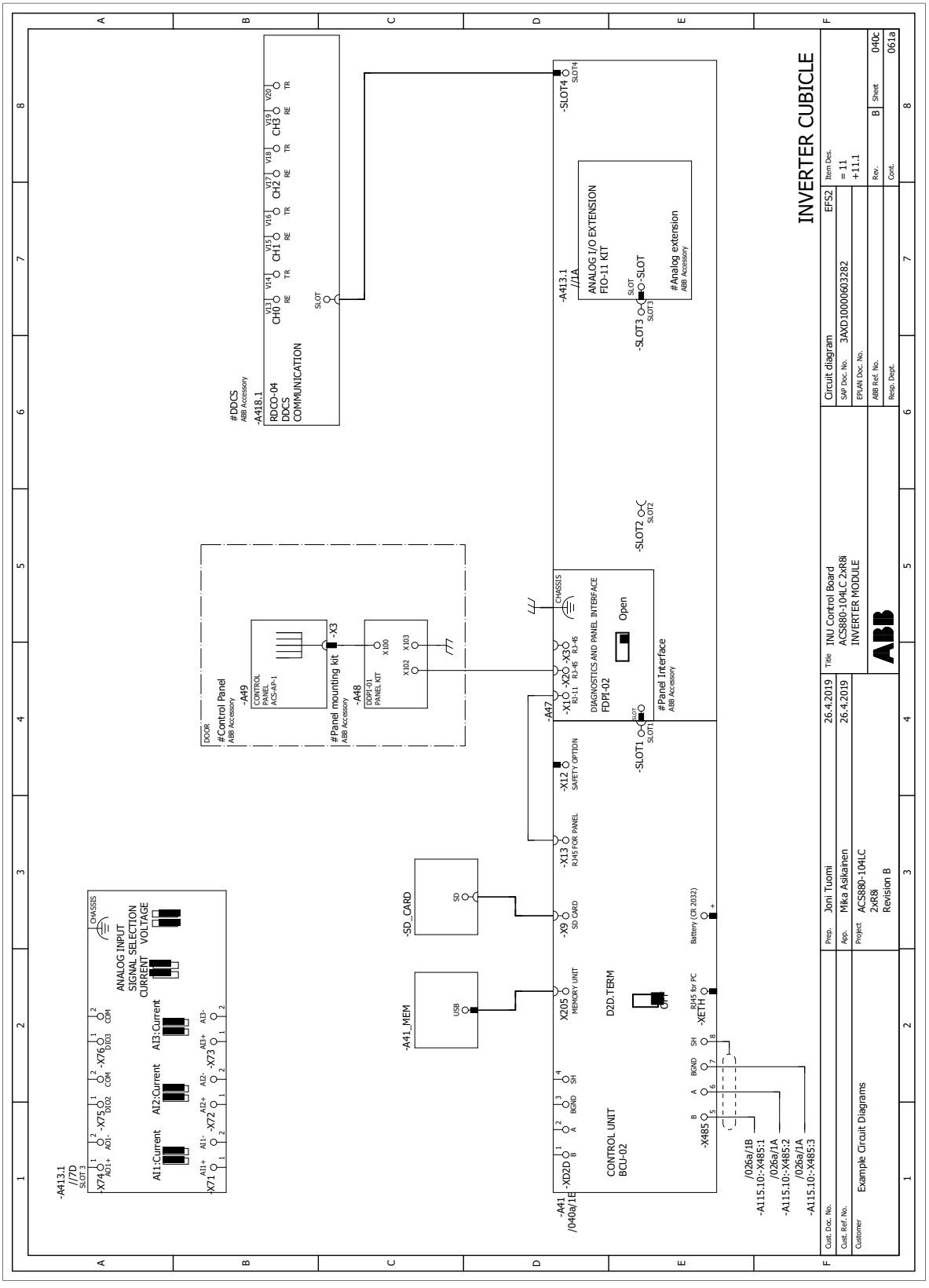
040a


INVERTER CUBICLE
Control and status signals
Terminal
Pin
-A41 START / STOP
1 - Start / 0 - Stop
-XDIB
1
-A41 FORWARD / REVERSE
0 - Forward / 1 - Reverse
-XDIB
2
-A41 RESET
1 - Reset
-XDIB
3
-A41 ACC / DEC TIME SET
0 --> Set 1 / 1 - Set 2
-XDIB
4
-A41 CONSTANT SPEED 1
1 - ON
-XDIB
5
-A41 BY DEFAULT NOT IN USE
-XDIB
6
-A41 READY
1 - READY
250V AC / 30V DC / 2A
-XRO1B
12
-A41 RUNNING
1 - RUNNING
250V AC / 30V DC / 2A
-XRO2B
22
-A41 FAULT (-1)
1 - NO FAULT
250V AC / 30V DC / 2A
-XRO3B
32
-A41 DIGITAL INTERLOCK
0 - ACTUATED
-XDIB
7
CONTROL UNIT
BCU-02
-A41
-XPOW
-A41
-XRO1
-A41
-XRO2
-A41
-XRO3
-A41
-XDI
-A41
-XD24
DI1...DI5
FLOATING POSITION
DICOM CONNECTED
J6B
TO DIOGND (DEFAULT)
#Control Unit
ABB Accessory
-A41
/040b/1A
/061a/1B
/040c/1D
/022a/2E
-XZ2:23
/022a/3E
-XZ2:24
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000603282
EPLAN Doc. No.
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev.
B
Sheet
040a
Cont.
040b
Prep.
Joni Tuomi
26.4.2019
App.
Mika Asikainen
26.4.2019
Project
ACS880-104LC
2xR8i
Revision B
Title
INU Control Board
ACS880-104LC 2xR8i
INVERTER MODULE
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams

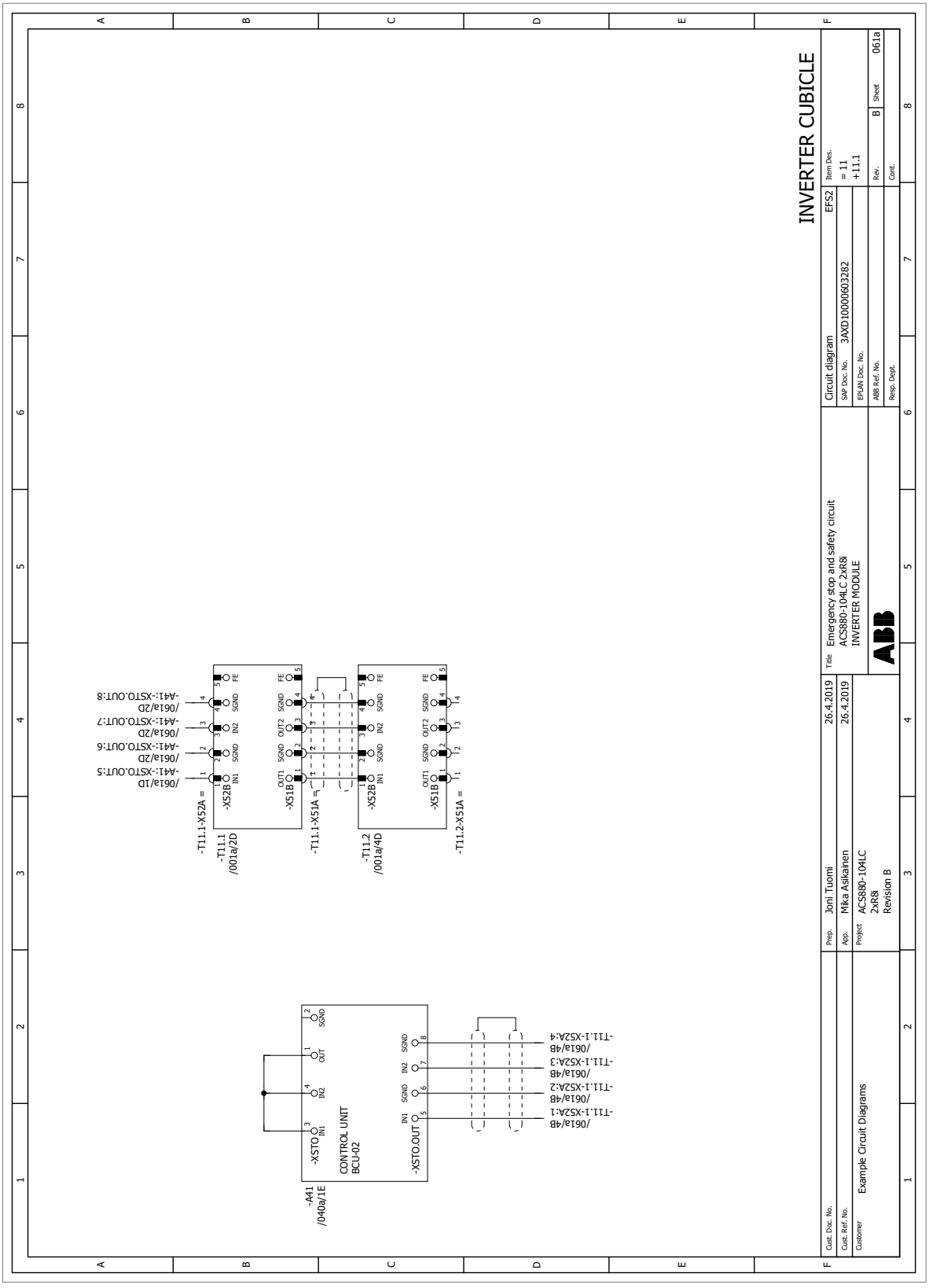
040b


-A41
/040a/1E
CONTROL UNIT
BCU-02
-A11
A11, A12 CURRENT/VOLTAGE
SELECTOR JUMPER
J1B
J1A
-A12
J2B
J2A
JUMPER IN J1A: CURRENT INPUT
JUMPER IN J1B: VOLTAGE INPUT
JUMPER IN J2A: CURRENT INPUT
JUMPER IN J2B: VOLTAGE INPUT
NUMBER OF FIBER CONNECTIONS
DEPENDS ON CONTROL UNIT VARIANT
+VREF -VREF AGND A11+ A11- A12+ A12- AO1 AO1 AO2 AO2 DIO1+ 0VD DIO2+ 0VD
-A41 -XAI
-A41 -XAO
-A41 -XDIO
TR RE TR RE
V1T V1R V2T V2R
-TI1.1:V20 /005a/6B
-TI1.1:V10 /005a/6B
-TI1.2:V20 /005a/6C
-TI1.2:V10 /005a/6C
Control and status signals
Terminal
Pin
-A41 SPEED REFERENCE
0(2)...10V
Rin > 200kohm
-XAIB
4
-A41 AI2 NOT SPECIFIED
By default not in use
0(4)...20mA§
-XAIB
6
-A41 SPEED
0(4)...20mA, RL < 500 ohm
0(4)...Motor speed
-XAOB
1
-A41 CURRENT
0(4)...20mA, RL < 500 ohm
0(4)...Motor current
-XAOB
3
-A41 READY
By default not in use
-XDIOB
1
-A41 RUNNING
By default not in use
-XDIOB
2
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams
Prep.
Joni Tuomi
26.4.2019
App.
Mika Aslkainen
26.4.2019
Project
ACS880-104LC
2xR8i
Revision B
Title
INU Control Board
ACS880-104LC 2xR8i
INVERTER MODULE
ABB
INVERTER CUBICLE
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000603282
EPLAN Doc. No.
ABB Ref. No.
Resp. Dept.
Item Des.
= 1.1
+11.1
Rev.
B
Sheet
040b
Cont.
040c

040c

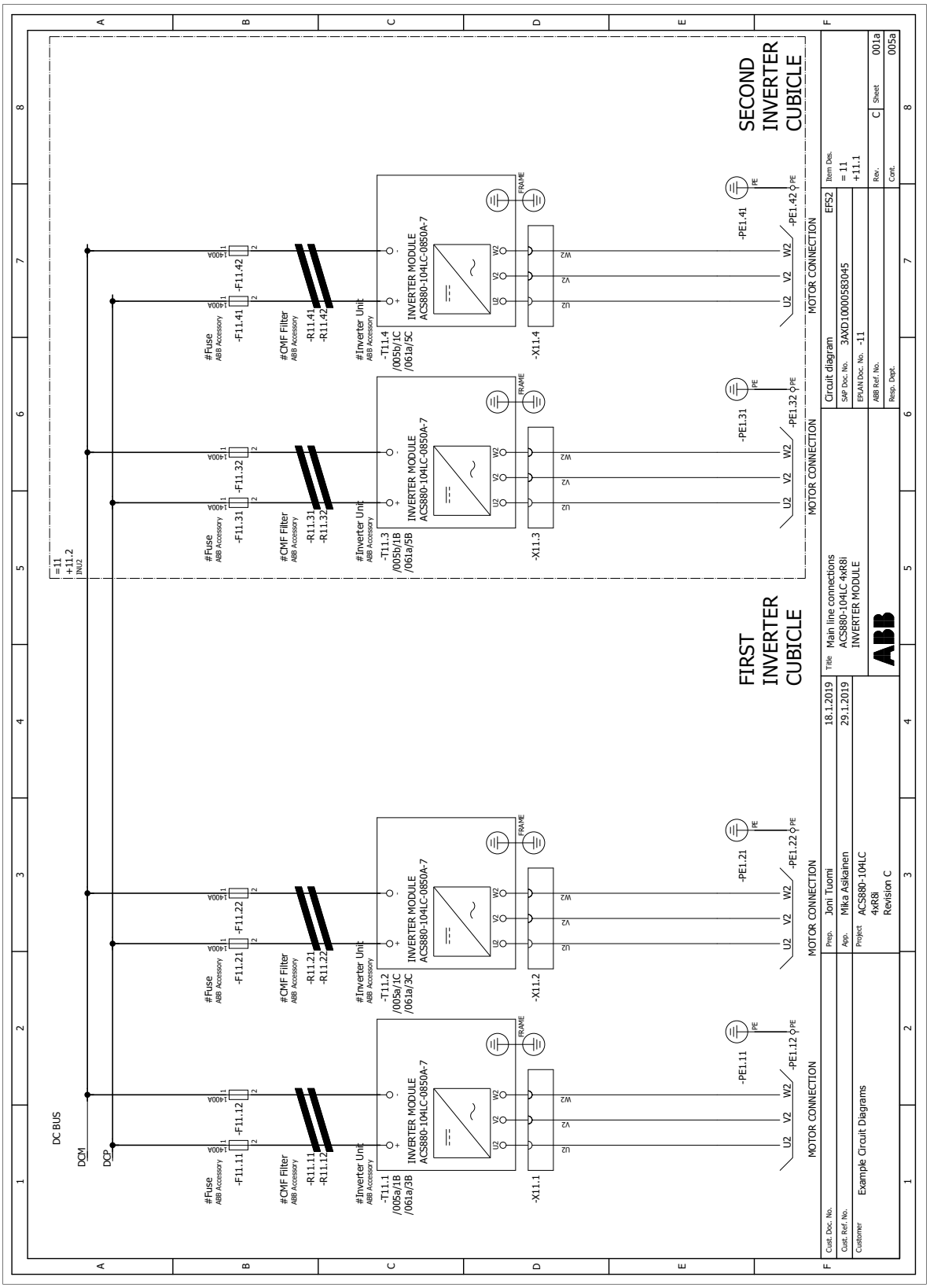

INVERTER CUBICLE
ANALOG I/O EXTENSION
FIO-11 KIT
#Analog extension
#Panel Interface
DIAGNOSTICS AND PANEL INTERFACE
FDPI-02
#Panel mounting kit
#Control Panel
#DDCS
RDCO-04
DDCS
COMMUNICATION
CONTROL UNIT
BCU-02
D2D.TERM
ANALOG INPUT
SIGNAL SELECTION
CURRENT
VOLTAGE
-A413.1
-A49
-A48
-A418.1
-A41
-A41_MEM
-SD_CARD
-SLOT1
-SLOT2
-SLOT3
-SLOT4
-X3
-X10
-X2
-X3
-X12
-X13
-X9
-X205
-XD2D
-X485
-XETH
-X74
-X75
-X76
-X72
-X73
-X71
Circuit diagram
EFS2
3AXD10000603282
ACS880-104LC 2xR8i
INVERTER MODULE
Example Circuit Diagrams
Revision B
26.4.2019
Joni Tuomi
Mika Asikainen
Sheet
040c
061a

061a

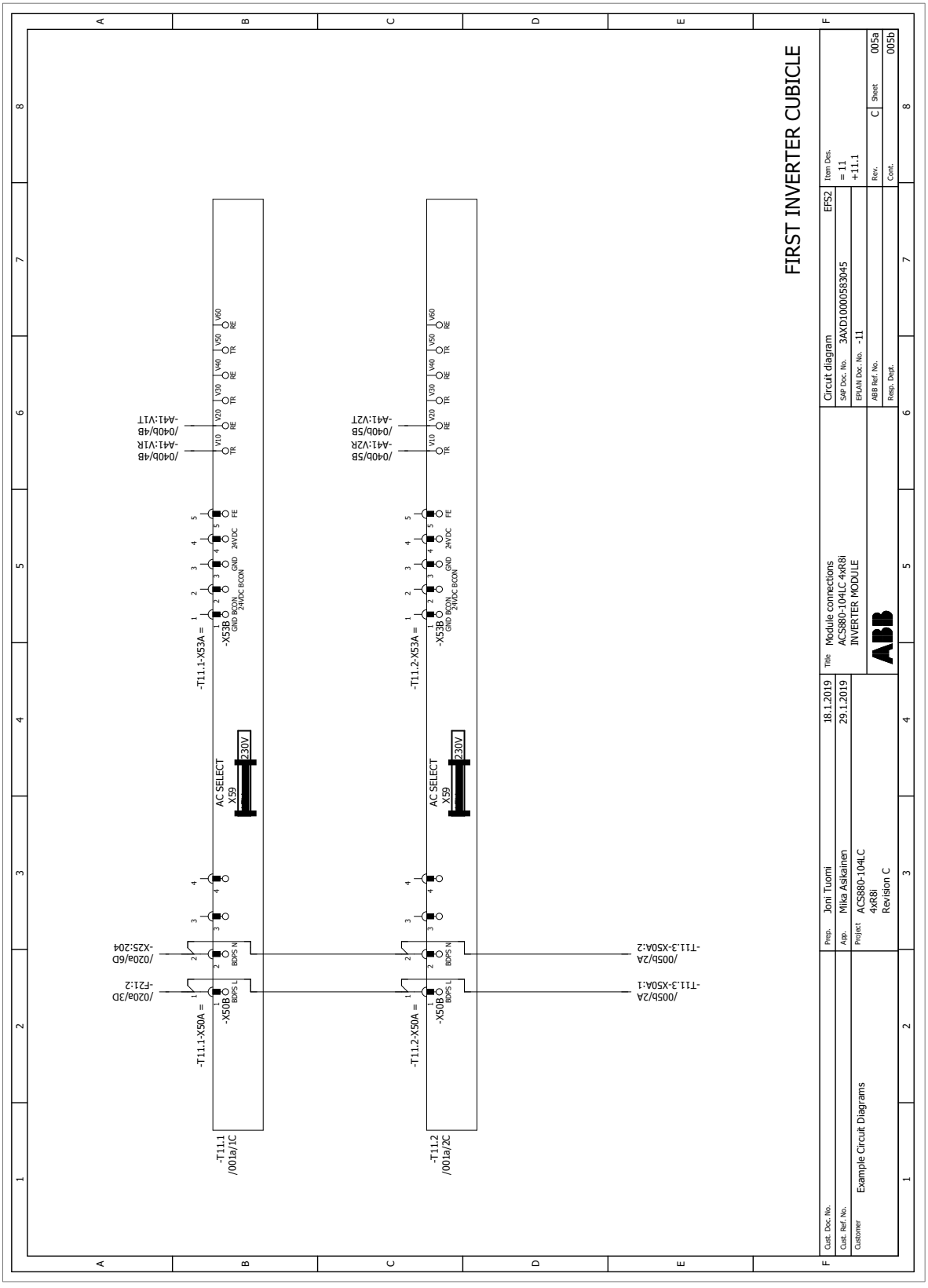

INVERTER CUBICLE
Circuit diagram
EFS2
SAP Doc. No.
3AXD10000603282
EPLAN Doc. No.
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev.
B
Sheet
061a
Cont.
Title
Emergency stop and safety circuit
ACS880-104LC 2xR8i
INVERTER MODULE
Prep.
Joni Tuomi
26.4.2019
App.
Mika Asikainen
26.4.2019
Project
ACS880-104LC
2xR8i
Revision B
Cust. Doc. No.
Cust. Ref. No.
Customer
Example Circuit Diagrams
-T11.1-X52A =
-T11.1
/001a/2D
-X52B
-X51B
-T11.1-X51A =
-T11.2
/001a/4D
-T11.2-X51A =
/061a/1D
-A41:-XSTO.OUT:5
/061a/2D
-A41:-XSTO.OUT:6
/061a/2D
-A41:-XSTO.OUT:7
/061a/2D
-A41:-XSTO.OUT:8
-A41
/040a/1E
CONTROL UNIT
BCU-02
-XSTO
-XSTO.OUT
/061a/4B
-T11.1-XSZA:1
/061a/4B
-T11.1-XSZA:2
/061a/4B
-T11.1-XSZA:3
/061a/4B
-T11.1-XSZA:4

Frame 4×R8i without DC switch/disconnector

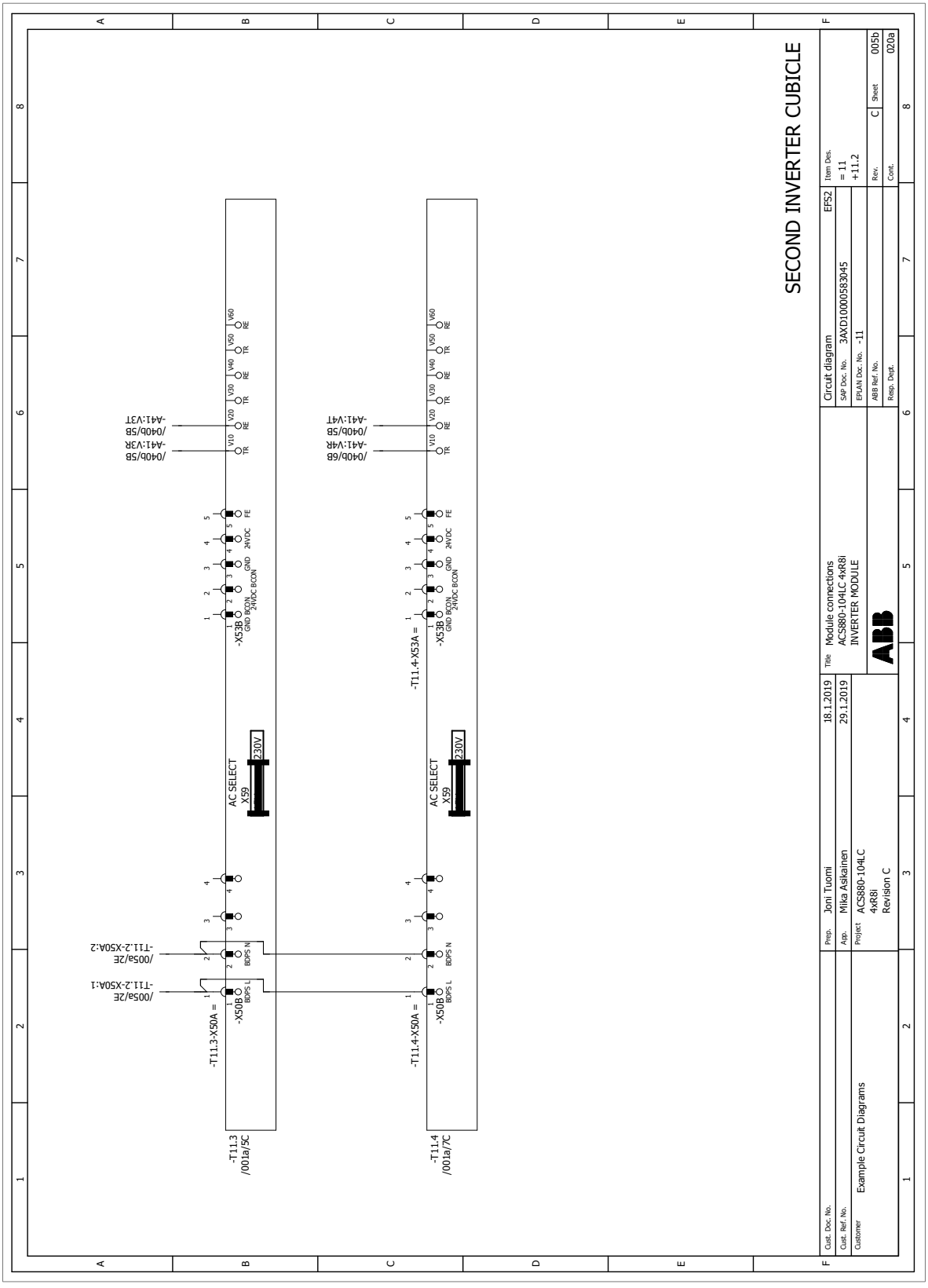
001a



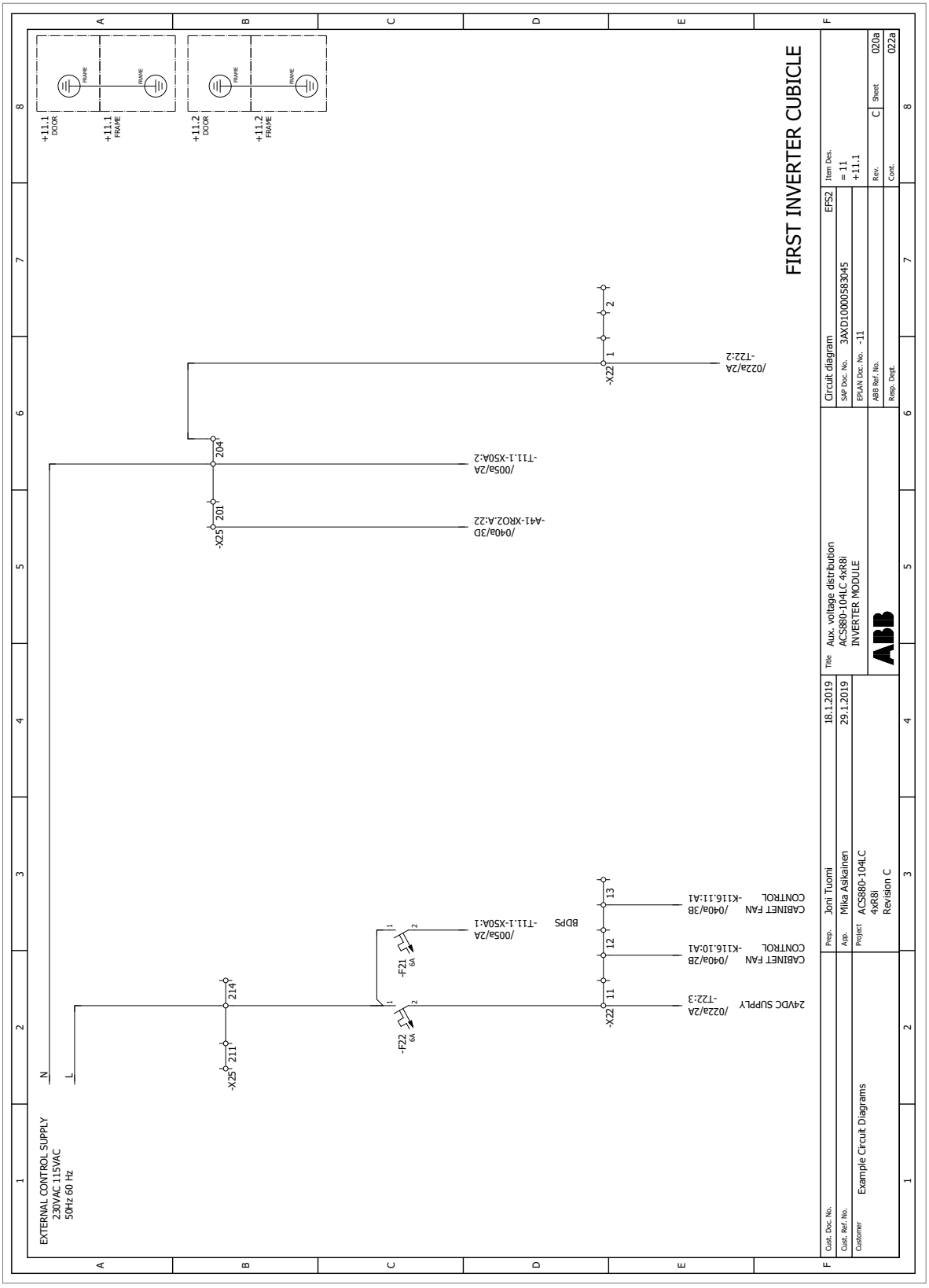
005a


FIRST INVERTER CUBICLE
-T11.1-X53A =
-X53B
-T11.2-X53A =
-X53B
AC SELECT
X59
230V
-T11.1-X50A =
-X50B
-T11.2-X50A =
-X50B
-T11.1
/001a/1C
-T11.2
/001a/2C
/040b/4B
-A41:V1R
/040b/4B
-A41:V1T
/040b/5B
-A41:V2R
/040b/5B
-A41:V2T
/020a/3D
-F21:2
/020a/6D
-X25:20↵
/005b/2A
-T11.3-X50A:1
/005b/2A
-T11.3-X50A:2
Prep. Joni Tuomi 18.1.2019
Chk. Mika Asikainen 29.1.2019
Project ACS880-104LC 4xR8i Revision C
Customer Example Circuit Diagrams
Title Module connections ACS880-104LC 4xR8i INVERTER MODULE
Circuit diagram EFS2
SAP Doc. No. 3AXD10000583045
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
Item Des. = 11 +11.1
Rev. C Sheet 005a
Cont. 005b

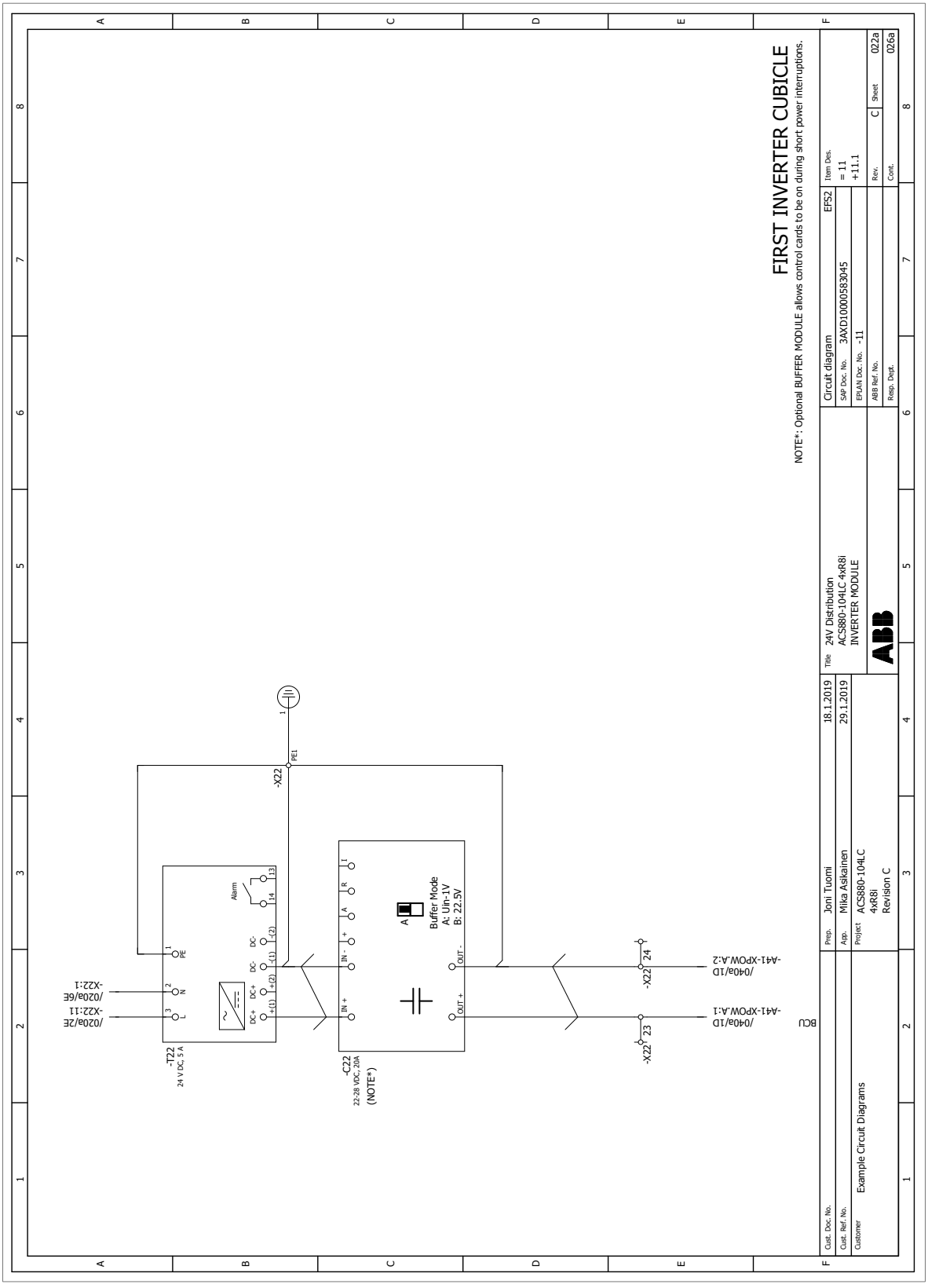
005b


SECOND INVERTER CUBICLE
-T11.3
/001a/5C
-T11.4
/001a/7C
-X53B
-X50B
-T11.3-X50A =
-T11.4-X53A =
-T11.4-X50A =
AC SELECT
X59
230V
/005a/2E
-T11.2-X50A:1
/005a/2E
-T11.2-X50A:2
/040b/5B
-A41:V3T
/040b/5B
-A41:V3R
/040b/6B
-A41:V4T
/040b/6B
-A41:V4R
Module connections
ACS880-104LC 4xR8i
INVERTER MODULE
Circuit diagram
3AXD10000583045
-11
EFS2
Item Des.
= 11
+11.2
Sheet
005b
020a
Prep.
Joni Tuomi
18.1.2019
Chkd.
Mika Asikainen
29.1.2019
Project
ACS880-104LC
4xR8i
Revision C
Example Circuit Diagrams
Customer

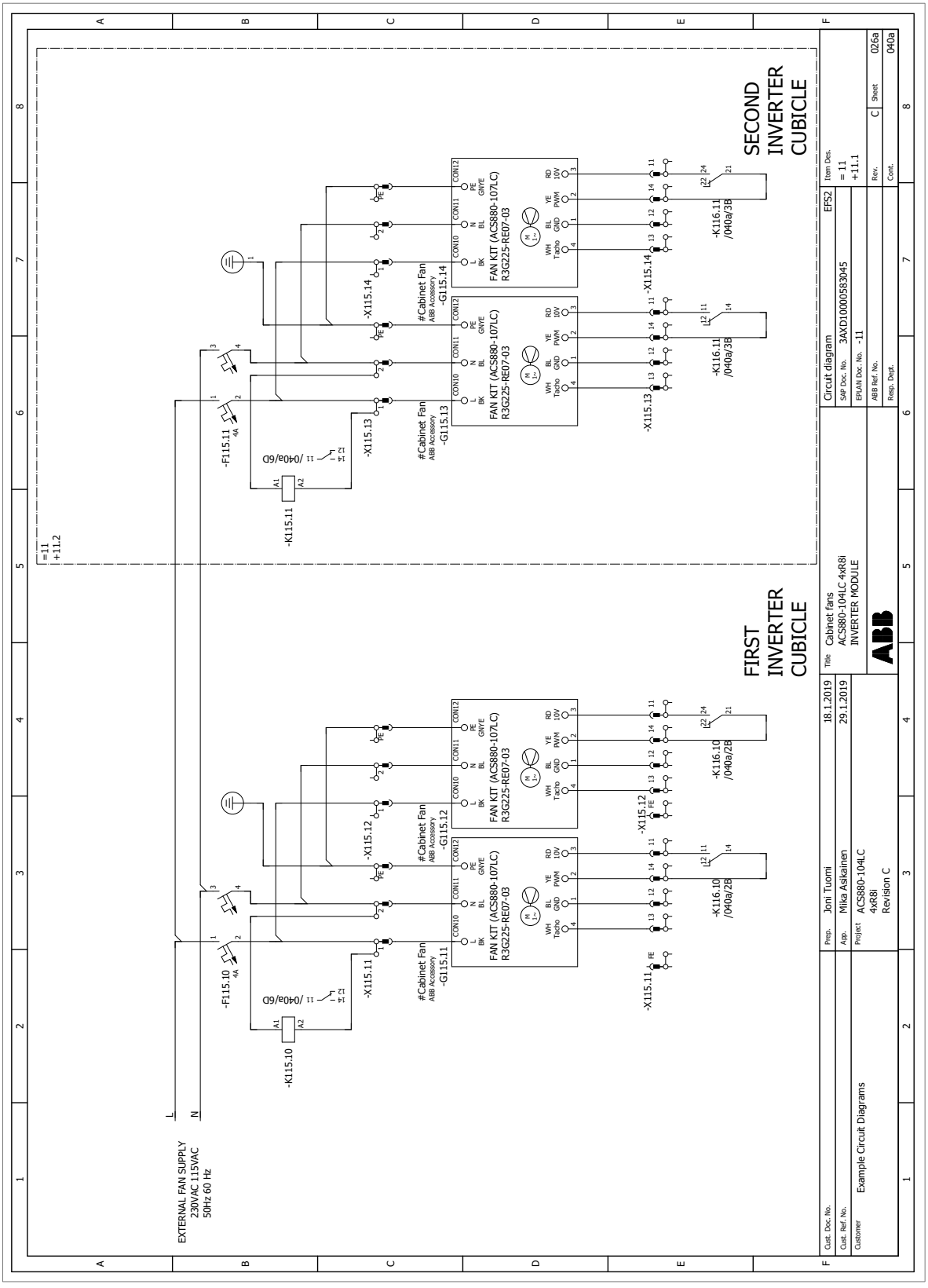
020a


FIRST INVERTER CUBICLE
+11.1 DOOR
+11.1 FRAME
+11.2 DOOR
+11.2 FRAME
FRAME
EXTERNAL CONTROL SUPPLY
230VAC 115VAC
50Hz 60 Hz
N
L
-X25 211
214
-F22 6A
-F21 6A
-X22 11
12
13
-X22 1
2
-X25 201
204
/022a/2A -T22:2
/005a/2A -T11.1-X50A:2
/040a/3D -A41-XRO2.A:22
/005a/2A -T11.1-X50A:1
BDPS
24VDC SUPPLY /022a/2A -T22:3
CABINET FAN CONTROL /040a/2B -K116.10:A1
CABINET FAN CONTROL /040a/3B -K116.11:A1
Circuit diagram
EFS2
SAP Doc. No. 3AXD10000583045
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev. C
Sheet 020a
Cont. 022a
Title Aux. voltage distribution
ACS880-104LC 4xR8i
INVERTER MODULE
Prep. Joni Tuomi 18.1.2019
Appr. Mika Askainen 29.1.2019
Project ACS880-104LC
4xR8i
Revision C
Cust. Doc. No.
Cust. Ref. No.
Customer Example Circuit Diagrams

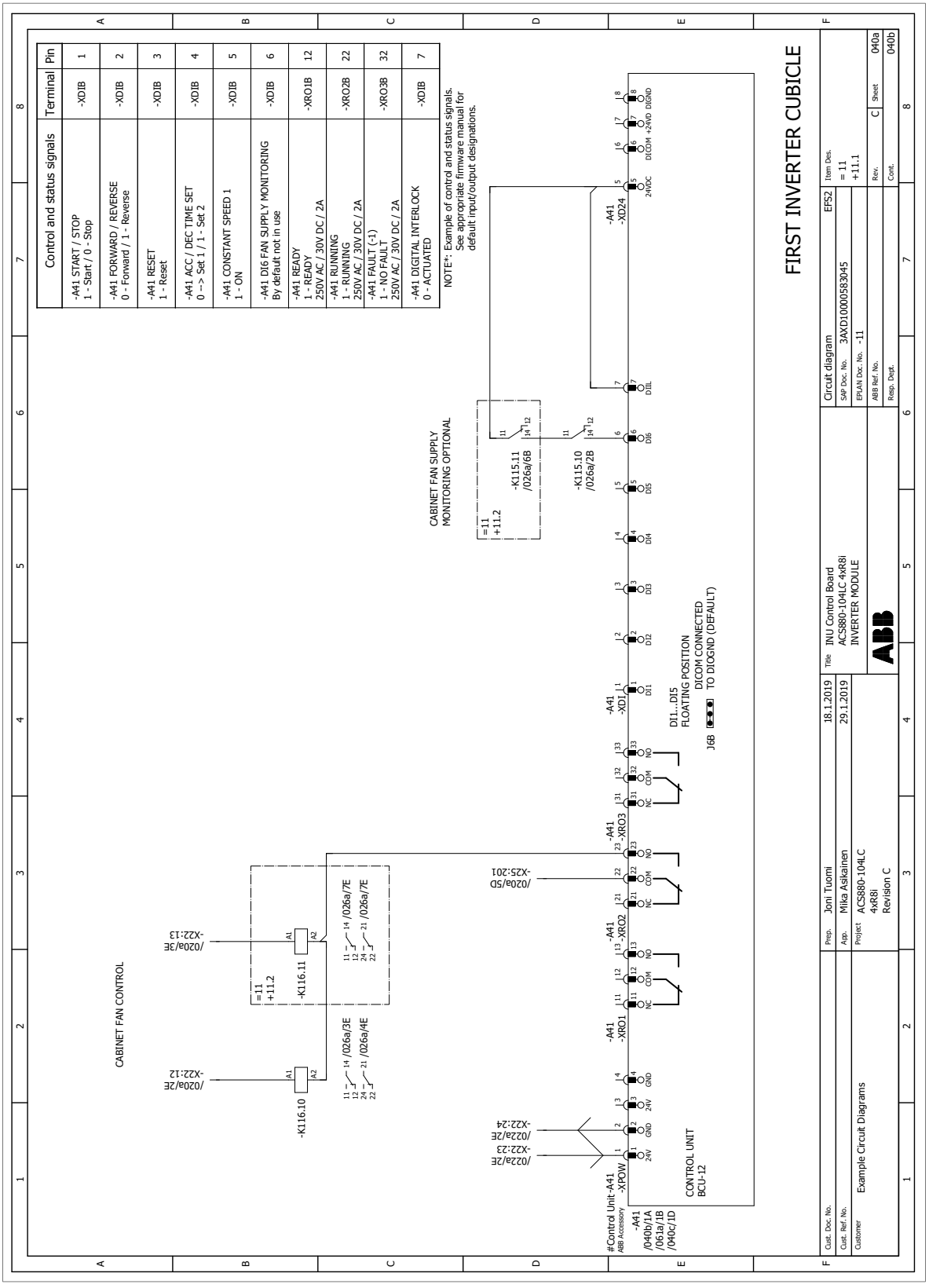
022a


FIRST INVERTER CUBICLE
NOTE*: Optional BUFFER MODULE allows control cards to be on during short power interruptions.
Title 24V Distribution ACS880-104LC 4xR8i INVERTER MODULE
Circuit diagram
SAP Doc. No. 3AXD10000583045
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
EFS2
Item Des. = 11 +11.1
Rev. C Sheet 022a
Cont. 026a
Prep. Joni Tuomi 18.1.2019
Appr. Mika Asikainen 29.1.2019
Project ACS880-104LC 4xR8i Revision C
Customer Example Circuit Diagrams
Cust. Doc. No.
Cust. Ref. No.
-T22 24 V DC, 5 A
-C22 22-28 VDC, 20A (NOTE*)
Buffer Mode A: Uin-1V B: 22.5V
Alarm
-X22
-X22 24
-X22 23
/020a/2E -X22:1:1
/020a/6E -X22:1:2
/040a/1D -A41-XPOW.A:1
/040a/1D -A41-XPOW.A:2
BCU

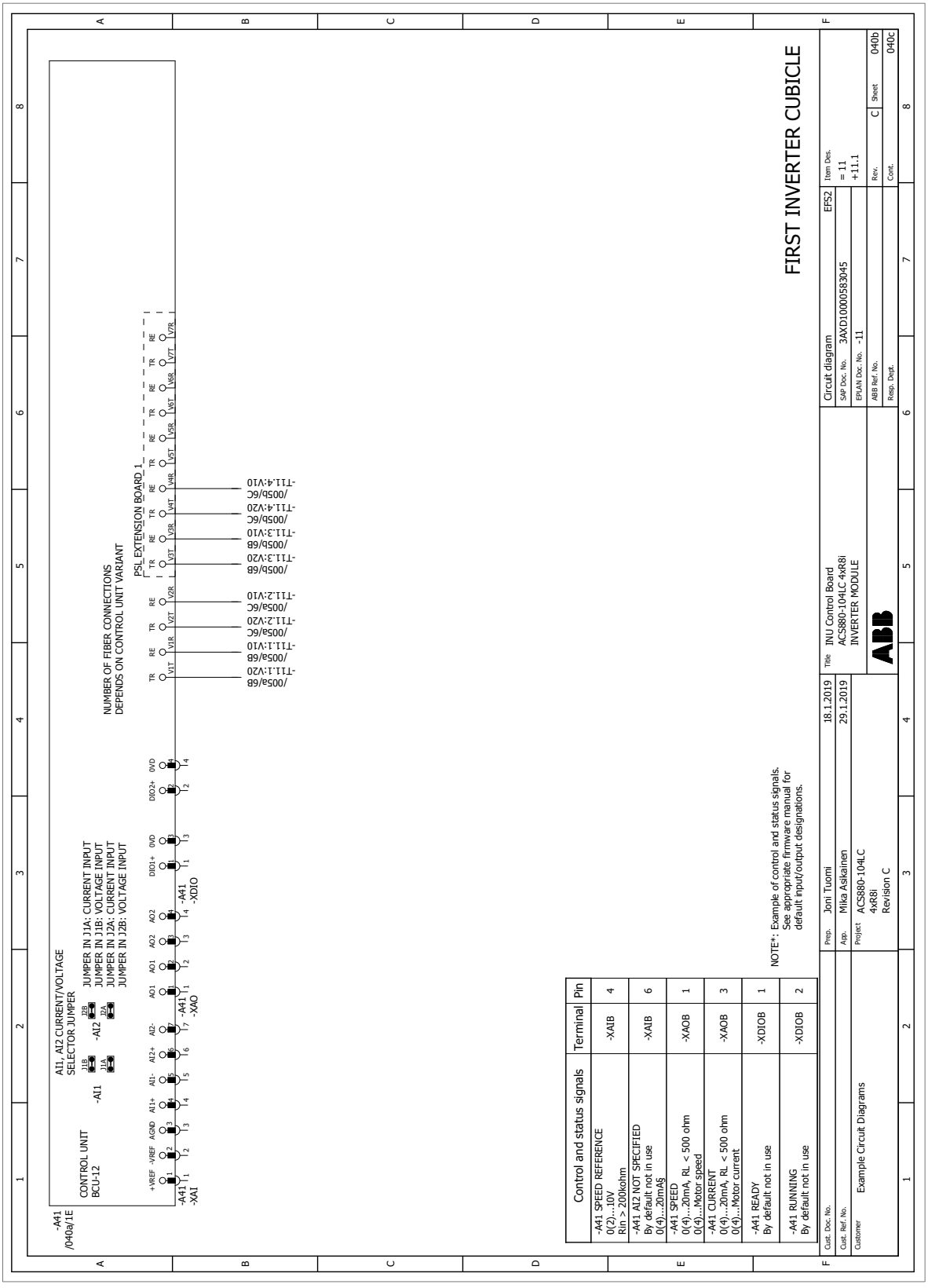
026a


SECOND INVERTER CUBICLE
FIRST INVERTER CUBICLE
EXTERNAL FAN SUPPLY 230VAC 115VAC 50Hz 60 Hz
Circuit diagram
EPS2
3AXD10000583045
-11
ACS880-104LC 4xR8i
INVERTER MODULE
Example Circuit Diagrams
ACS880-104LC 4xR8i
Revision C
Joni Tuomi
Mika Asikainen
18.1.2019
29.1.2019

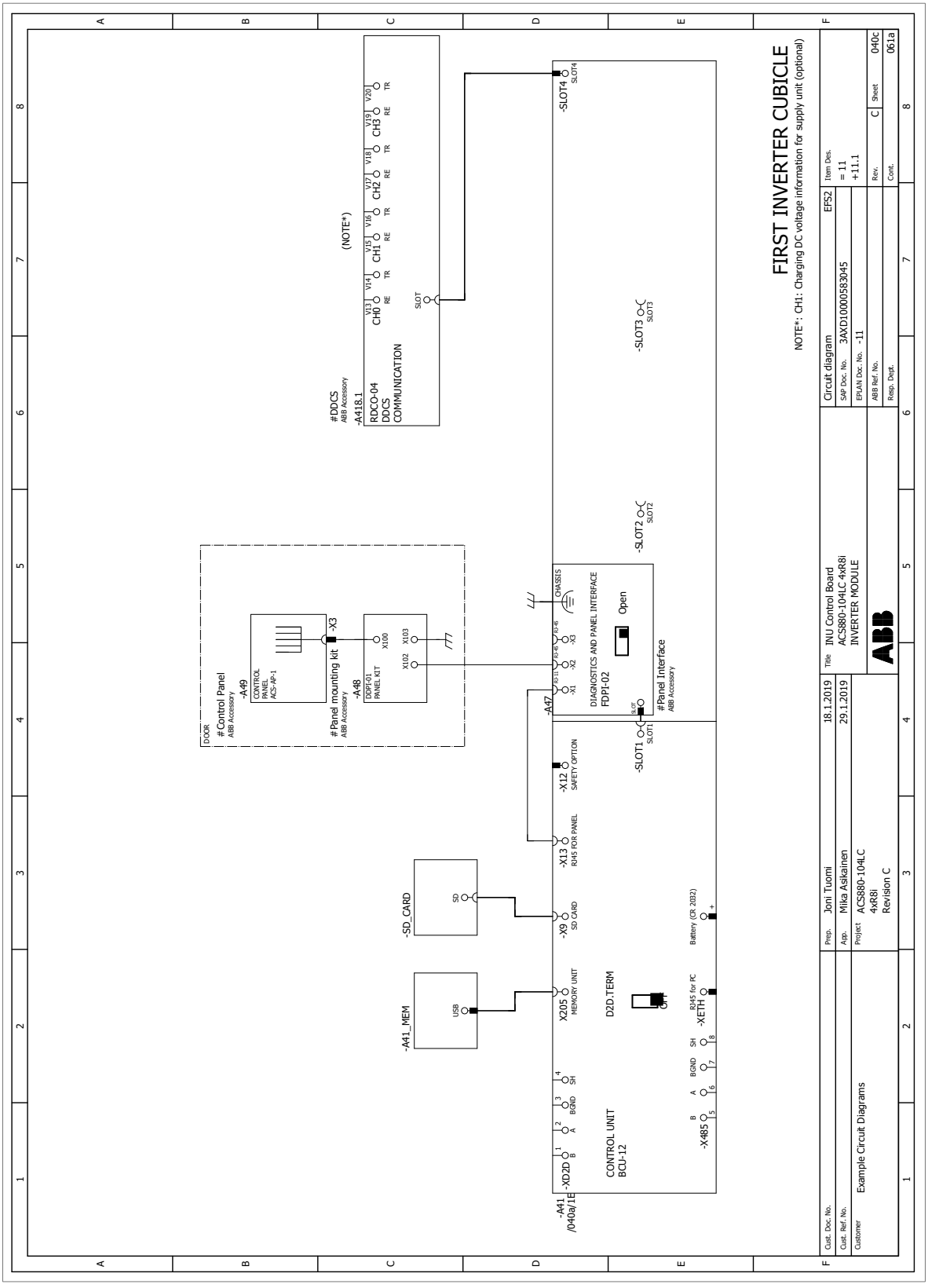
040a


FIRST INVERTER CUBICLE
CABINET FAN CONTROL
CABINET FAN SUPPLY MONITORING OPTIONAL
CONTROL UNIT BCU-12
INU Control Board ACS880-104LC 4xR8i INVERTER MODULE
Example Circuit Diagrams
ACS880-104LC 4xR8i Revision C
Joni Tuomi
Mika Asikainen
18.1.2019
29.1.2019
3AXD10000583045
EFS2
040a
040b

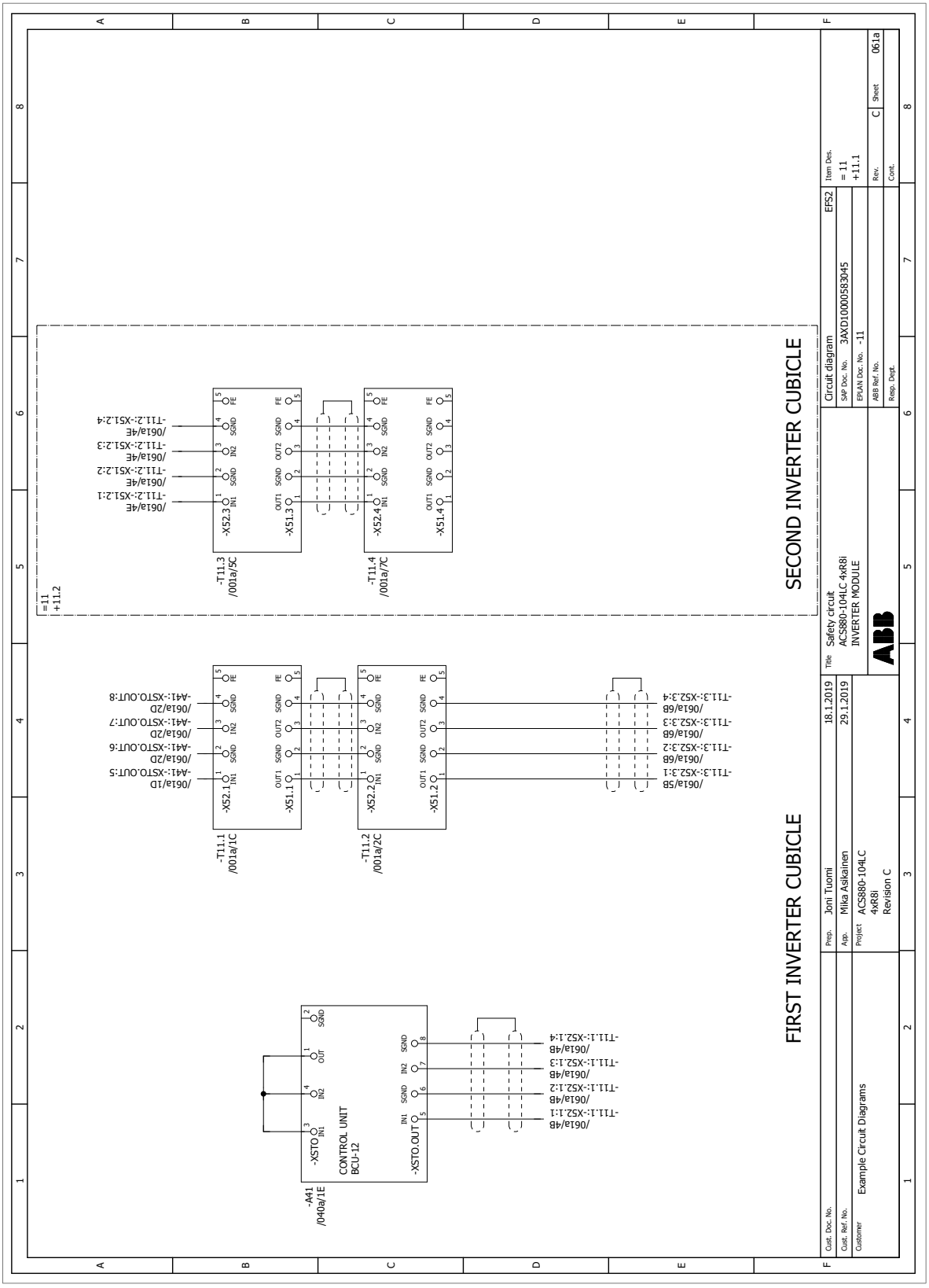
040b


FIRST INVERTER CUBICLE
-A41
/040a/1E
CONTROL UNIT
BCU-12
-AI1
-AI2
A11, AI2 CURRENT/VOLTAGE
SELECTOR JUMPER
JUMPER IN J1A: CURRENT INPUT
JUMPER IN J1B: VOLTAGE INPUT
JUMPER IN J2A: CURRENT INPUT
JUMPER IN J2B: VOLTAGE INPUT
NUMBER OF FIBER CONNECTIONS
DEPENDS ON CONTROL UNIT VARIANT
PSL EXTENSION BOARD 1
+VREF -VREF AGND AI1+ AI1- AI2+ AI2- AO1 AO2 AO2 DIO1+ 0VD DIO2+ 0VD
-A41 -XA1
-A41 -XAO
-A41 -XDIO
-T11.1:V1O
-T11.1:V2O
-T11.2:V1O
-T11.2:V2O
-T11.3:V1O
-T11.3:V2O
-T11.4:V1O
-T11.4:V2O
/005a/6B
/005a/6C
/005b/6B
/005b/6C
NOTE*: Example of control and status signals.
See appropriate firmware manual for
default input/output designations.
Control and status signals
Terminal
Pin
-A41 SPEED REFERENCE
0(2)...10V
Rin > 200kohm
-XAIB
4
-A41 AI2 NOT SPECIFIED
By default not in use
0(4)...20mA§
-XAIB
6
-A41 SPEED
0(4)...20mA, RL < 500 ohm
0(4)...Motor speed
-XAOB
1
-A41 CURRENT
0(4)...20mA, RL < 500 ohm
0(4)...Motor current
-XAOB
3
-A41 READY
By default not in use
-XDIOB
1
-A41 RUNNING
By default not in use
-XDIOB
2
Prep. Joni Tuomi 18.1.2019
Appr. Mika Asikainen 29.1.2019
Project ACS880-104LC
4xR8i
Revision C
Title INU Control Board
ACS880-104LC 4xR8i
INVERTER MODULE
ABB
Circuit diagram EFS2
SAP Doc. No. 3AXD10000583045
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev. C Sheet 040b
Cont. 040c
Cust. Doc. No.
Cust. Ref. No.
Customer Example Circuit Diagrams

040c


FIRST INVERTER CUBICLE
NOTE*: CH1: Charging DC voltage information for supply unit (optional)
(NOTE*)
#DDCS
ABB Accessory
-A418.1
RDCO-04
DDCS
COMMUNICATION
CH0
CH1
CH2
CH3
SLOT
-SLOT4
SLOT4
-SLOT3
SLOT3
-SLOT2
SLOT2
-SLOT1
SLOT1
DOOR
Control Panel
ABB Accessory
-A49
CONTROL
PANEL
ACS-AP-1
Panel mounting kit
ABB Accessory
-A48
DDPG01
PANEL KIT
-X3
X100
X102
X103
-A47
CHASSIS
DIAGNOSTICS AND PANEL INTERFACE
FDPI-02
Open
Panel Interface
ABB Accessory
-SD_CARD
SD
-A41_MEM
USB
-X9
SD CARD
-X13
RJ45 FOR PANEL
-X12
SAFETY OPTION
X205
MEMORY UNIT
D2D.TERM
-XETH
RJ45 for PC
Battery (CR 2032)
-X485
-XD2D
CONTROL UNIT
BCU-12
-A41
/040a/1E
Prep. Joni Tuomi 18.1.2019
Chk. Mika Asikainen 29.1.2019
Project ACS880-104LC
4xR8i
Revision C
Customer Example Circuit Diagrams
Cust. Doc. No.
Cust. Ref. No.
Title INU Control Board
ACS880-104LC 4xR8i
INVERTER MODULE
Circuit diagram EFS2
SAP Doc. No. 3AXD10000583045
EPLAN Doc. No. -11
ABB Ref. No.
Resp. Dept.
Item Des.
= 11
+11.1
Rev. C
Sheet 040c
Cont. 061a

061a


SECOND INVERTER CUBICLE
FIRST INVERTER CUBICLE
Safety circuit
ACS880-104LC 4xR8i
INVERTER MODULE
Circuit diagram
3AXD10000583045
-11
EFS2
= 11
+11.1
061a
Joni Tuomi
Mika Asikainen
ACS880-104LC
4xR8i
Revision C
Example Circuit Diagrams
CONTROL UNIT
BCU-12
-A41
/040a/1E
-T11.1
/001a/1C
-T11.2
/001a/2C
-T11.3
/001a/5C
-T11.4
/001a/7C

Further information

Product and service inquiries

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

Product training

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

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3AXD50000045610B

3AXD50000045610 Rev B (EN) EFFECTIVE 2019-06-29