ABB solar inverters

Hardware manual
PVS800-57 central inverters (100 to 1000 kW)

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List of related manuals

Inverter hardware manual	Code (English)	
PVS800-57 hardware manual	*3AUA0000053689*	1)

Inverter firmware manual		
PVS800 central inverters firmware manual	*3AUA0000058422*	1)
and adaptive program application guide	*3AUA0000091276*	

Option manuals and quides
Manuals and quick guides for I/O extension modules, fieldbus adapter modules, etc.

1) Delivered as a printed copy with the inverter.

Hardware manual

PVS800-57 central inverters
(100 to 1000 kW)

3AUA0000053689 Rev H
EN
EFFECTIVE: 2014-07-09

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1

Safety instructions

Contents of this chapter

This chapter contains the safety instructions which you must obey when you install and operate the inverter and do maintenance on the inverter. If you ignore the safety instructions, injury or death can occur, or damage can occur to the inverter, photovoltaic generator or adjoining equipment.

Use of warnings

Warnings tell you about conditions which can cause injury or death, or damage to the equipment. They also tell you how to prevent the danger. Notes draw attention to a particular condition or fact, or give information on a subject.

The manual uses these warning symbols:

Electricity warning tells about hazards from electricity which can cause injury or death, or damage to the equipment.

General warning tells about conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.

Electrostatic sensitive devices warning tells you about the risk of electrostatic discharge which can damage the equipment.

Safety in installation and maintenance

Precautions before electrical work

These precautions are for all personnel who do work on the inverter, its input and output cables, the transformer or photovoltaic generator.

<table>
<tr><td colspan="2">  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.</td></tr>
<tr><td>☐</td><td>1. Clearly identify the work location.</td></tr>
<tr><td>☐</td><td>2. Disconnect all possible voltage sources.
• Open the AC main switch-disconnector (Q1) and the DC main switch (Q2) of the inverter.
• Open the disconnector of the transformer as the AC main switch-disconnector (Q1) does not remove the voltage from the AC busbars of the inverter.
• Open the DC circuit breakers of the solar array junction boxes.
• Make sure that reconnection is not possible. Lock the disconnectors to open position and attach a warning notice to them.
• After you have disconnected the inverter, always wait for 5 minutes to let the intermediate circuit capacitors discharge before you continue.</td></tr>
<tr><td>☐</td><td>3. Protect any other energized parts in the work location against contact.</td></tr>
<tr><td>☐</td><td>4. Take special precautions when close to bare conductors.</td></tr>
<tr><td>☐</td><td>5. Measure that the installation is de-energized.
• Use a multimeter with an impedance of at least 1 Mohm.
• Make sure that the voltage between the inverter AC output terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V.
• Make sure that the voltage between the inverter module UDC+ and UDC- terminals and the grounding (PE) busbar is close to 0 V.
• Make sure that the voltage between the DC input terminals L+ and L- and the grounding (PE) busbar is close to 0 V.</td></tr>
</table>

☐	**6. Install temporary grounding as required by the local regulations.** Connect the AC and DC busbars to the PE using an appropriate temporary grounding tool.  Diameter of the connecting knob is 25 mm. *View of AC busbars grounding*
☐	**7. Ask the person in control of the electrical installation work for a permit to work.**

Electrical safety

These warnings are for all personnel who do work on the inverter, its input and output cables, the transformer or photovoltaic generator.

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 electrical installation or maintenance work.**
- Never work on the photovoltaic generator or the inverter or its input or output cables when the inverter is connected to electrical power system or to the photovoltaic generator. After disconnecting the inverter from the electrical power system and the DC input, always wait for 5 min to let the intermediate circuit capacitors discharge before you start working on the inverter, its input and output cables or the photovoltaic generator.

  Always ensure by measuring with a multimeter (impedance at least 1 Mohm) that:
  1) Voltage between inverter phases (L1, L2, L3) and the frame is close to 0 V.
  2) Voltage between the inverter module terminals (UDC+ and UDC-) and inverter DC input terminals (L+ and L-) and the frame is close to 0 V.

- Before working inside the inverter cabinet, isolate the AC line cables and busbars from the electrical power system with the disconnector of the power system transformer. Also, isolate the inverter from the photovoltaic generator with the safety switch of the generator or by other means. The grid disconnecting device (disconnecting means) of the inverter does not isolate the AC output cables and terminals from the electrical power system. The DC main switch/switches or DC input circuit breakers do not isolate the DC input cables or terminals from the DC voltage supplied by the photovoltaic generator.
- Before working inside the inverter cabinet, switch off or isolate the auxiliary voltage supply from the inverter.
- Before working on the unit, apply temporary grounding for work. See page 12.
- Do not work on the control cables when power is applied to the inverter or to the external control circuits. Externally supplied control circuits may cause dangerous voltages inside the inverter even when the main power on the inverter is switched off.
- Live parts inside the cubicle are protected against direct contact when all protective plastic covers and metallic shrouds are in place. Pay special attention when handling sharp metallic shrouds.
- Do not make any insulation or voltage withstand tests on the inverter or inverter modules.

Note:
- The DC connection terminals (UDC+, UDC-, L+ and L-) carry a dangerous DC voltage (up to 1100 V).
- External wiring can supply dangerous voltages to the terminals of relay outputs (RO1, RO2 and RO3).
- Depending on the external and internal wiring, dangerous voltages (115 V or 230 V) may be present at different terminals in the auxiliary connection unit.
- With options +F282 and +F283, one of the poles of the photovoltaic generator is grounded, and therefore, the other pole has full voltage against ground (up to 1100 V).

- When the photovoltaic generator cells are exposed to light (even if it is dim), the generator supplies DC voltage to the inverter.

Grounding

These instructions are for all personnel who are responsible for the grounding of the inverter.

WARNING! Obey these instructions. If you ignore them, injury or death, or equipment malfunction can occur, and electromagnetic interference can increase.

- If you are not a qualified electrician, do not do grounding work.
- Always ground the inverter and adjoining equipment. This is necessary for the personnel safety. Proper grounding also reduces electromagnetic emission and interference.
- Make sure that the conductivity of the grounding conductors is sufficient. See section *Selecting the power cables* on page *75*. Obey the local regulations.
- In a multiple-inverter installation, connect each inverter separately to protective earth (PE) busbar of the switch board or the transformer.
- When shielded AC power cables are used, make a 360° high frequency grounding of cable entries at the cabinet lead-through to suppress electromagnetic disturbances. In addition, connect the cable shields to protective earth (PE) to meet safety regulations.
- EMC filters are not allowed at the AC output of the inverter.
- Do not install the inverter on a TN (grounded) system.
- Do not install the EMC filter option (+E216) for the network side of the low voltage transformer on an (ungrounded) system.

Note:

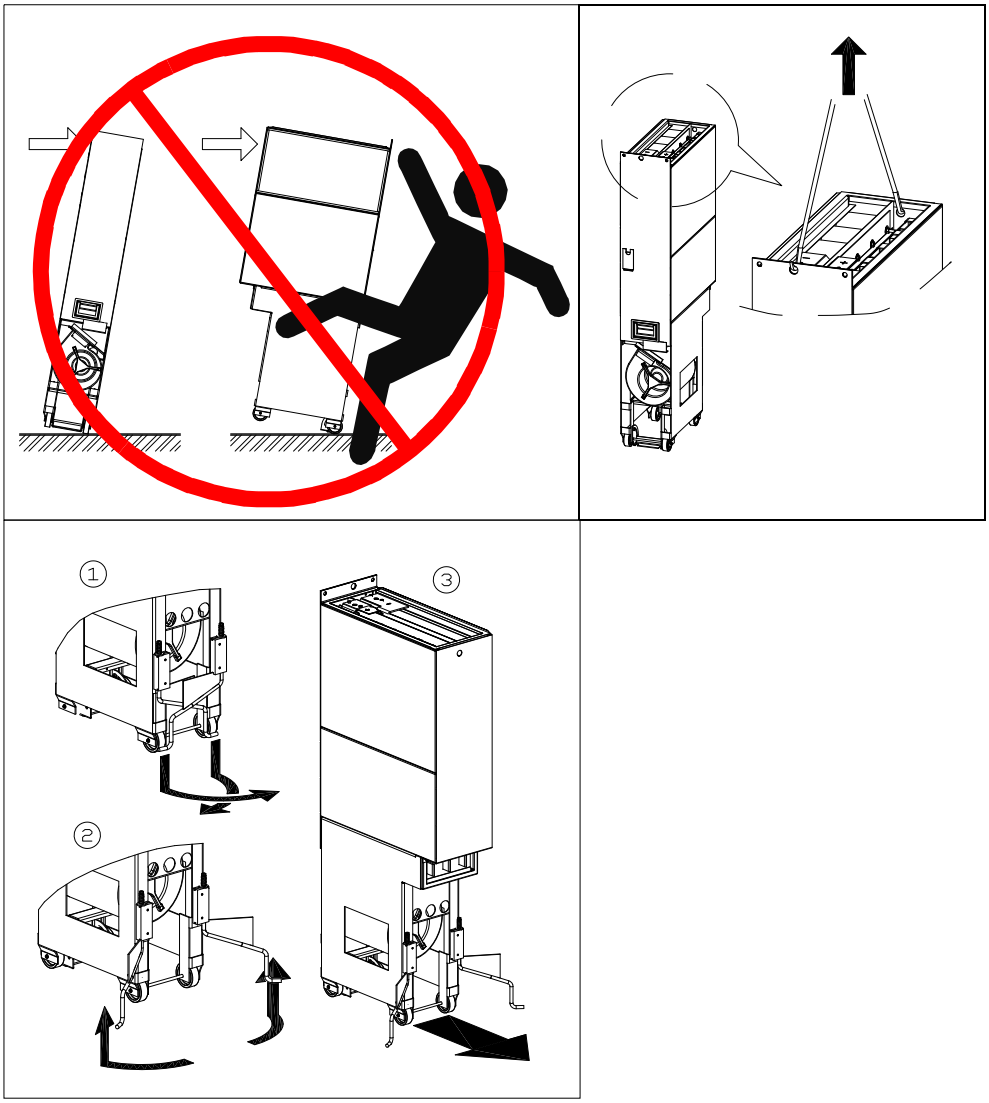
- You can use power cable shields as grounding conductors only when their conductivity is sufficient.
- As the normal touch current of the inverter is higher than 3.5 mA AC or 10 mA DC, you must use a fixed protective earth connection. See standard IEC/EN 62109, 5.2.5.

General safety

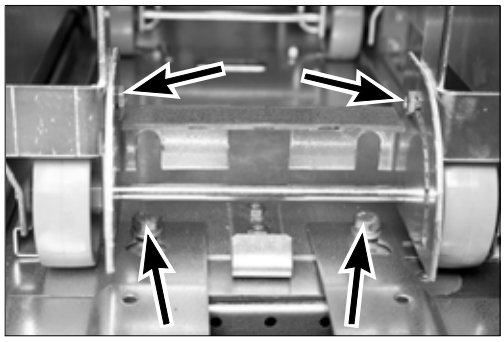
These instructions are for all personnel who install the inverter and do maintenance work on it.

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

- Standard IEC/EN 62109-2 (section 4.8.3.6) requires that as the inverter is not provided with full protection against shock hazard on the photovoltaic array, you must install and use the inverter inside a closed electrical operating area.
- Handle the drive module carefully:
  - Use safety shoes with a metal toe cap to avoid foot injury.
  - Use extreme caution when manoeuvering an inverter or LCL filter module that runs on wheels. Extend the support legs of the module when it is removed from the cabinet! Do not tilt the module! The modules are heavy and have a high center of gravity. They topple over easily if handled carelessly.
  - Lift the module by the upper part only using the lifting hole(s) at the top!



- When removing a module which is equipped with wheels, pull the module carefully out of the cubicle along the ramp. Make sure the wires do not catch. While pulling on the handle, keep a constant pressure with one foot on the base of the module to prevent the module from tipping over. Use safety shoes with metal toe cap to avoid foot injury.
- When replacing a module which is equipped with wheels, push the module up the ramp into the cubicle. Keep your fingers away from the edge of the module front plate to avoid pinching them between the module and the cubicle. Also keep a constant pressure with one foot on the base of the module to stabilize the movement.
- Do not use the ramp with plinth heights over 50 mm.The ramp supplied with the inverter is designed for a plinth height of 50 mm (the standard plinth height of ABB cabinets). Tighten the four fastening bolts of the ramp carefully.



- Beware of the cooling fan blades. The fans may continue to rotate for a while after disconnection of the electrical supply.
- Beware of hot surfaces. Some parts inside the inverter cabinet, such as heatsinks of power semiconductors, remain hot for a while after disconnection of the electrical supply.
- Make sure that debris from borings and grindings do not enter the inverter during the installation. Electrically conductive debris inside the unit may cause damage or malfunction.
- We do not recommend that you secure the cabinet by arc welding. However, if welding is necessary, ensure that the return wire is properly connected close to the weld in order not to damage the electronic equipment in the cabinet. Also ensure that welding fumes are not inhaled.

Printed circuit boards

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

Fiber optic cables

WARNING! Obey these instructions. If you ignore them, equipment malfunction and damage to the fiber optic cables can occur.

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

Start-up and operation

These warnings are for all personnel who commission, plan the operation or operate the inverter.

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

- Close the inverter AC and DC main switches and miniature DC circuit breakers (option +H377) before start.
- Do not open the inverter AC or DC main switches or miniature DC circuit breakers (option +H377) when the inverter is running.

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

- Before you adjust the inverter and put it into service, make sure that all equipment is suitable for operation.
- The maximum allowed number of power-ups by applying power is five in ten minutes.

Note:

- If an external source for the start command is selected and it is ON, the inverter will start immediately after a fault reset.
- When the control location is not set to Local (L not shown on the status row of the display), the stop key on the control panel will not stop the inverter. To stop the inverter using the control panel, press the LOC/REM key and then the stop key ⏹.

2

Introduction to the manual

Contents of this chapter

This chapter describes the intended audience and contents of the manual. It contains a flowchart of the steps in checking the delivery, installing and commissioning the inverter. The flowchart refers to chapters/sections in this manual and other manuals.

Target audience

This manual is intended for people who plan the installation, install, commission, use and service the inverter. Read the manual before you do work on the inverter. 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.

Contents of the manual

The chapters of the manual are briefly described below.

Safety instructions give safety instructions for the installation, commissioning, operation and maintenance of the inverter.

Introduction to the manual introduces the manual.

Operation principle and hardware description describes the operation principle and construction of the inverter in short.

Mechanical installation describes the mechanical installation procedure of the inverter.

Planning the electrical installation contains the instructions that you must obey when selecting the cables, protections, cable routing and way of operation for the inverter system.

Electrical installation describes the electrical installation process of the inverter.

Installation checklist contains a list for checking the mechanical and electrical installation of the inverter.

Start-up describes the start-up procedure of the inverter.

Fault tracing describes the fault tracing possibilities of the inverter.

Maintenance contains preventive maintenance instructions of the inverter.

Technical data contains the technical data for the inverter.

Dimension drawings contains example dimension drawings of the inverter.

Related documents

See the inside of the front cover.

Categorization by frame size and option code

Some instructions, technical data, dimensions and weights which concern only certain inverter frame sizes are marked with the symbol of the frame size, such as R8i. The frame size is not marked on the inverter designation label. To identify the frame size of your unit, see the rating tables in chapter *Technical data*.

The instructions and technical data which concern only certain optional selections are marked with option codes, eg, +Q951. The options included in the inverter can be identified from the option codes visible on the type designation label. The option selections are listed in section *Type designation key* on page *58*.

Quick installation, commissioning and operation flowchart

Task	See
Plan the installation. Check the ambient conditions, ratings, required cooling air flow, input and output power connection, compatibility with the solar generator and other technical data. Select the cables.	*Technical data* *Planning the electrical installation* Option manual (if optional equipment is included)
↓	
Unpack and check the units. Check that all necessary optional modules and equipment are present and correct. Only intact units may be started up.	*Moving the unit (*page *65*). If the converter has been non-operational for more than one year, the converter DC link capacitors need to be reformed. See *Capacitor reforming instructions* (3BFE64059629 [English]).
↓	
Check the installation site.	*Checking the installation site (*page *63*). *Technical data*
↓	
Route the cables.	*Routing the cables* (page *78*)
↓	

Task	See
Install the inverter. Connect the power cables. Connect the control and the auxiliary control cables.	*Mechanical installation* (page *63*), *Electrical installation* (page *83*)
↓	
Check the installation.	*Installation checklist* (page *97*)
↓	
Commission the inverter.	*Start-up* (page *99*), *PVS800 central inverters firmware manual* (3AUA0000058422 [English])

Terms and abbreviations

Term/Abbreviation	Explanation
AINT	Main circuit board inside the inverter module
APBU	Optical branching unit for fiber links that use the PPCS protocol. The unit is used for connecting parallel-connected inverter modules to the RDCU.
DC input	Connection point from solar array to inverter. One input consists of one positive and one negative terminal.
DDCS	Distributed drives communication system; a protocol used in optical fiber communication inside and between ABB drives and inverters.
EMC	Electromagnetic compatibility
Frame (size)	Relates to the construction type of the component in question. The term is often used in reference to a group of components that share a similar mechanical construction. To determine the frame size of a component, refer to the rating tables in chapter *Technical data*.
IGBT	Insulated gate bipolar transistor; a voltage-controlled semiconductor type widely used in inverters due to its easy controllability and high switching frequency.
Inverter	A cabinet-built entity containing all inverter modules together with their control electronics, and I/O and auxiliary components. The inverter module converts the DC voltage to AC voltage. Its operation is controlled by switching the IGBTs.
I/O	Input/Output
MCB	Miniature circuit breaker
MPPT	Maximum power point tracking. Inverter software function that automatically operates the photovoltaic generator at its maximum power point.
NAMU	Auxiliary measuring unit
NDPA	PC card, DDCS communication board; PC communication hardware for DriveWindow
NDPC	Optical transmitter/receiver; PC communication hardware for DriveWindow
NETA	Ethernet adapter module
Photovoltaic cell, generator, module, string, array and array junction box	In this manual, solar power system components based on photovoltaic effect are called solar cell, solar module, solar array, solar string and solar array junction box as defined below.
PGND	Grounding monitoring board

Term/Abbreviation	Explanation
PLC	Programmable logic controller
PPCS	Power plate communication system; a protocol used in the optical fiber link that controls the output semiconductors of an inverter module
RAIO	Analog I/O extension module
RDCO	DDCS communication module that can be snapped on the RMIO board to add the available fibre optic channels.
RDCU	Control unit. The RDCU is a separate unit consisting of an RMIO board built in a plastic housing.
RDIO	Digital I/O extension module
RFI	Radio-frequency interference
RMIO	Control and I/O board inside the RDCU control unit
RUSB	USB-DDCS adapter for connecting the DriveWindow PC tool to the inverter. The adapter is connected to the USB port of the PC and to the fiber optic channel of the RDCO.
Solar array	Group of parallel-connected solar strings
Solar array junction box	Device that connects outputs of multiple solar source circuits (strings) into a combined output circuit or circuits
Solar cell	Device that converts light directly into electricity by the photovoltaic effect
Solar generator	The total of all solar strings of a solar power supply system, which are electrically interconnected
Solar module	Packaged interconnected assembly of solar cells
Solar string	Circuit of series-connected solar modules
THD	Total harmonic distortion

3

Operation principle and hardware description

Contents of this chapter

This chapter gives a short description of the inverter’s operation principle and construction.

Product overview

The PVS800-57 is a central inverter for converting, adjusting and conveying power generated by a solar generator to the electrical power system.

The inverter is built in an air-cooled cabinet for indoor use. Cooling air is let in through the gratings at the lower part of the cabinet door. The air outlet is at the cabinet roof.

PVS800-57-0100kW

PVS800-57-0250kW and PVS800-57-0315kW

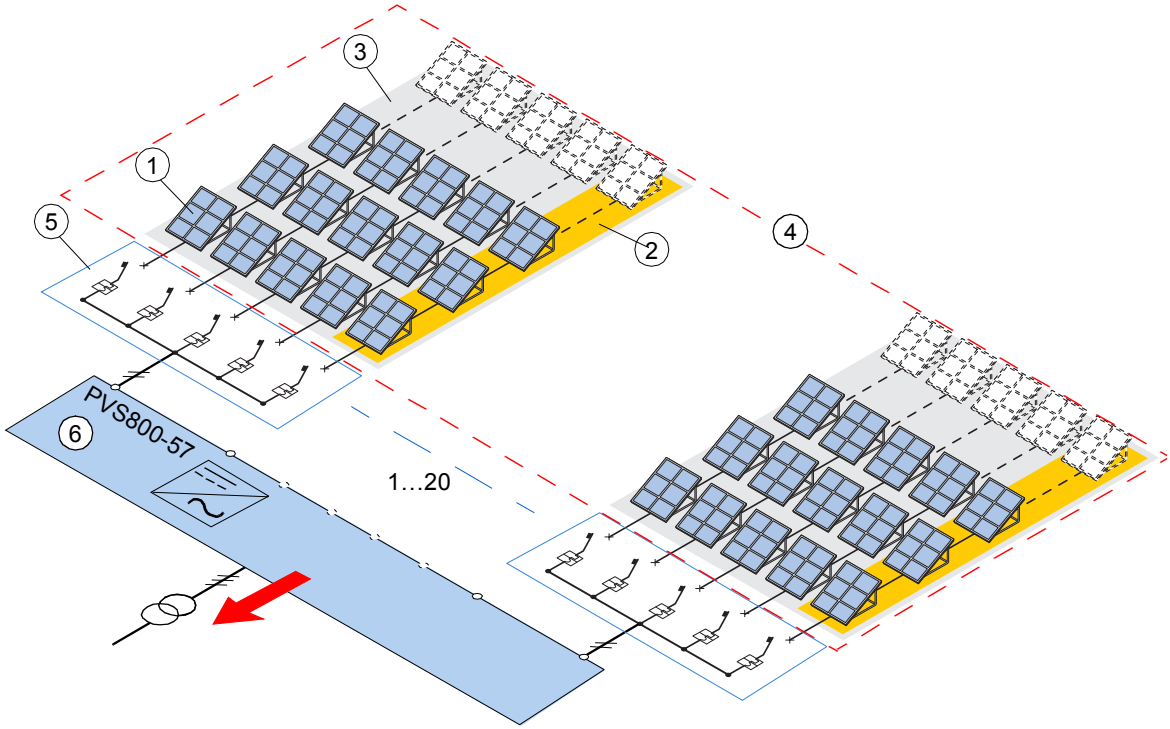
PVS800-57-0500kW and PVS800-57-0630kW

PVS800-57-0875kW and PVS800-57-1000kW

As standard, the solar generator is connected to the DC input terminals of the inverter with busbars and fuse links. Miniature circuit breakers can be used for connecting solar array junction boxes as option (+H377) for PVS800-57-0100kW.

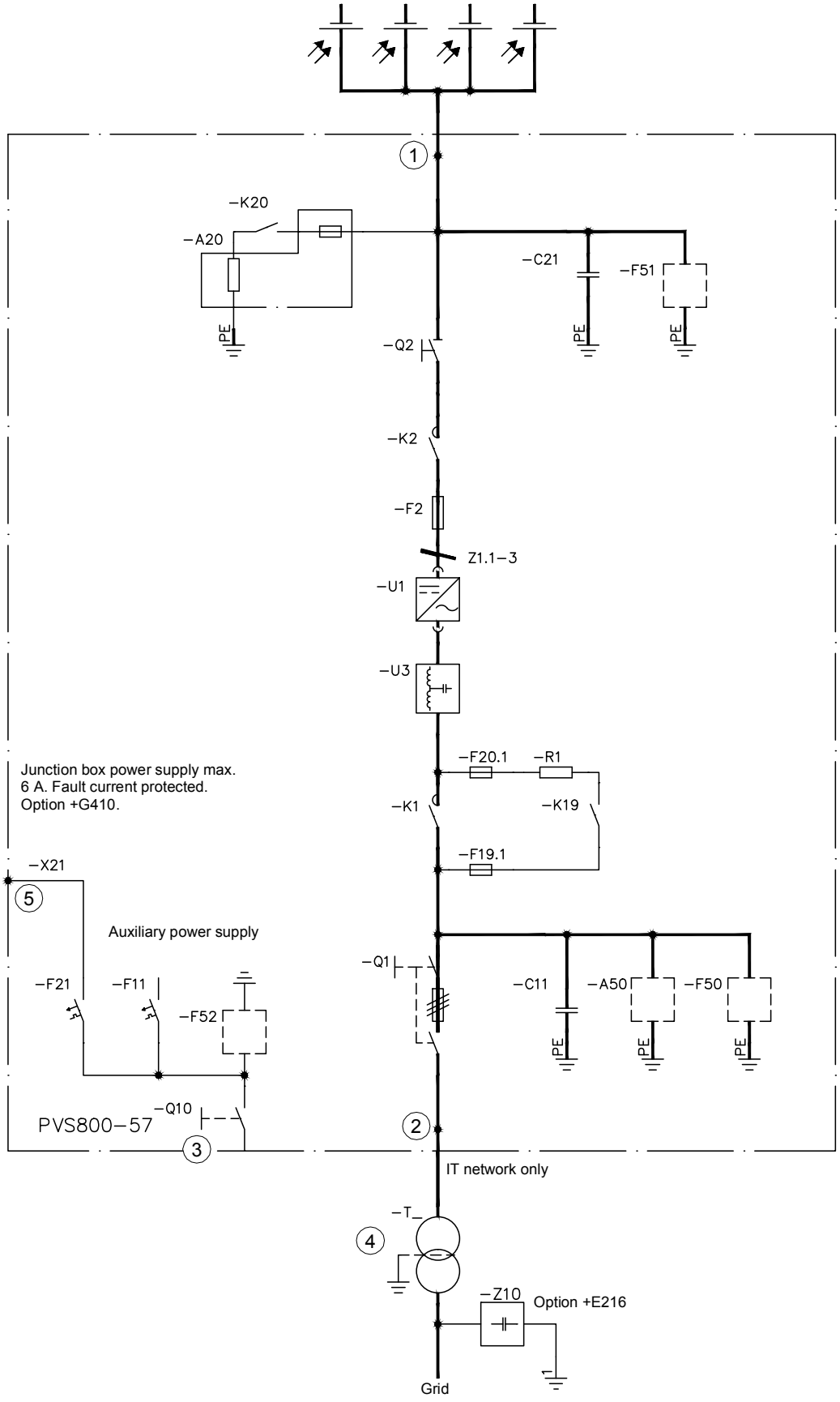
Block diagram of solar generator system

A block diagram of a solar generator system where the solar module string arrays are connected to the electrical power system through an inverter is shown below.



1 Solar module (photovoltaic module)
2 Solar string
3 Solar array
4 Solar generator
5 Solar array junction box
6 Inverter

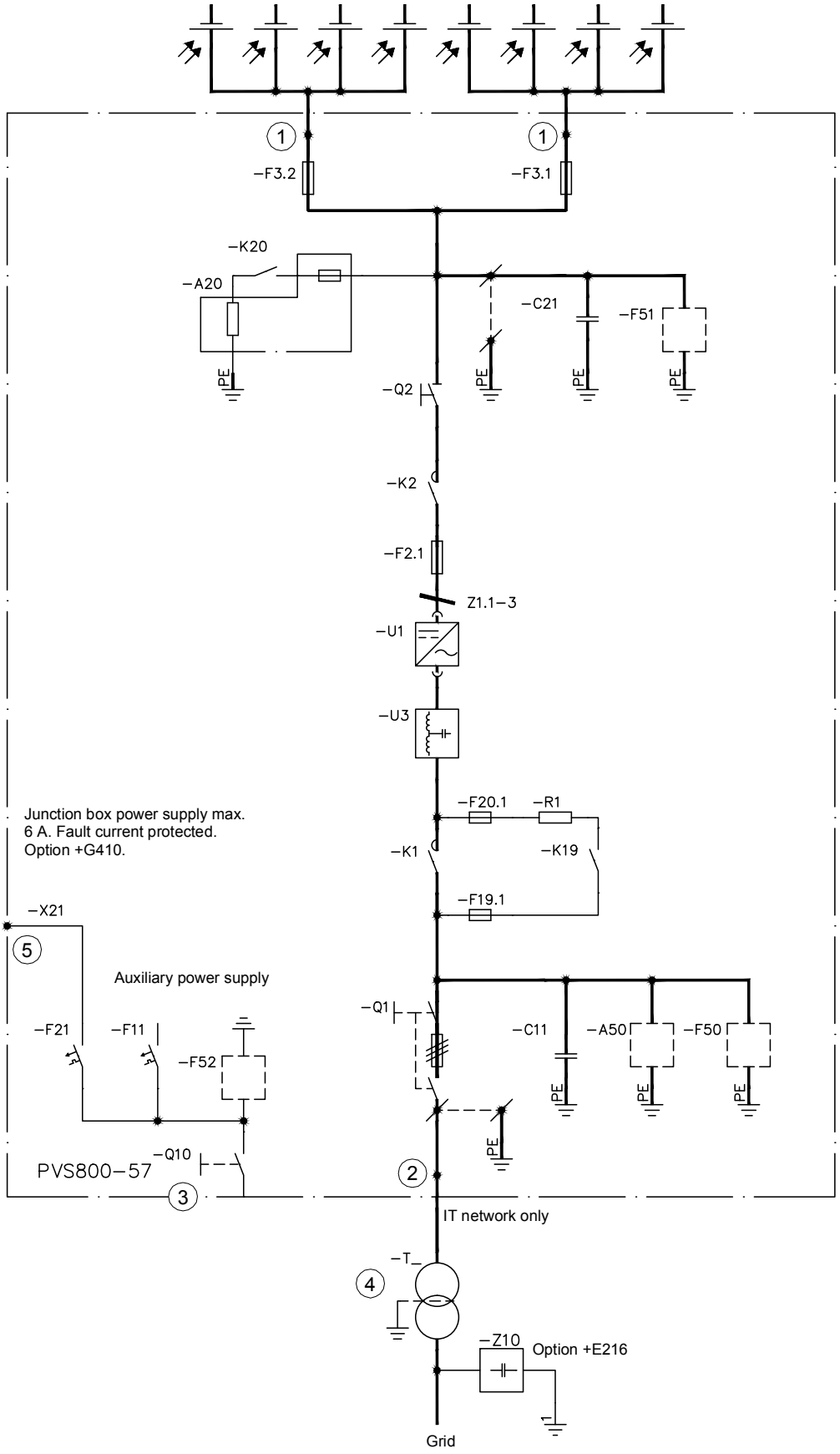
Example main circuit diagram of the inverter system (R7i)



Symbol	Terminal/Component	Description/Operation
1	DC input terminals	The solar generator is connected to the inverter DC input terminals with busbars or through miniature circuit breakers (option +H377).
2	AC output	The AC output terminals connect the inverter to the low-voltage AC power system.
3	Auxiliary control voltage input	The customer supplies 230 V AC 1-phase auxiliary control voltage to the inverter circuit boards, cooling fan(s) and contactor control circuits.
4	Transformer	The transformer connects the inverter AC side to the low-voltage or medium voltage distribution network.
5	Junction box power supply (option +G410)	The inverter supplies power to the junction box through terminal X21. Max 6 A. Fault current protected.
A20	Grounding board (with options +F282 and +F283)	Provides fuse protection and current monitoring. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
A50	Varistors	For overvoltage protection
C11 C21	EMC filter capacitor	Reduces electromagnetic interference.
F2	Inverter DC fuses	Protect the inverter module.
F50 F51 F52	Overvoltage protection devices (F50 with option +F263 only)	Devices for overvoltage protection against for example climatic overvoltages caused by lightning strikes.
K1	AC contactor	The inverter controls the AC contactor according to the operational state.
K2	DC contactor	The inverter controls the DC contactor according to the operational state. The solar generator is disconnected from the inverter when needed.
K19 R1 F19.1 F20.1	Charging circuit	The inverter controls the charging contactor after receiving a start command.
K20	Grounding contactor (with options +F282 and +F283)	The inverter software controls the disconnection of the positive/negative pole grounding. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
Q1	AC main switch-disconnector with fuses	Hand-operated switch which connects the inverter to the electrical power system. The switch includes AC main fuses. The AC main switch-disconnector can be operated at all times. If it is operated during operation, the inverter will trip as the grid disappears.
Q2	DC main switch	Hand-operated switch which connects the inverter to the solar generator. The switch is interlocked with the DC contactor so that it will not open unless the DC contactor is open. If there is no auxiliary power in the inverter, the switch cannot be operated at all. It will remain in the position where it already is.
Q10	Auxiliary control voltage switch	Hand-operated switch which connects the auxiliary control voltage to the inverter.

Symbol	Terminal/Component	Description/Operation
U1	Inverter module	Converts the DC voltage to AC voltage. The operation is controlled by switching the IGBTs.
U3	LCL filter	Smooths the current and voltage waveform.
Z1.1-3	Common mode filter	Reduces common mode voltages and currents in the solar generator and inverter main circuit and AC output.
Z10	EMC filter (option +E216)	EMC filter for low voltage distribution networks.

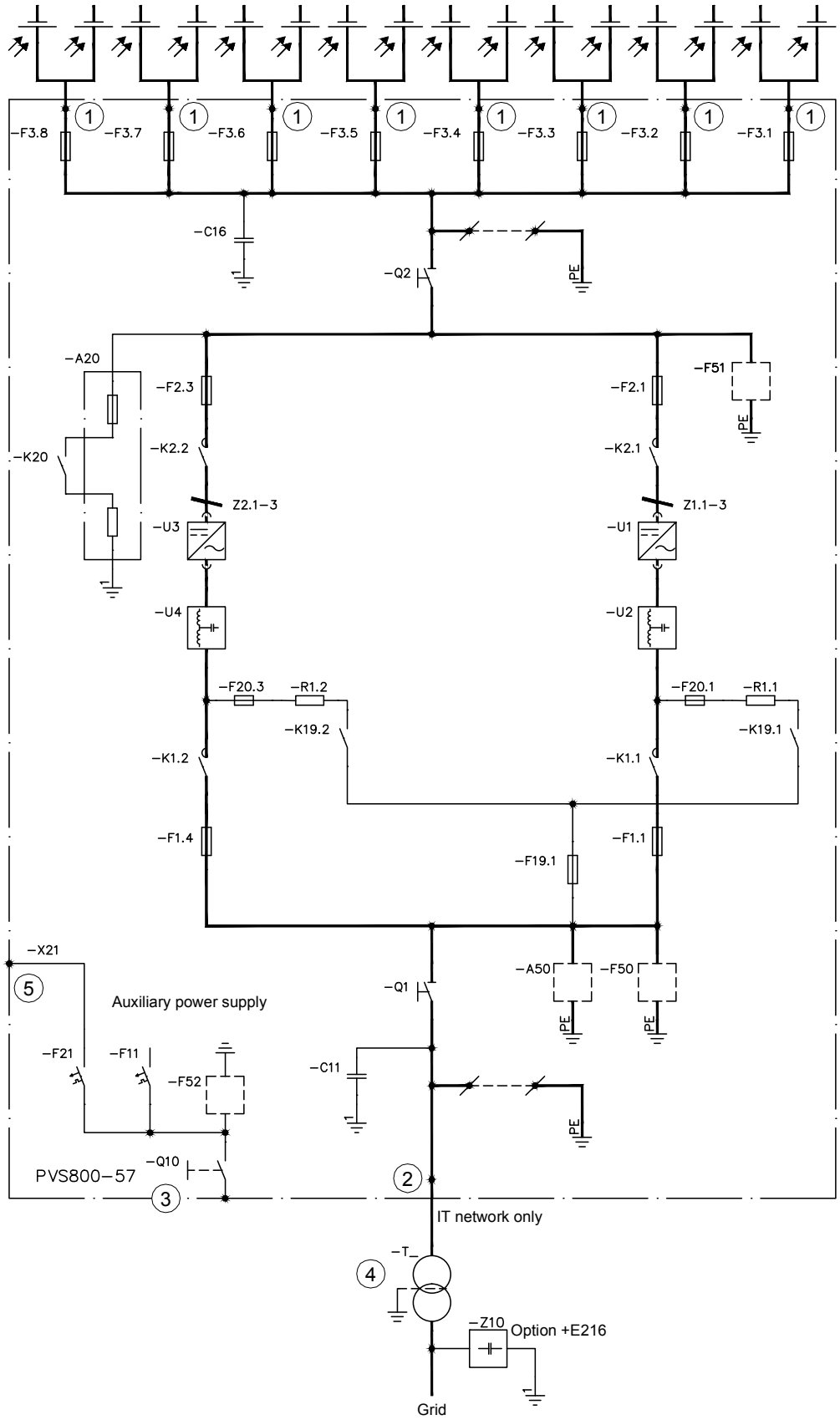
Example main circuit diagram of the inverter system (R8i)



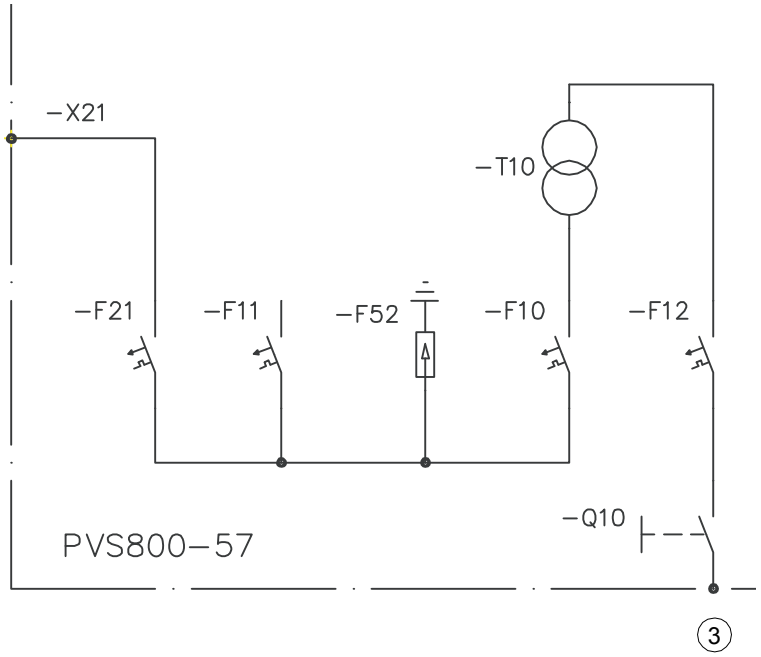
Symbol	Terminal/Component	Description/Operation
1	DC input terminals	The solar generator is connected to the inverter DC input terminals with busbars and fuse links.
2	AC output	The AC output terminals connect the inverter to the low-voltage AC power system.
3	Auxiliary control voltage input	The customer supplies 230 V AC 1-phase auxiliary control voltage to the inverter circuit boards, cooling fan(s) and contactor control circuits.
4	Transformer	The transformer connects the inverter AC side to the low-voltage or medium voltage distribution network.
5	Junction box power supply (option +G410)	The inverter supplies power to the junction box through terminal X21. Max 6 A. Fault current protected.
A20	Grounding board (with options +F282 and +F283)	Provides fuse protection and current monitoring. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
A50	Varistors	For overvoltage protection
C11 C21	EMC filter capacitor	Reduces electromagnetic interference.
F2.1	Inverter DC fuses	Protect the inverter module.
F3.x	Input DC fuses	Protect the DC input connections. The exact number of the fuses depends on the number of the DC input connections.
F50 F51 F52	Overvoltage protection devices (F50 with option +F263 only)	Devices for overvoltage protection against for example climatic overvoltages caused by lightning strikes.
K1	AC contactor	The inverter controls the AC contactor according to the operational state.
K2	DC contactor	The inverter controls the DC contactor according to the operational state. The solar generator is disconnected from the inverter when needed.
K19 R1 F19.1 F20.1	Charging circuit	The inverter controls the charging contactor after receiving a start command.
K20	Grounding contactor (with options +F282 and +F283)	The inverter software controls the disconnection of the positive/negative pole grounding. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
Q1	AC main switch-disconnector with fuses	Hand-operated switch which connects the inverter to the electrical power system. The switch includes AC main fuses. The AC main switch-disconnector can be operated at all times. If it is operated during operation, the inverter will trip as the grid disappears.
Q2	DC main switch	Hand-operated switch which connects the inverter to the solar generator. The switch is interlocked with the DC contactor so that it will not open unless the DC contactor is open. If there is no auxiliary power in the inverter, the switch cannot be operated at all. It will remain in the position where it already is.

Symbol	Terminal/Component	Description/Operation
Q10	Auxiliary control voltage switch	Hand-operated switch which connects the auxiliary control voltage to the inverter.
U1	Inverter module	Converts the DC voltage to AC voltage. The operation is controlled by switching the IGBTs.
U3	LCL filter	Smooths the current and voltage waveform.
Z1.1-3	Common mode filter	Reduces common mode voltages and currents in the solar generator and inverter main circuit and AC output.
Z10	EMC filter (option +E216)	EMC filter for low voltage distribution networks.

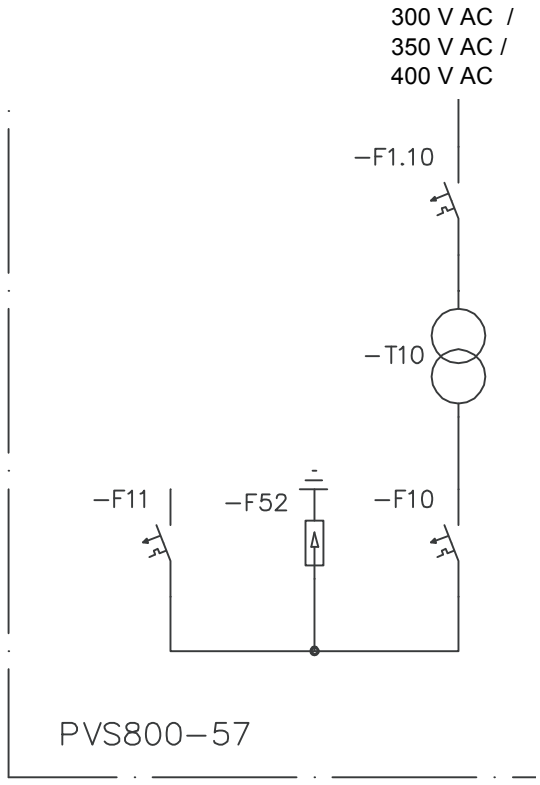
Example main circuit diagram of the inverter system (2 × R8i)



External 100 V AC, 115 V AC or 200 V AC auxiliary power supply (options +G396, +G397 and +G398)



Auxiliary power supply from the inverter main circuit (option +G415)

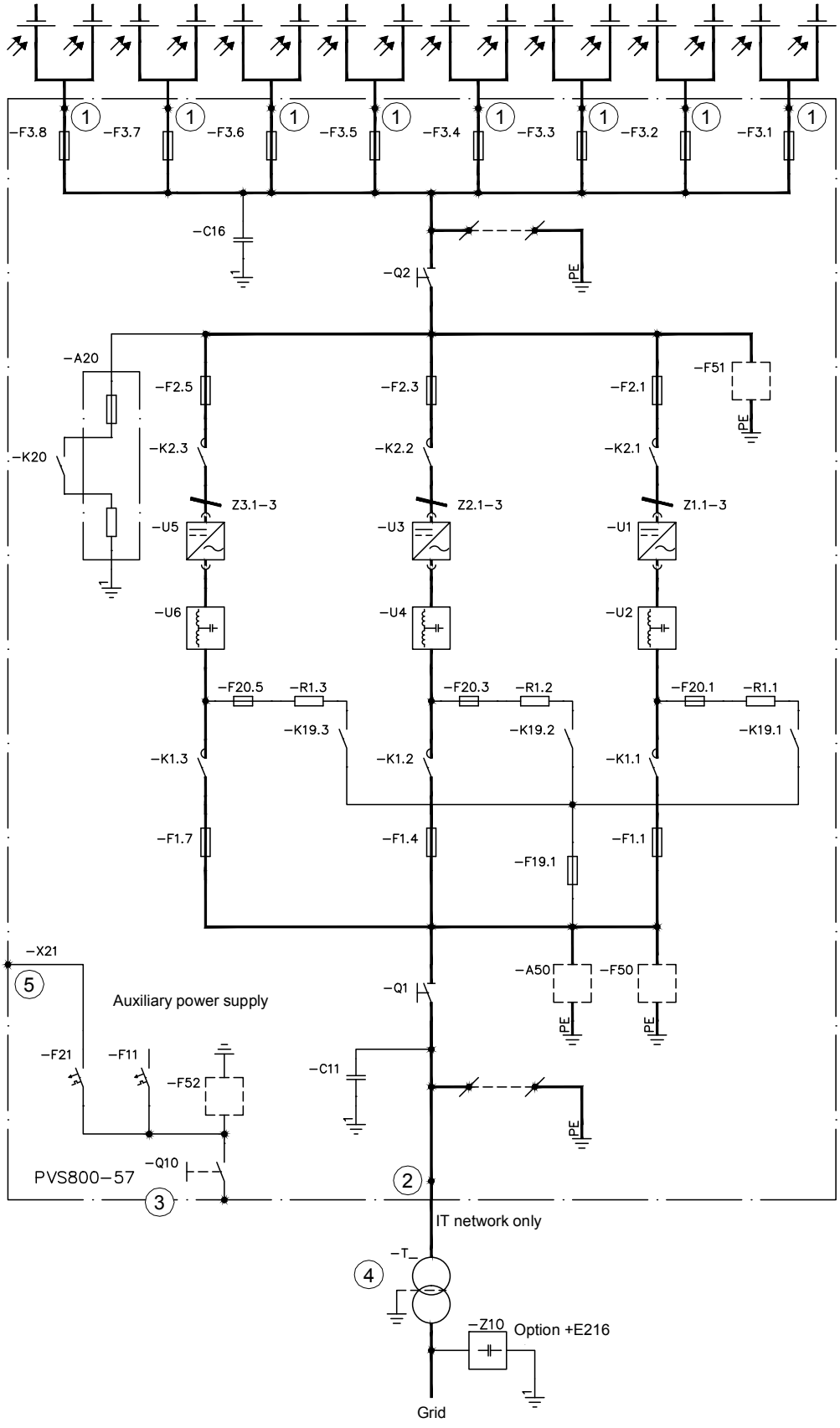


Descriptions of symbols

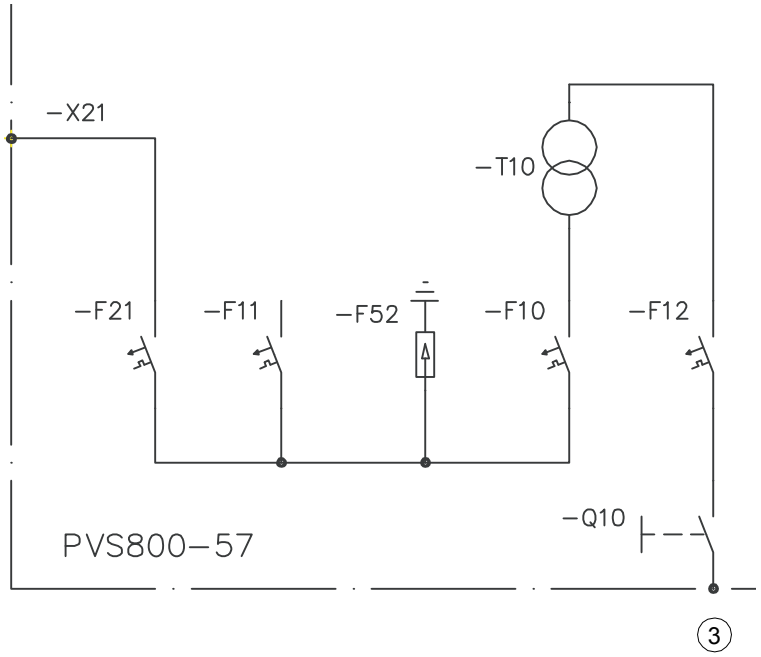
Symbol	Terminal/Component	Description/Operation
1	DC input terminals	The solar generator is connected to the inverter DC input terminals with busbars and fuse links.
2	AC output	The AC output terminals connect the inverter to the low-voltage AC power system.
3	Auxiliary control voltage input	The customer supplies 230 V AC 1-phase auxiliary control voltage to the inverter circuit boards, cooling fan(s) and contactor control circuits. For other voltages, see section *External 100 V AC, 115 V AC or 200 V AC auxiliary power supply (options +G396, +G397 and +G398)* on page *39*.
4	Transformer	The transformer connects the inverter AC side to the low-voltage or medium voltage distribution network.
5	Junction box power supply (option +G410)	The inverter supplies power to the junction box through terminal X21. Max 6 A. Fault current protected.
A20	Grounding board (with options +F282 and +F283)	Provides fuse protection and current monitoring. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
A50	Varistors	For overvoltage protection
C11 C16	EMC filter capacitor	Reduces electromagnetic interference.
F1.1 F1.4	AC fuses	Protect the inverter module and main circuit components.
F2.1 F2.3	Inverter DC fuses	Protect the inverter module.
F3.x	Input DC fuses	Protect the DC input connections. The exact number of the fuses depends on the number of the DC input connections.
F50 F51 F52	Overvoltage protection devices (F50 with option +F263 only)	Devices for overvoltage protection against for example climatic overvoltages caused by lightning strikes.
K1.1 K1.2	AC contactors	The inverter controls the AC contactor according to the operational state.
K2.1 K2.2	DC contactors	The inverter controls the DC contactor according to the operational state. The solar generator is disconnected from the inverter when needed.
K19.1 K19.2 R1.1 R1.2 F19.1 F20.1 F20.3	Charging circuit	The inverter controls the charging contactors after receiving a start command.
K20	Grounding contactor (with options +F282 and +F283)	The inverter software controls the disconnection of the positive/negative pole grounding. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.

Symbol	Terminal/Component	Description/Operation
Q1	AC main switch-disconnector	Hand-operated switch which connects the inverter to the electrical power system. The AC main switch-disconnector can be operated at all times. If it is operated during operation, the inverter will trip as the grid disappears.
Q2	DC main switch	Hand-operated switch which connects the inverter to the solar generator.
Q10	Auxiliary control voltage switch	Hand-operated switch which connects the auxiliary control voltage to the inverter.
T10	Auxiliary voltage transformer (with options +G396, +G397, +G398 and +G415)	Provides auxiliary voltage for the inverter circuit boards, cooling fans and contactor control circuits.
U1 U3	Inverter module	Converts the DC voltage to AC voltage. The operation is controlled by switching the IGBTs.
U2 U4	LCL filter	Smooths the current and voltage waveform.
Z1.1-3 Z2.1-3	Common mode filter	The filter reduces common mode voltages and currents in the solar generator and inverter main circuit and AC output.
Z10	EMC filter (option +E216)	EMC filter for low voltage distribution networks.

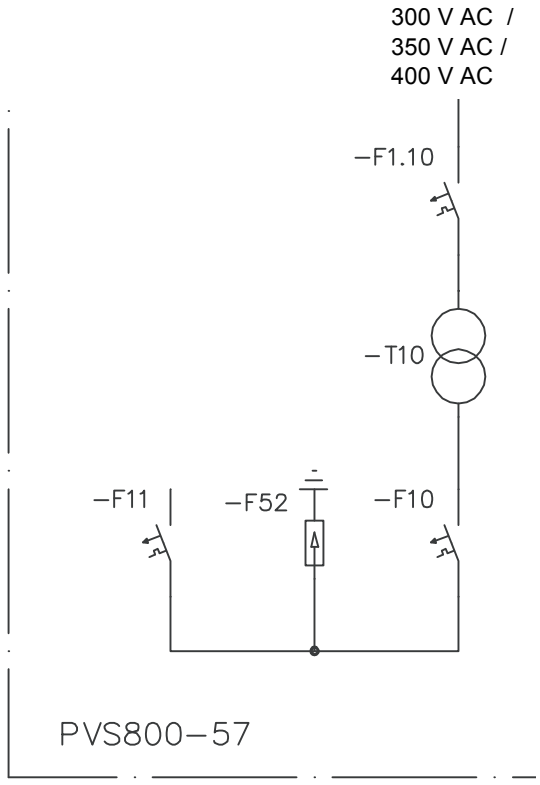
Example main circuit diagram of the inverter system (3 × R8i)



- **External 100 V AC, 115 V AC or 200 V AC auxiliary power supply (options +G396, +G397 and +G398)**



- **Auxiliary power supply from the inverter main circuit (option +G415)**



Descriptions of symbols

Symbol	Terminal/Component	Description/Operation
1	DC input terminals	The solar generator is connected to the inverter DC input terminals with busbars and fuse links.
2	AC output	The AC output terminals connect the inverter to the low-voltage AC power system.
3	Auxiliary control voltage input	The customer supplies 230 V AC 1-phase auxiliary control voltage to the inverter circuit boards, cooling fans and contactor control circuits. For other voltages, see section *External 100 V AC, 115 V AC or 200 V AC auxiliary power supply (options +G396, +G397 and +G398)* on page *39*.
4	Transformer	The transformer connects the inverter AC side to the low-voltage or medium-voltage distribution network.
5	Junction box power supply (option +G410)	The inverter supplies power to the junction box through terminal X21. Max 6 A. Fault current protected.
A20	Grounding board (with options +F282 and +F283)	Provides fuse protection and current monitoring. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
A50	Varistors	For overvoltage protection.
C11 C16	EMC filter capacitor	Reduces electromagnetic interference.
F1.1 F1.4 F1.7	AC fuses	Protect the inverter module and main circuit components.
F2.1 F2.3 F2.5	Inverter DC fuses	Protect the inverter module.
F3.x	Input DC fuses	Protect the DC input connections. The exact number of the fuses depends on the number of the DC input connections.
F50 F51 F52	Overvoltage protection devices (F50 with option +F263 only)	Devices for overvoltage protection against, for example, climatic overvoltages caused by lightning strikes.
K1.1 K1.2 K1.3	AC contactors	The inverter controls the AC contactor according to the operational state.
K2.1 K2.2 K2.3	DC contactors	The inverter controls the DC contactor according to the operational state. The solar generator is disconnected from the inverter when needed.
K19.1 K19.2 K19.3 R1.1 R1.2 R1.3 F19.1 F20.1-6	Charging circuit	The inverter controls the charging contactors after receiving a start command.

Symbol	Terminal/Component	Description/Operation
K20	Grounding contactor (with options +F282 and +F283)	The inverter software controls the disconnection of the positive/ negative pole grounding. See section *Positive or negative pole grounding (options +F282 and +F283)* on page *42*.
Q1	AC main switch	Hand-operated switch which connects the inverter to the electrical power system. The AC main switch can be operated at all times. If it is operated during operation, the inverter will trip as the grid disappears.
Q2	DC main switch	Hand-operated switch which connects the inverter to the solar generator.
Q10	Auxiliary control voltage switch	Hand-operated switch which connects the auxiliary control voltage to the inverter.
T10	Auxiliary voltage transformer (with options +G396, +G397, +G398 and +G415)	Provides auxiliary voltage for the inverter circuit boards, cooling fans and contactor control circuits.
U1 U3 U5	Inverter module	Converts the DC voltage to AC voltage. The operation is controlled by switching the IGBTs
U2 U4 U6	LCL filter	Smooths the current and voltage waveform.
Z1.1-3 Z2.1-3 Z3.1-3	Common mode filter	The filter reduces common mode voltages and currents in the solar generator and inverter main circuit and AC output.
Z10	EMC filter (option +E216)	EMC filter for low-voltage distribution networks.

Electrical power network supervision functions

The inverter control program includes electrical power network supervision functions. The inverter monitors, for example, overvoltage, undervoltage, overfrequency, underfrequency and frequency change rate in the electrical power system. The functions are used for disconnecting the inverter from the power system in power system fault situations. The disconnecting times and frequency limits depend on the owner of the power system and local legislation.

The inverter also provides the electrical power network supervision functions with certified monitoring relays (options +Q969, +Q974, +Q975 and +Q980).

Positive or negative pole grounding (options +F282 and +F283)

The positive and negative pole grounding options can be used when solar modules require grounding of inverter DC poles. The grounding of the poles complies with standard IEC 62109-2. One DC line needs to be grounded for certain thin-film photovoltaic module types and if required by country-specific regulations.

The grounding is always connected when auxiliary power is connected, except when the automatic photovoltaic generator insulation check is done before the inverter starts.

The grounding wire is protected by a fuse on the PGND-02 board. Due to personnel protection reasons, the grounding is disconnected when sudden level changes are monitored from the grounding wire current.

The grounding resistance can be adjusted by the user. For instructions, see page *101*.

Reduced run operation in case of a hardware failure

If an inverter module or an LCL filter is out of order, it is possible to continue running the inverter with reduced output current. In this case the inverter controls only modules which are unbroken. Inverter output current is reduced in relation to the removed modules. For example, if one inverter module is broken in PVS800-57-1000kW-C, the inverter output current is reduced to 66.7% of the nominal current. Reduced run is not possible with inverters that have only one inverter module.

To operate the PVS800 with reduced run, you must remove the charging circuit fuses specified in the tables below. However, you do not have to remove the broken inverter module or LCL filter. This is possible because broken parts can be isolated with AC and DC contactors inside the PVS800 cabinet. For removing the broken component, obey the instructions in chapter *Maintenance*.

Inverter modules are divided into two control groups, which can be enabled or disabled according to the need. If a module group is disabled, the inverter modules which are part of that group are not used. The following tables list the possible control combinations in the reduced run operation.

PVS800-57-500kW-A and PVS800-57-630kW-B:

Inverter control unit parameter 16.05 USED MODULES	Description	Reduced output current	Charging circuit fuses to be removed
GROUP 1	Left inverter module (U1) is used.	50%	F20.3-4
GROUP 2	Right inverter module (U2) is used.	50%	F20.1-2
GROUPS 1 and 2 (default)	Left (U1) and right (U2) inverter modules are used.	100%	None

PVS800-57-875kW-B and PVS800-57-1000kW-C:

Inverter control unit parameter 16.05 USED MODULES	Description	Reduced output current	Charging circuit fuses to be removed
GROUP 1	Left inverter module (U1) is used.	33.3%	F20.3-6

Inverter control unit parameter 16.05 USED MODULES	Description	Reduced output current	Charging circuit fuses to be removed
GROUP 2	Middle (U3) and right (U5) inverter modules are used.	66.7%	F20.1-2
GROUPS 1 and 2 (default)	Left (U1), middle (U3) and right (U5) inverter modules are used.	100%	None

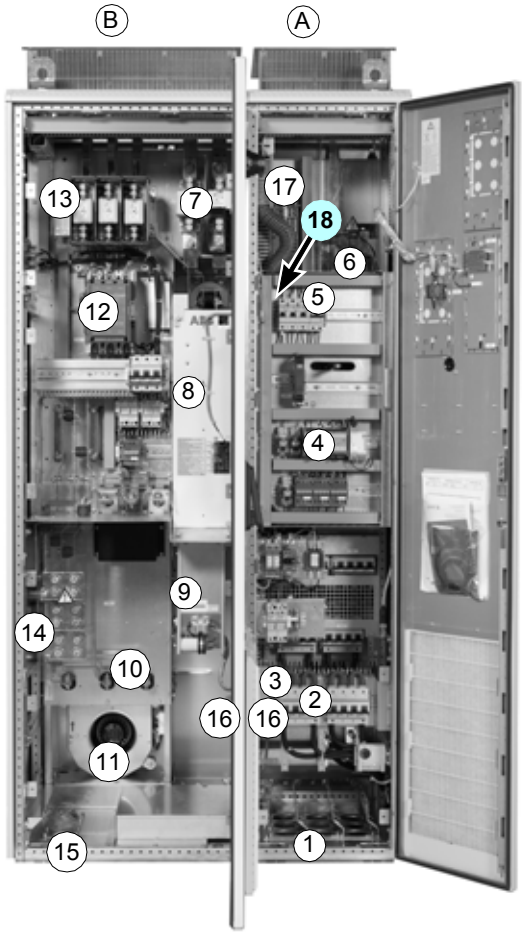
See *PVS800 central inverters firmware manual* (3AUA0000058422 [English]) for detailed instructions on how to enable the reduce run operation.

Layout drawings

The figures below show examples of cabinet layout for different frame sizes. Depending on the selected options, the actual equipment may differ from what is depicted below.

Cabinet layout of frame R7i

A cabinet of frame R7i is shown below with doors open and shrouds removed.



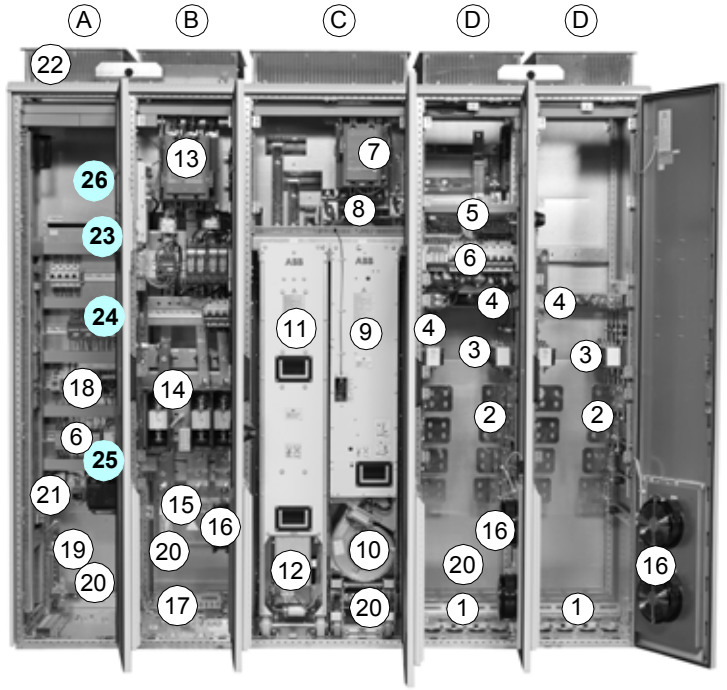
	Description
A	Incoming cubicle
B	Inverter module cubicle
1	DC cable lead-throughs
2	Photovoltaic generator connection terminals
3	Auxiliary control voltage connection terminals and switch
4	Ground fault monitoring device (options +Q954 and +Q976)
5	Grid monitoring relay (options +Q969 and +Q974)
6	DC contactor
7	Inverter DC fuses
8	Inverter module
9	Inverter module cooling fan
10	LCL filter
11	LCL filter cooling fan
12	AC contactor
13	AC main switch-disconnector with fuses (Q1)
14	AC output (grid connection) terminals
15	AC output cable lead-throughs
16	Heating resistor (option +G300)
17	Junction box power supply (option +G410)

18

18	External control interfaces (behind the swing-out frame)
1	RDCU control unit (A41, inverter control unit)
2	RDCU control unit (A43, master control unit)

Cabinet layout of frame R8i

A cabinet of frame R8i is shown below with doors open and shrouds removed.



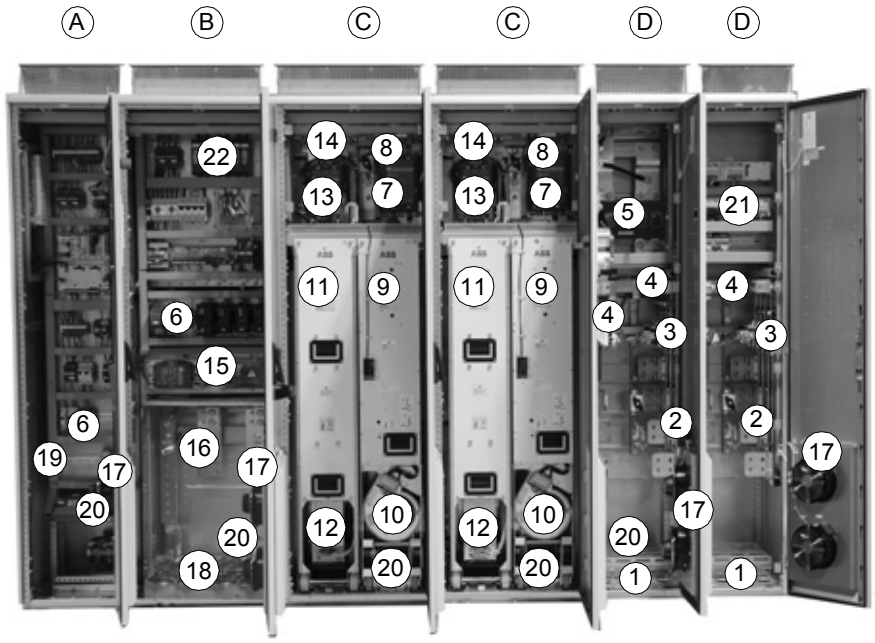
Cubicles	
A	Auxiliary control cubicle
B	Output cubicle
C	Inverter module cubicle
D	Incoming cubicle

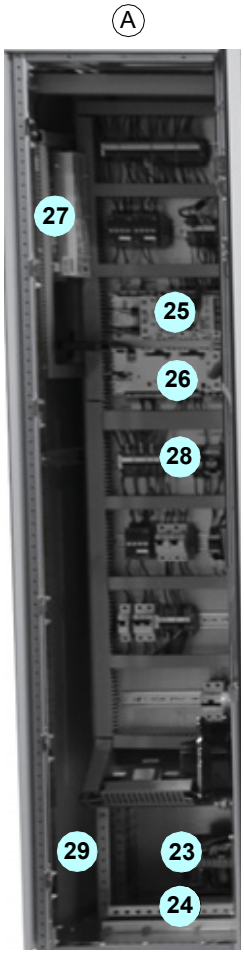
External control interfaces	
23	RDCU control unit (A41, inverter control unit). Optional fieldbus adapter modules: +K454, +K458, +K466, +K479.
24	RDCU control unit (A43, master control unit)
25	NETA-x1 Intelligent Ethernet adapter (options +K464 and +K484)
26	VSN700-05 data logger (options +K485 and +K486)

	Description
1	DC cable lead-throughs
2	DC input terminals (fuse protected)
3	Input DC fuses
4	Connecting knobs for temporary grounding of the DC busbars for work
5	DC main switch
6	Ground fault monitoring device (options +Q954 and +Q976)
7	DC contactor
8	Inverter DC fuses
9	Inverter module
10	Inverter module cooling fan
11	LCL filter
12	LCL filter cooling fan
13	AC contactor
14	AC main switch-disconnector with fuses (Q1)
15	AC output (grid connection) terminals with connecting knobs for temporary grounding for work
16	Cabinet fans (on the cubicle doors)
17	AC output cable lead-throughs
18	Grid monitoring relay (options +Q969, +Q974 and +Q980)
19	115/230 V auxiliary control voltage connection terminals and switch
20	Heating resistor (option +G300)
21	Junction box power supply (option +G410)
22	Roof fan

Cabinet layout of frame 2 × R8i

A cabinet of frame 2 × R8i is shown below with doors open and shrouds removed.





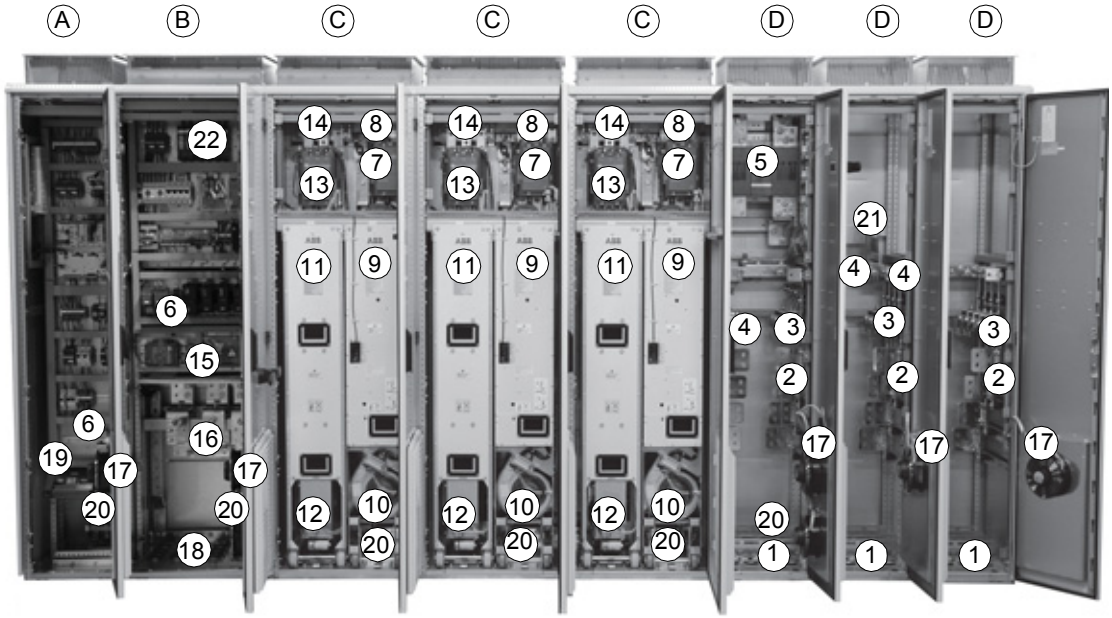
Cubicles	
A	Auxiliary control cubicle
B	Output cubicle
C	Inverter module cubicle
D	Incoming cubicles

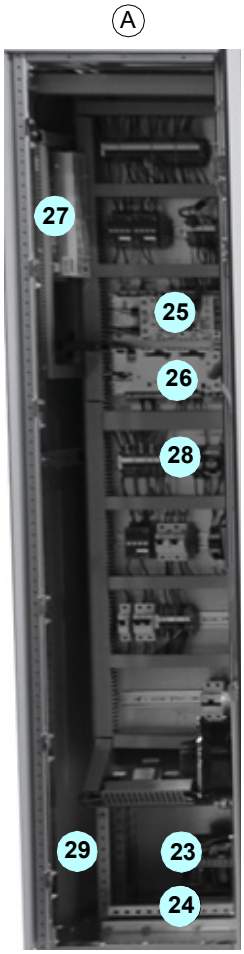
External control interfaces	
23	Junction box power supply (option +G410)
24	115/230 V auxiliary control voltage connection terminals and switch (Q10)
25	RDCU control unit (A41, inverter control unit). Optional fieldbus adapter modules: +K454, +K458, +K466, +K479.
26	RDCU control unit (A43, master control unit)
27	APBU branching unit
28	NETA-01 Intelligent Ethernet adapter module (option +K464)
29	NETA-21 remote monitoring tool (option +K484) and VSN700-05 data logger (options +K485 and +K486)

	Description
1	DC cable lead-throughs
2	DC input terminals (fuse protected)
3	Input DC fuses
4	Connecting knobs for temporary grounding of the DC busbars for work
5	DC main switch
6	Ground fault monitoring device (options +Q954, +Q976 and +Q981)
7	DC contactor
8	Inverter DC fuses
9	Inverter module
10	Inverter module cooling fan
11	LCL filter
12	LCL filter cooling fan
13	AC contactor
14	AC fuses
15	AC main switch-disconnector (Q1)
16	AC output (grid connection) terminals with connecting knobs for temporary grounding for work
17	Cabinet fans (on the cubicle doors)
18	AC output cable lead-throughs
19	Grid monitoring relay (options +Q969, +Q974, +Q975 and +Q980)
20	Heating resistor (option +G300)
21	AIMA I/O module adapter
22	Charging circuit fuses

Cabinet layout of frame 3 × R8i

A cabinet of frame 3 × R8i is shown below with doors open and shrouds removed.





Cubicles	
A	Auxiliary control cubicle
B	Output cubicle
C	Inverter module cubicle
D	Incoming cubicles

External control interfaces	
23	Junction box power supply (option +G410)
24	115/230 V auxiliary control voltage connection terminals and switch (Q10)
25	RDCU control unit (A41, inverter control unit). Optional fieldbus adapter modules: +K454, +K458, +K466, +K479.
26	RDCU control unit (A43, master control unit)
27	APBU branching unit
28	NETA-01 Intelligent Ethernet adapter module (option +K464)
29	NETA-21 remote monitoring tool (option +K484) and VSN700-05 data logger (options +K485 and +K486)

	Description
1	DC cable lead-throughs
2	DC input terminals (fuse protected)
3	Input DC fuses
4	Connecting knobs for temporary grounding of the DC busbars for work
5	DC main switch
6	Ground fault monitoring device (options +Q954, +Q976 and +Q981)
7	DC contactor
8	Inverter DC fuses
9	Inverter module
10	Inverter module cooling fan
11	LCL filter
12	LCL filter cooling fan
13	AC contactor
14	AC fuses
15	AC main switch-disconnector (Q1)
16	AC output (grid connection) terminals with connecting knobs for temporary grounding for work
17	Cabinet fans (on the cubicle doors)
18	AC output cable lead-throughs
19	Grid monitoring relay (options +Q969, +Q974, +Q975 and +Q980)
20	Heating resistor (option +G300)
21	AIMA I/O module adapter
22	Charging circuit fuses

Door devices

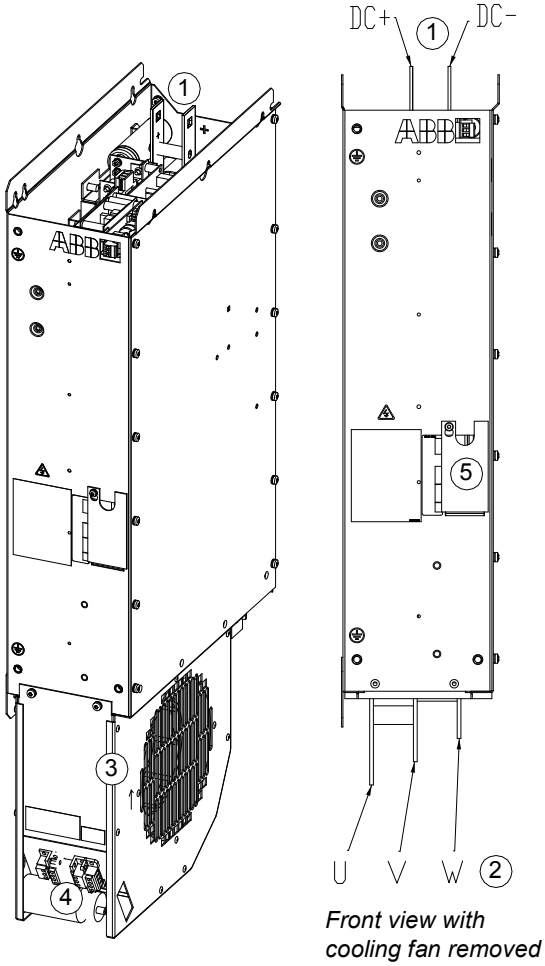
The cabinet doors are equipped with:

- an inverter control panel
- AC and DC main switch operating handles
- an emergency stop push button in frames 2 × R8i and 3 × R8i (option +Q951 in R7i and R8i)
- an emergency stop reset button (with option +Q951) and ground fault indication/reset button (with option +Q954) in frame R7i and R8i.

The emergency stop push button is wired to digital input DI6 of inverter control unit A43. When the button is pushed, switch S20 in the control circuit opens, and the DI6 status changes to zero. The inverter stops modulating and opens the AC and DC contactors.

Inverter module (R7i)

The cooling fan at the base of the inverter module is fed from the auxiliary voltage supply.



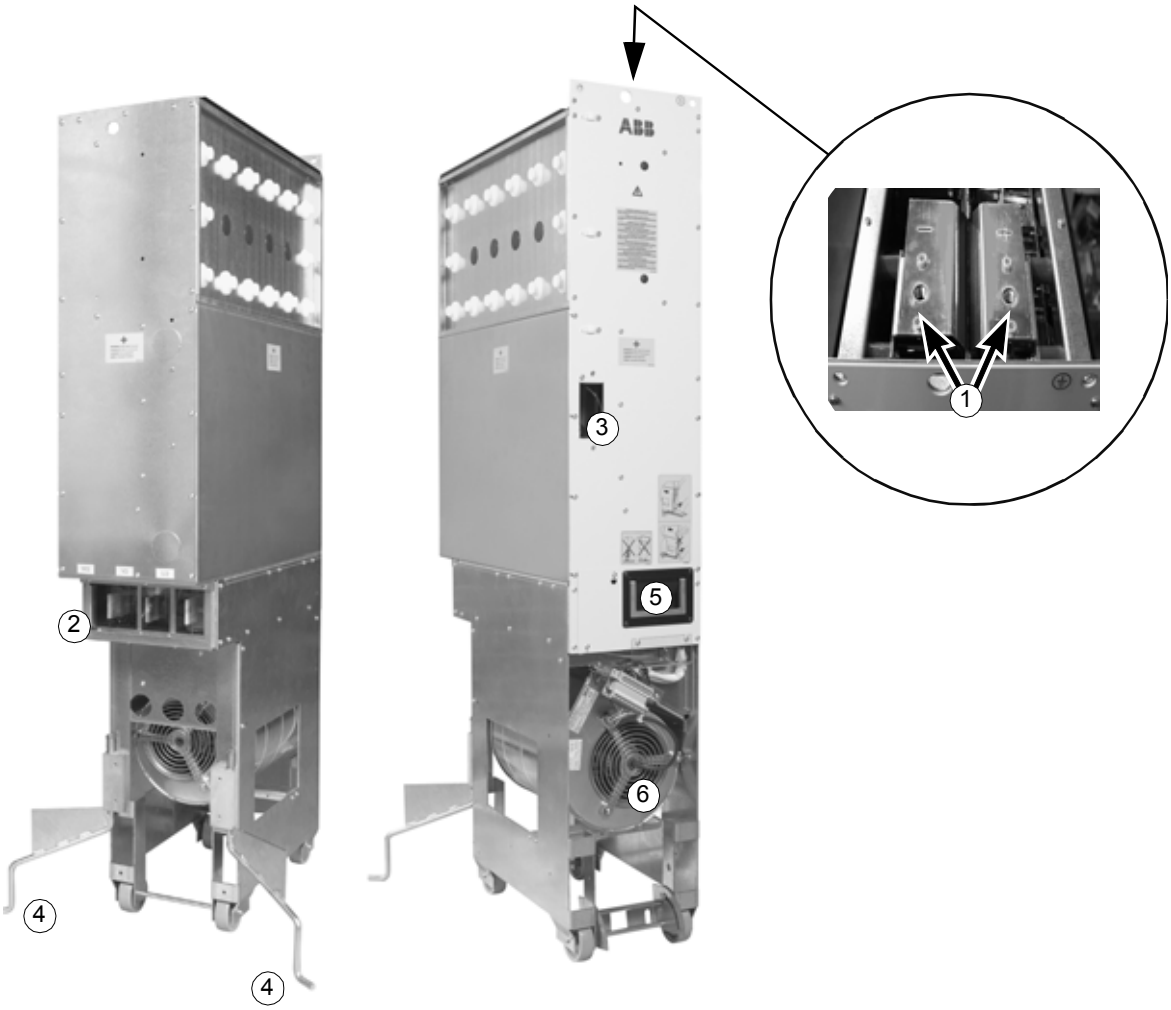
Front view with cooling fan removed

	Description
1	DC (input) connections
2	Output busbars
3	Cooling fan
4	Power connection for cooling fan (X41)
5	Fiber optic connectors

Inverter module (R8i)

The modules run on wheels, which, along with the quick connector at the AC output, enable quick replacement of a module for maintenance.

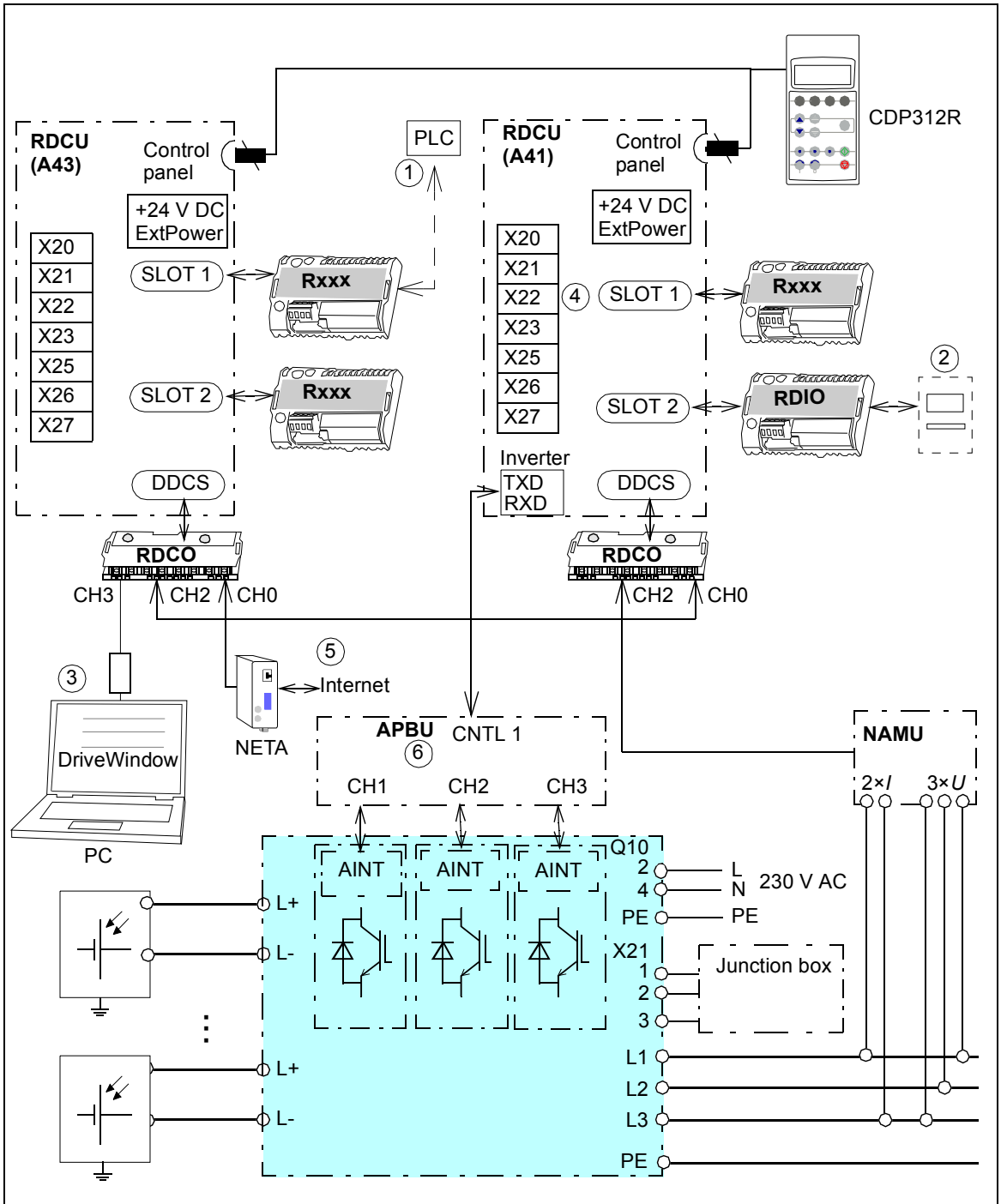
The inverter module is equipped with a speed-controlled cooling fan involving a power supply board and a fan inverter board that outputs a frequency in the range of 15 to 55 Hz to the fan. The fan is regulated according to the temperature of the output stage of the module. The power to the fan is supplied from the intermediate DC circuit.



Item	Explanation
1	DC (input) connections
2	AC output busbars. They match the quick connector socket mounted in the cubicle.
3	Fiber optic connectors of the AINT board. Connected to the RDCU control unit.
4	Retractable support legs
5	Handle
6	Cooling fan

Connections and interfaces overview

The diagram below shows the power connections and control interfaces of the PVS800-57 inverters.



[1] Monitoring and/or controlling of the inverter; [2] Grid monitoring relay (option +Q969, +Q974, +Q975 or +Q980);
[3] See page 96; [4] Ground fault monitoring (option +Q954, +Q976 or +Q981)

[5] Remote monitoring (default connection). For ring topology, see the firmware manual for the required parameter settings.

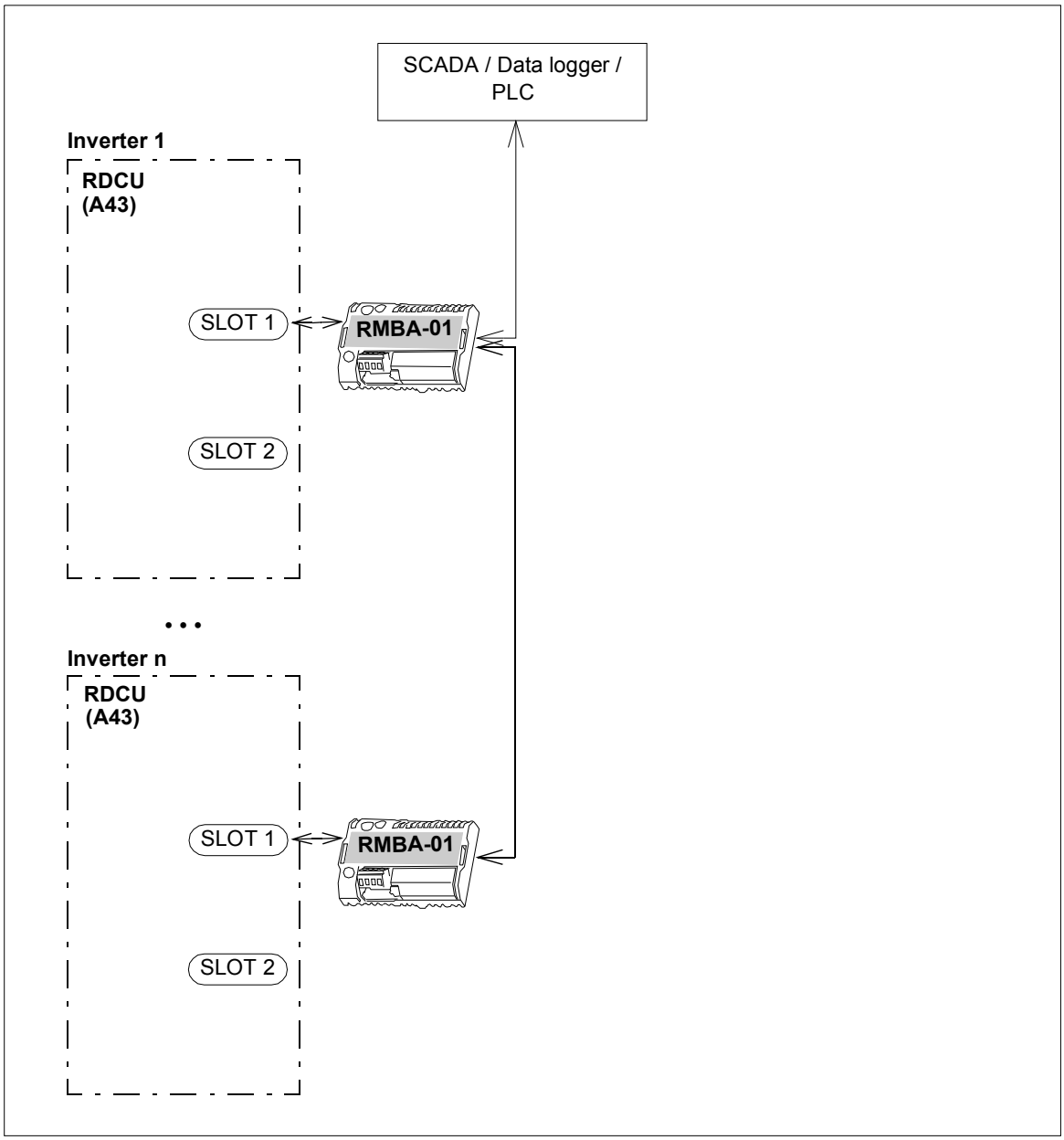
[6] APBU branching unit and connection to AINT boards through APBU only in frames 2 × R8i and 3 × R8i. In frames 1 × R7i and 1 × R8i, the fiber optic cables from A41 are connected directly to AINT. 2 × R8i uses channels CH1 and CH2 for the connection.

See chapter *Electrical installation* for the wiring instructions and section *Control unit (RDCU/RMIO) connection data* on page *138* for the control unit specifications. For more information on the connections, see the circuit diagrams delivered with the inverter.

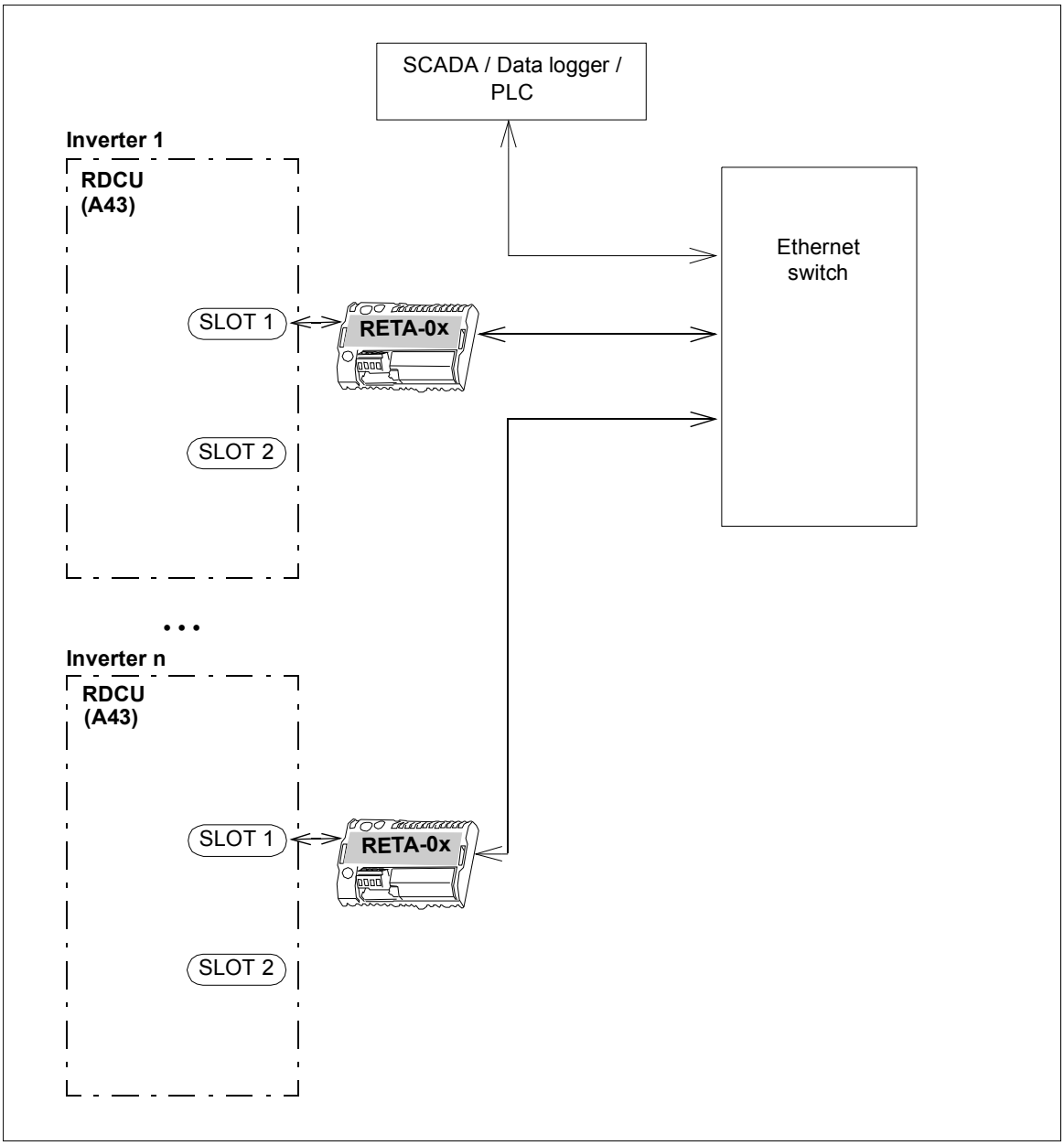
Device	Description
RDCU (A43)	**Master control unit equipped with the RMIO board containing the PVS800 solar inverter master control program.**
Terminal block	
X20, X21	Reference voltage ±10 V DC
X21	Analog inputs (3 pcs) and outputs (2 pcs)
X22	Digital inputs (7 pcs)
X23	Auxiliary voltage output and input 24 V DC
X25 to X27	Relay outputs (3 pcs)
+24 V DC ExtPower	External power input
Slot 1	
Rxxx-0x	Fieldbus adapter module RETA-01, RETA-02, RPBA-01 or RMBA-01
Slot 2	
Rxxx-0x	Fieldbus adapter module RMBA-01
DDCS	
RDCO-0x	DDCS communication adapter module
PC	For using the inverter PC tools
NETA-0x	Ethernet adapter module for Internet browser-based remote monitoring of the inverter
RDCU (A41)	**Inverter control unit equipped with the RMIO board containing the PVS800 solar inverter control program.**
Terminal block	
X20, X21	Reference voltage 24 V DC
X21	Analog inputs and outputs (5 pcs) Reserved. Contact ABB, if need to be used.
X22	Digital inputs (7 pcs), one input reserved for the optional ground fault monitoring
X23	Auxiliary voltage output and input 24 V DC
X25 to X27	Relay outputs (3 pcs)
+24 V DC ExtPower	External power input
SLOT 1 (This slot is reserved for 2 × R8i and 3 x R8i units.)	
SLOT 2	
RDIO-01	Reserved for inverter control and grid monitoring relay signals.
DDCS	
RDCO-01	DDCS communication adapter module

Connection examples

The diagram below shows a connection example for SCADA, PLC or data logger when a Modbus/RTU connection is used.



The diagram below shows a connection example for SCADA, PLC or data logger when a Modbus/TCP connection is used.



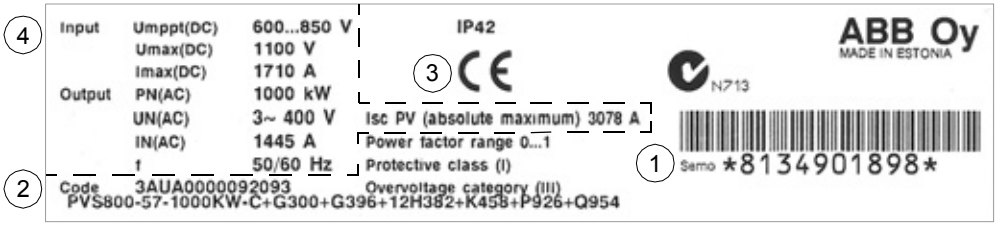
CDP-312R control panel

The CDP-312R is the user interface of the inverter unit, providing the essential controls such as Start/Stop/Reset/Reference, and the parameter settings for the inverter control programs. The control panel is connected to the RDCU units. For information on using the control panel, refer to the firmware manual.

Type designation labels

Inverter label

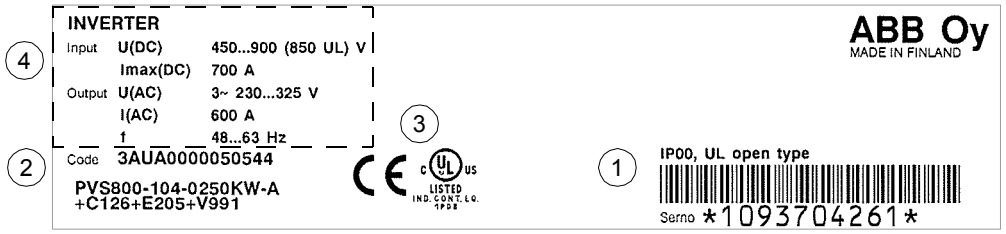
The type designation label of the inverter includes the ratings, valid markings, a type designation and a serial number, which allow individual recognition of each inverter. The type designation label is located on the front cover of the inverter cabinet. An example label is shown below.



No.	Description
1	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.
2	Type designation, see section *Type designation key* below.
3	Valid markings
4	Ratings of inverter

Inverter module label

The type designation label of the inverter module includes the ratings, valid markings, a type designation and a serial number. The module label is attached to the front panel of the inverter module. Example labels are shown below.



No.	Description
1	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 modules with the same number.
2	Type designation
3	Valid markings
4	Ratings of inverter module

Type designation key

The type designation contains information on the specifications and configuration of the inverter. The first digits from left express the basic configuration, eg, PVS800-57-250kW-A. The optional selections are given thereafter, separated by plus signs, eg, +Q951. The main selections are described below. Not all selections are available for all types. For more information, refer to *PVS800-57 ordering information* (3AXD10000021367), available on request.

Types -0100kW-A to -0315kW-B

Selection	Alternatives		
Product series	PVS800 product series (ABB central inverters)		
Type	57	Cabinet-built central inverter. When no options are selected: IP42 (UL Type 2), AC contactor, DC fuses (100 kW), gPV fuses (250 kW and 315 kW), fuse switch, terminals for 230 V AC external control voltage, CDP312 control panel, RDIO for internal control, RDCO-03 module for optical communication, EMC filtering, common mode filter, PVS800 solar inverter control programs, bottom entry and exit of cables, coated boards, maximum DC voltage 1000 V DC, ungrounded DC input, IT (ungrounded) AC output, DC input overvoltage and surge protection, AC output overvoltage protection with varistors, AC grounding terminals on output busbars, DC input busbars (number of DC inputs must be selected with a plus code), DC contactor and main switch, DC grounding terminals on input busbars, electrical power network supervision function, electrical power network support functions, a set of manuals, warranty 12/24 months.	
Nominal AC power	xxxkW	Refer to the rating tables, page 123.	
Voltage	A	300 V AC (operational [MPPT] DC voltage range 450…825 V DC)	
	B	350 V AC (operational [MPPT] DC voltage range 525…825 V DC)	
+ options			
Filters	E216	EMC/RFI filter for the network side of the transformer on TN (grounded) low voltage networks	
Cabinet and construction options	C178	VDE approved	
	G300	Cabinet heater	
	G396	Auxiliary power supply, 100 V, for 250 kW and 315 kW units	Only one of options G396, G397, G398 can be selected. If option G415 is selected, options G396, G397, G398 cannot be selected.
	G397	Auxiliary power supply, 115 V, for 250 kW and 315 kW units	
	G398	Auxiliary power supply, 200 V, for 250 kW and 315 kW units	
	G410	Junction box power supply	
	J401	Inverter monitoring display	
Line options	F263	Advanced AC output overvoltage and surge protection	
	F282	Grounding, positive DC	
	F283	Grounding, negative DC	
	0F291	No input DC fuses	
Cabling	H377	MCB-protected DC input connections: 4 × miniature circuit breakers for 100 kW units	
	H382	1 × fuse-protected DC input connections for 100 kW units	
	2H382	2 × fuse-protected DC input connections for 250 kW and 315 kW units	
	4H382	4 × fuse-protected DC input connections for 250 kW and 315 kW units	
	8H382	8 × fuse-protected DC input connections for 250 kW and 315 kW units	

Selection	**Alternatives**		
Fieldbus	K454	RPBA-01 PROFIBUS DP adapter module	Slot 1: Only one of options K454, K458, K466, K467 can be selected.
	K458	RMBA-01 Modbus adapter module (Slot 1)	
	K464	NETA-01 Intelligent Ethernet adapter module	
	K466	RETA-01 Ethernet/IP™ and Modbus/TCP adapter module	
	K467	RETA-02 Ethernet PROFINET IO and Modbus TCP/IP™ adapter module	
	K484	NETA-21 remote monitoring tool and NEXA-21 extension unit for DDCS	
	K485	VSN700-05 data logger and RMBA-01 Modbus adapter module	
	K486	VSN700-05 data logger and RETA-01 Ethernet/IP™ and Modbus/TCP adapter module	
Specialities	P902	Customized (described in Technical appendix)	
	P926	Extended warranty 24/30 months	
	P927	Extended warranty 36/42 months	
	P928	Extended warranty 60/66 months	
Safety options	Q951	Emergency stop	
	Q954	Ground fault monitoring in IT (ungrounded) systems	
	Q976	Ground fault monitoring in IT (ungrounded) systems (ABB CM-IWN.5)	
	Q980	Grid monitoring relay, BDEW approved, for 500 kW and 630 kW units	
	Q969	Grid monitoring relay, ENEL approved	
	Q974	Grid monitoring relay, VDE0126 approved	
Documentation language	R701	German (delivered set may include manuals in English)	
	R702	Italian (delivered set may include manuals in English)	
	R707	French (delivered set may include manuals in English)	
	R708	Spanish (delivered set may include manuals in English)	

Types -0500kW-A to -1000kW-C

Selection	Alternatives		
Product series	PVS800 product series (ABB central inverters)		
Type	57	Cabinet-built central inverter. When no options are selected: IP42 (UL Type 2), AC main contactor, gPV fuses, AC side switch disconnector, terminals for 230 V AC external control voltage, CDP312 control panel, RDCO-03 module for optical communication, CE-marked according to LV and EMC, PVS800 solar inverter control programs, bottom entry and exit of cables, coated boards, maximum DC voltage 1100 V DC, ungrounded DC input, IT (ungrounded) AC output, DC input overvoltage and surge protection (type 1+2), AC output overvoltage protection with varistors, AC grounding terminals on output busbars, DC input busbars (number of DC inputs must be selected with a plus code), DC contactor and main switch, DC grounding terminals on input busbars, grid support functions (Low voltage ride-through disables anti-islanding functionality, Reactive power production during the night), a set of manuals, warranty 12/24 months.	
Nominal AC power	xxxkW	Refer to the rating tables, page *123*.	
Voltage	B	350 V AC (operational [MPPT] DC voltage range 525…825 V DC)	
	C	400 V AC (operational [MPPT] DC voltage range 600…850 V DC)	
+ options			
Filters	E216	EMC/RFI filter for the network side of the transformer on TN (grounded) low voltage networks	
Cabinet and construction options	C175	Container option for PVS800-IS	Must be selected for PVS800-IS PVS1 and PVS2.
	C176	Doors with hinges on the left side	
	C178	VDE approved	
	G300	Cabinet heater	
	G396	Auxiliary power supply, 100 V	Only one of options G396, G397, G398 can be selected. If option G415 is selected, options G396, G397, G398 cannot be selected.
	G397	Auxiliary power supply, 115 V	
	G398	Auxiliary power supply, 200 V	
	G410	Junction box power supply	
	G415	Auxiliary power supply from main circuit	
	G416	Current transducers for all DC inputs. Voltage signals to an external controller.	
	G417	Current transducers for all DC inputs. Internally monitored and supervised.	
Line options	F263	Advanced AC output overvoltage and surge protection	
	F282	Grounding, positive DC	
	F283	Grounding, negative DC	
	0F291	No input DC fuses	
Cabling	4H382	4 × fuse-protected DC input connections for 500 kW and 630 kW units	
	5H382	5 × fuse-protected DC input connections for 500 kW and 630 kW units	
	8H382	8 × fuse-protected DC input connections for 500 kW, 630 kW, 875 kW and 1000 kW units	
	10H382	10 × fuse-protected DC input connections for 500 kW, 630 kW, 875 kW and 1000 kW units	
	12H382	12 × fuse-protected DC input connections for 500 kW, 630 kW, 875 kW and 1000 kW units	
	15H382	15 × fuse-protected DC input connections for 500 kW, 630 kW, 875 kW and 1000 kW units	
	16H382	16 × fuse-protected DC input connections for 875 kW and 1000 kW units	
	20H382	20 × fuse-protected DC input connections for 875 kW and 1000 kW units	

Selection	**Alternatives**		
Fieldbus	K454	RPBA-01 PROFIBUS DP adapter module	Slot 1: Only one of options K454, K458, K466, K467 can be selected.
	K458	RMBA-01 Modbus adapter module	
	K464	NETA-01 Intelligent Ethernet adapter module	
	K466	RETA-01 Ethernet/IP™ and Modbus/TCP adapter module	
	K467	RETA-02 Ethernet PROFINET IO and Modbus TCP/IP™ adapter module	
	K484	NETA-21 remote monitoring tool and NEXA-21 extension unit for DDCS	
	K485	VSN700-05 data logger and RMBA-01 Modbus adapter module	
	K486	VSN700-05 data logger and RETA-01 Ethernet/IP™ and Modbus/TCP adapter module	
Specialities	P902	Customized (described in Technical appendix)	
	P926	Extended warranty 24/30 months	
	P927	Extended warranty 36/42 months	
	P928	Extended warranty 60/66 months	
Safety options	Q954	Ground fault monitoring in IT (ungrounded) systems (BENDER Iso-PV)	
	Q976	Ground fault monitoring in IT (ungrounded) systems (ABB CM-IWN.5)	
	Q981	Ground fault monitoring in IT (ungrounded) systems (ABB CM-IWN.6S)	
	Q969	Grid monitoring relay, ENEL approved	
	Q974	Grid monitoring relay, VDE0126 approved	
	Q975	Grid monitoring relay, UK G59 approved	
	Q980	Grid monitoring relay, BDEW approved	
Documentation language	R701	German (delivered set may include manuals in English)	
	R702	Italian (delivered set may include manuals in English)	
	R707	French (delivered set may include manuals in English)	
	R708	Spanish (delivered set may include manuals in English)	
	R711	Russian (delivered set may include manuals in English)	

4

Mechanical installation

Contents of this chapter

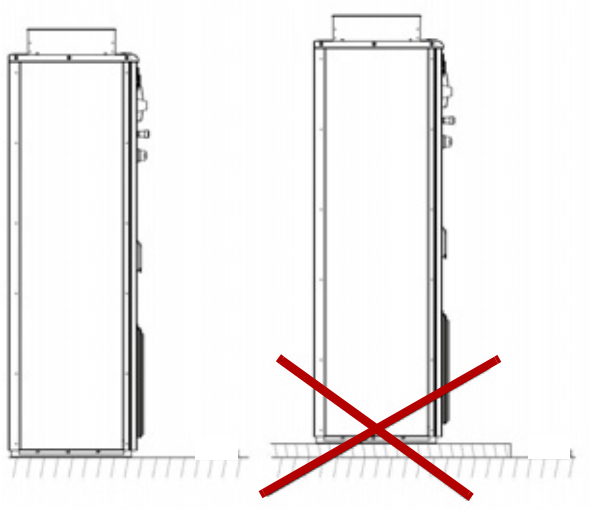
This chapter describes the mechanical installation procedure of the inverter.

Checking the installation site

See section *Ambient conditions* on page *144* for allowable operating conditions, and section *Dimensions, weights and free space requirements* on page *132* for requirements for free space around the unit.

The floor that the unit is installed on must be of non-flammable material, as smooth as possible, and strong enough to support the weight of the unit. The floor flatness must be checked with a spirit level before the installation of the cabinets into their final position. The maximum allowed deviation from the surface level is 5 mm in every 3 metres. The installation site should be levelled, if necessary, as the cabinet is not equipped with adjustable feet.

Note: For easy maintenance, do not install the inverter on a higher level than the floor in front of it. If the inverter is placed higher, the ramp supplied with the inverter cannot be used when replacing an inverter module.



The wall behind the unit must be of non-flammable material.

Required tools

The tools required for moving the unit to its final position, fastening it to the floor and tightening the connections are listed below:

- crane, fork-lift or pallet truck (check load capacity!); iron bar, jack and rollers
- Pozidrive and Torx (2.5–6 mm) screwdrivers for the tightening of the frame screws
- torque wrench
- set of wrenches and sockets.

Checking the delivery

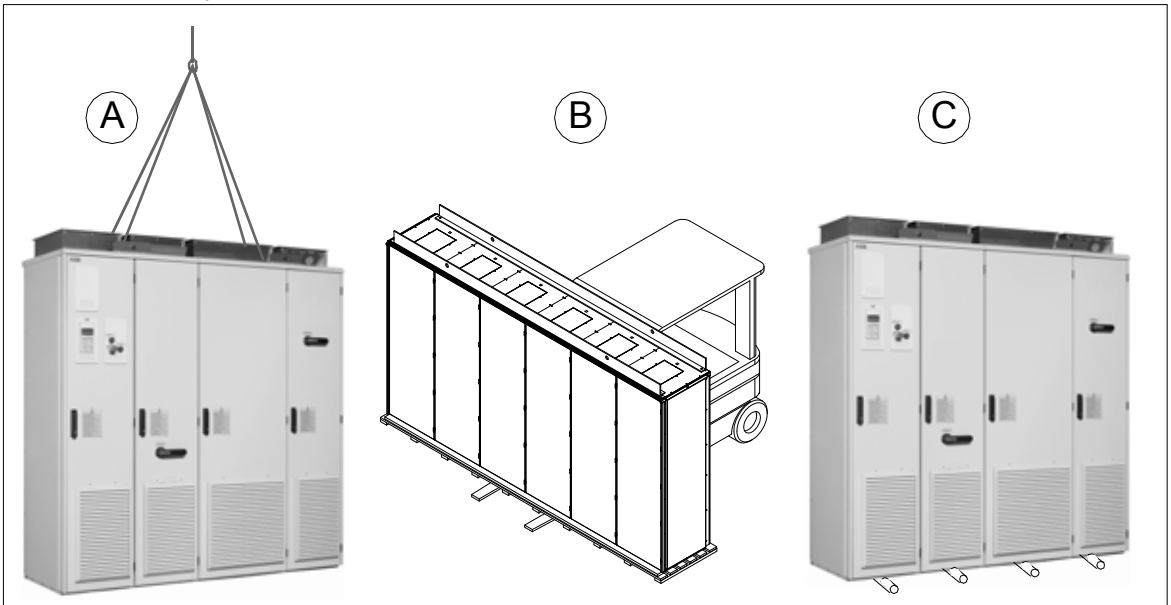
The inverter delivery contains:

- inverter cabinet line-up
- optional modules (if ordered) installed onto the RDCU control units
- ramp for the inverter module replacement (frame R8i)
- appropriate inverter manuals and optional module manuals
- delivery documents.

Check that there are no signs of damage. Manuals and other loose parts are delivered inside the inverter. Before attempting installation and operation, check the information on the type designation label of the inverter to verify that the delivery is of the correct type. See sections *Type designation labels* on page *56* and *Type designation key* on page *58*.

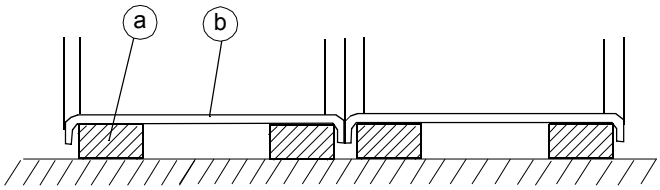
Moving the unit

Move the unit by crane (A), fork-lift or pallet truck (B), or on rollers (C) as shown below.



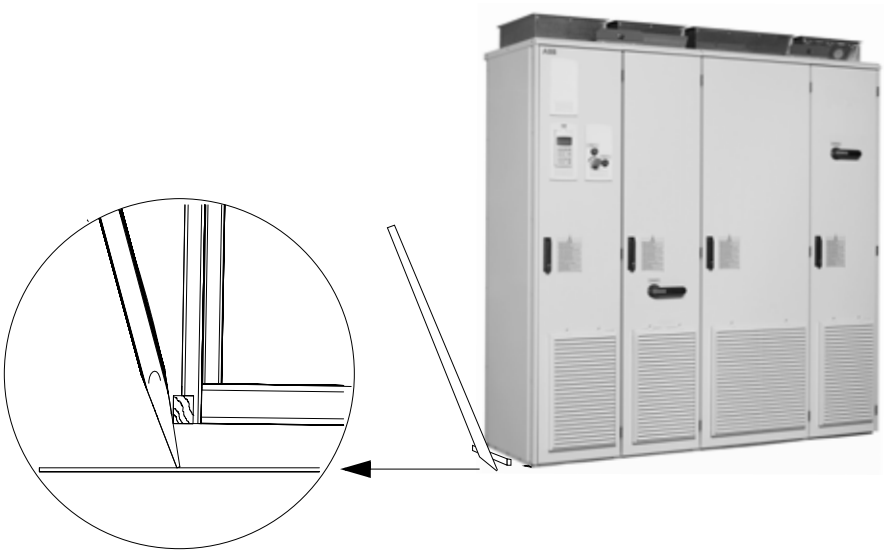
A	Use the steel lifting bars attached to the top of the cabinet. Insert the lifting ropes or slings into the holes of the lifting bars. The lifting bars can be removed (not mandatory) once the cabinet is in its final position. **If the lifting bars are removed, the bolts must be refastened to retain the degree of protection of the cabinet.**
B	The unit is to be moved only in the upright position. The centre of gravity is high. Be therefore careful when transporting the unit. Avoid tilting the cabinet. If using a pallet truck, check its load capacity before attempting to move the unit.

If the cabinet needs to be laid on its back, it must be supported from below beside the cubicle seams as shown below. a) support, b) cabinet back panel. **Note:** Transportation of a unit on its back is only allowed if the unit is equipped for such transportation at the factory.



Placing the unit

Move the cabinet into its final position with an iron bar and a piece of wood at the bottom edge of the cabinet. Place the wooden piece properly in order not to damage the cabinet frame!

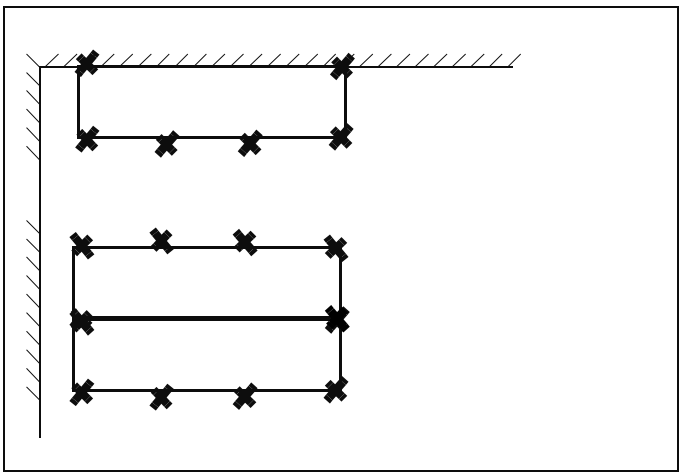


Overview of the installation process

The unit must be installed in an upright vertical position. It can be installed with its back against a wall, or back-to-back with another unit and side by side. Fasten the cabinet to the floor (and roof) as described under *Fastening the cabinet to the floor*, page *67*.

Note 1: Leave required free space around the unit. See page *132*.

Note 2: Height adjustment can be done by using metal shims between the bottom frame and floor.



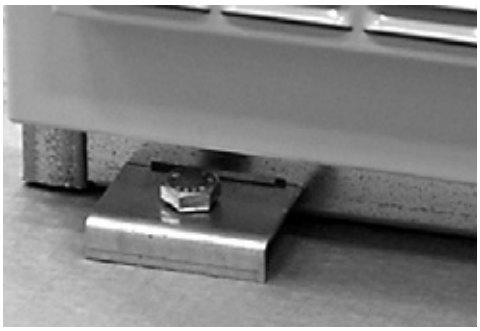
Fastening the cabinet to the floor

The cabinet must be fastened to the floor by using clamps along the edge of the cabinet bottom, or by bolting the cabinet to the floor through the holes inside.

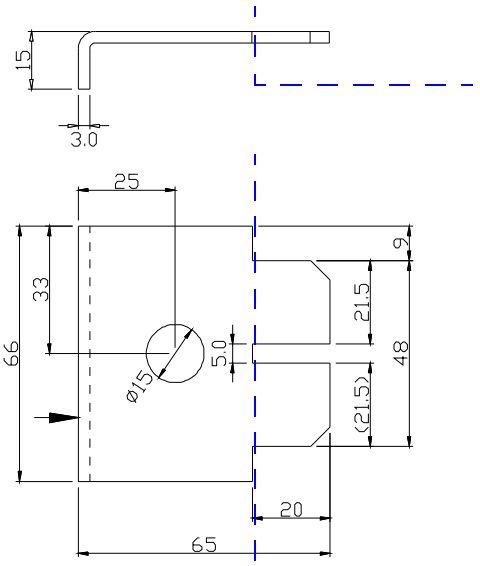
Alternative 1 – Clamping

Insert the clamps into the twin slots along the front and rear edges of the cabinet frame body and fasten them to the floor with a bolt. The recommended maximum distance between the clamps is 800 mm (31.5”).

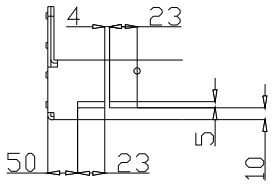
If there is not enough working space behind the cabinet for mounting, fasten the top of the cabinet to the wall with L-brackets (not included in the delivery). Use the lifting bar fastening holes and bolts (M16).



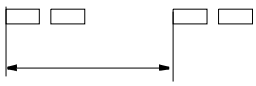
Clamp

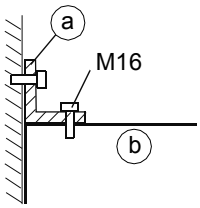


Clamp dimensions in millimetres. The dotted line denotes the cabinet frame.



Slot detail, front view (dimensions in millimetres)

Cubicle width	Distance between slots 
400 mm	250 mm (9.85”)
600 mm	450 mm (17.7”)
800 mm	650 mm (25.6”)

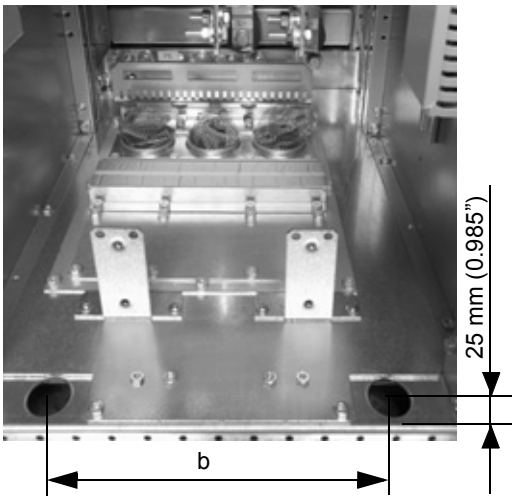


Fastening the cabinet at the top with L-brackets (side view)
a) L-bracket
b) Cabinet roof

Alternative 2 – Using the holes inside the cabinet

The cabinet can be fastened to the floor using the fastening holes inside the cabinet, if they are accessible. The recommended maximum distance between the fastening points is 800 mm (31.5”).

If the back fastening holes are not accessible, fasten the top of the cabinet to the wall with L-brackets (not included in the delivery). Use the lifting bar fastening holes and bolts (M16).

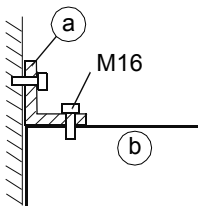


Fastening holes inside the cabinet.

a) Cubicle width

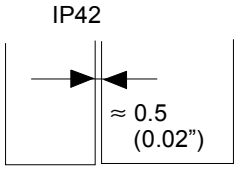
b) Distance between fastening holes. Outer hole diameter 31 mm (1.22”). Bolt size: M10 or M12

a (mm)	**b**
400	250 mm (9.85”)
600	450 mm (17.7”)
800	650 mm (25.6”)



Fastening the cabinet at the top with L-brackets (side view)
a) L-bracket
b) Cabinet roof

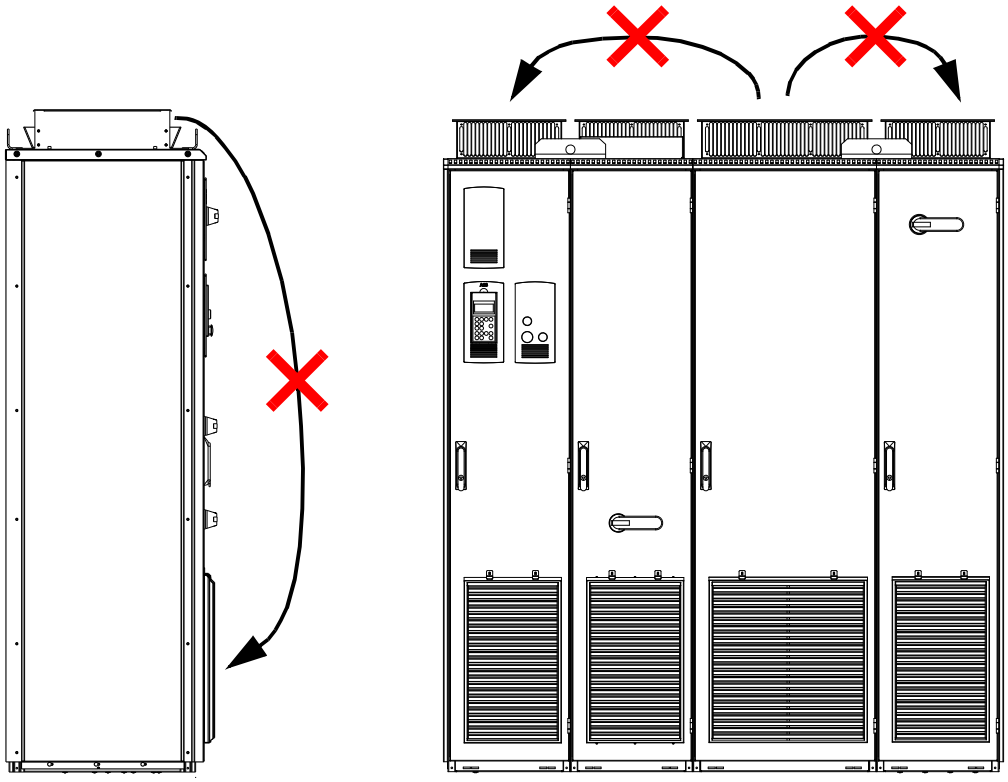
Added width:
Side panels of the cabinet: 15 mm (0.6”)
Back panel of the cabinet: 10 mm (0.4”)
Gap between cubicles (mm):



Miscellaneous

Preventing the recirculation of hot air

Prevent hot air circulation outside the inverter by leading the outcoming hot air away from the area where the inlet air to the inverter is taken. Also, ensure that the hot air from the inverter module cubicle cannot enter the adjacent cubicles.



Ventilation duct at the air outlet of the cabinet

A ventilation duct can be constructed at the air outlet of the inverter cabinet. If an exhaust fan is used, ensure that the capacity is sufficient. See *Losses, cooling data and noise* on page *133.*

Note: The ventilation system must keep the static pressure in the air outlet duct sufficiently below the pressure of the room where the inverter is located in order that the cabinet fans can produce the required air flow through the cabinet. Ensure that no dirty or moist air is able to flow backward to the inverter in any case, even during off-time or while servicing the inverter or the ventilation system.

Calculating the required static pressure difference

The required static pressure difference between the exit air duct and the inverter installation room can be calculated as follows:

$$\Delta p_s = (1.5\ldots2) \cdot p_d$$

where

$$p_d = 0.5 \cdot \rho \cdot v_m^2$$

$$v_m = q / A_c$$

p_d ≙ dynamic pressure

ρ ≙ air density (kg/m^3)

v_m ≙ average air velocity in the exit duct(s) (m/s)

q ≙ rated air flow of the inverter (m^3/s)

A_c ≙ cross-sectional area of the exit duct(s) (m^2)

Example:

The cabinet has 3 exit openings of 315 mm diameter. The rated air flow of the cabinet is 3760 m^3/h = 1.0 m^3/s.

$A_c = 3 \cdot 0.315^2 \cdot \pi / 4 = 0.234$ m^2

$v_m = q / A_c = 1.0 / 0.234 = 4.3$ m/s

$p_d = 0.5 \cdot \rho \cdot v_m^2 = 0.5 \cdot 1.1 \cdot 4.3^2 = 10$ Pa

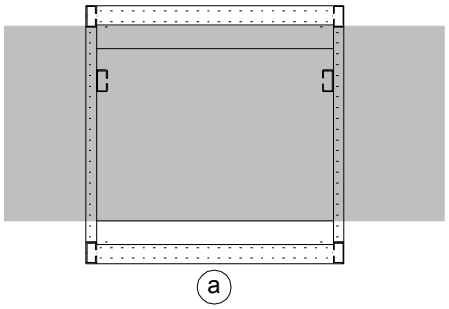
The required pressure in the exit air duct is then, 1.5…2 • 10 Pa = 15…20 Pa, below the pressure in the room.

More information: Contact ABB.

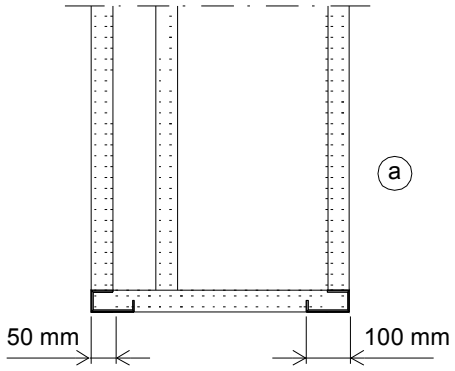
Cable duct in the floor below the cabinet

A cable duct can be constructed below the middle part of the cabinet. The duct width may not exceed 450 mm. The cabinet weight lies on the 100 mm wide section in front and 50 mm wide section on the back which the floor must carry.

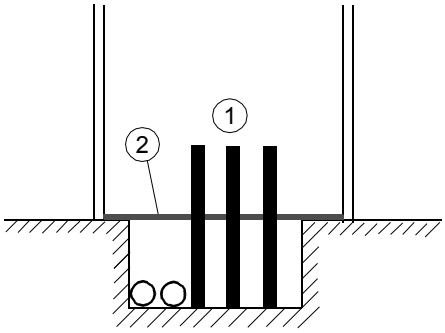
Prevent the cooling air flow from the cable duct to the cabinet by bottom plates. To ensure the degree of protection for the cabinet, use the original bottom plates delivered with the unit. With user-defined cable entries, take care of the degree of protection, fire protection and EMC compliance.



Allowed area for cable duct (view from above). a) Cabinet front. The shaded area can be used for a cable duct.



Minimum widths for the floor support (side view). a) Cabinet front.



Preventing cooling air flow. 1) Cables. 2) Bottom plates.

5

Planning the electrical installation

Contents of this chapter

This chapter contains the instructions that you must obey when selecting the cables, transformer, protections, cable routing and way of operation for the inverter system.

Limitation of liability

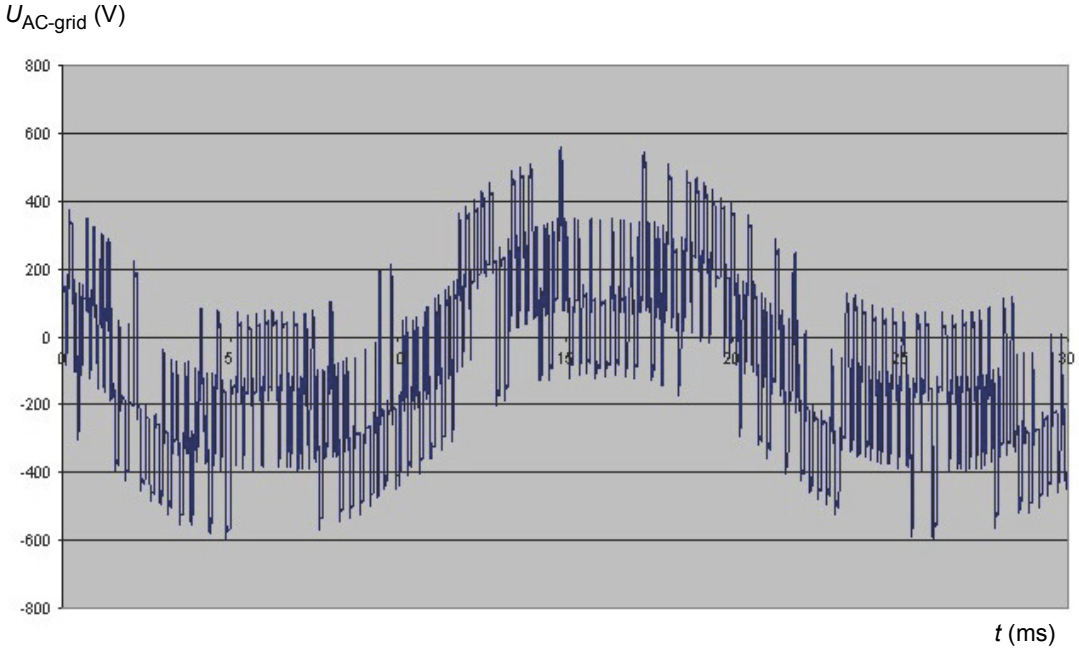
The installation must always be designed and made according to applicable local laws and regulations. ABB does not assume any liability whatsoever for any installation which breaches the local laws and/or other regulations. Furthermore, if the recommendations given by ABB are not followed, the inverter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

Selecting the transformer

Transformers designed for photovoltaic applications are available from ABB. Each inverter must be galvanically isolated from other inverters and medium and low voltage network by a dedicated transformer or winding. If you intend to connect inverters in parallel, please contact ABB for more information. ABB recommends a transformer designed for the environment where it will be installed, compliance with power transformer standard IEC 60076 and testing according to converter transformer standard for industrial applications IEC 61378-1. Country-specific requirements must always be fulfilled.

Requirements for the transformer

- suitable for the network and inverter AC voltage, current and power
- suitable for use with IGBT inverters
- degree of protection, temperature limits and lifetime are appropriate for the environment
- equipped with a static grounded screen between the high and low voltage windings
- voltage withstand level of the low voltage winding is at least 1.6 kV against ground. A typical voltage waveform against ground is shown below.



- voltage rise time withstand level (d*u*/d*t*) of the low voltage winding is at least 1000 V per microsecond against ground.
- recommended rated short-circuit impedance (X_k) for each inverter is approximately 6% (±1%)
- withstands low-voltage side current DC components of at least 0.5% of the nominal rated current preferably without using an air gap
- withstands the 3% total harmonic distortion generated by the inverter. However, we recommend dimensioning the transformer for at least 5% total harmonic distortion to withstand possible outside interference from the network.

ABB recommends that the transformer is equipped with an off-load tap changer for voltage regulation on the high-voltage side of the winding with two 2.5% step points to the plus and minus directions.

The inverter does not require any specific transformer notation. ABB recommends using traditional notations, such as Dy11d0, Dy11y11, etc.

Do not ground the neutral (star) point of the transformer or connect it to the neutral points of other windings.

Selecting the grid disconnecting device

The inverter is equipped with a hand-operated disconnecting device which isolates the inverter and the solar generator from the electrical power system. The disconnecting device does not, however, isolate the inverter AC output busbars from the power system. Therefore, during installation and maintenance work on the inverter, the AC output cables and busbars must be isolated from the electrical power system with a disconnector at the transformer.

Selecting the DC input disconnecting device

As standard, the inverter is equipped with a hand-operated disconnecting device. Optionally, PVS800-57-0100kW can be equipped with miniature DC input circuit breakers (option +H377). The breakers do not, however, isolate the inverter DC input conductors and terminals from the input voltage. Therefore, the junction boxes must be equipped with breakers for the isolation.

Checking the compatibility of the solar generator and inverter

Check that

- generator current and voltage match the rated values of the inverter
- generator open circuit voltage does not exceed the maximum allowed DC voltage of the inverter
- generator operating range lies between the limits of the maximum power point tracking (MPPT) function of the inverter control program
- generator grounding requirements match with the inverter.

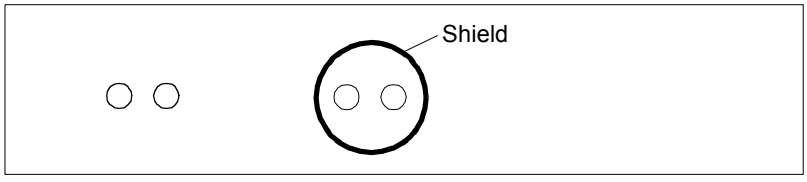
Selecting the power cables

General rules

Dimension the DC input power and AC output power cables **according to local regulations**:

- Dimension the cable to carry the inverter load current. See chapter *Technical data* for the rated currents.
- Select a cable rated for at least 70 °C maximum permissible temperature of conductor in continuous use.
- The inductance and impedance of the PE conductor/cable (grounding wire) 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).
- Select an AC output cable rated for at least 0.6/1.0 kV AC.

A two-conductor system is allowed for the DC input cabling but a shielded cable can also be used.



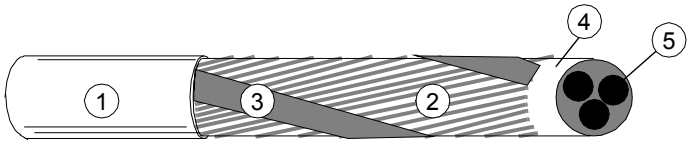
Symmetrical shielded cable is recommended for the AC output cabling; see section *Recommended AC output power cable types* below. Compared to a four-conductor system, the use of symmetrical shielded cable reduces electromagnetic emission of the whole inverter system.

Note: When continuous metal conduit is employed, shielded cable is not required. The conduit must have bonding at both ends as with cable shield.

To operate as a protective conductor, the shield conductivity requirements according to IEC 61439-1 are shown below when the protective conductor is made of the same metal as the phase conductors:

Cross-sectional area of the phase conductors **S (mm^2)**	**Minimum cross-sectional area of the corresponding protective conductor** **S_p (mm^2)**
$S \leq 16$	S
$16 < S \leq 35$	16
$35 < S$	S/2

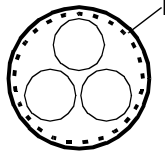
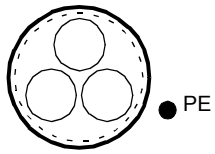
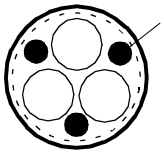
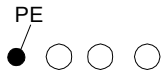
To effectively suppress radiated and conducted radio-frequency emissions, the cable shield conductivity must be at least 1/10 of the phase conductor conductivity. The requirements are easily met with a copper or aluminum shield. The minimum requirement of the cable shield is shown below. It consists of a concentric layer of copper wires with an open helix of copper tape or copper wire. The better and tighter the shield, the lower the emission level.



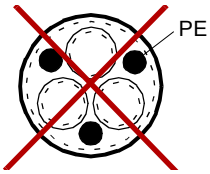
1	Insulation jacket
2	Copper wire screen
3	Helix of copper tape or copper wire
4	Inner insulation
5	Cable core

Recommended AC output power cable types

The power cable types that can be used for the inverter AC output are represented below

	Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. The shield must meet the requirements of IEC 61439-1, see above. Check with local / state / country electrical codes for allowance.
	Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. A separate PE conductor is required if the shield does not meet the requirements of IEC 61439-1, see above.
	Symmetrical shielded cable with three phase conductors and symmetrically constructed PE conductor, and a shield. The PE conductor must meet the requirements of IEC 61439-1.
	A four-conductor system (three phase conductors and a protective conductor on a cable tray). **WARNING!** Ground all conductive cable supports, cable clamps and individual conductive items close to cables, such as cable trays. A **dangerous** voltage can become present on the non conductive outer sheath of the cable. This can cause injury or death.

Not allowed power cable types

	Symmetrical shielded cable with individual shields for each phase conductor is not allowed on any power cabling.

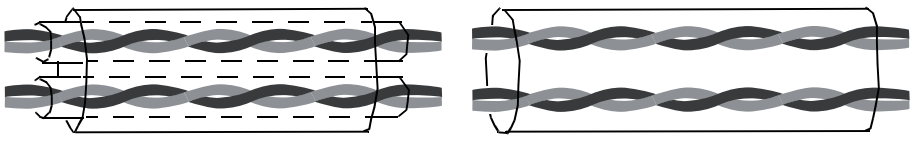
Selecting the control cables

General rules

All control cables must be shielded.

Use a double-shielded twisted pair cable for analog signals. Employ one individually shielded pair for each signal. Do not use common return for different analog signals.

A double-shielded cable is the best alternative for low-voltage digital signals but single-shielded twisted pair cable (Figure b) is also usable.



a
A double-shielded twisted pair cable

b
A single-shielded twisted pair cable

Signals in separate cables

Run analog and digital signals in separate, shielded cables.

Never mix 24 V DC and 115/230 V AC signals in the same cable.

Signals allowed to be run in the same cable

Relay-controlled signals, providing their voltage does not exceed 48 V, can be run in the same cables as digital input signals. It is recommended that the relay-controlled signals be run as twisted pairs.

Relay cable type

The cable type with braided metallic screen (eg, ÖLFLEX by LAPPKABEL, Germany) has been tested and approved by ABB.

Installation sites above 2000 metres (6560 feet)

WARNING! Protect against direct contact when installing, operating and servicing the RMIO board wiring and optional modules attached to the board. The Protective Extra Low Voltage (PELV) requirements stated in EN 50178 are not fulfilled at altitudes above 2000 m (6560 ft).

Routing the cables

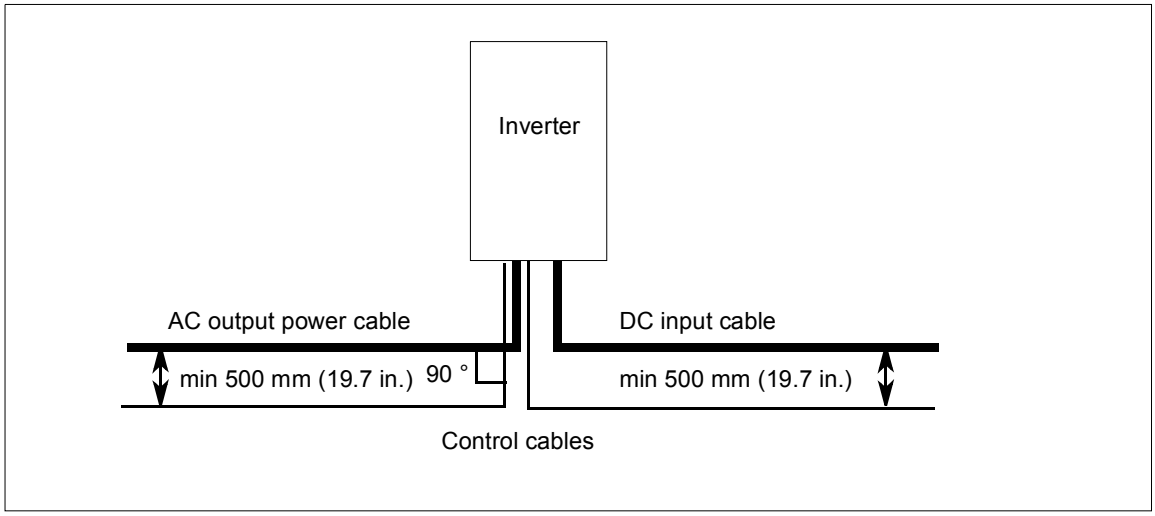
It is recommended that the input DC power cable, output AC power cable and control cables be installed on separate trays.

Where control cables must cross power cables ensure they are arranged at an angle as near to 90 degrees as possible. Do not run extra cables through the inverter.

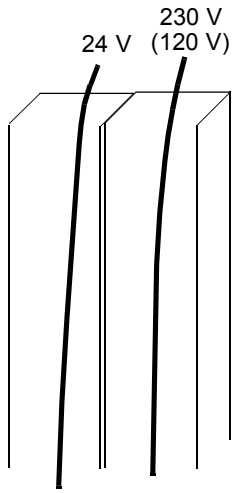
The cable trays must have good electrical bonding to each other and to the grounding electrodes. Aluminium tray systems can be used to improve local equalizing of potential.

If four conductor AC cabling is used, place the three output phase cables symmetrically and close to each other. Asymmetrical installation may induce current to grounding cables and metal structures.

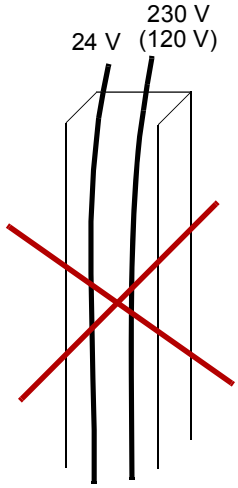
A diagram of the cable routing is shown below.



Separate control cable ducts



Lead 24 V and 230 V (120 V) control cables in separate ducts inside the cabinet.



Not allowed unless the 24 V cable is insulated for 230 V (120 V) or insulated with an insulation sleeving for 230 V (120 V).

Implementing short-circuit and thermal overload protection

Protecting the inverter and AC output cable in short-circuit situations

The inverter is equipped with internal AC fuses which restrict inverter damage in case of a short-circuit inside the inverter. Install external protection (such as fuses) according to local regulations, appropriate AC line voltage and the rated current of the inverter to protect the AC output cable.

Protecting the photovoltaic generator and DC input cable in short-circuit situations

The input DC fuses or optional DC input miniature circuit breakers (option +H377) protect the inverter DC circuit and the DC input cables in a short-circuit situation when the cable is dimensioned according to inverter nominal DC current and fuse and breaker ratings. See section *Fuses* on page *127* for the fuse and breaker ratings.

To protect inverters delivered without input DC fuses (option +0F291), follow the instructions in section *Instructions for inverters delivered without input DC fuses (option +0F291)* on page *82*.

Note: The inverter does not protect the photovoltaic generator. Install adequate protection devices to, for example, each string.

Protecting the inverter and the AC output cable against thermal overload

The inverter protects itself and the AC output cable against thermal overload when the cable is dimensioned according to the nominal current of the inverter. No additional thermal protection devices are needed.

Supplying power for the auxiliary circuits

Supply the inverter with rated auxiliary voltage. Protect the supply according to local regulations with, eg, fuses and/or fault current breakers. Do not connect any additional appliances to the inverter without consulting with ABB.

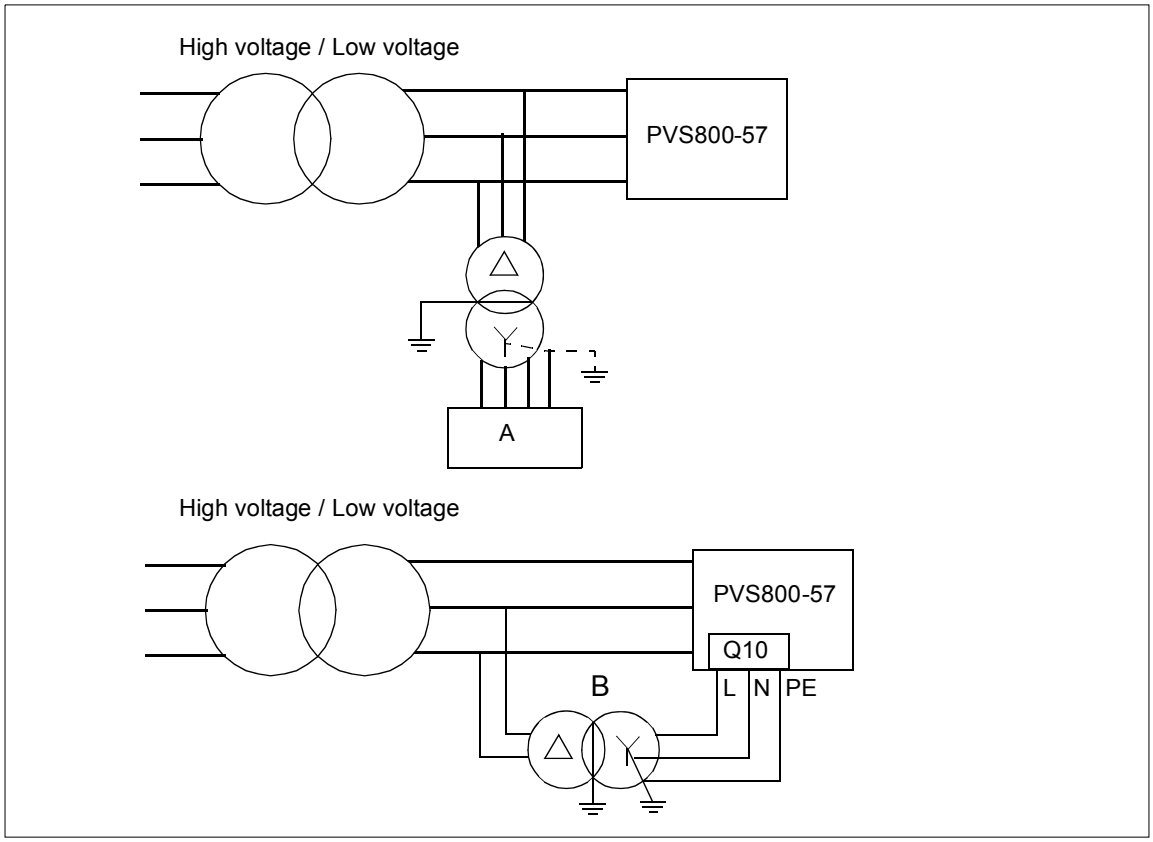
Implementing the low voltage ride-through function

The user can define by parameters when the inverter must stay connected to the grid (ie, the depth and length of the grid voltage transient). The user can also define how much the inverter supports the grid with capacitive reactive current during the grid voltage transient. For more information, see *PVS800 central inverters firmware manual* (3AUA0000058422 [English]).

If a low voltage ride-through function is used with the PVS800-57-100kW-A, PVS800-57-250kW-A or PVS800-57-315kW-B inverters, the auxiliary power supply must be uninterruptible (that is, the auxiliary voltage is not allowed to have voltage dips). Use of an external UPS device (uninterruptible power supply) is recommended in that case.

Supplying circuits from the AC output of the inverter

If the AC output of the inverter is used for supplying any circuits, provide galvanic isolation as shown in the diagram below. A denotes other equipment and B supplying auxiliary circuit of the inverter. See also *Connecting the external power supply cable for the auxiliary circuit* on page *89*. For instructions on selecting the transformer, see section *Selecting the transformer* on page *73*.



Implementing ground fault monitoring in IT (ungrounded) systems

The internal ground fault monitoring of the inverter is based on total sum of the phase current measurements. The monitoring will detect severe ground faults in IT (ungrounded) systems. However, often the ground fault leakage current does not exceed the trip level and the inverter remains is operation. The inverter can be equipped with insulation monitoring device option +Q954, +Q976 or +Q981, or the IT system must be monitored otherwise with a monitoring device suitable for use with inverters. Because of the leakage currents of inverters, many ground fault monitoring devices do not work properly with them.

Insulation monitoring device (options +Q954, +Q976 and +Q981)

Options +Q954, +Q976 and +Q981 include an insulation monitoring device with a coupling device that enables measurement of the insulation resistance. According to the IEC 62109-2 standard, the measurement is needed before the inverter can be started.

The insulation monitoring device measures insulation resistance between the DC busbars and protective earth (PE). When the inverter is operating, the insulation resistance of the AC busbars against the protective earth is also measured indirectly. The monitoring device reacts to all ground faults in IT systems which are galvanically connected to each other.

If the insulation resistance between the conductors and the ground falls below the set response values, the state of the alarm relay in the insulation monitoring device is changed, and in R7i and R8i the indication LED on the cabinet door lights up. The inverter is tripped or an alarm is generated depending on the parameter settings. The measured insulation resistance value can be read from the inverter parameters in 3 × R8i frames equipped with option +Q954.

When auxiliary power to the insulation monitoring device is switched off, its alarm relays are switched to the fault position.

With option +Q954, the response values and parameters of the insulation monitoring device can be set with its function keys.

Note: The insulation monitoring device measures the insulation resistance of the solar generator correctly according to the settings when the inverter is not operating. For disabling the monitoring device during the inverter operation, contact ABB.

Safety information

The insulation monitoring device is constructed according to state-of-the-art and recognized technical safety rules. Nevertheless, when the device is used, hazards may occur to the life and limb of the user or of third parties, or there may be adverse effects on the monitoring device or on other valuable property. The monitoring device must only be used

- for the purpose for which it is intended
- when it is in perfect technical condition as far as safety is concerned.

Only one insulation monitoring device may be used in each interconnected IT system.

When insulation or voltage test is to be carried out, the device is to be isolated from the system for the test period.

The ground fault monitoring function (+Q954, +Q976 and +Q981) is not a personnel safety or fire protection feature.

Customer wiring

The insulation monitoring device can be connected to external systems. See the circuit diagrams delivered with the inverter.

Start-up

See chapter *Start-up*.

More information

- Circuit diagrams delivered with the inverter
- Manufacturer's operating manual of the insulation monitoring device

Implementing positive or negative pole grounding (options +F282 and +F283)

Some solar module types require positive or negative grounding. Make sure that the optional positive (+F282) or negative (+F283) grounding method is suitable for the solar modules that you are using.

Ground the panels during long maintenance breaks if the panel type requires it.

Limiting the conducted disturbances with the EMC filter (option +E216) in low-voltage TN (grounded) networks

The optional EMC filter (+E216) can be installed at the network-side of the low voltage transformer to limit the conducted disturbances to other equipment connected to the network. The filter has capacitors connected to ground and is not suitable for IT (ungrounded) networks. Ensure that the network owner and operator allows the installation of this kind of a filter. The filter must always be installed according to local regulations.

Instructions for inverters delivered without input DC fuses (option +0F291)

If the standard input DC fuses are not suitable for the customer application, the inverter can be delivered without input DC fuses (option +0F291). In this case, install appropriate DC fuses to protect the inverter DC circuit and the DC input cables in a short-circuit situation. Protect the positive and negative poles of an input with separate fuses. The power loss of a fuse may never exceed 25 W.

The table in section *Fuses for inverters delivered without input DC fuses (option +0F291)* (page *130*) shows the rated DC current for selecting the input DC fuses.

Mechanical installation of the input DC fuses

Use M10 or M12 bolts and nuts to connect the fuses to the busbars.

6

Electrical installation

Contents of this chapter

This chapter describes the electrical installation process of the inverter.

Warnings

WARNING! Only qualified electricians are allowed to do the work described in this chapter. Obey the *Safety instructions* on the first pages of this manual. If you ignore the safety instructions, injury or death can occur.

Checking the insulation of the assembly

Inverter

Every inverter module has been tested for insulation between the main circuit and the chassis (2700 V rms 50 Hz for 1 second) at the factory. Therefore, do not make any voltage tolerance or insulation resistance tests eg, hi-pot or megger, on any part of the inverter.

AC output cable

Check the insulation of the AC output cable according to local regulations before connecting it to the inverter.

DC input cable(s)

Check the insulation of the DC input cable(s) according to local regulations before connecting it to the inverter.

Photovoltaic generator

Ensure that the insulation of the solar generator has been checked according to manufacturer's instructions. The solar generator must be disconnected from the inverter during the insulation check.

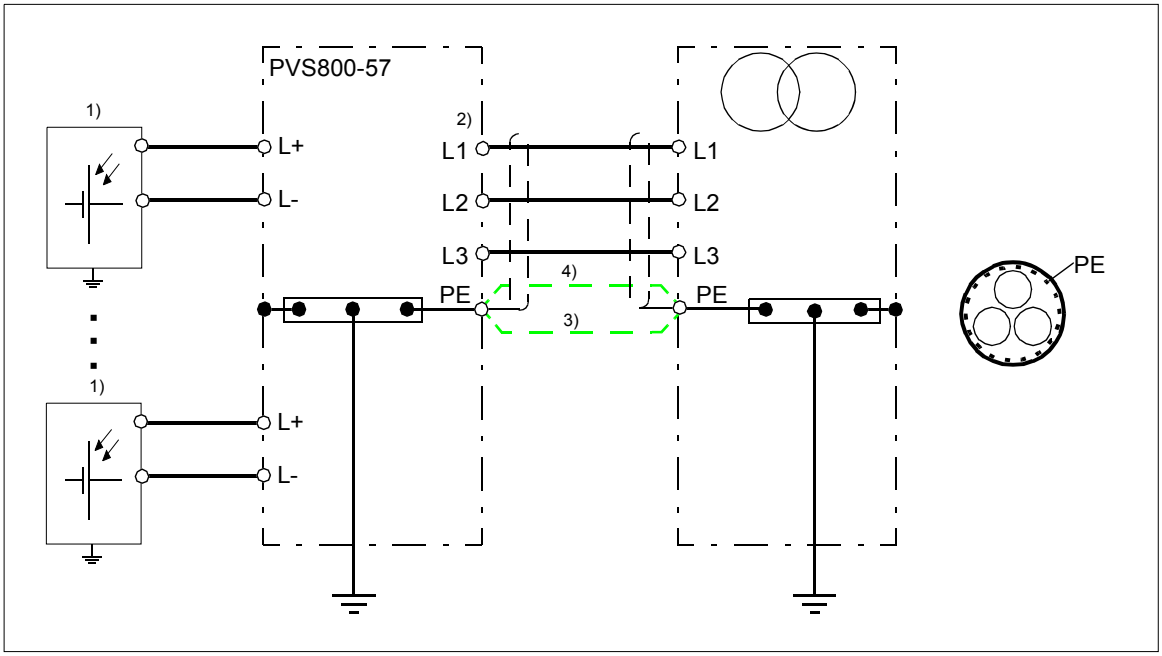
Checking the compatibility with IT (ungrounded) systems

The EMC filter (option +E216) is not suitable for use in an IT (ungrounded) system. Check that the low-voltage network is of the TN (grounded) type. If not, please contact ABB.

WARNING! If the optional EMC filter +E216 is installed on an IT system (an ungrounded power system or a high resistance-grounded [over 30 ohm] power system, the system will be connected to earth potential through the EMC filter capacitors. This may cause danger or damage the equipment in the network.

Connecting the power cables

Connection diagram of a shielded cable



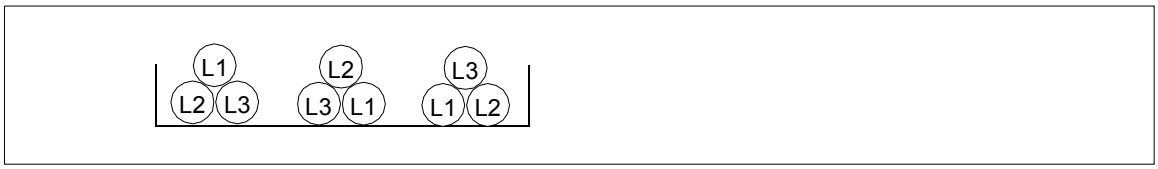
1) Solar array junction box

2) 360 degrees grounding is recommended at the cabinet entry if shielded cable is used. Ground the other end of the input cable shield or PE conductor at the transformer.

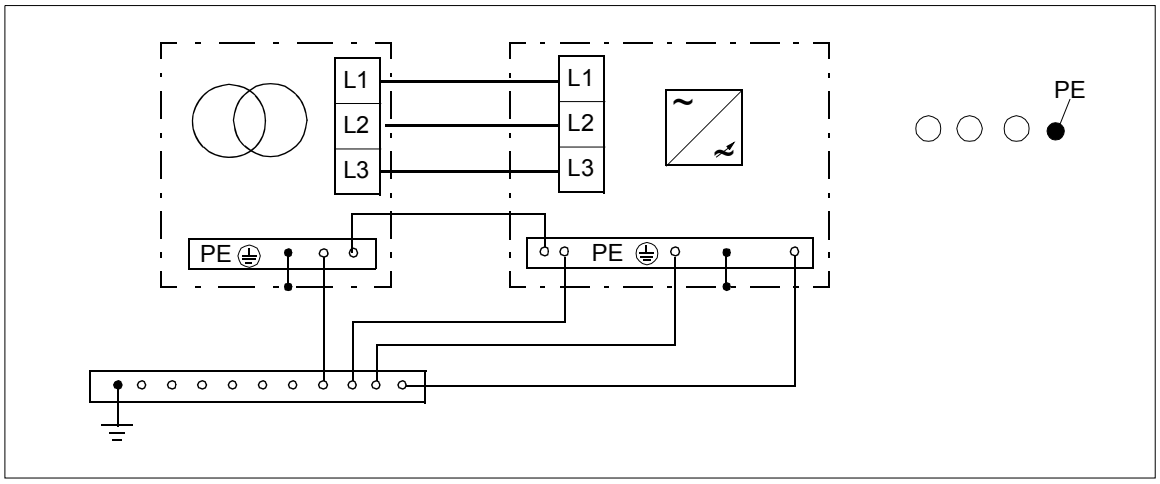
3), 4) If shielded cable is used (not required but recommended) and the conductivity of the shield is < 50% of the conductivity of the phase conductor, use a separate PE cable (3) or a cable with a grounding conductor (4).

Connection diagram of a four-conductor system

Arrange the cables as shown below to get an as equal current distribution as possible.



Connect single-core cables without concentric protective shield (armor) as shown below.

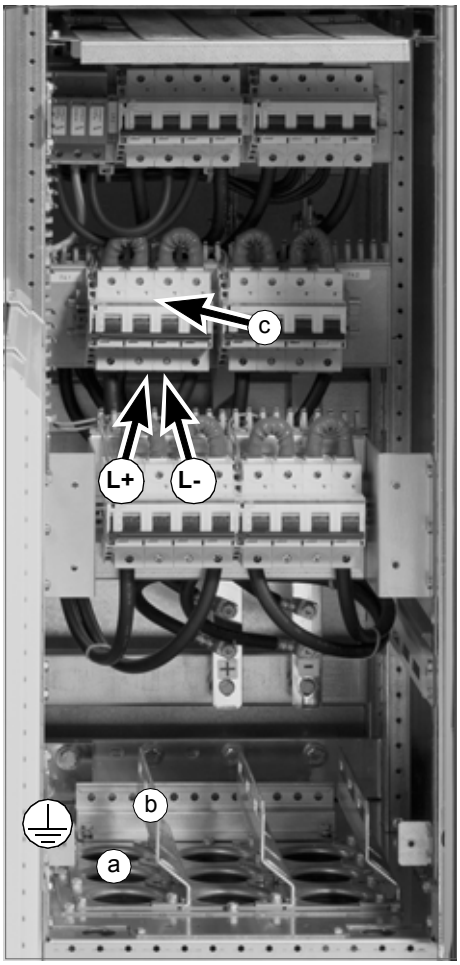


WARNING! Ground all conductive cable supports, cable clamps and individual conductive items close to cables, such as cable trays. A dangerous voltage can become present on the non-conductive outer sheath of the cable. This can cause injury or death.

DC input cable connection procedure

1. Remove the shroud covering the input power terminals.
2. Lead the cable(s) into the inside of the cabinet. If a shielded cable is used, connect the shield to the cabinet grounding busbar with a cable lug.
3. Connect the DC- conductor to terminal L- and the DC+ conductor to terminal L+.

   Note: In the R8i, 2 × R8i and 3 × R8i frame sizes with fuse-protected DC input connections, the location of the + and - terminals varies depending on the number of the DC input connections. See chapter *Dimension drawings*.
4. If a separate PE conductor is used, connect it to the cabinet grounding terminal.
5. Refit the shroud onto the input power terminals.

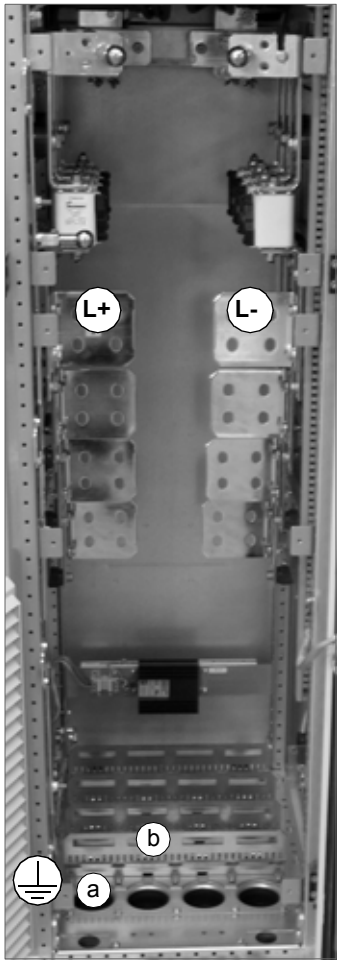


DC input terminals of frame R7i with option +H377 (four miniature circuit breakers for four DC input connections)

a) Cable lead-throughs

b) Cable support

b) DC input miniature circuit breakers



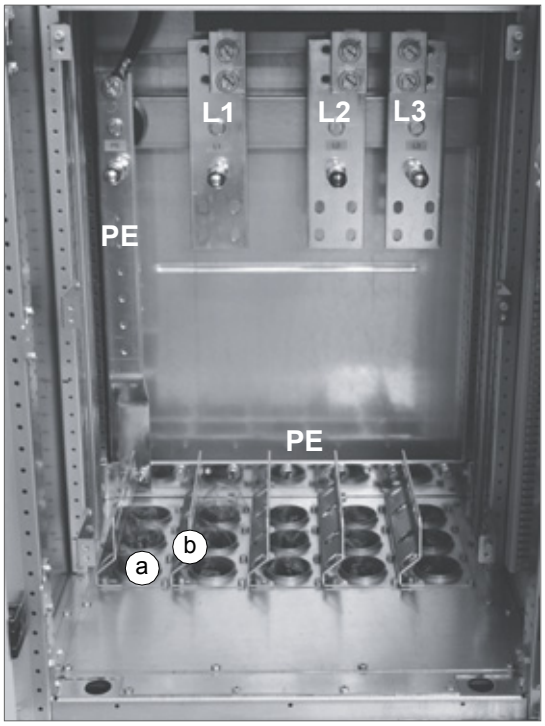
DC input terminals of frame R8i with option +4H382 and frame 2 × R8i (four fuse-protected DC input connections)

a) Cable lead-throughs

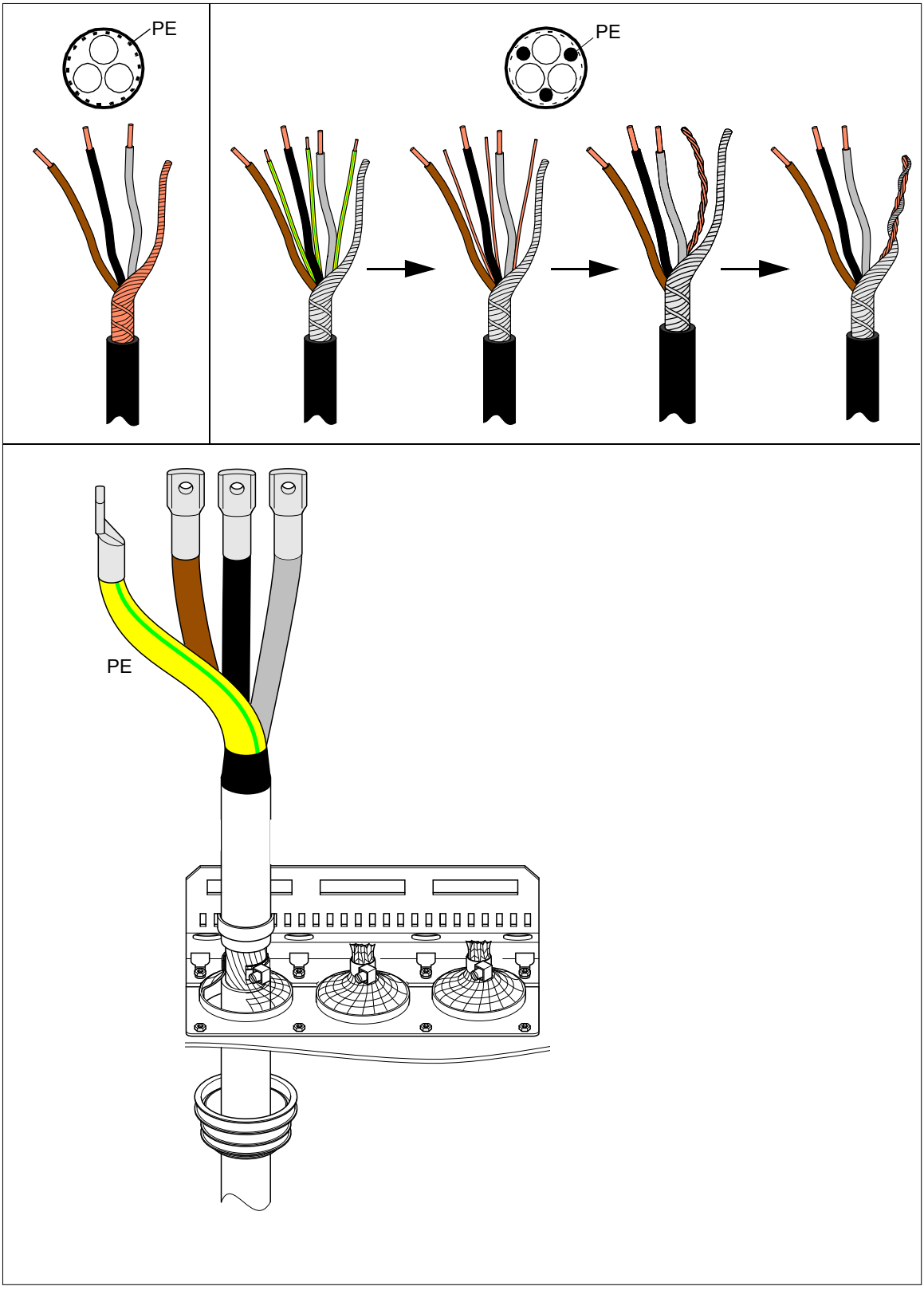
b) Cable support

AC output cable connection procedure

1. Remove the shroud covering the output power terminals.
2. Lead the cable(s) into the inside of the cabinet. If a shielded cable is used, prepare the cable ends and make the 360° grounding arrangements at the cabinet entry as shown on the next page. Connect the twisted shield of the AC output cable(s) to the cabinet PE (ground) busbar with a cable lug.
3. Connect the phase conductors to terminals L1, L2 and L3. Connect the separate PE/grounding conductor (if present) to the cabinet PE (ground) busbar.
4. Refit the shroud onto the output power terminals.

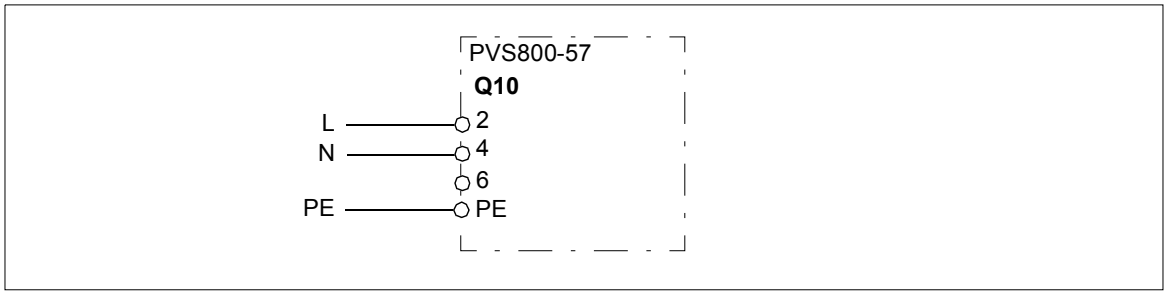


AC output terminals of PVS800-57-1000kW
a) 360 degrees EMC lead-throughs
b) Cable support


PE
PE
PE

Connecting the external power supply cable for the auxiliary circuit

Connect the external power supply cable conductors to the terminals of auxiliary control voltage switch Q10 as shown below. For the location of the switch inside the cabinet, see the cabinet layout photos in chapter *Operation principle and hardware description*.

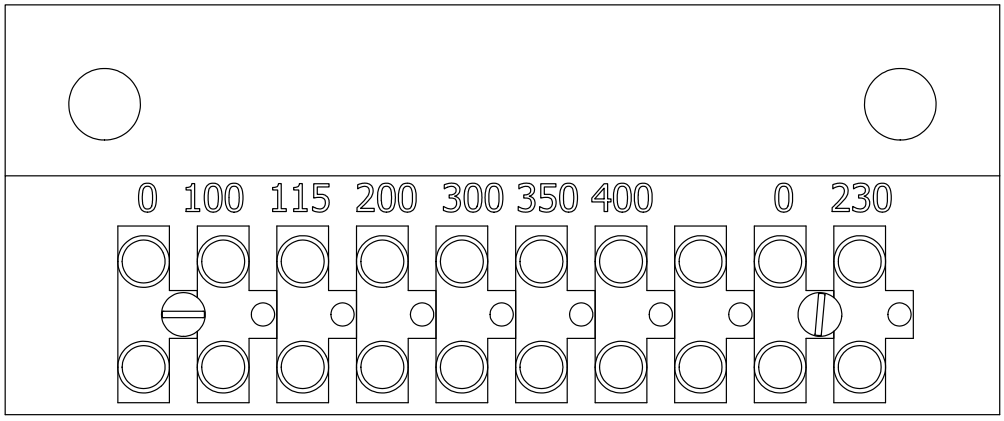


Maximum fuse: 16 A

Note concerning power supply from IT (ungrounded) systems: Contact ABB for instructions. Equip the power supply for the auxiliary circuit with fault current circuit breakers for ground fault indication and tripping. If the overvoltage protection device of the auxiliary control voltage input causes unnecessary ground fault trippings, the type of the device must be changed.

Checking the wiring of the auxiliary voltage transformer (options +G396, +G397, +G398 and +G415)

The connections of the auxiliary voltage transformer (T10) are made at the factory. Check that the connections agree with the selected option code (+G396, +G397, +G398) or the used main voltage (+G415). If not, change the connection wire to the correct voltage terminal.

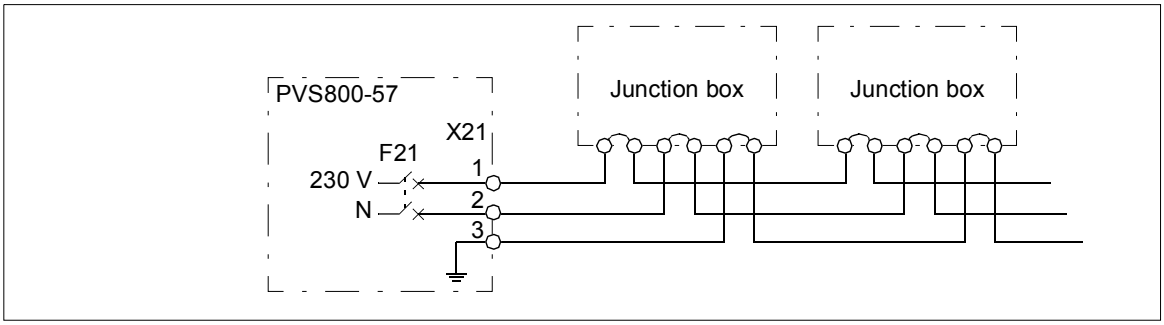


Connecting the DC current measurement signals to an external controller (option +G416)

This table shows the terminals for connecting the DC current measurement signals (0…4 V) to an external controller. The terminals for connecting the grounding wires are X50:9 and X50:29. For DC input options +4H382 and +5H382, the terminal block is located in the first incoming cubicle (DCU1). For the other DC input options, the terminal block is located in the second incoming cubicle (DCU2). Lead the control cables to the applicable incoming cubicle through the bottom lead-through.

Number of DC input	DC input fuse	Current measurement output terminal
1	F3:1	X50:11
2	F3:2	X50:12
3	F3:3	X50:13
4	F3:4	X50:14
5	F3:5	X50:15
6	F3:6	X50:16
7	F3:7	X50:17
8	F3:8	X50:18
9	F3:9	X50:19
10	F3:10	X50:20
11	F3:11	X50:31
12	F3:12	X50:32
13	F3:13	X50:33
14	F3:14	X50:34
15	F3:15	X50:35
16	F3:16	X50:36
17	F3:17	X50:37
18	F3:18	X50:38
19	F3:19	X50:39
20	F3:20	X50:40

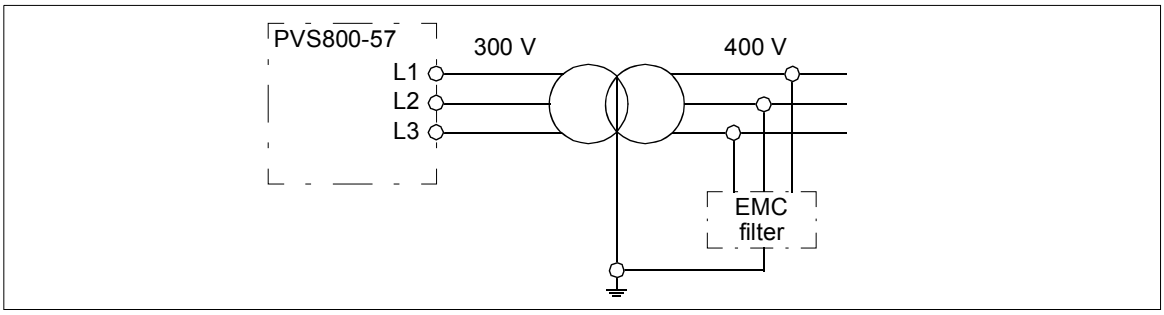
Connecting the junction box power supply (option +G410)



The maximum allowed current that can be connected to the power supply is 6 A.

Connecting the EMC filter (option +E216)

Connect the EMC filter on the network side of the low voltage transformer.



Connecting the control cables

External control cable connections to the RMIO board terminals of the inverter are shown below. For more information, see the firmware manual.

Default I/O connection diagram (RDCU – A43)

The external control cable connections to the RMIO board for the PVS800 solar inverter master control program with default settings are shown below (program version GSXR7360 and later).

Terminal block size:
cables 0.3 to 3.3 mm^2 (22 to 12 AWG)
Tightening torque:
0.2 to 0.4 N·m
(0.2 to 0.3 lbf·ft)

RMIO

X20

1	VREF-	Reference voltage -10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	

X21

1	VREF+	Reference voltage 10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	
3	AI1+	DC current measurement -10 … 10 V
4	AI1-	
5	AI2+	Grounding current measurement. 4…20 mA, R_{in} = 100 ohm [4]
6	AI2-	
7	AI3+	Solar generator DC voltage measurement. 0(4)…20 mA, R_{in} = 100 ohm
8	AI3-	
9	AO1+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
10	AO1-	
11	AO2+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
12	AO2-	

X22

1	DI1	Reset
2	DI2	By default, not in use. [1]
3	DI3	AC and DC overvoltage protection
4	DI4	DC cable overcurrent protection
5	DI5	By default, not in use [5]
6	DI6	Status of the emergency stop circuit
7	+24VD	+24 V DC max. 100 mA
8	+24VD	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DIIL	DC grounding acknowledgement [4]

X23

1	+24V	Auxiliary voltage output and input, non-isolated, 24 V DC 250 mA [2]
2	GND	

X25

1	RO1	Relay output 1: By default, not in use. With option +Q951 reserved. [3]
2	RO1	
3	RO1	

X26

1	RO2	Relay output 2: Fault indication [6] 1 = No fault 0 = Fault
2	RO2	
3	RO2	

X27

1	RO3	Relay output 3: Grounding switch control [4]
2	RO3	
3	RO3	

1) Can be configured for Start/Stop or other use with parameter settings.
2) Total maximum current shared between this output and the optional modules installed on the board.
3) Can be configured with parameter settings for resetting the emergency stop circuit with the emergency stop reset button on the cabinet door (option +Q951 in PVS800-57-0100kW, -0250kW and -0315kW units).
4) Used only with options +F282 and +F283.
5) Transformer trip (MWS)
6) Can be configured with parameter 66.03 DO2.

Default I/O connection diagram (RDCU – A41)

The external control cable connections to the RMIO board for the PVS800 solar inverter control program with default settings are shown below (program version ISXR7360 and later).

Terminal block size:
cables 0.3 to 3.3 mm^2 (22 to 12 AWG)
Tightening torque:
0.2 to 0.4 N·m
(0.2 to 0.3 lbf·ft)

RMIO

X20

1	VREF-	By default, not in use. -10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	

X21

1	VREF+	By default, not in use. 10 V DC, 1 kohm ≤ R_L ≤ 10 kohm
2	AGND	
3	AI1+	Insulation resistance measurement 0 … 10 V (option +Q954), R_{in} = 200 kohm
4	AI1-	
5	AI2+	AC cubicle ambient temperature measurement 4...20 mA ≙ -30…+80 °C.
6	AI2-	
7	AI3+	DC cubicle ambient temperature measurement. 4...20 mA ≙ -30…+80 °C.
8	AI3-	
9	AO1+	Fan speed control for LCL filters. 0(4)…20 mA, R_L ≤ 700 ohm
10	AO1-	
11	AO2+	By default, not in use. 0(4)…20 mA, R_L ≤ 700 ohm
12	AO2-	

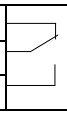
X22

1	DI1	Fan acknowledgement and LCL filter temperature supervision
2	DI2	Run enable. 0 = Inverter run is disabled 1 = Inverter run is enabled
3	DI3	Status of the AC contactor K1.1. 0 = Open, 1 = Closed
4	DI4	Ground fault supervision (options +Q954, +Q976 and +Q981)
5	DI5	By default, not in use.
6	DI6	Status of the 24 V auxiliary power buffer. 0 = Buffer is not full, 1 = Buffer is full
7	+24VD	+24 V DC max. 100 mA
8	+24VD	
9	DGND1	Digital ground
10	DGND2	Digital ground
11	DIIL	By default, not in use.

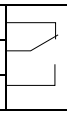
X23

1	+24V	Auxiliary voltage output and input, non-isolated, 24 V DC 250 mA [1]
2	GND	

X25

1	RO1	 Relay output 1: Charging contactor control
2	RO1	
3	RO1	

X26

1	RO2	 Relay output 2: Control of the AC contactor K1.3
2	RO2	
3	RO2	

X27

1	RO3	 Relay output 3: Control of the AC contactor K1 / K1.1.
2	RO3	
3	RO3	

1) Total maximum current shared between this output and the optional modules installed on the board.

Default I/O connections (RDIO on RDCU – A41)

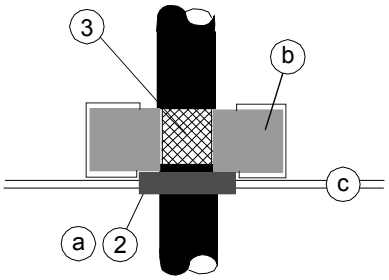
The default connections of the RDIO-01 digital I/O extension modules inserted on the inverter control unit are shown below.

Digital input/output	RDIO terminal	Description		
		100 kW and 250 kW units	**500 kW and 630 kW units**	**875 kW and 1000 kW units**
RDIO-01 no. 1 on Slot 2 – A412				
Digital input 1	X11:DI1	Status of the DC contactor K2. 0 = Open 1 = Closed	Status of the DC contactor K2.1. 0 = Open 1 = Closed	Status of the DC contactor K2.1. 0 = Open 1 = Closed
Digital input 2	X12:DI2	-	Status of the DC contactor K2.2. 0 = Open 1 = Closed	Status of the DC contactor K2.2. 0 = Open 1 = Closed
Digital input 3	X12:DI3	Status of the grid monitoring relay (options +Q969, +Q974, +Q975 and +Q980) 0 = Grid is not OK 1 = Grid is OK	Status of the grid monitoring relay (options +Q969, +Q974, +Q975 and +Q980) 0 = Grid is not OK 1 = Grid is OK	Status of the grid monitoring relay (options +Q969, +Q974, +Q975 and +Q980) 0 = Grid is not OK 1 = Grid is OK
Relay output 1	X21:RO1	Control of the DC contactor K2.	Control of the DC contactor K2.1.	Control of the DC contactor K2.1
Relay output 2	X22:RO2	-	Control of the DC contactor K2.2.	Control of the DC contactor K2.2
RDIO-01 no. 2 on Slot 1 – A411				
Digital input 1	X11:DI1	-	Status of the AC contactor K1.2. 0 = Open 1 = Closed	Status of the AC contactor K1.2. 0 = Open 1 = Closed
Digital input 2	X12:DI2	-	-	Status of the AC contactor K1.3. 0 = Open 1 = Closed
Digital input 3	X12:DI3	-	-	Status of the DC contactor K2.3. 0 = Open 1 = Closed
Relay output 1	X21:RO1	-	Control of the AC contactor K1.2	Control of the AC contactor K1.2
Relay output 2	X22:RO2	-	-	Control of the DC contactor K2.3

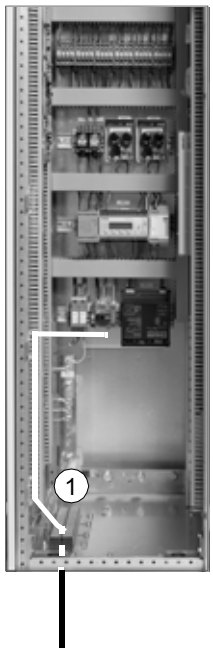
Connection procedure

Making 360 degrees grounding at the cabinet lead-through for the control cables

1. Loosen the EMI conductive cushions.
2. Cut adequate holes to the rubber grommets in the lead-through plate and lead the cables through the grommets and the cushions into the cabinet.
3. Strip off the cable plastic sheath above the lead-through plate just enough to ensure proper connection of the bare shield and the EMI conductive cushions.
4. Tighten the EMI conductive cushions around the bare shield.



Side view of the cable lead-through
a) Grommet
b) EMI conductive cushion
c) Lead-through plate

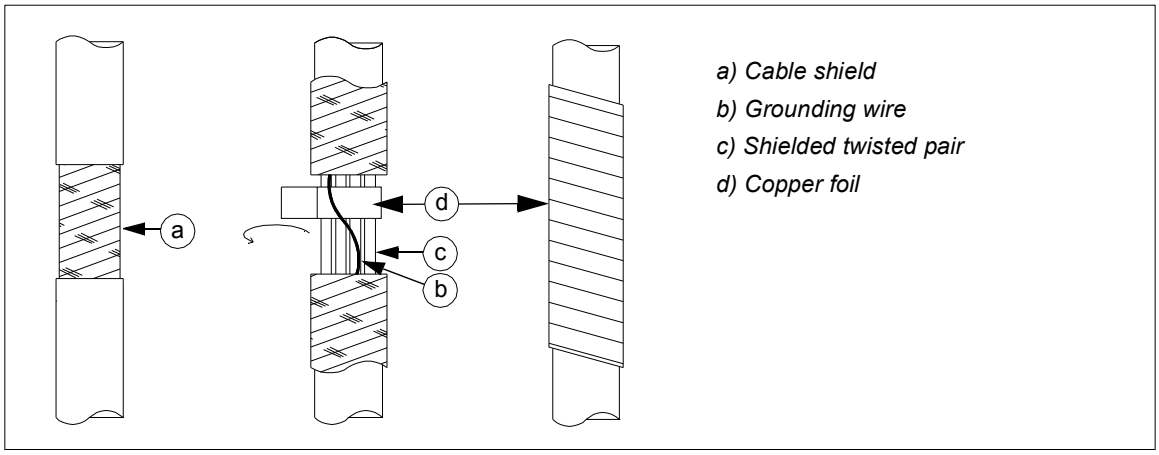


Control cable routing (Auxiliary control cubicle of PVS800-57-0250kW and -0315kW)

Control cable routing (Auxiliary control cubicle of PVS800-57-0500kW, -630kW, -0875kW and -1000kW)

Note: If the outer surface of the shield is non-conductive:

- Cut the shield at the midpoint of the bare part. Be careful not to cut the conductors or the grounding wire (if present).
- Turn the shield inside out to expose its conductive surface.
- Cover the turned shield and the stripped cable with copper foil to keep the shielding continuous.



Connecting the cables to the I/O terminals

Connect the conductors to the appropriate detachable terminals of the RMIO board (see pages *92* and *93*). At the terminal block, use shrink tubing or insulating tape to contain any stray strands. The shield (especially in case of multiple shields) can also be terminated with a lug and fastened with a screw at nearest grounding clamp. Leave the other end of the shield unconnected or ground it indirectly via a few nanofarads high-frequency capacitor, eg, 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.Tighten the screws to secure the connection.
Note: Keep any signal wire pairs twisted as close to the terminals as possible. Twisting the wire with its return wire reduces disturbances caused by inductive coupling.

Connecting a PC

For connecting a PC to the inverter during the start-up procedure, see chapter *Start-up*.

For normal use, connect the PC through a fiber optic link to CH3 of the RDCO module inserted in the master control unit (A43).

Installing optional modules

Mechanical installation

Optional modules such as fieldbus adapters and I/O extensions are inserted in the optional module slot on the RDCU control unit at the factory. The module is fastened with a screw. See page *52* for the available slots.

Note: Correct installation of the screw is essential for fulfilling the EMC requirements and for proper operation of the module.

Wiring the modules

See the appropriate optional module manual for specific installation and wiring instructions.

7

Installation checklist

Contents of this chapter

This chapter contains a list for checking the mechanical and electrical installation of the inverter.

Checklist

Go through the checks below with another person. Obey the *Safety instructions* given on the first pages of this manual.

	Check that…
MECHANICAL INSTALLATION	
☐	There is sufficient free space around the unit. (See page *132*.)
☐	The ambient operating conditions are allowed. (See page *144*.)
☐	The unit is properly fastened to the floor and wall. (See *Mechanical installation*)
☐	The cooling air is able to flow freely and cooling air volume is sufficient.
ELECTRICAL INSTALLATION (See *Electrical installation*)	
☐	The capacitors are reformed if stored over one year (refer to *Capacitor reforming instructions* (3BFE64059629 [English]).
☐	The inverter is grounded properly.
☐	The AC line voltage matches the nominal output voltage of the inverter.

Check that…

- ☐ The AC transformer is suitable for use with the inverter. (See section *Selecting the transformer*, page *73*.)
- ☐ The insulation of the assembly is sufficient. (See section *Checking the insulation of the assembly*, page *83*.)
- ☐ The AC power system is an IT (ungrounded) system.
- ☐ The AC power cable connections at L1, L2 and L3 and their tightening torques are OK.
- ☐ The DC power cable connections at UDC+ and UDC– and their tightening torques are OK.
- ☐ The power cables are routed away from other cables. (See section *Routing the cables*, page *78*.)
- ☐ The auxiliary power supply cable connections at Q10 and their tightening torques are OK.
- ☐ In units with option +G396, +G397 or +G398, the auxiliary voltage level matches the option code and wiring of the transformer.
- ☐ The external control connections to the inverter are OK (including emergency stop, fieldbus etc.).
- ☐ The cable connections at the junction box and their tightening torques are OK.
- ☐ The EMC filter (option +E216) is correctly installed, if present.
- ☐ There are no tools, foreign objects or dust from drilling inside the modules or the cabinet.
- ☐ All shrouds and covers are in place.

8

Start-up

Contents of this chapter

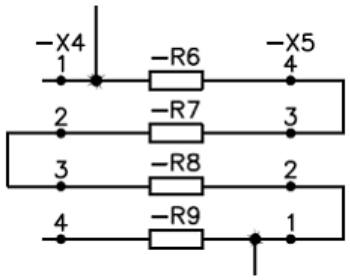
This chapter describes the start-up procedure of the inverter. It also gives some advice for operation.

Start-up procedure

The functioning of the inverter is first tested in the local control mode with the control panel (CDP312R). Thereafter, the control program parameters are set. The start-up procedure is described step-by-step in the table below.

SAFETY		
☐	**WARNING!** Obey the safety instructions during the installation and start-up procedure. See chapter *Safety instructions*.	
☐	Only qualified electricians are allowed to install and start-up the inverter.	
PRIMARY AND AMBIENT CONDITION CHECKS		
☐	Check that the mechanical and electrical installation of the inverter is OK. See chapter *Installation checklist*.	
☐	Check that the insulation of the assembly is OK. See section *Checking the insulation of the assembly*, page *83*.	**Note:** If the insulation is not OK, the optional insulation resistance monitoring (option +Q954, +Q976 or +Q981) cannot be tuned properly.
☐	Check that the ambient conditions for start-up, temperature and humidity level is within the limits. See section *Ambient conditions*, page *144*. **Note:** Depending on the humidity level or temperature, it can be necessary to use cabinet heaters continuously for a longer time before start-up.	

☐	Set up the cabinet heater (option +G300): • Set the maximum temperature with the T65 thermostat (default 10 °C). **Note:** Especially in very humid conditions when the inverter is installed on the site for a longer period without grid connection keep the cabinet heaters on for several days before commissioning.	
☐	Choose the control mode by connecting the heater power supply wire to one of the three terminals listed below: • X5:3 = Heating is switched off by the T65 thermostat and when the inverter is modulating. • X5:4 = Heating is controlled by the K65 customer control relay 24 V DC control signal and by the T65 thermostat. • X5:5 = Heating is only controlled by the T65 thermostat.	The optional cabinet heater has three control modes (see circuit diagram sheets 64 and 65 delivered with the inverter). The control mode can be selected by changing the heater power supply wire in the auxiliary control cabinet. More information: Circuit diagrams delivered with the inverter
☐	Check that it is light enough for the inverter to be able to feed power to the AC power system (grid) once it is operating.	**Note:** There must be enough light so that the solar generator is able to feed power to the inverter. This enables verifying that the inverter functions properly. Parameter settings can be done during the dark hours. Also, the inverter modulation can be tested without input power from the photovoltaic arrays.
☐	Check that the polarity and voltage of each connected DC solar string is correct: • Remove the inverter DC fuses. • Measure that the plus pole is connected to the plus terminal and the minus pole to the minus terminal and the voltage is correct. • Put the DC fuses back into their place.	**Note**: There should be a record/document stating that the polarity and voltage of each solar string is correct.
☐	Verify the expected DC voltage. Check that the open circuit DC voltage from the solar generator lies within the allowed range of the inverter (eg, 450…1000 V DC).	**Note**: The expected DC voltage can be estimated by using the open circuit voltage of the solar modules and the number of modules in a string.
SETTING UP THE INSULATION MONITORING DEVICE (options +Q954, +Q976 and +Q981)		
☐	Check that there is only one insulation monitoring device for the inverter in the same galvanically connected IT system.	**Note**: Using more than one insulation monitoring device in the galvanically connected IT system will cause false results in the insulation measurement.
☐	Check that the settings of the insulation monitoring device suit the installation and agree with the local regulations. The trip limit is adjusted to 30 kohm at the factory by default.	More information: • Circuit diagrams delivered with the inverter • Insulation monitoring device manufacturer's operating manual
SETTING UP CURRENT TRANSDUCERS (option +G417) FOR ALL DC INPUTS		
☐	Adjust monitoring settings for DC current measurements.	See the firmware manual.

ADJUSTING GROUNDING RESISTANCE FOR POSITIVE OR NEGATIVE POLE GROUNDING (options +F282 and +F283)		
	By default, the grounding resistance is set to 3 kohm. If needed, modify the resistor configuration on the PGND-02 (A20) board as follows: • **WARNING!** Make sure that the voltage is disconnected and the DC main switch (Q2) is open. • Remove the shroud protecting the board. • Rewire the jumper wires on terminals X4 and X5.	
PARAMETER SETTINGS BEFORE FIRST START		
☐	Make the parameter settings needed before the first start according to the firmware manual.	See the start-up section in the firmware manual.
FIRST START (local control mode)		
☐	Measure and record the DC voltage from the solar generator. -100kW units with optional miniature circuit breakers (+H377): Open the miniature circuit breakers. Measure and record all DC inputs.	**Note**: The expected and measured DC voltages should be roughly equal.
☐	-100kW units with optional miniature circuit breakers (+H377): Close the miniature circuit breakers.	
☐	Close the AC and DC main switches.	

☐	Switch on the auxiliary power.	The control boards and the CDP312R control panel should “wake up”. The inverter is in the stand-by mode if no faults are active. This is indicated by the STAND BY text on the control panel. For descriptions of the inverter modes, refer to the firmware manual.
		`1 -> 654.0 V`
		`STATE STAND BY`
		`AC POWER 0.0 kW`
		`AC CURR1 0 A`
		Note: There may be fault and warning indications flashing on the display. They will be reset during the next steps.

☐	Ensure that the control panel is controlling the master control unit (A43) by checking the node number from the display.	See the firmware manual.
☐	Units with optional emergency stop function (+Q951): Release the emergency stop button and reset the emergency stop circuit.	
☐	Units with optional positive/negative grounding (+F282/+F283): Configure the grounding option.	See the firmware manual.
☐	Reset all faults on both control boards.	See the firmware manual.
☐	Check that the DC voltage of the solar generator matches the value of 01.34 PV MODULE DC MEAS in the Master control program.	**Note**: If the DC voltage differs from the parameter value, do not try to start the inverter. Contact ABB.

☐ Check that the inverter is in local control mode, ie, letter L is at the top row of the control panel display. If not, press the control panel key (LOC/REM).

```
 1 L ->      654.0 V
STATE       STAND BY
AC POWER    0.0 kW
AC CURR1      0 A
```

☐ Start the inverter by pressing the control panel key (I).

Description of the events in a normal starting procedure

After receiving the start command, the inverter goes to the SLEEP mode.

```
 1 L ->      598.0 V I
STATE       SLEEP
AC POWER    0.0 kW
AC CURR1      0 A
```

If there is enough DC voltage available, the inverter starts with the START ISU mode after a delay defined by parameter group 31 (the default delay is 10 minutes).

```
 1 L ->     617.0 V I
STATE       START ISU
AC POWER    0.0 kW
AC CURR1      0 A
```

In this mode the inverter charges the DC capacitors from the AC output and synchronizes to the grid. The DC contactor closes. The inverter goes to the MPPT mode and starts to produce active power to the AC output.

```
 1 L ->     570.0 V    I
STATE       MPPT
AC POWER   20.0 kW
AC CURR1     39 A
```

When there is not enough DC voltage and/or power available, the inverter goes back to the SLEEP mode after a delay defined by parameter group 31.

It may be useful to shorten the delays during the start-up temporarily. Wake-up and sleep levels should match the available DC voltage.

☐ Check that the inverter operates properly from the following actual value parameters in the master control program:

- 01.34 PV MODULE DC MEAS
- 01.10 AC POWER
- 01.07 AC CURRENT L1.

The DC voltage should have dropped from the open circuit voltage and the active power should match the line current and the AC voltage.

Example display:

```
 1 L ->      500.0 V I
STATE       MPPT
AC POWER 102.0 kW
AC CURR1    197 A
```

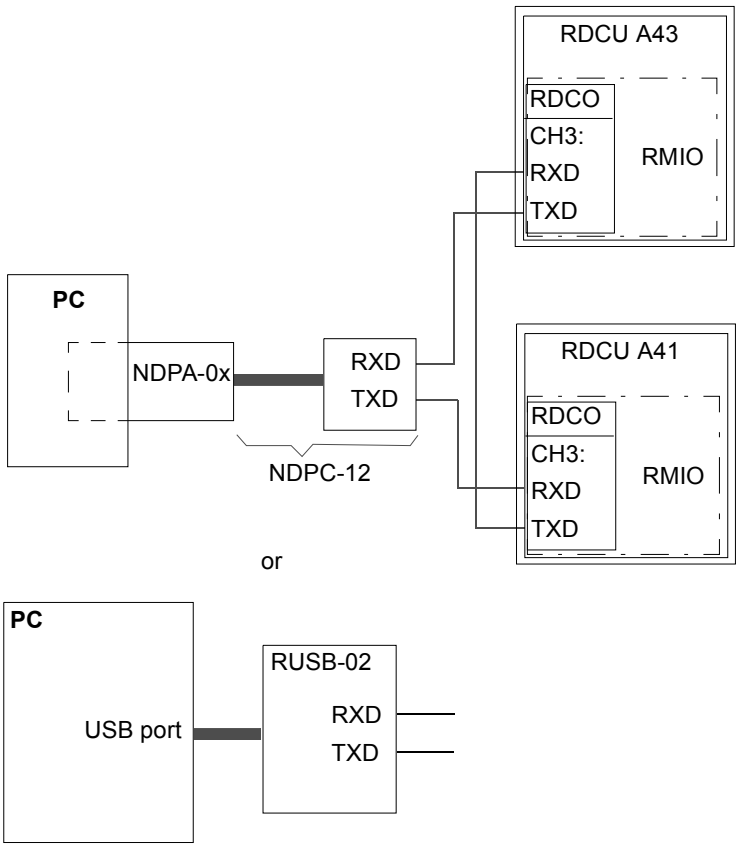
☐ Stop the inverter by pressing the control panel key (O).

Note: Some grid-related functions like the low voltage ride-through and grid monitoring will start to work only after the inverter has been started and stopped once.

☐	Set parameter 98.08 AUTO LINE ID RUN to NO.	This parameter setting prevents an unnecessary ID run in case of auxiliary power loss of the control board. **Note:** If the phase order changes, set 99.07 LINE SIDE ID RUN to YES to run the ID run once. See the firmware manual.
SETTING UP FIELDBUS CONTROL (option +K454, +K458, +K466, or +K467)		
☐	Set the fieldbus parameters of the master control program according to the external controller.	See *PVS800 central inverters firmware manual* (3AUA0000058422 [English]) and the appropriate fieldbus adapter module manual.
☐	Check that the inverter can be seen from the PLC.	
☐	Check that you can read the signals from the inverter.	
☐	Check that you can start and stop the inverter.	
☐	Test control and actual values.	
REGISTERING THE INVERTER		
☐	Fill a commissioning report for registering the inverter. You can find the report on the InstalledBase web page http://www180.abb.com:8010/logistics/InstalledBase/Pages/InstalledBase.aspx If you do not have access to InstalledBase, submit a Membership Request on the Installed Base main page. Note that InstalledBase is only for ABB internal or ABB partner use. **Note:** It is recommended to attach the parameter lists and back-up files of the inverter and master control program to the report as well.	

Connecting DriveWindow

If the DriveWindow PC tool is used in the start-up procedure, proceed as follows.

☐	Connect the PC to the inverter in a ring as shown below: 	
☐	Start the DriveWindow program and connect to the inverter by choosing ABB.SMP OPC server.	**Note:** If all connected control units are not seen through the optical ring, check that the node address of each RMIO board is set properly. Connect optical fibers to channel CH3 in each RMIO board and change parameter 70.15 CH3 NODE ADDR accordingly. **Note:** The new node address becomes valid only after the next power-up of the RMIO board.
☐	Open the parameter window from the DriveWindow program.	

Configuring the NETA-01 Ethernet adapter module

See *NETA-01 Ethernet adapter module user's manual* (3AFE64605062 [English]).

Configuring the NETA-21 remote monitoring tool

See *NETA-21 remote monitoring tool user's manual* (3AUA0000096939 [English]).

9

Fault tracing

Contents of this chapter

This chapter describes the fault tracing possibilities of the inverter.

LEDs

This table describes LEDs of the inverter.

Where	LED	When the LED is lit
RMIO board (A41)	Red	Inverter in fault state
	Green	The power supply on the board is OK.
RMIO board (A43)	Red	Inverter in fault state
	Green	The power supply on the board is OK.
Control panel mounting platform	Red	Inverter in fault state
	Green	The main + 24 V power supply for the control panel and the RMIO board is OK.
AINT board	V204 (green)	+5 V voltage of the board is OK.
	V309 (red)	Not in use.
	V310 (green)	IGBT control signal transmission to the gate driver control boards is enabled.

Warning and fault messages displayed by the CDP-312R control panel

The control panel displays the warnings and faults of the inverter control unit that it is currently controlling. Flashing messages WARNING, ID:2 or FAULT, ID:2 on the control panel display indicate a warning or fault at the other control unit. To display the warning or fault identification text, switch the control panel to view the other control unit.

See *PVS800 central inverters firmware manual* (3AUA0000058422 [English]) for the descriptions, causes and remedies of the warning and fault messages.

Fault: Same ID numbers

If the ID numbers of the two control units are set equal, the control panel stops functioning. To clear the situation:

- Disconnect the panel cable from the master control unit RMIO board (A43).
- Set the ID number of the inverter control unit RMIO board (A41) to 2. For the setting procedure, see the *PVS800 central inverters firmware manual* (3AUA0000058422 [English]).
- Connect the disconnected cable to the RMIO board of the master control unit (A43) again and set its ID number to 1.

Fault tracing of the insulation monitoring device (options +Q954, +Q976 and +Q981)

Refer to section *Implementing ground fault monitoring in IT (ungrounded) systems*, page *81*.

10

Maintenance

Contents of this chapter

This chapter contains preventive maintenance instructions of the inverter.

Maintenance intervals

If installed in an appropriate environment, the inverter requires very little maintenance. The tables below lists the routine maintenance intervals recommended by ABB. The recommended maintenance intervals and component replacements are based on specified operational and environmental conditions.

Note: Long-term operation near the specified maximum ratings or environmental conditions may require shorter maintenance intervals for certain components.

The tables below contain user tasks. For tasks to be performed by ABB and more details on the maintenance, consult your local ABB Service representative. On the Internet, go to http://www.abb.com/searchchannels.

Descriptions of symbols

Action	Description
I	Visual inspection and maintenance action if needed
P	Performance of on/off-site work (commissioning, tests, measurements or other work)
R	Replacement of component if ambient temperature is below 40 °C (104 °F) and there is no cyclic heavy load and no continuous nominal load.

Recommended annual maintenance actions by the user

ABB recommends these annual inspections to ensure the highest reliability and optimum performance.

Action	Target
I	Air inlet and outlet meshes on the cabinet doors
R	Air filters on the cabinet doors
P	Quality of supply voltage
I	Spare parts
P	Capacitor reforming, spare modules and spare capacitors
I	Tightness of terminals
I	Dustiness, corrosion or temperature
I	Heat sink

Recommended maintenance intervals after start-up

Component	Years from start-up							
	3	6	9	12	15	18	20	21
Cooling [1]								
Main cooling fan of inverter module		R		R		R		
Cooling fan of LCL filter		R		R		R		
Cabinet cooling fan (roof)		R		R		R		
Cabinet cooling fan (door)		R		R		R		
Inverter unit								
DC circuit electrolytic capacitors and discharging resistors [2]							R	
Main circuit interface board [2]				R				
Flat ribbon cables				R				
Control								
Memory back-up battery in APBU branching unit		R		R		R		
Cabinet temperature measurement sensor and transmitter check (DRMU-W)	I	I	I	I	I	I		I
24 V DC buffer [3]			R	R		R		
Connections and environment								
Quick connector of converter module			R	I		R		
Checking and cleaning of power connections	I	I	I	I	I	I		I

4FPS10000027105

1) If the inverter is continuously used for reactive power compensation during the night, halve the replacement interval accordingly. If reactive power compensation is used only partially, check the operating hours of fans in the Inverter control program parameter 01.31 FAN ON-TIME. Reset the counter when the fans are replaced.

2) Estimated maintenance interval in ideal conditions: ambient temperature between 0…40° C (104 °F), indoor conditioned (IEC62109), and no cyclic heavy load.

3) If operation temperature is continuously below 40° C (104 °F), replacement after 12 years. If above 40° C, replacement after 9 years. Contact ABB for replacement.

Cleaning the interior of the cabinet

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

WARNING! Use a vacuum cleaner with an antistatic hose and nozzle. Using a normal vacuum cleaner creates static discharges which can damage circuit boards.

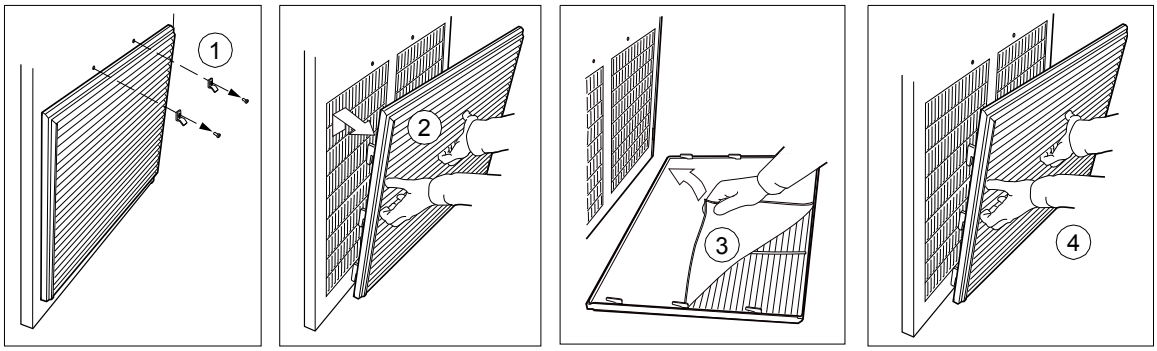
1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. When necessary, clean the interior of the cabinet with a soft brush and a vacuum cleaner.
3. Clean the air inlets and outlets of the fans.
4. Check the air inlet filters of the cabinet. Replace when necessary; see section *Replacing the air filters* below.

Replacing the air filters

Check the air filters and replace if necessary (see section *Losses, cooling data and noise* on page *133* for the correct filter types).

Inlet (door) filters

1. Remove the fasteners at the top of the grating.
2. Lift the grating and pull it away from the door.
3. Replace the air filter mat.
4. Install the grating in reverse order.



Cleaning the heatsink

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

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the inverter cubicle door.
3. Extract the inverter module from the cabinet as described in section *Replacing the inverter module (frames R8i, 2 × R8i, 3 × R8i)*.
4. Remove the module cooling fan as described in section *Fans* below.
5. Blow clean, dry compressed air (not humid) from bottom to top and simultaneously use a vacuum cleaner at the air outlet to trap the dust. **Note:** Prevent the dust from entering adjoining equipment.
6. Refit the cooling fan.

Checking and cleaning the power connections (R8i, 2 × R8i, 3 × R8i)

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the inverter cubicle door.
3. Extract one inverter module from the cabinet as described in section *Replacing the inverter module (frames R8i, 2 × R8i, 3 × R8i)*.
4. Check the tightness of the busbar connections at the quick connector. Use the tightening torque tables in chapter *Technical data*.
5. Clean all contact surfaces of the quick connector and apply a layer of suitable joint compound (eg, Isoflex® Topas NB 52 from Klüber Lubrication) onto them.
6. Re-insert the inverter module.
7. Repeat steps 4 to 7 for all remaining inverter modules.

Fans

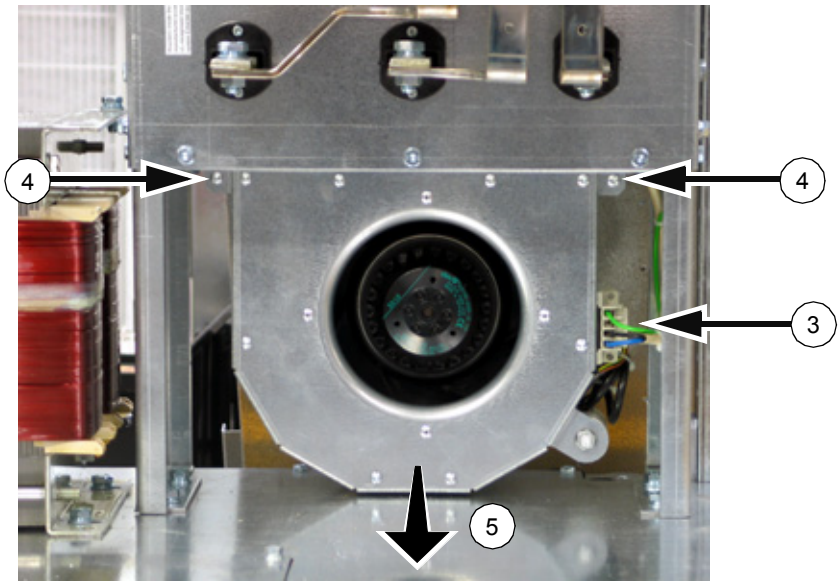
The cooling fan lifespan depends on the inverter usage and ambient temperature. See the firmware manual for an actual signal which indicates the hours of usage of the fan.

Fan failure can be predicted by the increasing noise from fan bearings and the gradual rise in the heatsink temperature in spite of heatsink cleaning. If the inverter is operated in a critical part of a process, fan replacement is recommended once these symptoms start appearing. Replacement fans are available from ABB. Do not use other than ABB-specified spare parts.

Replacing the LCL filter cooling fan (R7i)

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

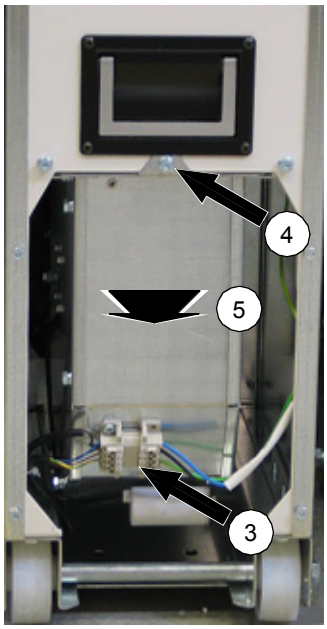
1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the LCL filter cubicle door.
3. Disconnect the wire plug.
4. Remove the two screws holding the fan unit.
5. Pull the fan unit out.
6. Install new fan in reverse order.



Replacing the LCL filter cooling fan (R8i, 2 × R8i, 3 × R8i)

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

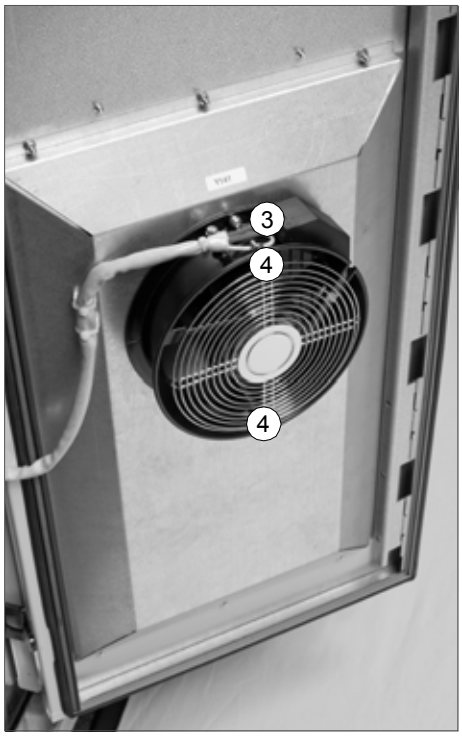
1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the LCL filter cubicle door.
3. Disconnect the fan wiring plug.
4. Undo the screw of the fan fastening clip.
5. Pull the fan out.
6. Install a new fan in reverse order.



Replacing the door fans

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

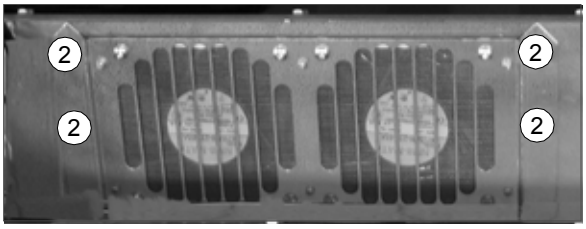
1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the cubicle door.
3. Disconnect the fan supply wires.
4. Undo the fan fastening screws.
5. Install a new fan in reverse order.

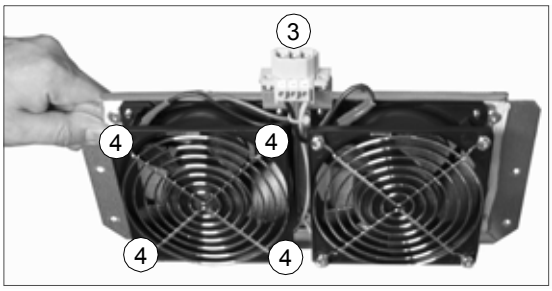


Replacing the cabinet roof fans (R8i)

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Undo the four fastening screws of the fan assembly plate.
3. Disconnect the fan wiring plug.
4. Undo the fan fastening screws.
5. Disconnect power supply and PE wires.
6. Install a new fan in reverse order.

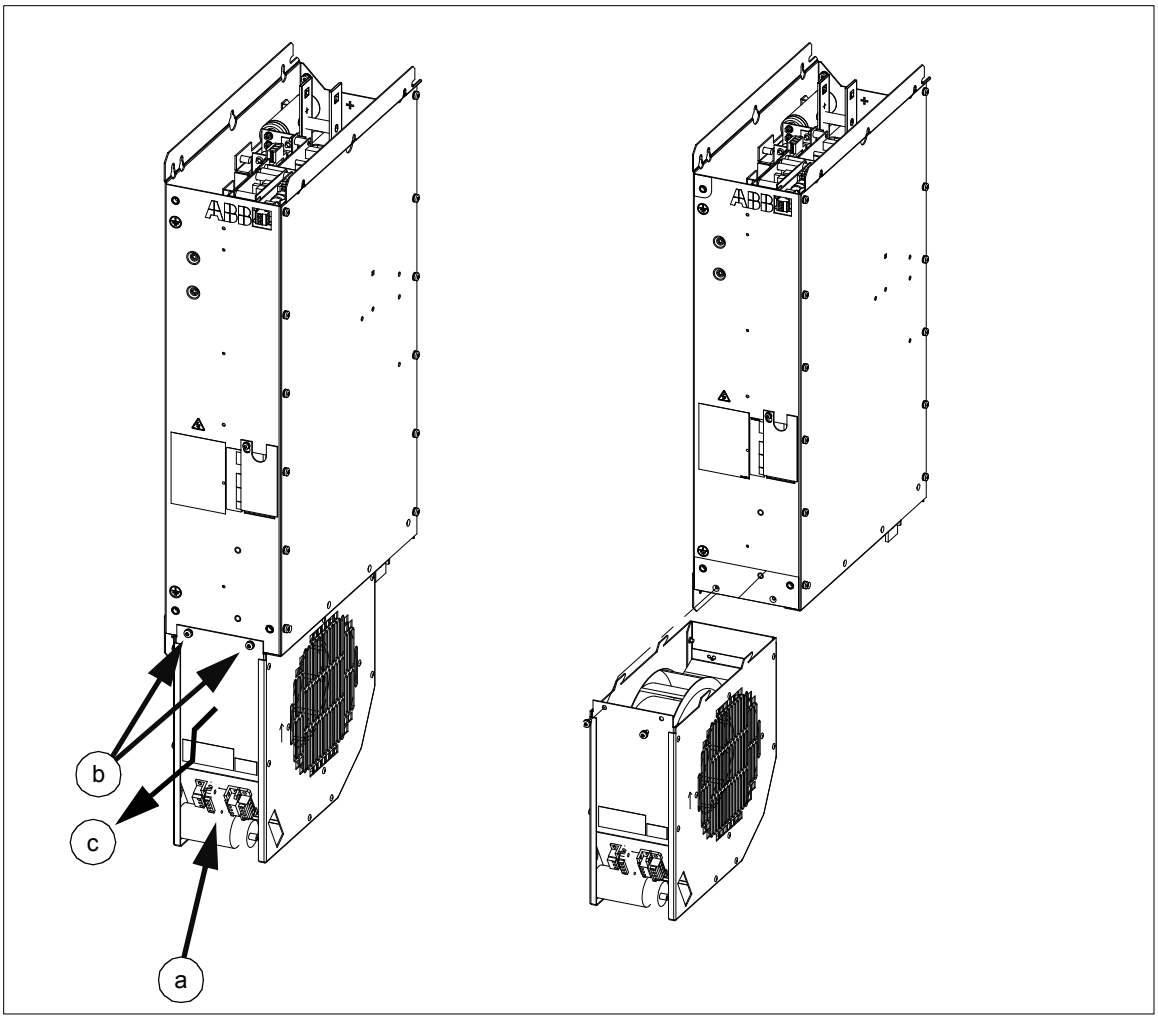




Replacing the cooling fan of the inverter module (R7i)

WARNING! Obey the safety instructions, page 11. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

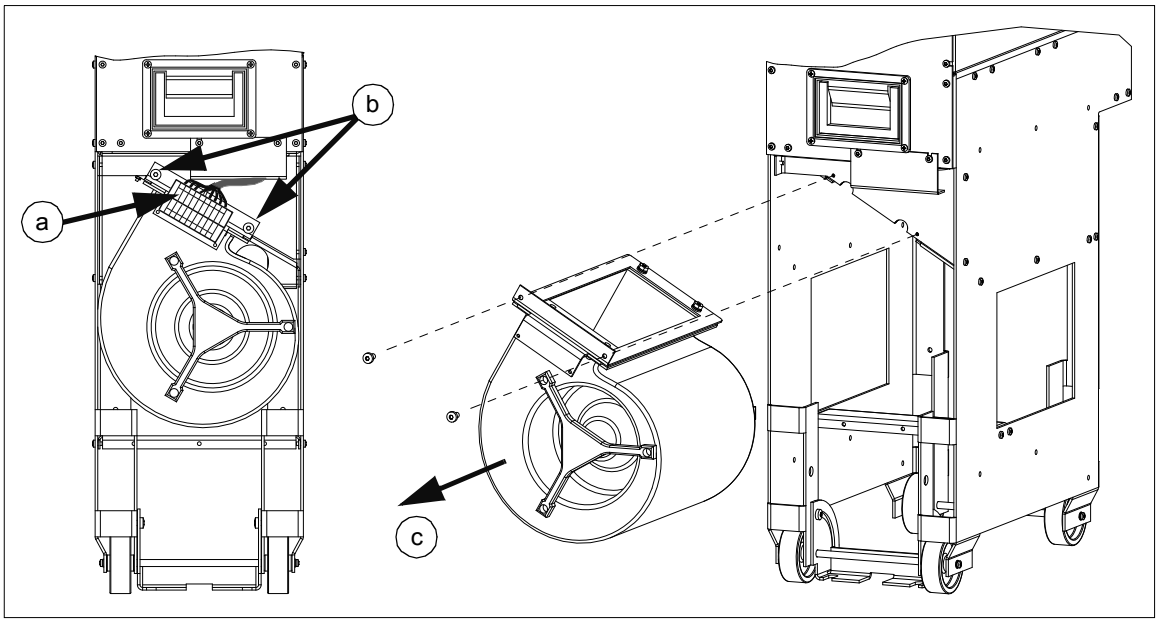
1. Stop the inverter and do the steps in section *Precautions before electrical work* on page 12 before you start the work.
2. Open the inverter cubicle door.
3. Disconnect the wire plug (a).
4. Remove the two screws holding the fan unit (b).
5. To free the fan, pull it slightly outwards, then downwards (c).
6. Install new fan in reverse order.



Replacing the cooling fan of the inverter module (R8i, 2 × R8i, 3 × R8i)

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the inverter cubicle door.
3. Disconnect the fan wiring plug (a).
4. Remove the locking screws (b).
5. Pull the fan out along its sliding rails (c).
6. Install new fan in reverse order.

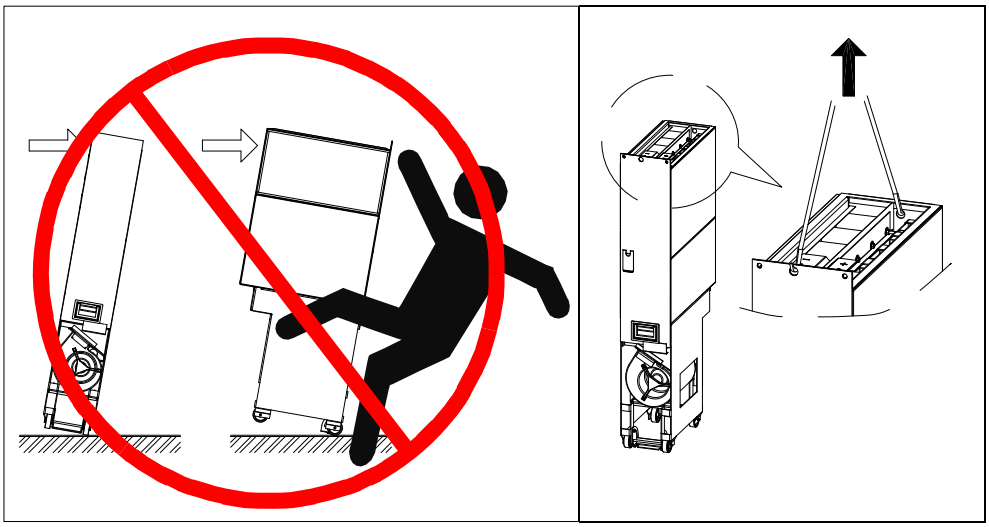


Replacing the inverter module (frames R8i, 2 × R8i, 3 × R8i)

WARNING! Obey the safety instructions, page *11*. If you ignore the instructions, physical injury or death, or damage to the equipment can occur.

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

- Use extreme caution when manoeuvering the inverter module. Extend the support legs of the module when it is removed from the cabinet! Do not tilt the module! The module is heavy and has a high center of gravity. It topples over easily if handled carelessly.
- Lift the module by the upper part only using the lifting hole(s) at the top!

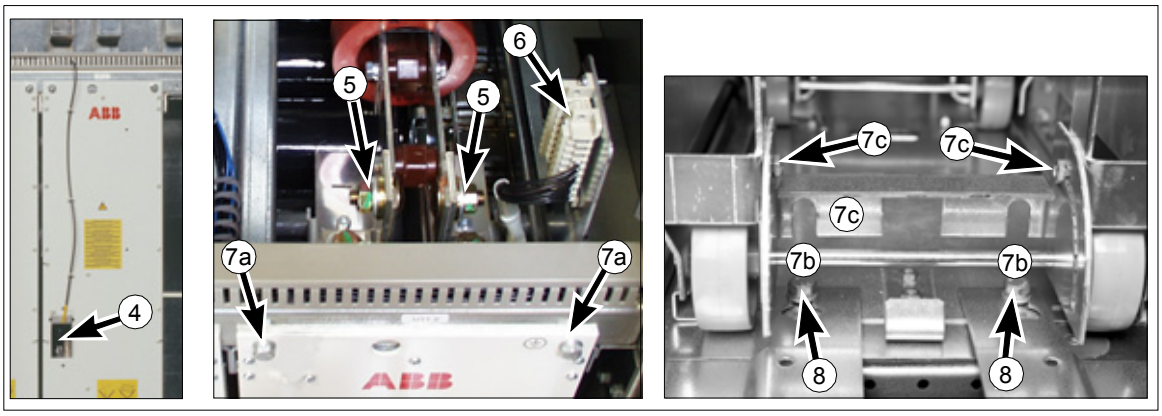


- Do not use the ramp with plinth heights over 50 mm.The ramp supplied with the inverter is designed for a plinth height of 50 mm (the standard plinth height of ABB cabinets). Tighten the four fastening bolts of the ramp carefully.

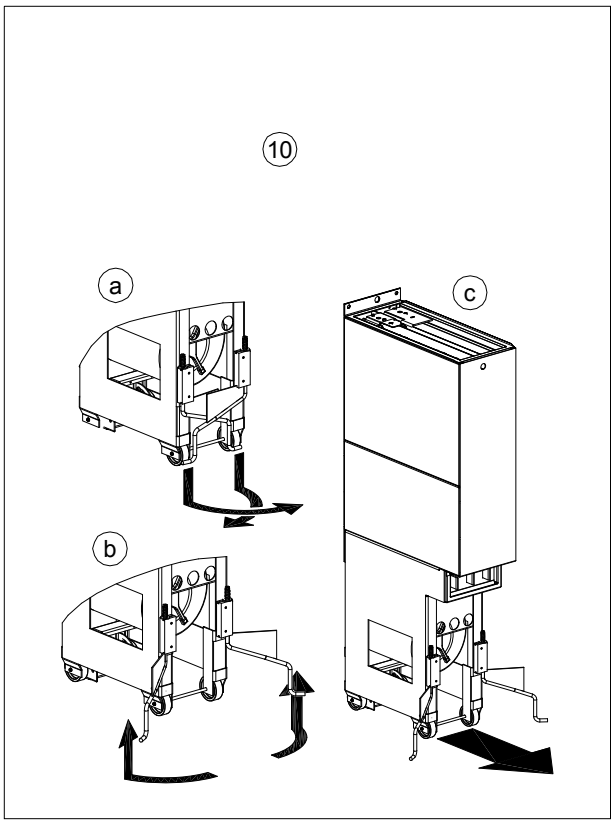
Extracting the module from the cubicle

1. Stop the inverter and do the steps in section *Precautions before electrical work* on page *12* before you start the work.
2. Open the cubicle door.
3. Remove any shrouds that protect the busbars and cable entries.
4. Open the transparent cover on the front of the inverter module (the rightmost module) and disconnect the fiber optic cables. Move the cables aside.
5. Remove the L-shaped DC busbars on top of the module.
6. Disconnect the terminal block (X50) next to the DC busbars.
7. Remove the two module fastening screws (7a) at the top. At the base of the module, loosen the two fastening bolts (7b) but leave them in place; lift the bracket (7c) and fasten it into the up position carefully.

8. Insert the module pull-out ramp under the two bolts at the base of the module and tighten the bolts carefully.



9. Pull the module carefully out of the cubicle along the ramp. Make sure the wires do not catch. While pulling on the handle, keep a constant pressure with one foot on the base of the module to prevent the module from tipping over. Use safety shoes with metal toe cap to avoid foot injury.
10. Extend the support legs of the module. Keep the legs extended until the module is about to be inserted back into the cubicle.



Inserting the module into the cubicle

1. Move the new inverter module close to the ramp, then retract the support legs of the module.
2. Push the module up the ramp back into the cubicle. Keep your fingers away from the edge of the module front plate to avoid pinching them between the module and the cubicle. Also, keep a constant pressure with one foot on the base of the module to stabilize the movement.
3. Refasten the module fixing screws at the top and reconnect the DC busbars. The tightening torque is 70 N·m for M12 screws.
4. Reconnect the cables (X50, fiber optic cables).
5. Loosen the module fastening bolts at the base of the module and remove the pull-out ramp. Flip the module fastening bracket into the down position and tighten the screws.
6. Close the cubicle door.

Replacing the LCL filter

Contact ABB.

Capacitors

The inverter intermediate circuit employs several electrolytic capacitors. Their lifespan depends on the inverter loading and ambient temperature. Capacitor life can be prolonged by lowering the ambient temperature. Capacitor life shortens in high ambient temperatures and under heavy loading.

It is not possible to predict a capacitor failure. Capacitor failure is usually followed by a mains 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.

Reforming the capacitors

Reform (re-age) spare part capacitors once a year according to *Capacitor reforming instructions* (3BFE64059629 [English]).

11

Technical data

Contents of this chapter

This chapter contains the technical data for the inverters.

Ratings

The inverter ratings are given below.

Inverter type PVS800-57-...	Frame size	Temp	Nominal ratings								
			$I_{N(AC)}$	$I_{max(DC)}$	$U_{N(AC)}$	$P_{N(AC)}$	P_{pv}	I_{sc}PV	Backfeed current *	Inrush current	
			A	A	V	kW	kW_p	A	A	A	ms
0100kW-A	R7i	40 °C	195	245	300	100	120	414	150	400	200
0250kW-A	R8i	40 °C	485	600	300	250	300	1035	270	400	200
0315kW-B	R8i	45 °C	520	615	350	315	380	1107	270	400	200
0500kW-A	2×R8i	50 °C	965	1145	300	500	600	2061	550	800	200
0630kW-B	2×R8i	45 °C	1040	1230	350	630	760	2214	550	800	200
0875kW-B	3×R8i	50 °C	1445	1710	350	875	1050	3078	440	800	200
1000kW-C	3×R8i	50 °C	1445	1710	400	1000	1200	3078	440	800	200

* The values depend on the fuse ratings.

00592517

$I_{N(AC)}$	Continuous AC output current.
$P_{N(AC)}$	Continuous AC output power.
$I_{max(DC)}$	Maximum input current at nominal output power and ambient temperature
$U_{N(AC)}$	Nominal output voltage
P_{pv}	Recommended maximum input power to ensure full output power at normal radiation conditions. Inverter limits the power to a safe level.
kW_p	kW peak
I_{sc} PV	Absolute maximum total photovoltaic array short-circuit current (DC)
Temp	Nominal ambient temperature. The values apply to this temperature.

Altitude derating

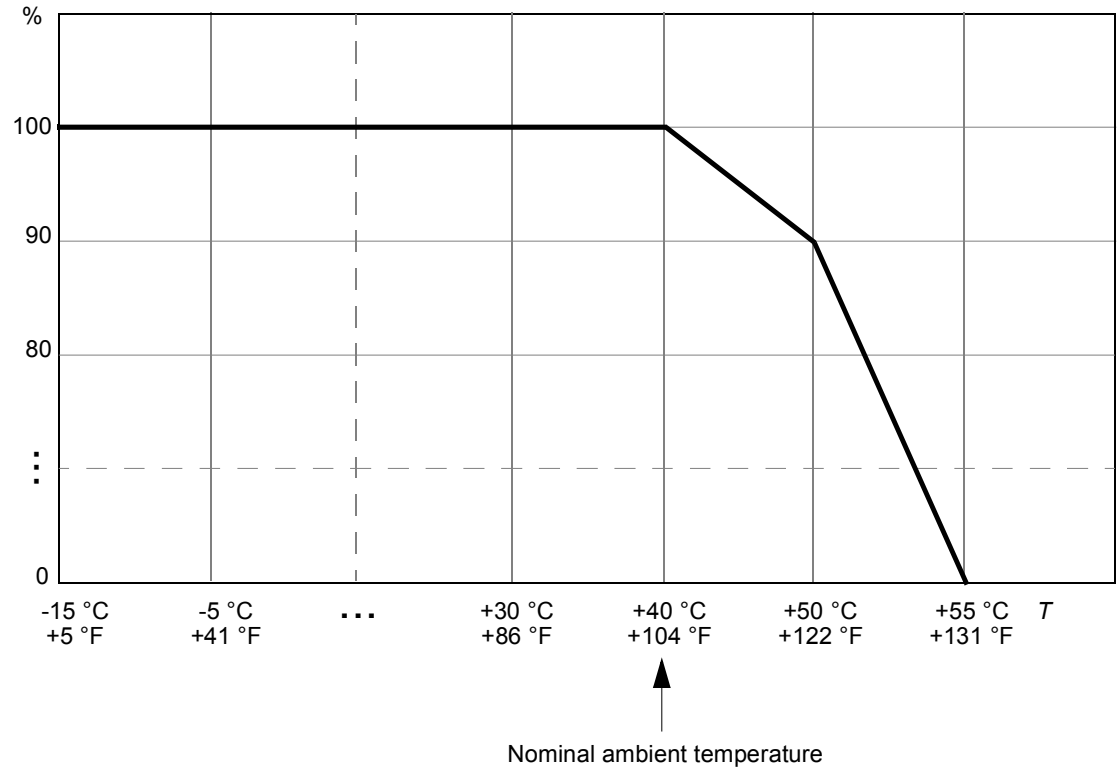
The inverter load capacity (current and power) decreases if the installation site altitude exceeds 1000 metres (3300 ft). The derating is 1% for every 100 m (328 ft). For the maximum installation site altitude, see section *Ambient conditions* on page *144*.

Temperature rating curves

The load capacity (current and power) decreases if the ambient temperature exceeds the nominal ambient temperature.

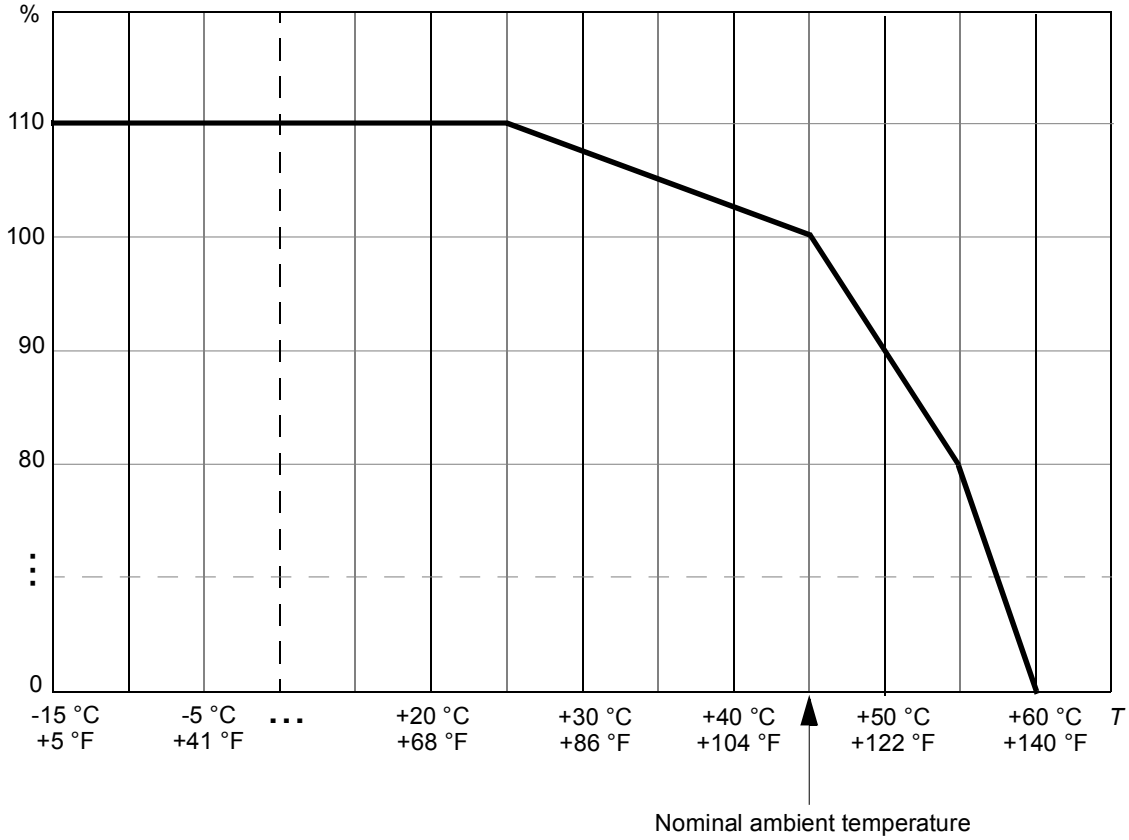
Temperature rating of types -0100kW-A and -0250kW-A

In the temperature range +40 °C (+104 °F) to +50 °C (+122 °F), the rated output current is decreased as shown below.



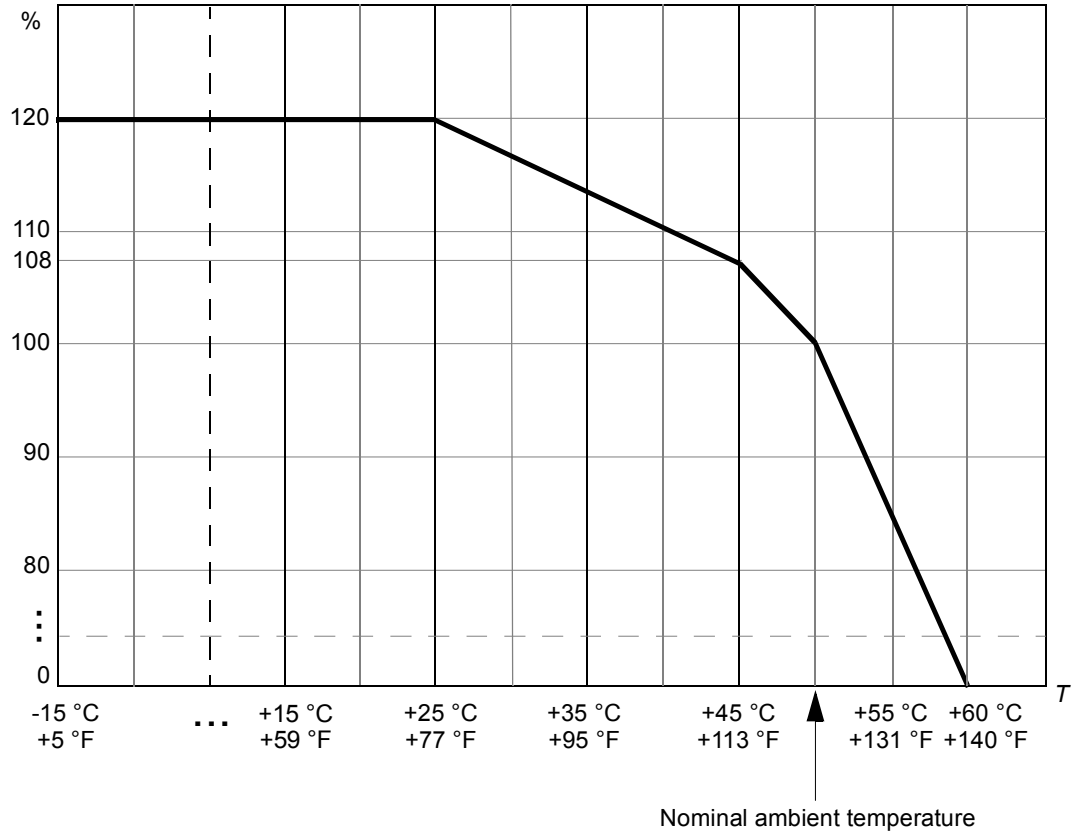
Temperature rating of types -0315kW-B and -0630kW-B

This curve shows the load capacity of inverter types -0315kW-B and -0630kW-B as a function of ambient temperature. The curve is applicable at altitudes below 1000 m (3300 ft).



Temperature rating of types-0500kW-A, -0875kW-B and -1000kW-C

This curve shows the load capacity of inverter types -0500kW-A, -0875kW-B and -1000kW-C as a function of ambient temperature. The curve is applicable at altitudes below 1000 m (3300 ft).



With temperature compensated altitude derating

Each degree of maximum ambient temperature below the nominal ambient temperature gives a compensation to the altitude derating, but the temperature derating curve and maximum allowed altitude must not be exceeded. When calculating the compensated altitude derating factor, you must observe the corner points of the temperature rating curves.

Example1: For inverter types PVS800-57-0100kW-A and PVS800-57-0250kW-A installed at 1800 m (5900 ft), if the maximum ambient temperature is limited to +35 °C (95 °F), the compensated altitude derating factor is 100% - 8 · 1% + (40 - 35) · 1% = 97% or 0.97.

Example 2: For inverter types PVS800-57-0315kW-B, PVS800-57-0630kW-B installed at 2100 m (6890 ft), if the maximum ambient temperature is limited to +35 °C (95 °F), the compensated altitude derating factor is 100% - 11 · 1% + (45 - 35) · 0.5% = 94% or 0.94.

Example 3: For inverter types PVS800-57-0500kW-A, PVS800-57-0875kW-B and PVS800-57-1000kW-C installed at 2800 m (9200 ft), if the maximum ambient temperature is limited to +32 °C (89 °F), the compensated altitude derating factor is 100% - 18 · 1% + (50 - 45) · 1.6% + (45 - 32) · 0.6% = 97.8% or 0.978.

Type equivalence table

Inverter type	Frame size	Inverter module(s) used	LCL filter(s) used
PVS800-57-0100kW-A	R7i	PVS800-104-0105kW-A	SLCL-05
PVS800-57-0250kW-A	R8i	PVS800-104-0250kW-A	SLCL-16
PVS800-57-0315kW-B	R8i	PVS800-104-0315kW-B	SLCL-16
PVS800-57-0500kW-A	2×R8i	2×PVS800-104-0250kW-A	2×SLCL-16
PVS800-57-0630kW-B	2×R8i	2×PVS800-104-0315kW-B	2×SLCL-16
PVS800-57-0875kW-B	3×R8i	3xPVS800-104-0315kW-B	3xSLCL-17
PVS800-57-1000kW-C	3×R8i	3xPVS800-104-0315kW-B	3xSLCL-17

Fuses

Data for the factory-installed fuses are given in the tables below. Fuses from other manufacturers can be used if they meet the given ratings.

Main circuit AC fuses

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0100kW-A	3	400	170M5808D	-
PVS800-57-0250kW-A	3	1000	170M6814D	6,9URD3PV1000
PVS800-57-0315kW-B	3	1000	170M6814D	6,9URD3PV1000
PVS800-57-0500kW-A	6	1000	170M6414	6,9URD33TTF1000
PVS800-57-0630kW-B	6	1000	170M6414	6,9URD33TTF1000
PVS875-57-0875kW-B	9	1000	170M6414	6,9URD33TTF1000
PVS800-57-1000kW-C	9	1000	170M6414	6,9URD33TTF1000

Inverter DC fuses

Inverter type	Fuse information			
	Qty	Rated current (A)	Bussmann	Mersen
PVS800-57-0100kW-A	2	400	170M6303	-
PVS800-57-0250kW-A	2	800	170M5398	11URD73PA0800
PVS800-57-0315kW-B	2	800	170M5398	11URD73PA0800
PVS800-57-0500kW-A	4	800	170M5398	11URD73PA0800
PVS800-57-0630kW-B	4	800	170M5398	11URD73PA0800
PVS800-57-0875kW-B	6	800	170M5398	11URD73PA0800
PVS800-57-1000kW-C	6	800	170M5398	11URD73PA0800

DC fuses for 2 DC input connections (option +2H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0250kW-A	4	400	PV-400AF3
PVS800-57-0315kW-B	4	400	PV-400AF3

DC fuses for 4 DC input connections (option +4H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0250kW-A	8	250	PV-250AF2
PVS800-57-0315kW-B	8	315	PV-315AF3
PVS800-57-0500kW-A	8	400	PV-400AF3
PVS800-57-0630kW-B	8	400	PV-400AF3

DC fuses for 5 DC input connections (option +5H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0500kW-A	10	400	PV-400AF3
PVS800-57-0630kW-B	10	400	PV-400AF3

DC fuses for 8 DC input connections (option +8H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0250kW-A	16	160	PV-160AF2
PVS800-57-0315kW-B	16	160	PV-160AF2
PVS800-57-0500kW-A	16	250	PV-250AF2
PVS800-57-0630kW-B	16	250	PV-250AF2
PVS800-57-0875kW-B	16	400	PV-400AF3
PVS800-57-1000kW-C	16	400	PV-400AF3

DC fuses for 10 DC input connections (option +10H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0500kW-A	20	200	PV-250AF2
PVS800-57-0630kW-B	20	200	PV-250AF2
PVS800-57-0875kW-B	20	315	PV-315AF3
PVS800-57-1000kW-C	20	315	PV-315AF3

DC fuses for 12 DC input connections (option +12H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0500kW-A	24	200	PV-200AF2
PVS800-57-0630kW-B	24	200	PV-200AF2
PVS800-57-0875kW-B	24	250	PV-250AF2
PVS800-57-1000kW-C	24	250	PV-250AF2

DC fuses for 15 DC input connections (option +15H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0500kW-A	30	160	PV-160AF2
PVS800-57-0630kW-B	30	160	PV-160AF2
PVS800-57-0875kW-B	30	200	PV-200AF2
PVS800-57-1000kW-C	30	200	PV-200AF2

DC fuses for 16 DC input connections (option +16H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0875kW-B	32	200	PV-200AF2
PVS800-57-1000kW-C	32	200	PV-200AF2

DC fuses for 20 DC input connections (option +20H382)

Inverter type	Fuse information		
	Qty	Rated current (A)	Bussmann
PVS800-57-0875kW-B	40	160	PV-160AF2
PVS800-57-1000kW-C	40	160	PV-160AF2

Fuses for inverters delivered without input DC fuses (option +0F291)

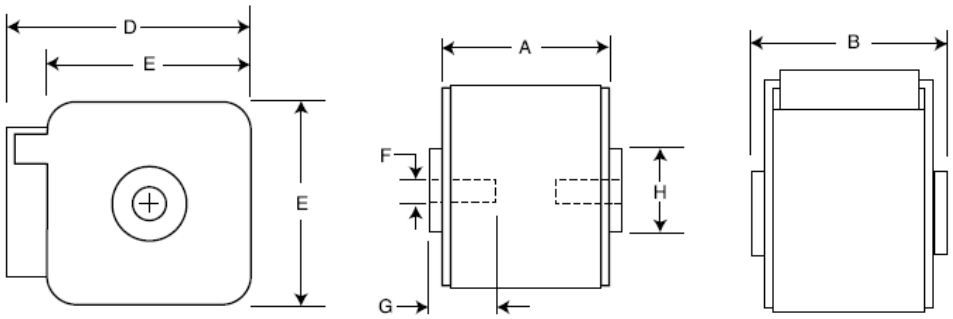
The table below shows the rated DC current for selecting the input DC fuses (see the next table) as per the number of the DC input connections to the solar generator.

No. of DC input connections	Rated current for the input DC fuses (A)					
	-0250kW-A	-0315kW-B	-0500kW-A	-0630kW-B	-0875kW-A	-1000kW-A
2	400 A	400 A	-	-	-	-
3	315 A	355 A	-	-	-	-
4	250 A	250 A	400 A	400 A	-	-
5	200 A	200 A	400 A	400 A	-	-
6	160 A	200 A	355 A	355 A	-	-
7	160 A	160 A	315 A	315 A	-	-
8	160 A	160 A	250 A	250 A	400 A	400 A
9	-	-	250 A	250 A	355 A	355 A
10	-	-	200 A	200 A	315 A	315 A
11	-	-	200 A	200 A	315 A	315 A
12	-	-	200 A	200 A	250 A	250 A
13	-	-	160 A	160 A	250 A	250 A
14	-	-	160 A	160 A	250 A	250 A
15	-	-	160 A	160 A	200 A	200 A
16	-	-	-	-	200 A	200 A
17	-	-	-	-	200 A	200 A
18	-	-	-	-	200 A	200 A
19	-	-	-	-	160 A	160 A
20	-	-	-	-	160 A	160 A

The table below shows the recommended input DC fuse types. For other fuses, contact ABB.

Rated DC fuse current of the inverter (A)	Recommended input DC fuses
400 A	PV-400AF3
355 A	PV-355AF3
315 A	PV-315AF3
250 A	PV-250AF2
200 A	PV-200AF2
160 A	PV-160AF2

Dimensions of the recommended fuses (mm). 1 mm = 0.0394 in.



Size	Type code	A	B	D	E	F	G	H
2	PV-***AF2	81	91	77	61	M10	9.5	24
3	PV-***AF3	82	91	92	76	M12	9.5	30

Miniature DC circuit breakers (option +H377)

Inverter type	Breaker information	
	Qty	ABB
PVS800-57-0100kW-A	4	S804PV-S80

Miniature circuit breakers for options +G300 and +G410

Option	Breaker
+G300	S 202-K6
+G410	DS201-C6A30

Dimensions, weights and free space requirements

The heights and depths of the cabinet are given below.

Inverter type PVS800-57-…	Height		Depth	
	mm	in.	mm	in.
0100kW-A	2130	83.84	690	27.17
0250kW-A	2130	83.84	680	26.77
0315kW-B	2130	83.84	680	26.77
0500kW-A	2130	83.84	708	27.87
0630kW-B	2130	83.84	708	27.87
0875kW-B	2130	83.84	708	27.87
1000kW-C	2130	83.84	708	27.87

The widths of the cabinet are given below.

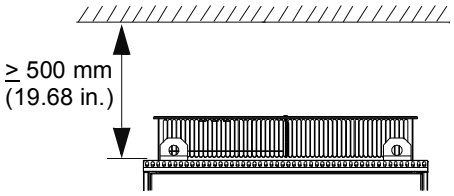
Inverter type PVS800-57-…	Width (mm)										
	+H377	+H382	+2H382	+4H382	+5H382	+8H382	+10H382	+12H382	+15H382	+16H382	+20H382
0100kW-A	1030	1030	-	-	-	-	-	-	-	-	-
0250kW-A	-	-	1830	1830	-	2230	-	-	-	-	-
0315kW-B	-	-	1830	1830	-	2230	-	-	-	-	-
0500kW-A	-	-	-	2630	2630	3030	3030	3430	3430	-	-
0630kW-B	-	-	-	2630	2630	3030	3030	3430	3430	-	-
0875kW-B	-	-	-	-	-	3630	3630	4030	4030	4430	4430
1000kW-C	-	-	-	-	-	3630	3630	4030	4030	4430	4430

The weights of the cabinet are given below.

Inverter type PVS800-57-…	Weight (kg)										
	+H377	+H382	+2H382	+4H382	+5H382	+8H382	+10H382	+12H382	+15H382	+16H382	+20H382
0100kW-A	700	600	-	-	-	-	-	-	-	-	-
0250kW-A	-	-	1100	1200	-	1320	-	-	-	-	-
0315kW-B	-	-	1100	1200	-	1320	-	-	-	-	-
0500kW-A	-	-	-	1640	1650	1760	1770	1880	1890	-	-
0630kW-B	-	-	-	1640	1650	1760	1770	1880	1890	-	-
0875kW-B	-	-	-	-	-	2320	2330	2440	2450	2560	2570
1000kW-C	-	-	-	-	-	2320	2330	2440	2450	2560	2570

The free space requirements are given below.

Required free space around the unit for cooling							
Front		**Side**		**Above**		**Back**	
mm	in.	mm	in.	mm	in.	mm	in.
150	5.91	-	-	500	19.68	-	-



Required free space for door opening: see chapter *Dimension drawings*.

Losses, cooling data and noise

The inverter is cooled by an internal fan, flow direction from front to top.

Inverter type	**Heat dissipation** [1]	**Cooling air flow**				**Noise**
		Inverter module cubicles		**Total air flow** [2]		
	kW	m^3/h	ft^3/h	m^3/h	ft^3/h	dB
PVS800-57-0100kW-A	4	-	-	1300	46000	75
PVS800-57-0250kW-A	10	2500	88300	3250	115000	75[3]
PVS800-57-0315kW-B	10	2500	88300	3250	115000	75[3]
PVS800-57-0500kW-A	20	5000	177000	6000	212000	75[3]
PVS800-57-0630kW-B	20	5000	177000	6000	212000	75[3]
PVS800-57-0875kW-B	30	7950	281000	9450	333700	75
PVS800-57-1000kW-C	30	7950	281000	9450	333700	75

[1] for dimensioning the ventilation of the electric equipment room

[2] cooling air flow for a cabinet with one DC input cubicle only

[3] at partial power typically < 65 dB with speed-controlled fans

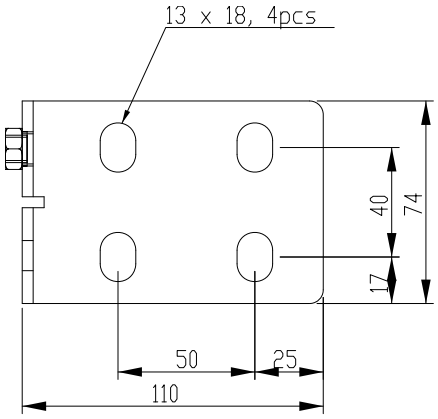
Terminal and lead-through data for the DC input power cable

The DC busbars are tin-plated. Cable lugs suited to tin-plated materials can be used.

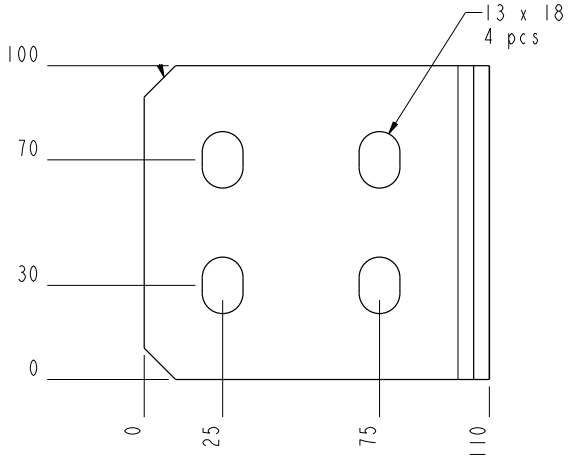
Inverter type	**No. of cable lead-throughs Ø60 mm (2.36”)**					
	+H377	**+H382**	**+2/4/5H382**	**+8/10H382**	**+12/15H382**	**+16/20H382**
PVS800-57-0100kW-A	3 × 3	1 × 3	-	-	-	-
PVS800-57-0250kW-A	-	-	4 × 4	8 × 4	-	-
PVS800-57-0315kW-B	-	-	4 × 4	8 × 4	-	-
PVS800-57-0500kW-A	-	-	4 × 4	8 × 4	12 × 4	-
PVS800-57-0630kW-B	-	-	4 × 4	8 × 4	12 × 4	-
PVS800-57-0875kW-B	-	-	-	8 × 4	12 × 4	16 x 4
PVS800-57-1000kW-C	-	-	-	8 × 4	12 × 4	16 x 4

The DC input power cable terminal data is given in the table below.

Units with fuse-protected DC input connections														
DC busbars													PE busbar	
Inverter type PVS800-57-	Pcs (plus + minus)										Bolt size	Tightening torque	Bolt size	Tightening torque
	+H382	+2H382	+4H382	+5H382	+8H382	+10H382	+12H382	+15H382	+16H382	+20H382				
0100kW-A	2	-	-	-	-	-	-	-	-	-	M12 or ½”	70 N·m (50 lb·ft)	M10 or 3/8”	30…44 N·m (2…32 lb·ft)
0250kW-A	-	4	8	-	16	-	-	-	-	-				
0315kW-B	-	4	8	-	16	-	-	-	-	-				
0500kW-A	-	-	8	10	16	20	24	30	-	-				
0630kW-B	-	-	8	10	16	20	24	30	-	-				
0875kW-B	-	-	-	-	16	20	24	30	32	40				
1000kW-C	-	-	-	-	16	20	24	30	32	40				



Terminals of PVS800-57-0100kW-A



Terminals of PVS800-57-0250kW-A, -0315kW-B, -0500kW-A, -0630kW-B,- 0875kW-B and -1000kW-C

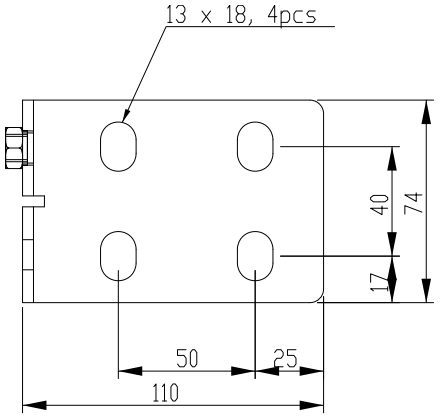
Units with MCB-protected DC input connections (option +H377)							
Inverter type PVS800-57-	Photovoltaic switches					PE busbar	
	Pcs		Max. wire size (mm^2)		Tightening torque	Bolt size	Tightening torque
0100kW-A	4		6…50 (stranded cable) 6…70 (solid cable)		3…4 N·m (2.2…3.0 lb·ft)	M10 (3/8”)	30…44 N·m (2…32 lb·ft)

Terminal and lead-through data for the AC output power cable

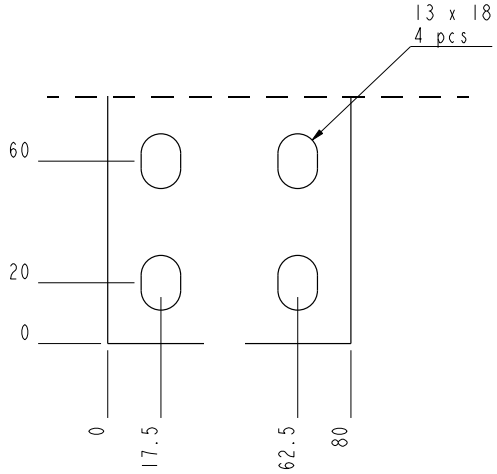
The AC busbars are tin-plated. Cable lugs suited to tin-plated materials can be used.

Inverter type	No. of cable lead-throughs Ø60 mm (2.36”)
PVS800-57-0100kW-A	3
PVS800-57-0250kW-A	2 × 3
PVS800-57-0315kW-B	2 × 3
PVS800-57-0500kW-A	3 × 4
PVS800-57-0630kW-B	3 × 4
PVS800-57-0875kW-B	3 × 4
PVS800-57-1000kW-C	3 × 4

Inverter type PVS800-57-	AC busbars			PE busbar	
	Pcs	Bolt size	Tightening torque	Screw	Tightening torque
0100kW-A	3	M12 or ½”	70 N·m (50 lb·ft)	M10 (3/8”)	30…44 N·m 2…32 lb·ft)
0250kW-A	3				
0315kW-B	3				
0500kW-A	3				
0630kW-B	3				
0875kW-B	6				
1000kW-C	6				

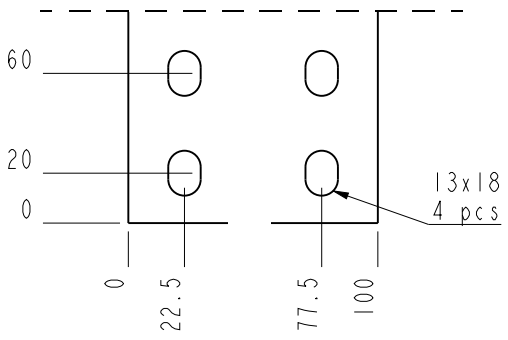


Terminals of PVS800-57-0100kW-A



Terminals of PVS800-57-0250kW-A and -0315kW-B

Terminals of PVS800-57-0500kW-A, -0630kW-B, - 0875kW-B and -1000kW-C



AC output connection specification

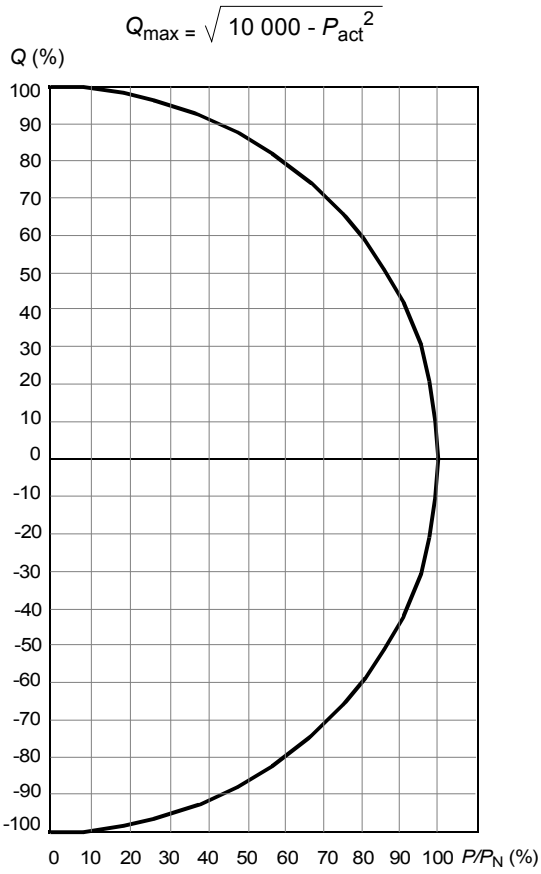
Voltage	Types -0100kW-A, -0250kW-A and -0500kW-A: 300 V AC 3-phase ± 10% Types -0315kW-B, -0630kW-B and -0875kW-B: 350 V AC 3-phase ± 10% Type -1000kW-C : 400 V AC 3-phase ± 10%
Allowed electrical system type	3-phase IT (ungrounded) system. Galvanic isolation for each inverter is needed.
Transformer	The transformer must be suitable for IGBT-based inverter use with high d*u*/d*t* values against the ground. Dedicated low-voltage winding is needed for each inverter. Static screen between windings with proper dimensioning is needed. For details on selecting the transformer, see *Selecting the transformer* on page 73.
Short-circuit withstand strength (IEC 60439-1)	Type -0100kW-A: Maximum allowable prospective short-circuit current is 10 kA when protected by fuses given in fuse tables. Types -0250kW-A … -1000kW-C: Maximum allowable prospective short-circuit current is 50 kA when protected by fuses given in fuse tables. When temporary grounding for work is applied (the grounding cables are connected to the connecting knobs of the AC and DC busbars and PE of the inverter): the maximum allowable prospective short-circuit current is decreased to 25 kA / 1 s. If the connected grounding cables and clamps are not equivalent to the prospective short-circuit rating of the inverter, the total rating will be lower.
Frequency	48 to 63 Hz withstand with normal dimensioning (grid-compliance may require disconnection at smaller values.) Maximum rate of change 17%/s
Imbalance	Max. ± 3% of nominal phase to phase AC line voltage
Voltage dips	Max. 25% **Note:** If the inverter is expected to survive voltage dips (low-voltage ride-through), auxiliary power supply must be ensured, for example, by an uninterruptible power supply.
Fundamental power factor (cos phi$_1$)	1

Power factor (cos phi$_1$) adjustment range

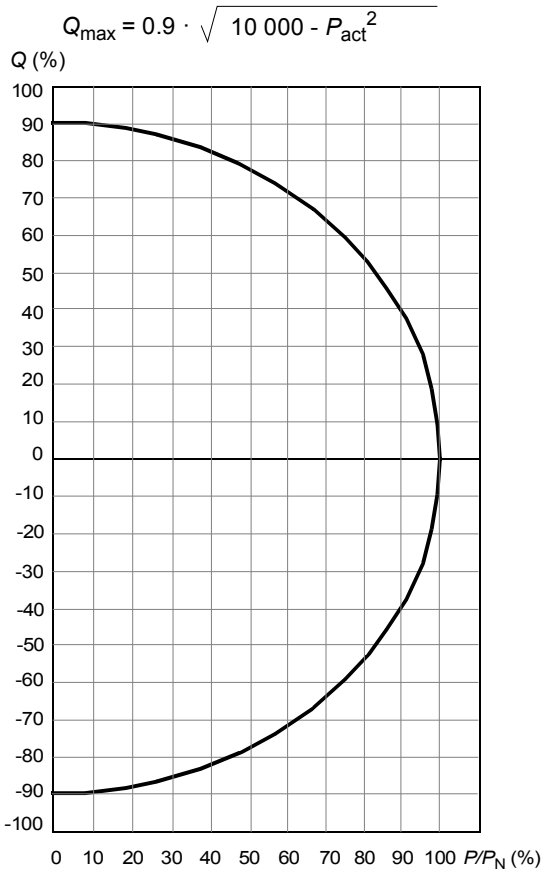
0…1 capacitive or inductive depending on the dimensioning

The following graphs illustrate the equipment operation with the nominal AC voltage and nominal ambient temperature. See *Ratings* on page *123*.

Types -0100kW-A and -0250kW-A



Types -0315kW-B, -0500kW-A, 0630kW-B, -0875kW-B, -1000kW-C



Q Reactive power in percentage of nominal active power

P/P_N Relative active power

Current See section *Ratings*.

Overvoltage category (IEC 62109, IEC 60664-1) 3 (With option +F263, the category is 1.)

Harmonic distortion THD current < 3% at nominal load

DC input connection data

Maximum DC power (P_{pv}) See section *Ratings*.

Maximum DC current ($I_{max(DC)}$) See section *Ratings*.

Maximum DC voltage ($U_{max(DC)}$) Types -0100kW-A, -0250kW-A and -0315kW-B: 1000 V DC

Types -0500kW-A, -0630kW-B, -0875kW-B and -1000kW-C: 1100 V DC

Operational DC voltage range, $U_{mppt(DC)}$ Types -0100kW-A, -0250kW-A and -0500kW-A: 450…825 V DC

Types -0315kW-B, -0630kW-B and -0875kW-B: 525…825 V DC

Type -1000kW-C: 600…850 V DC

Voltage ripple < 3%

Overvoltage category (IEC 62109, IEC 60664-1) 2

Auxiliary power connection data

Voltage	230 V AC (115 V AC optional)
Frequency	50/60 Hz
Allowed electrical system	TN-S (grounded) system. If IT (ungrounded) system, contact ABB for instructions.
Overvoltage category (IEC 62109, IEC 60664-1)	2

Control unit (RDCU/RMIO) connection data

Analog inputs

	RDCU (A43, PVS800 master control program): one programmable differential current input (0 mA / 4 mA … 20 mA, R_{in} = 100 ohm). **RDCU (A41, PVS800 inverter control program):** two programmable differential current input (0 mA / 4 mA … 20 mA, R_{in} = 100 ohm) and one programmable differential voltage input (-10 V ... +10 V, R_{in} = 200 kohm). The analog inputs are galvanically isolated as a group.
Insulation test voltage	500 V AC, 1 min
Max. common mode voltage between the channels	±15 V DC
Common mode rejection ratio	≥ 60 dB at 50 Hz
Resolution	0.025% (12 bit) for the -10 V … +10 V input. 0.5% (11 bit) for the 0…+10 V and 0…20 mA inputs.
Inaccuracy	±0.5% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ±100 ppm/°C (±56 ppm/°F), max.

Constant voltage output

Voltage	+10 V DC, 0, -10 V DC ± 0.5% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ±100 ppm/°C (±56 ppm/°F) max.
Maximum load	10 mA
Applicable potentiometer	1 kohm to 10 kohm

Auxiliary power output

Voltage	24 V DC ± 10%, short circuit proof
Maximum current	250 mA (shared between this output and optional modules installed on the RMIO)

Analog outputs

	Two programmable current outputs: 0 (4) to 20 mA, R_L ≤ 700 ohm
Resolution	0.1% (10 bit)
Inaccuracy	±1% (Full Scale Range) at 25 °C (77 °F). Temperature coefficient: ±200 ppm/°C (±111 ppm/°F) max.

Digital inputs

	RDCU (A43, PVS800 master control program): two programmable digital inputs (common ground: 24 V DC, -15% to +20%) and a start interlock input. Group isolated, can be divided in two isolated groups (see *Isolation and grounding diagram* below). **RDCU (A41, PVS800 inverter control program):** one programmable digital input (common ground: 24 V DC, -15% to +20%) and a start interlock input. Group isolated, can be divided in two isolated groups (see *Isolation and grounding diagram* below). Internal supply for digital inputs (+24 V DC): short-circuit proof. An external 24 V DC supply can be used instead of the internal supply.

Insulation test voltage	500 V AC, 1 min
Logical thresholds	< 8 V DC ≙ “0”, > 12 V DC ≙ “1”
Input current	DI1 to DI 5: 10 mA, DI6: 5 mA
Filtering time constant	1 ms

Relay outputs

	RDCU (A43, PVS800 master control program): two programmable relay outputs, or with option +Q951 one programmable relay output
	RDCU (A41, PVS800 inverter control program): without option +Q954 one programmable relay output
Switching capacity	8 A at 24 V DC or 250 V AC, 0.4 A at 120 V DC
Minimum continuous current	5 mA rms at 24 V DC
Maximum continuous current	2 A rms
Insulation test voltage	4 kV AC, 1 minute

DDCS fiber optic link

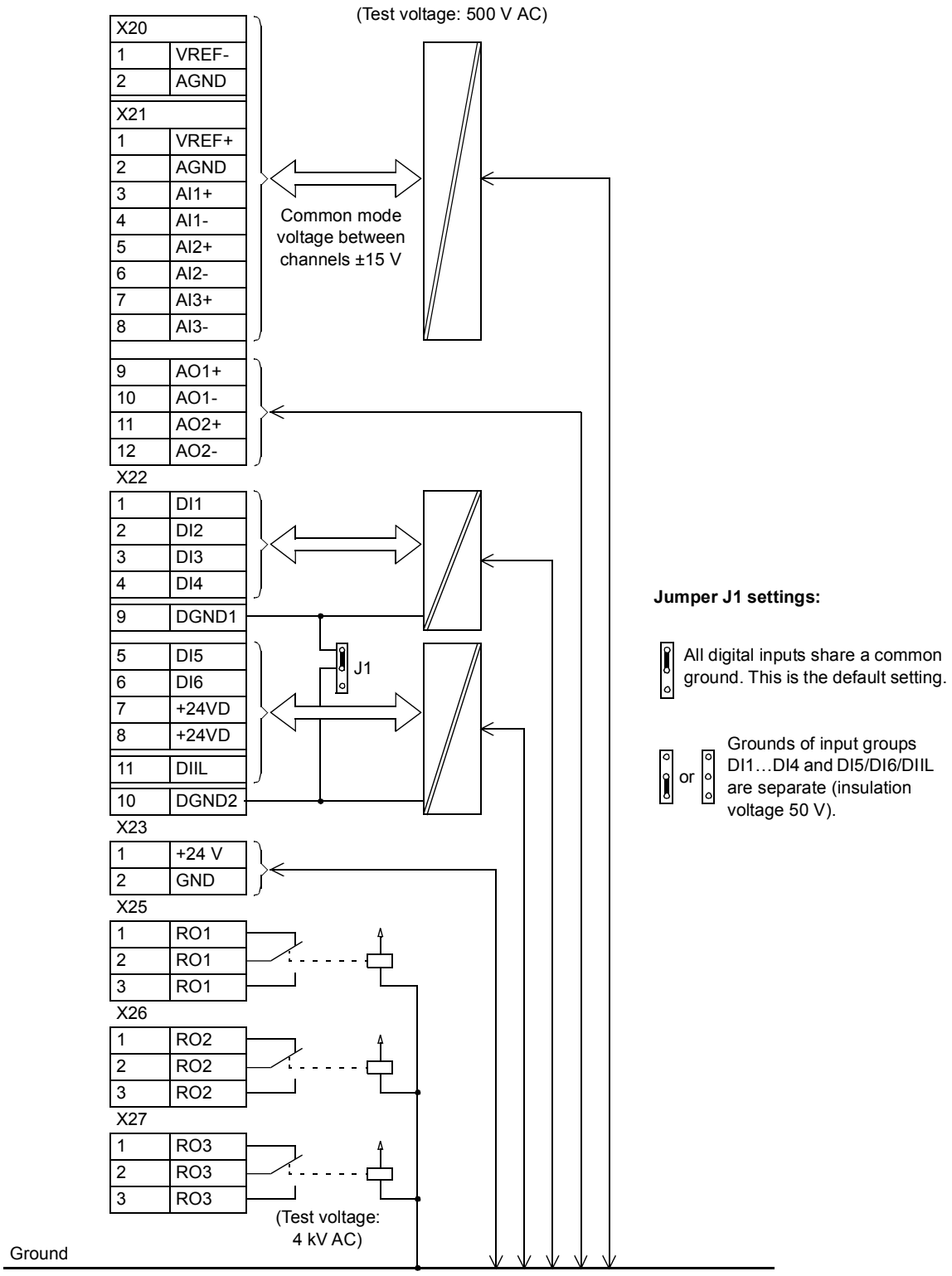
	With optional communication adapter module RDCO. Protocol: DDCS (ABB Distributed drives communication system)

24 V DC power input

Voltage	24 V DC ± 10%
Typical current consumption (without optional modules)	250 mA
Maximum current consumption	1200 mA (with optional modules inserted)

The terminals on the RMIO board as well as on the optional modules attachable to the board fulfil the Protective Extra Low Voltage (PELV) requirements stated in EN 50178 provided that the external circuits connected to the terminals also fulfil the requirements and the installation site is below 2000 m (6560 ft). Above 2000 m (6560 ft), see page *78.*

Isolation and grounding diagram



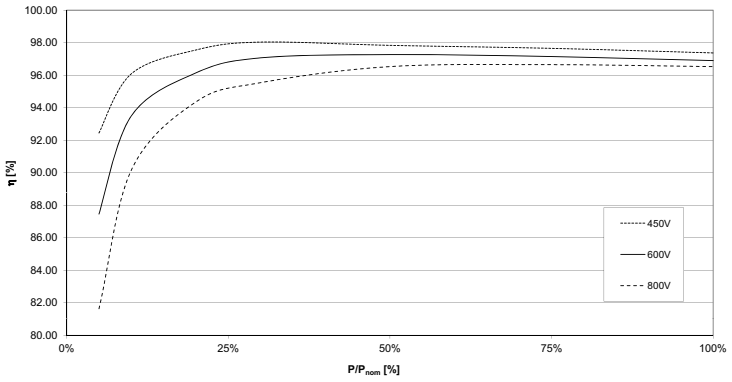
Efficiency

All values below are without auxiliary power consumption. The inverter complies with efficiency standards IEC 61683 and EN 50530.

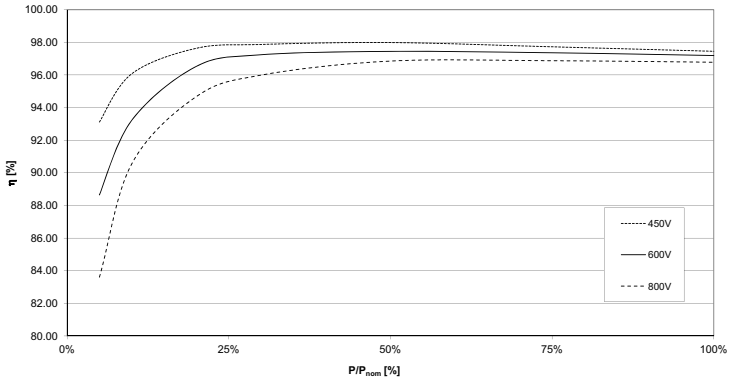
Maximum efficiency	**DC voltage**		
	450 V	600 V	800 V
PVS800-57-0100kW-A	98.0	97.3	96.6
PVS800-57-0250kW-A	98.0	97.4	96.9
PVS800-57-0500kW-A	98.6	98.1	97.6

European (EURO-eta) efficiency	**DC voltage**		
	450 V	600 V	800 V
PVS800-57-0100kW-A	97.5	96.5	95.3
PVS800-57-0250kW-A	97.6	96.7	95.7
PVS800-57-0500kW-A	98.2	97.5	96.5

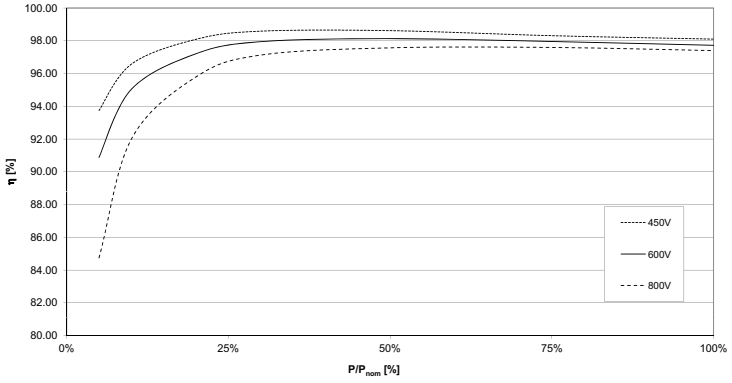
PVS800-57-0100kW-A efficiency



PVS800-57-0250kW-A efficiency



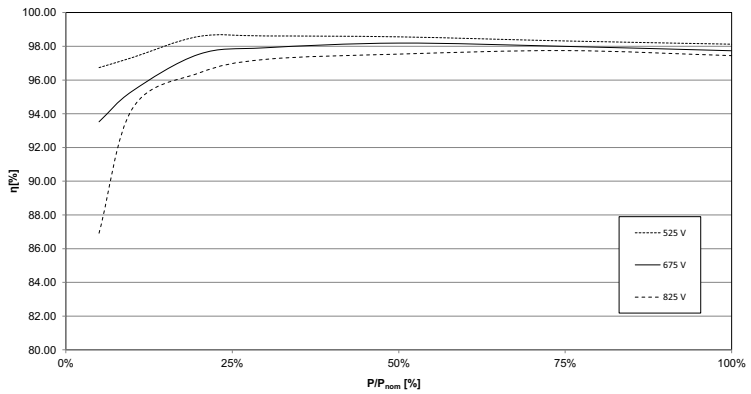
PVS800-57-0500kW-A efficiency



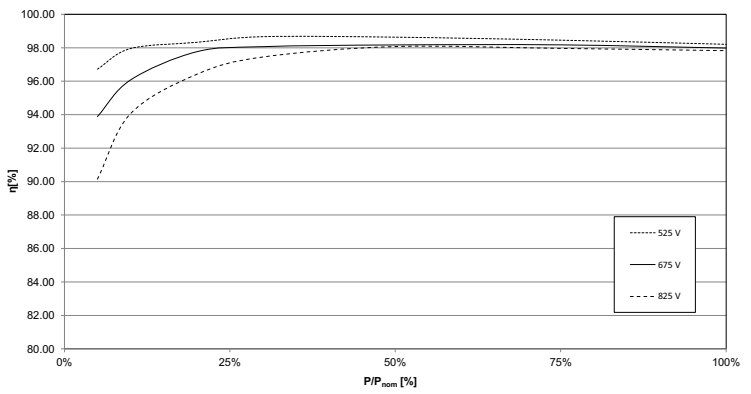
Maximum efficiency	DC voltage		
	525 V	675 V	825 V
PVS800-57-0315kW-B	98.6	98.2	97.7
PVS800-57-0630kW-B	98.6	98.2	98.1
PVS800-57-0875kW-B	98.7	98.3	97.9

European (EURO-eta) efficiency	DC voltage		
	525 V	675 V	825 V
PVS800-57-0315kW-B	98.3	97.7	96.8
PVS800-57-0630kW-B	98.4	97.8	97.3
PVS800-57-0875kW-B	98.5	97.8	97.1

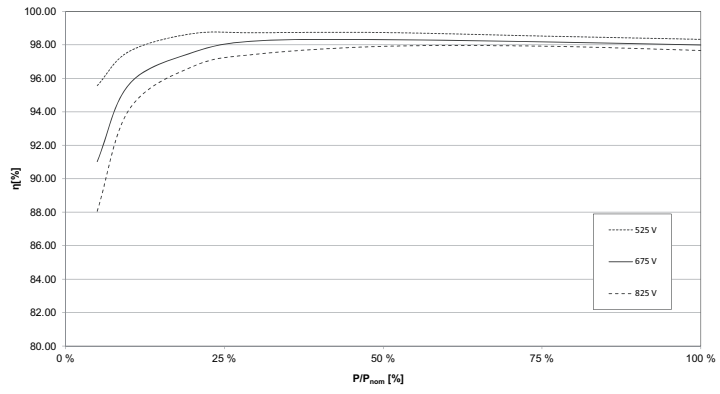
PVS800-57-0315kW-B efficiency



PVS800-57-0630kW-B efficiency



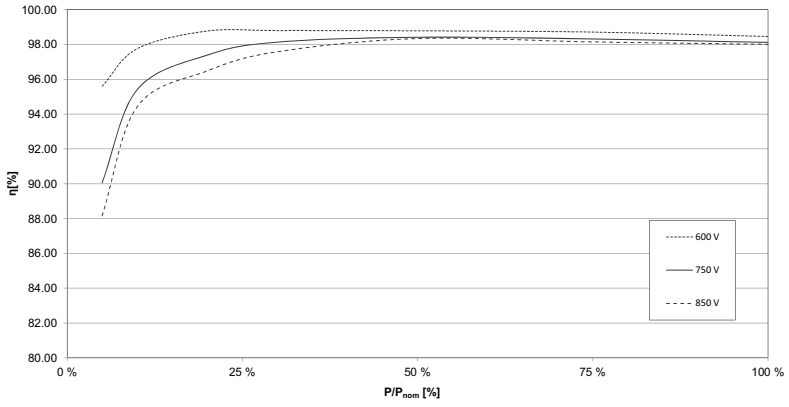
PVS800-57-0875kW-B efficiency



Maximum efficiency	**DC voltage**		
	600 V	750 V	850 V
PVS800-57-1000kW-C	98.8	98.4	98.3

European (EURO-eta) efficiency	**DC voltage**		
	600 V	750 V	850 V
PVS800-57-1000kW-C	98.6	97.8	97.4

PVS800-57-1000kW-C efficiency



Degrees of protection

	IP42 (UL type 2)
Protective class	Class I (IEC 62109-1)

Ambient conditions

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

Note: If the installation has ventilation ducts directly to outdoors (eg, a container installation), back flow of moist and dusty air must be prevented. See section *Ventilation duct at the air outlet of the cabinet* on page *69*.

	Operation installed for stationary use	**Storage** in the protective package	**Transportation** in the protective package
Installation site altitude	Types -0100kW-A, -0250kW-A, 0315kW-B: 0 to 2000 m (6562 ft) above sea level Types -0500kW-A, -0630kW-B, 0875kW-B and -1000kW-C: 0 to 4000 m (13123 ft) Above 1000 m (281 ft), see section *Altitude derating* on page *124.*	-	-
Air temperature	Types -0100kW-A and -0250kW-A: -15 to +55 °C (5 to 131 °F) Types -0315kW-B, -0500kW-A, -0630kW-B, -0875kW-B and -1000kW-C: -15 to +60 °C (5 to 140 °F) If the operating temperature falls below 0 °C (32 °F), cabinet heater option +G300 has to be used. No frost allowed. See section *Temperature rating curves*.	-40 to +70 °C (-40 to +158 °F)	-40 to +70 °C (-40 to +158 °F)
Relative humidity	5 to 95%	Max. 95%	Max. 95%
	No condensation allowed. Maximum allowed relative humidity is 60% in the presence of corrosive gases. If the inverter is installed on a site where the relative humidity limits may be exceeded, cabinet heater option +G300 has to be used.		
Environmental category (IEC 62109-1)	Indoor conditioned		
Wet conditions (IEC 62109-1)	Not to be used in wet location. The installation location must be dry.		
Pollution degree (IEC 62109-1)	2. Normally only non-conductive pollution is allowed.		
Contamination levels (IEC 60721-3-3, IEC 60721-3-2, IEC 60721-3-1)	No conductive dust allowed.		
	Chemical gases: Class 3C1 Solid particles: Class 3S2	Chemical gases: Class 1C2 Solid particles: Class 1S3	Chemical gases: Class 2C2 Solid particles: Class 2S2
Atmospheric pressure	61.6 to 106 kPa 0.7 to 1.05 atmospheres	70 to 106 kPa 0.7 to 1.05 atmospheres	60 to 106 kPa 0.6 to 1.05 atmospheres

Vibration (IEC 60068-2)	Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal	Max. 1 mm (0.04 in.) (5 to 13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2 to 100 Hz) sinusoidal	Max. 3.5 mm (0.14 in.) (2 to 9 Hz), max. 15 m/s^2 (49 ft/s^2) (9 to 200 Hz) sinusoidal
Shock (IEC 60068-2-27)	Not allowed	Max. 100 m/s^2 (330 ft/s^2), 11 ms	Max. 100 m/s^2 (330 ft/s^2), 11 ms
Free fall	Not allowed	100 mm (4 in.) for weight over 100 kg (220 lb)	100 mm (4 in.) for weight over 100 kg (220 lb)

Materials

Cabinet	Hot-dip zinc-coated (thickness approximately 20 micrometers) steel sheet (thickness 1.5 mm) with polyester thermosetting powder coating (thickness approximately 80 micrometers) on visible surfaces except back panel. Color: RAL 7035 (light beige, semigloss).
Air filters on the cabinet door	For 400 mm wide cubicles: AIR-TEX G-150, 318 mm × 540 mm (ABB code: 64666533) For 600 mm wide cubicles: AIR-TEX G-150, 518 mm × 540 mm (ABB code: 646665324)
Busbars	Tin-plated copper or aluminium
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinctive
Package	Frame: Wood or plywood. Plastic wrapping: PE-LD. Bands: PP or steel.
Disposal	The inverter contains raw materials that should be recycled to preserve energy and natural resources. The package materials are environmentally compatible and recyclable. All metal parts can be recycled. The plastic parts can either be recycled or burned under controlled circumstances, according to local regulations. Most recyclable parts are marked with recycling marks. If recycling is not feasible, all parts excluding electrolytic capacitors and printed circuit boards can be landfilled. The DC capacitors (C1-1 to C1-x) contain electrolyte and the printed circuit boards contain lead, both of which are classified as hazardous waste within the EU. They must be removed and handled according to local regulations. For further information on environmental aspects and more detailed recycling instructions, please contact your local ABB distributor.

Auxiliary circuit power consumption

The auxiliary circuit must be supplied by the customer galvanically separated from inverter output.

Inverter type	Total in running max. (W)	Total in stand-by (W)	Additional consumption in stand-by (option +G300) (max. W)
PVS800-57-0100kW-A	310	60	150
PVS800-57-0250kW-A	310	60	250
PVS800-57-0315kW-B	310	60	250
PVS800-57-0500kW-A	490	65	350
PVS800-57-0630kW-B	490	65	350
PVS800-57-0875kW-B	650	65	450
PVS800-57-1000kW-C	650	65	450

Notes:

- The values above do not include the cooling fans of the inverter modules. Their power is taken from the solar generator.
- Every additional incoming cubicle increases the auxiliary power consumption by 50 W in PVS800-57-0100kW-A…PVS800-57-0630kW-B and by 25 W in PVS800-57-0875kW-B…PVS800-57-1000kW-C.
- The actual consumption depends on the options installed.
- Option +G300: The actual power consumption depends on temperature.
- Option +G410: Maximum power consumption 20 W per junction box.
- The auxiliary circuit has to be protected with 16 A gG fuses. See the circuit diagrams delivered with the inverter.

Applicable standards and requirements

	The inverter complies with the standards below.
IEC/EN 62109-1:2010	*Safety of power converters for use in photovoltaic power systems Part 1: General requirements*
IEC/EN 62109-2:2011	*Safety of power converters for use in photovoltaic power systems Part 2: Particular requirements for inverters* The inverter complies with the standard when the inverter and the photovoltaic array are installed and used inside a closed electrical operating area. Then, the inverter does not need to comply with subclauses 4.8.2.1, 4.8.2.2, 4.8.3.2, 4.8.3.4, and 4.8.3.5.1b. However, the inverter complies with subclauses 4.8.2.1 and 4.8.2.2.
EN 50530:2010	*Overall efficiency of photovoltaic inverters*
IEC 60529:1989 / EN 60529:1991	*Degrees of protection provided by enclosures (IP code)*
IEC/EN 61000-6-2:2005	*Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*
IEC/EN 61000-6-4:2007	*Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*
IEC 61683:1999	*Photovoltaic systems – Power conditioners – Procedure for measuring efficiency*
IEC 61000-3-12:2011	*Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤75 A per phase* **Note:** The inverter complies with the standard when its output power is 20% of the nominal power or greater. When the output power is less than 20% of the nominal power, the short-circuit ratio R_{sce} = 250.

For the rest of the applicable standards and grid codes, go to www.abb.com/solar on the Internet.

CE marking

A CE mark is attached to the inverter to verify that the unit follows the provisions of the European Low Voltage and EMC Directives.

Compliance with the European Low Voltage Directive

The compliance with the European Low Voltage Directive has been verified according to standard EN 62109.

Compliance with the European EMC directive

The EMC Directive defines the requirements for immunity and emissions of electrical equipment used within the European Union. EMC standards EN 61000-6-2:2005 and EN 61000-6-4:2007 cover requirements stated for electrical and electronic apparatus intended for use in industrial environments.

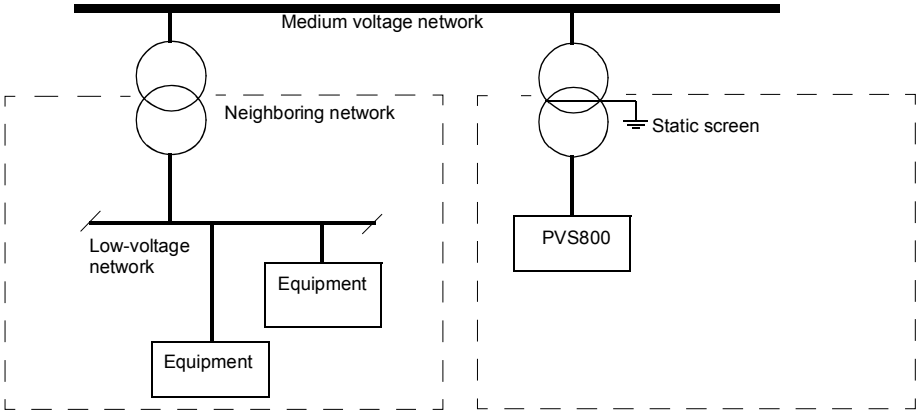
Compliance with EMC standards EN 61000-6-2:2005 and EN 61000-6-4:2007

EMC stands for **E**lectro**m**agnetic **C**ompatibility. It is the ability of electrical/electronic equipment to operate without problems within an electromagnetic environment. Likewise, the equipment must not disturb or interfere with any other product or system within its locality.

Medium voltage network

The requirements of the EMC Directive can be met as follows:

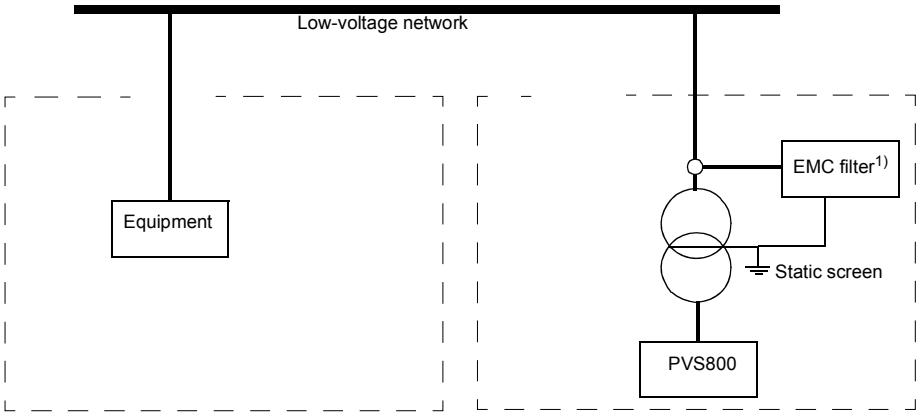
1. A transformer with static screening between the primary and secondary windings is used to ensure that no excessive emission is propagated to neighboring low-voltage networks.
2. The inverter is installed to an IT (ungrounded) system according to the instructions given in the hardware manual.



Low-voltage network

The requirements of the EMC Directive can be met as follows:

1. A transformer with static screening between the primary and secondary windings is used to ensure that no excessive emission is propagated to neighboring low-voltage networks.
2. The low-voltage network is of the TN type (grounded).
3. The EMC filter (option +E216) is installed on network side of the low-voltage transformer.
4. The inverter is installed according to the instructions given in the hardware manual.



1) option +E216

“C-tick” marking

“C-tick” marking is required in Australia and New Zealand. A “C-tick” mark is attached to the inverter to verify compliance with the relevant standards IEC/EN 61000-6-2:2005 and IEC/EN 61000-6-4:2007, mandated by the Trans-Tasman Electromagnetic Compatibility Scheme.

For fulfilling the requirements of the standard, see section *Compliance with the European EMC directive* on page *147*.

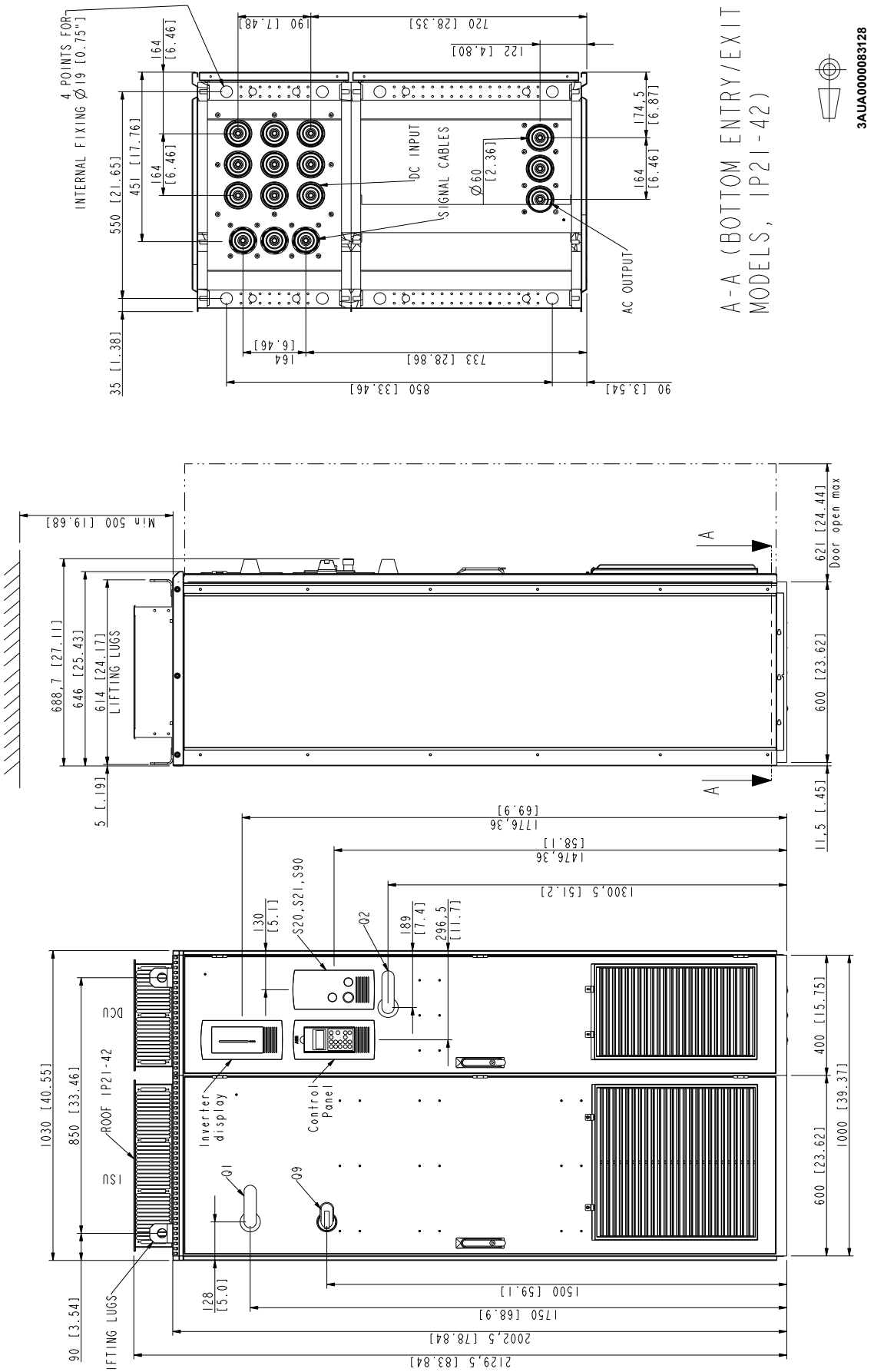
12

Dimension drawings

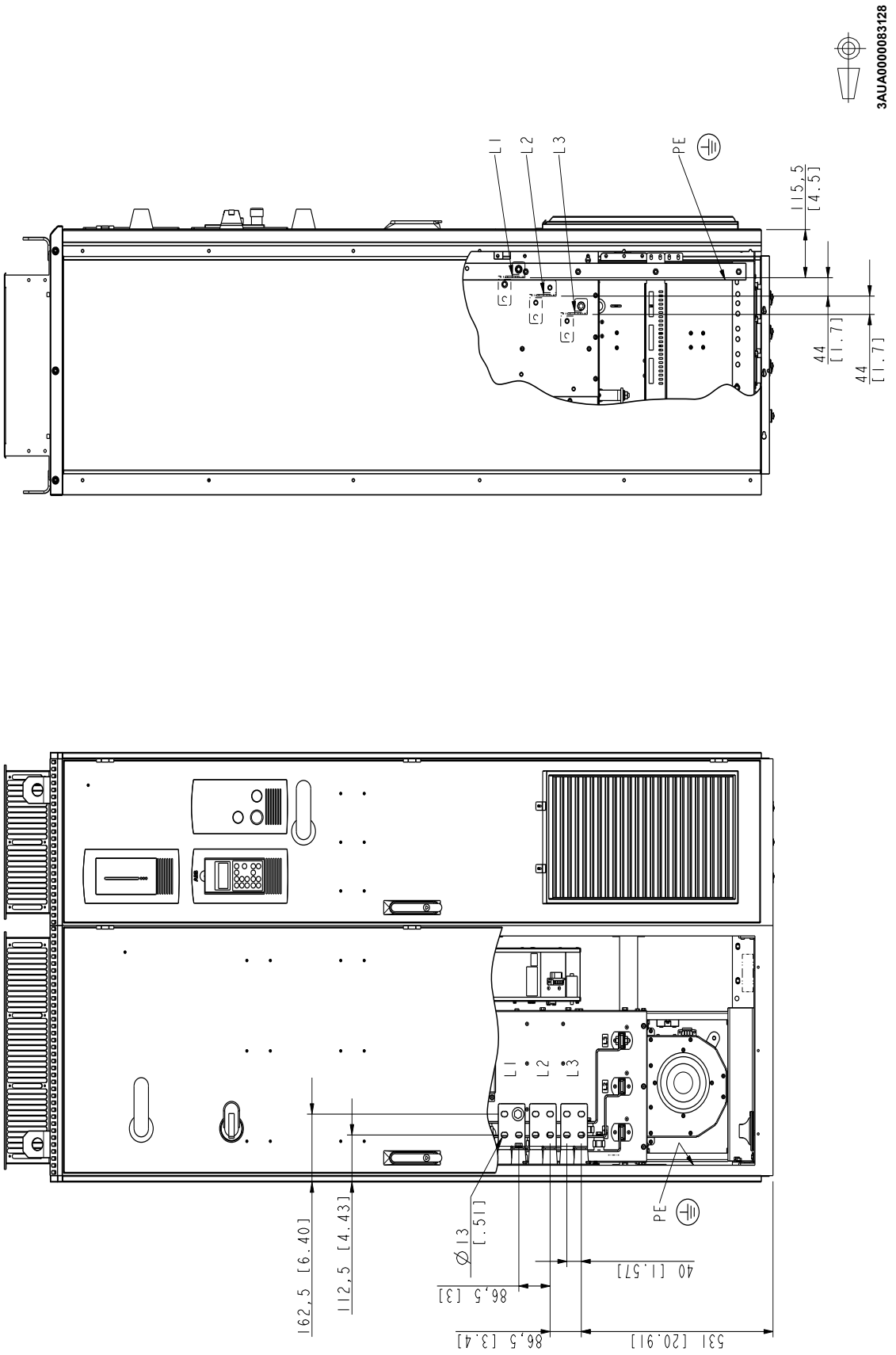
Contents of this chapter

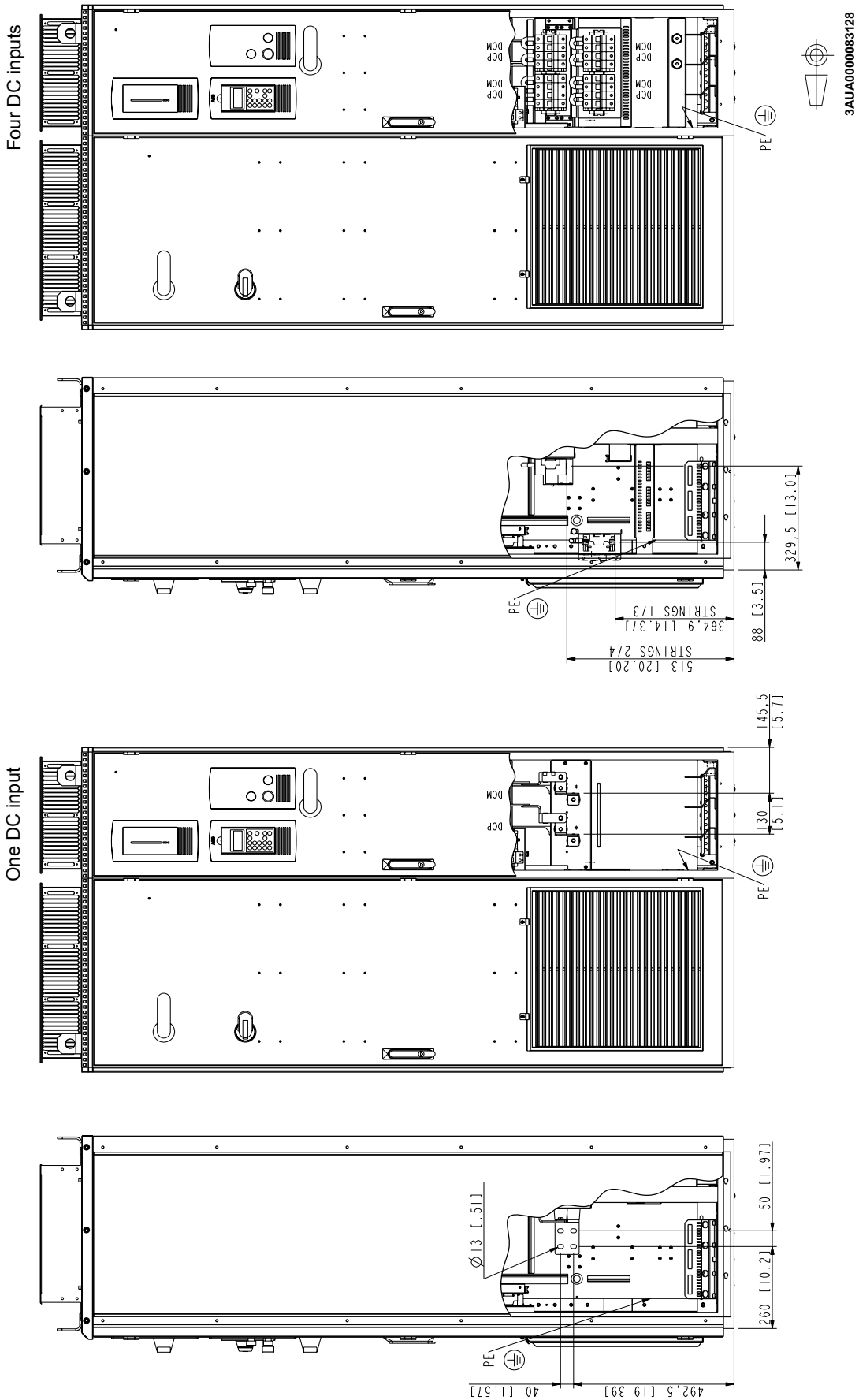
This chapter contains example dimension drawings of the inverter.

Frame R7i


4 POINTS FOR
INTERNAL FIXING Ø19 [0.75"]
164 [6.46]
90 [7.48]
720 [28.35]
122 [4.80]
174.5 [6.87]
164 [6.46]
550 [21.65]
451 [17.76]
DC INPUT
SIGNAL CABLES
Ø60 [2.36]
AC OUTPUT
35 [1.38]
733 [28.86]
850 [33.46]
90 [3.54]
A-A (BOTTOM ENTRY/EXIT MODELS, IP21-42)
3AUA0000083128
Min 500 [19.68]
621 [24.44]
Door open max
688.7 [27.11]
646 [25.43]
614 [24.17]
LIFTING LUGS
600 [23.62]
5 [.19]
11.5 [.45]
1776.36 [69.9]
1476.36 [58.1]
1300.5 [51.2]
130 [5.1]
S20,S21,S90
Ø2
189 [7.4]
296.5 [11.7]
DCU
ISU
ROOF IP21-42
1030 [40.55]
850 [33.46]
400 [15.75]
1000 [39.37]
600 [23.62]
Inverter display
Control Panel
Ø1
Ø9
128 [5.0]
1500 [59.1]
1750 [68.9]
2002.5 [78.84]
2129.5 [83.84]
LIFTING LUGS

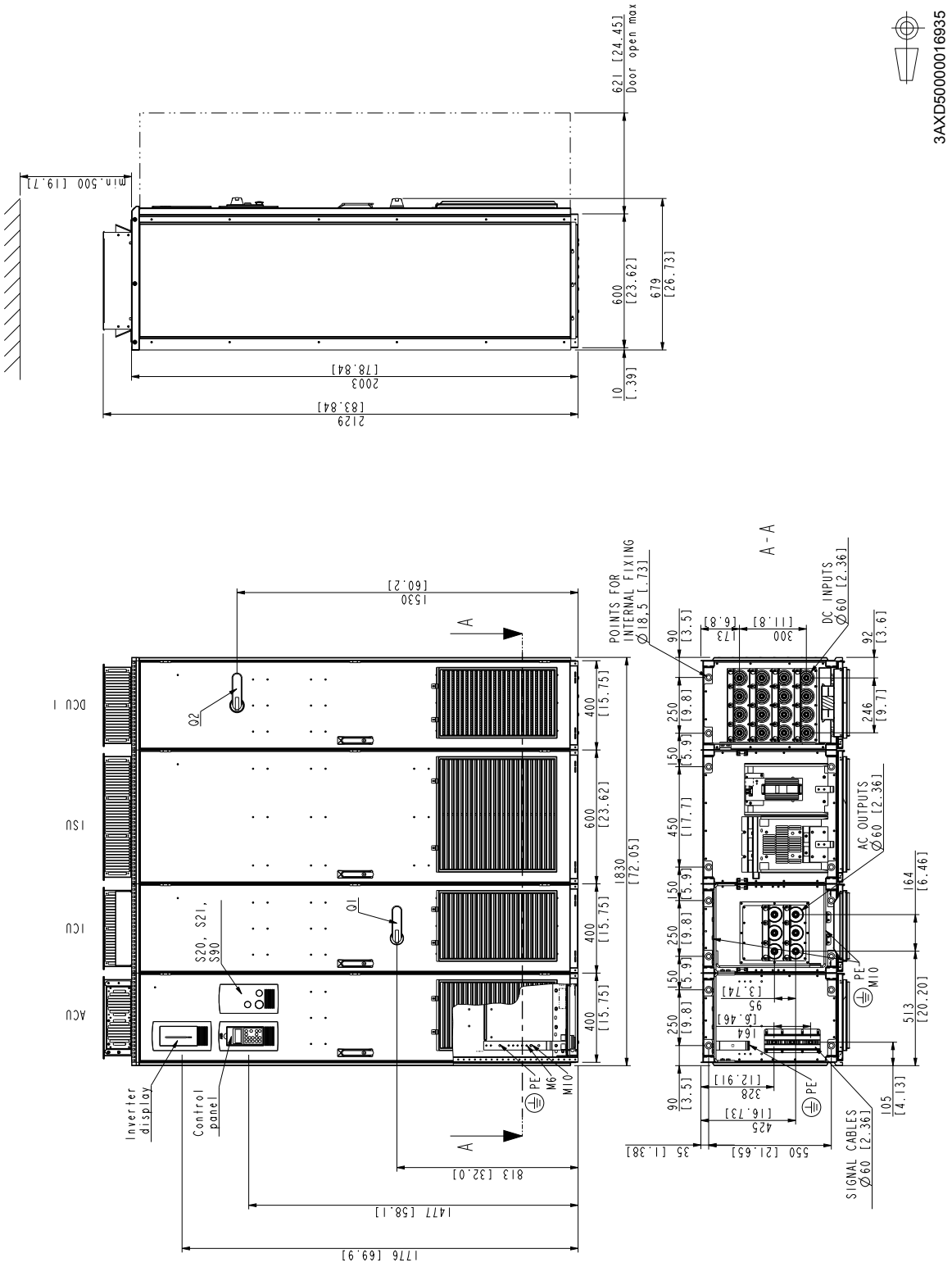
AC output:


3AUA0000083128
L1
L2
L3
PE
115,5
[4.5]
44
[1.7]
44
[1.7]
162,5 [6.40]
112,5 [4.43]
Ø13
[.51]
86,5 [3]
86,5 [3.4]
40 [1.57]
531 [20.91]

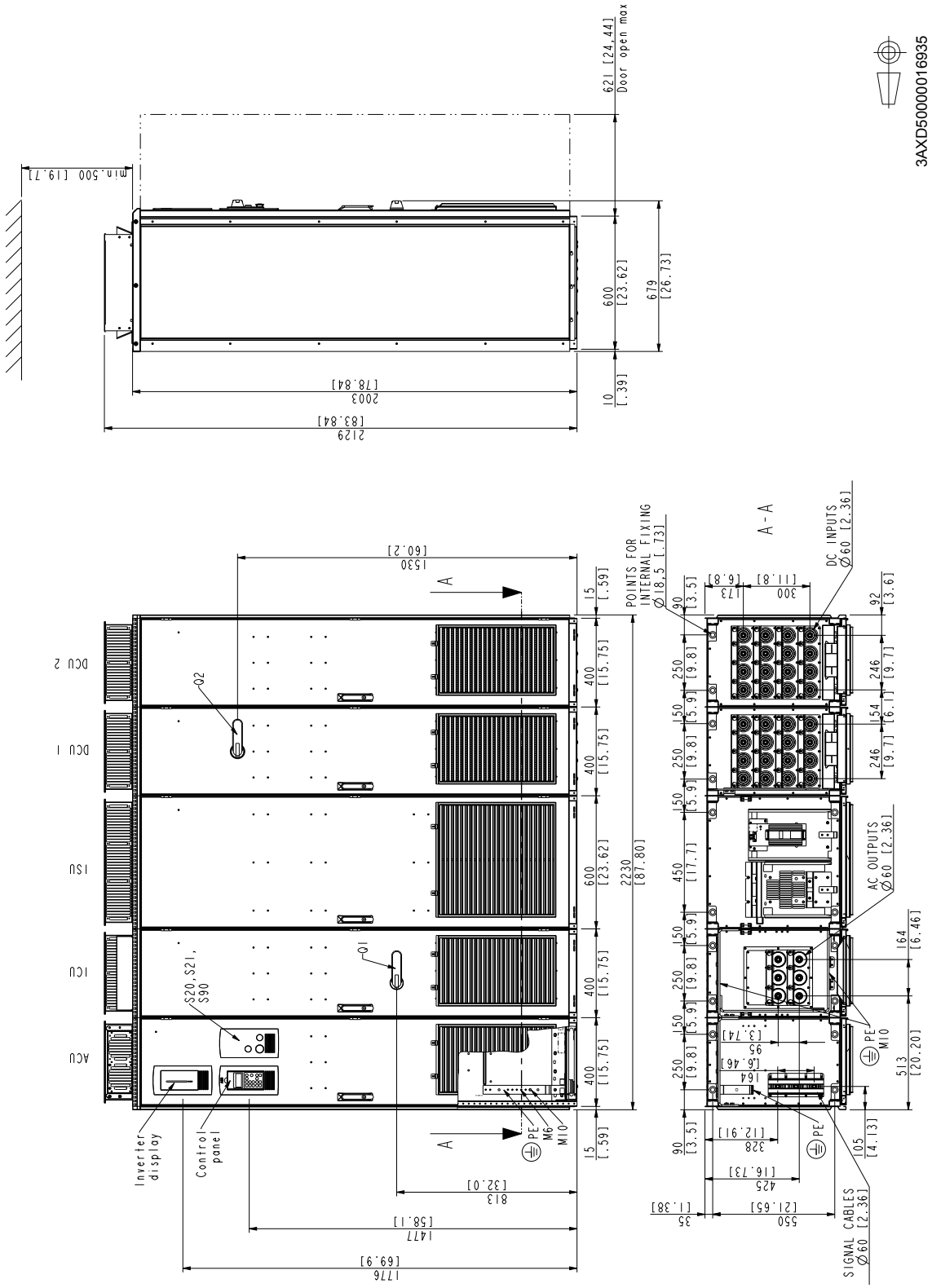

Four DC inputs
DCP
DCM
DCP
DCM
DCP
DCM
DCP
DCM
PE
3AUA0000083128
PE
STRINGS 1/3
364,9 [14.37]
STRINGS 2/4
513 [20.20]
329,5 [13.0]
88 [3.5]
One DC input
DCP
DCM
PE
145,5
[5.7]
130
[5.1]
Ø13 [.51]
PE
40 [1.57]
492,5 [19.39]
260 [10.2]
50 [1.97]

Frame R8i

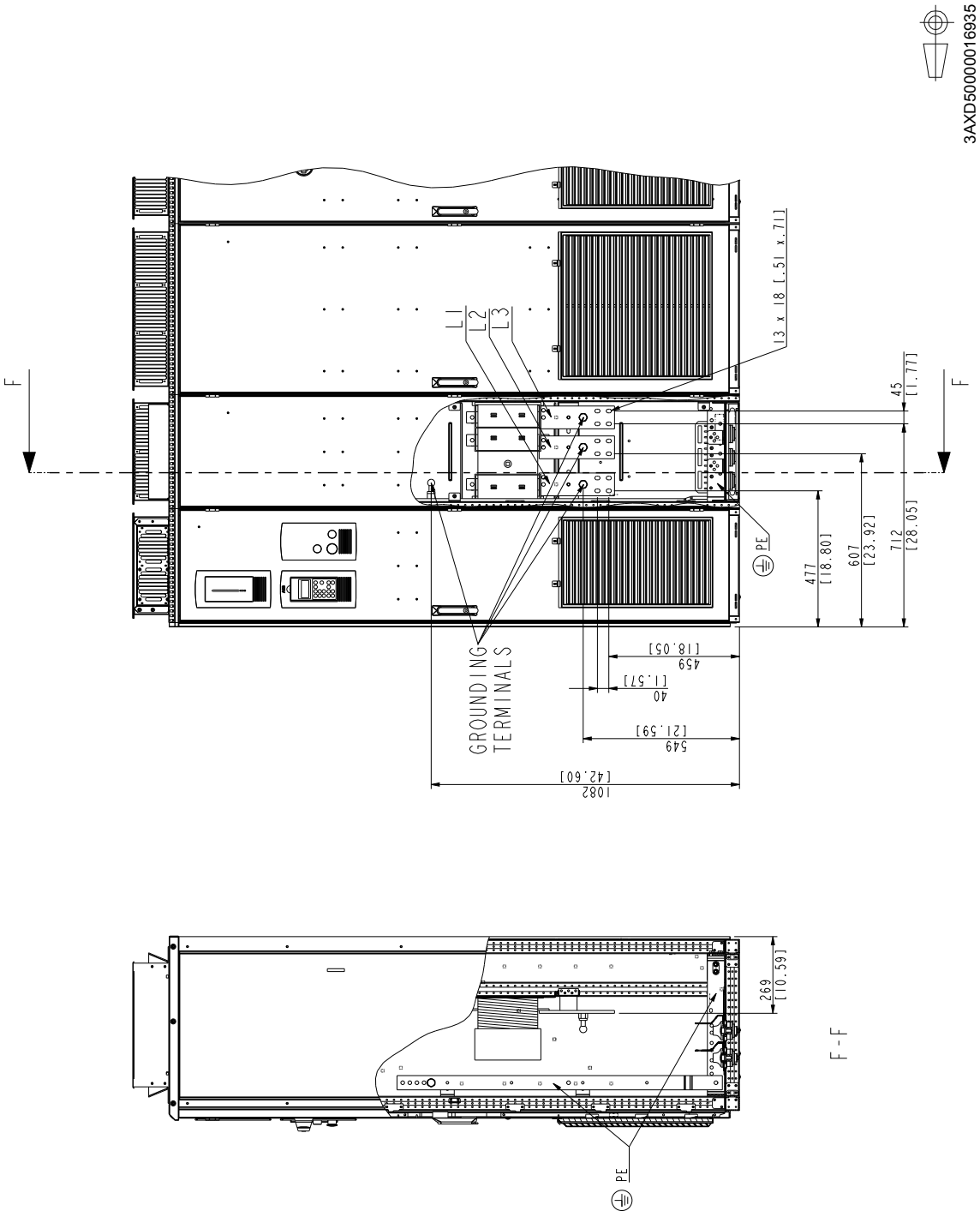
R8i – 2 DC inputs (option +2H382) or 4 DC inputs (option +4H382):



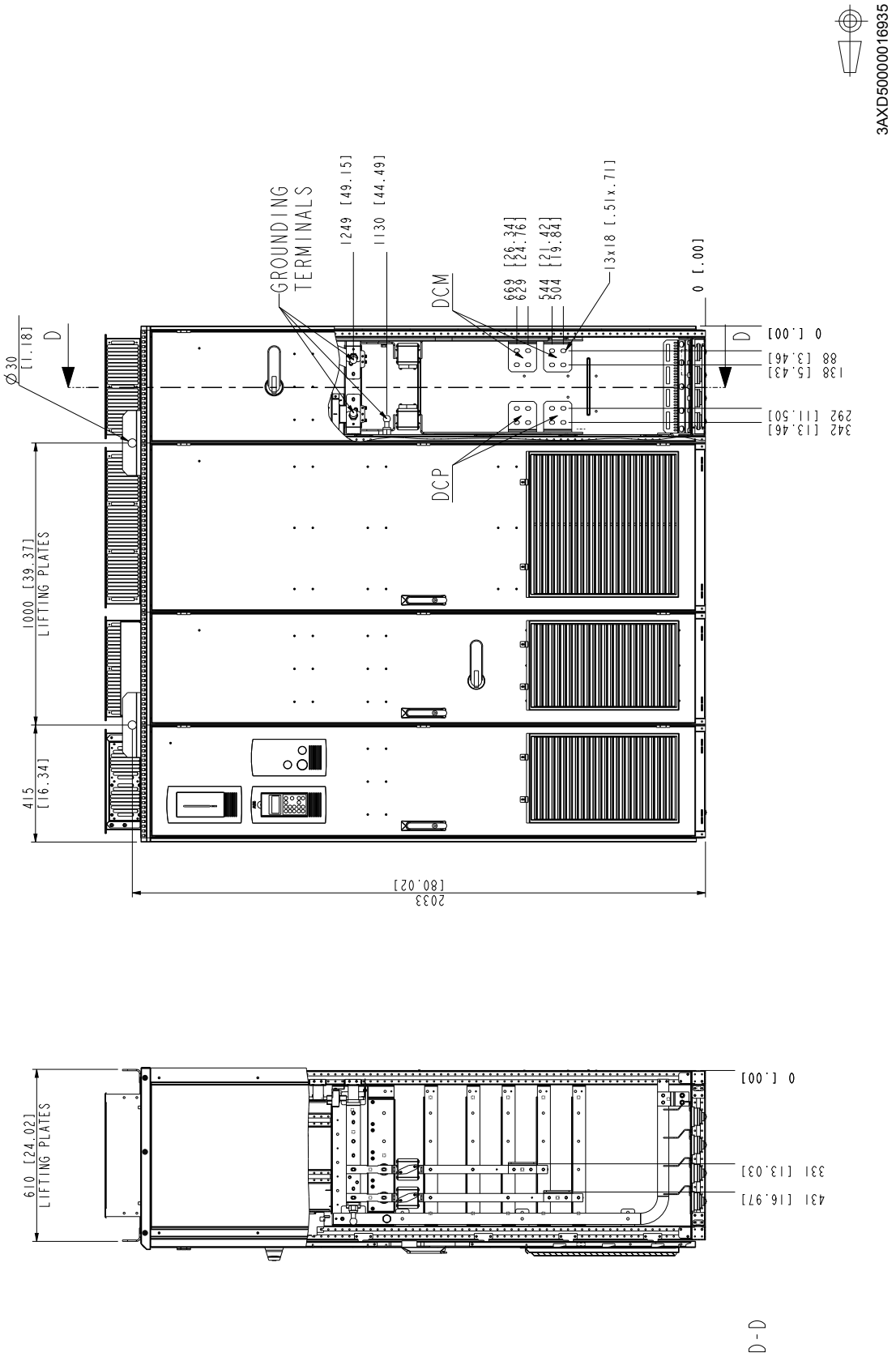
R8i – 8 DC inputs (option +8H382):



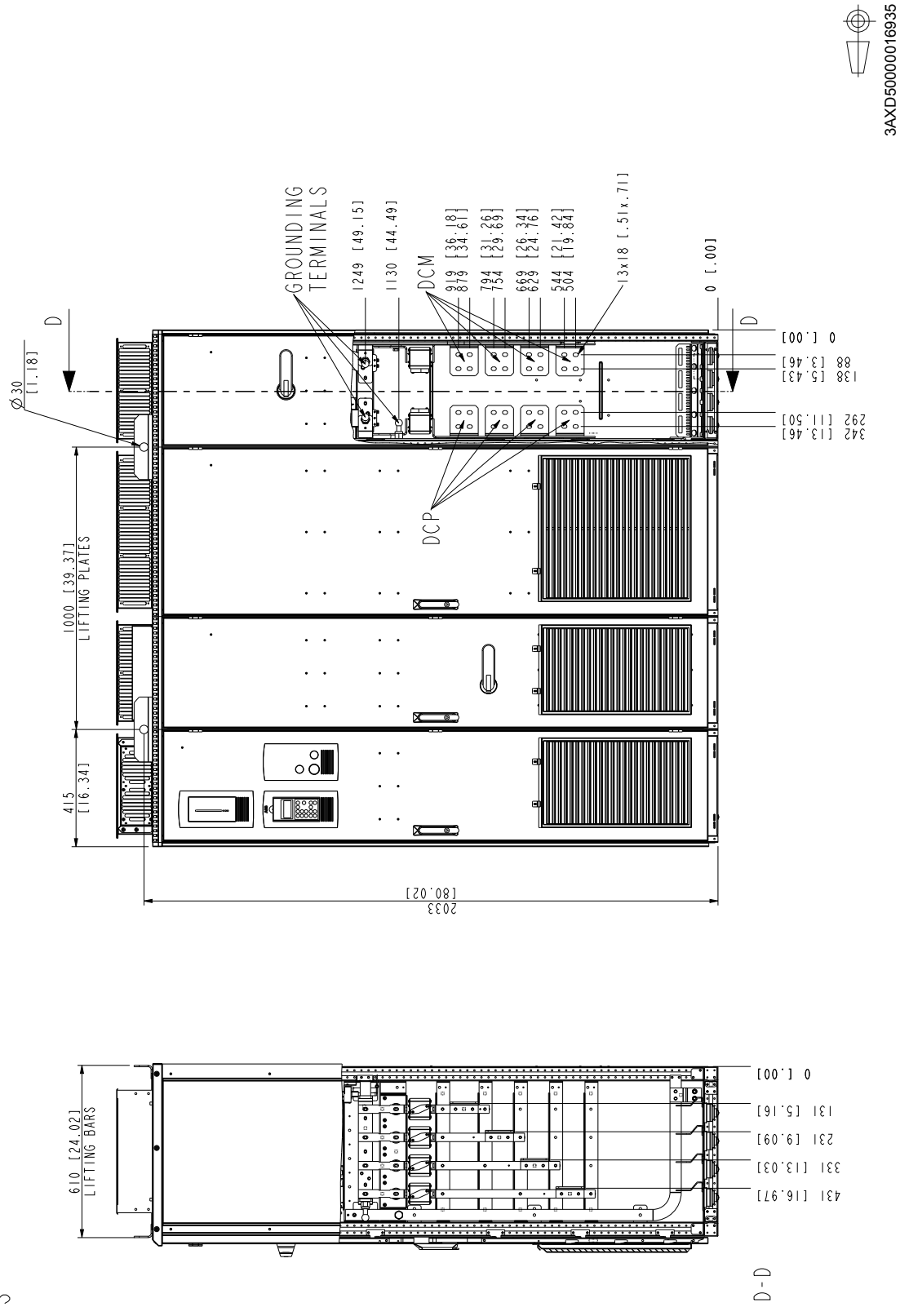
R8i – AC output terminals:



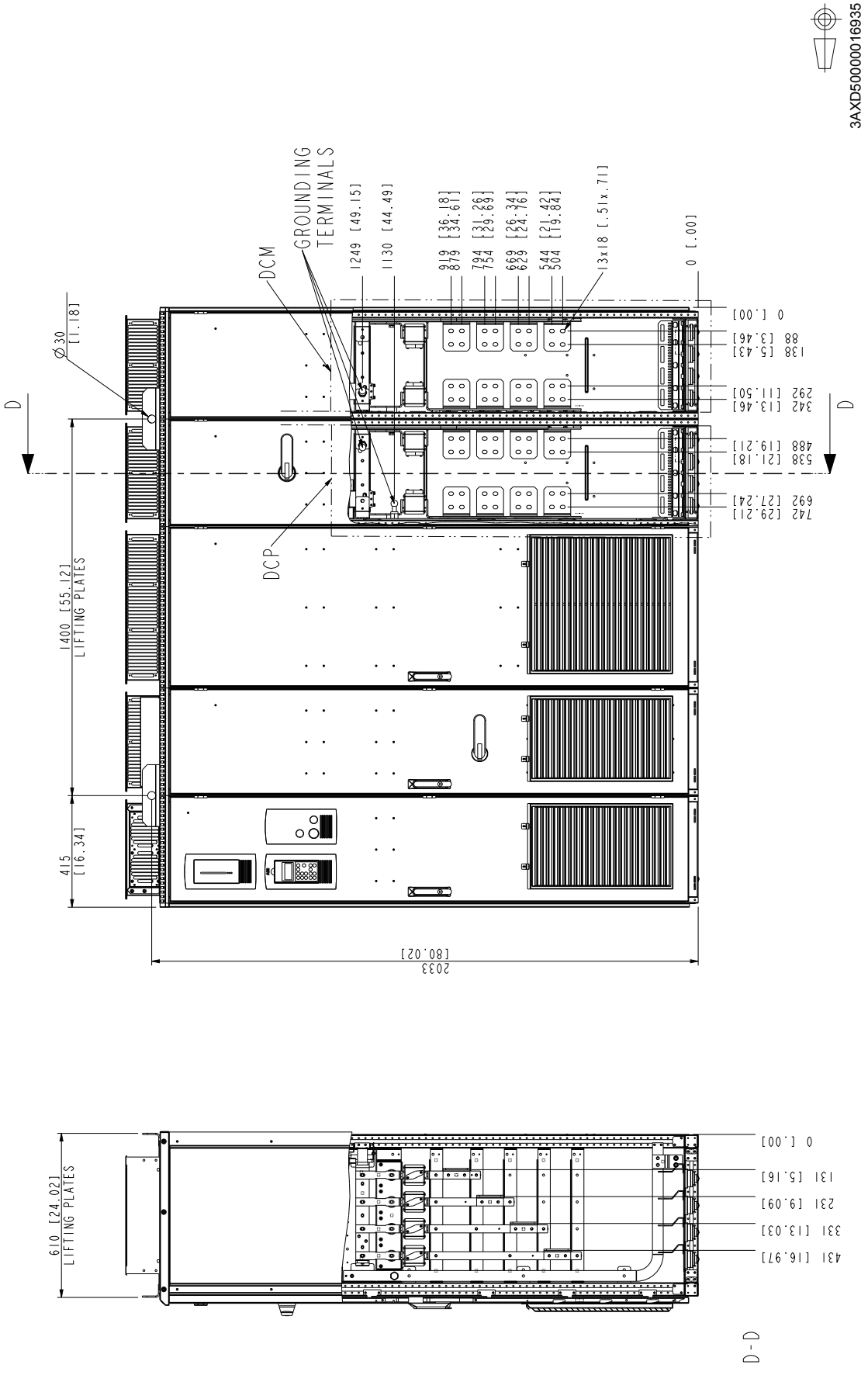
R8i – DC terminals of units with 2 DC inputs (option +2H382):



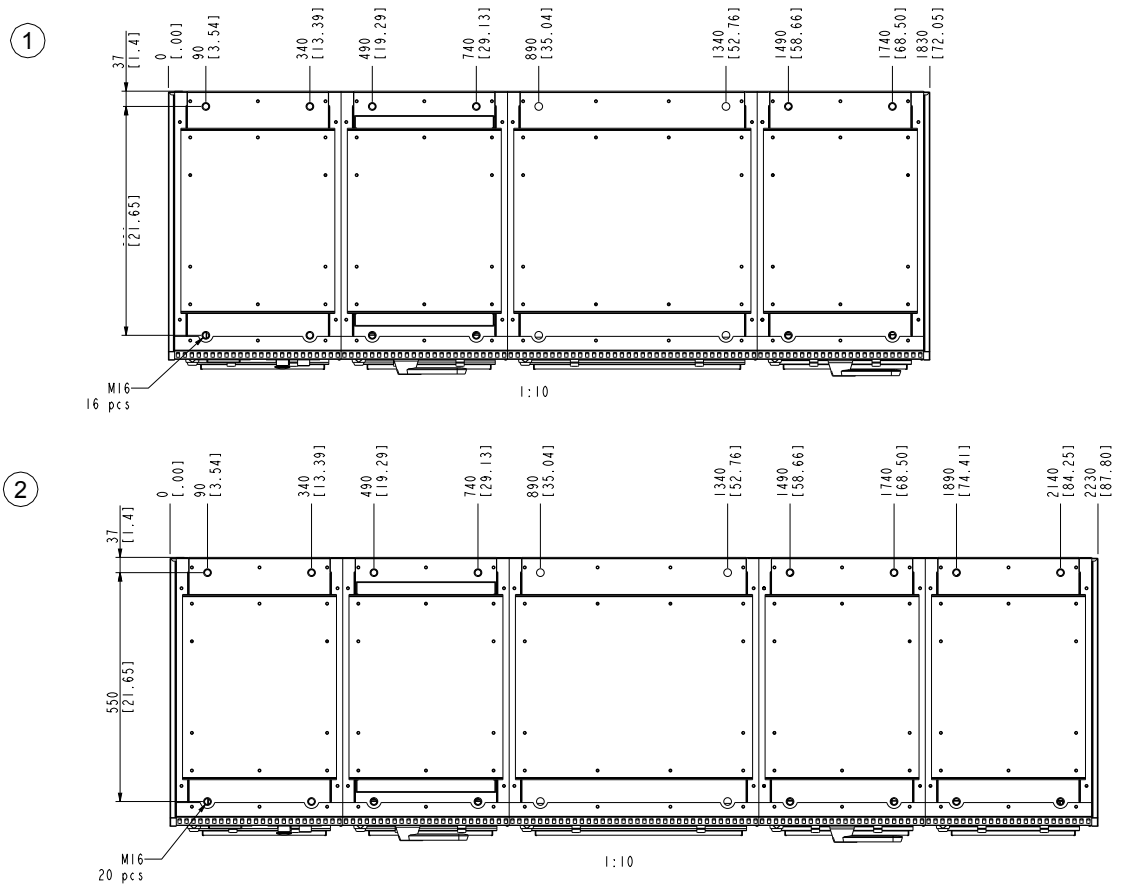
R8i – DC terminals of units with 4 DC inputs (option +4H382):



R8i – DC terminals of units with 8 DC inputs (option +8H382):



R8i – Top view of fastening points:

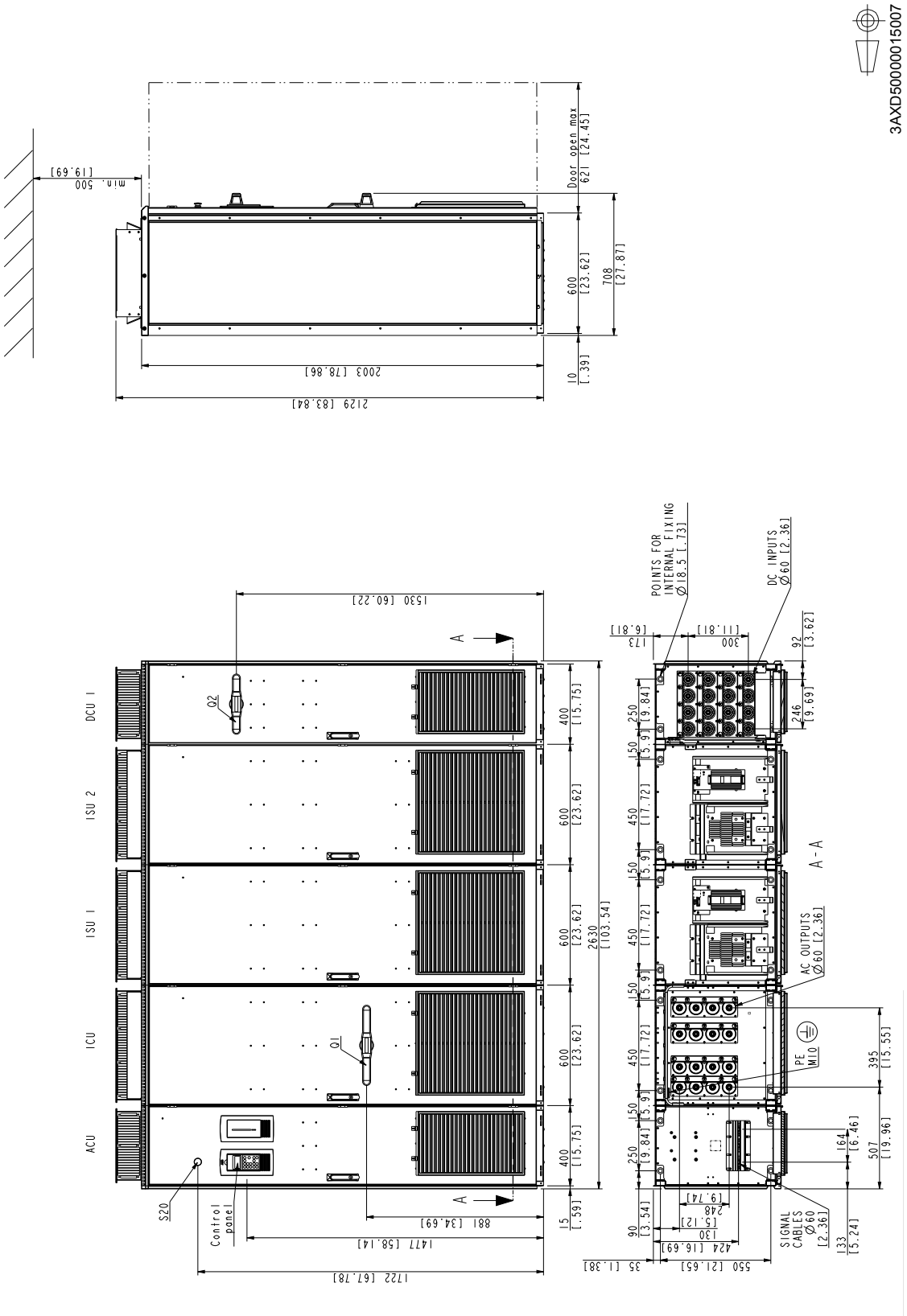


3AXD50000016935

1) Two DC inputs (option +2H382), four DC inputs (option +4H382)
2) Eight DC inputs (option +8H382)

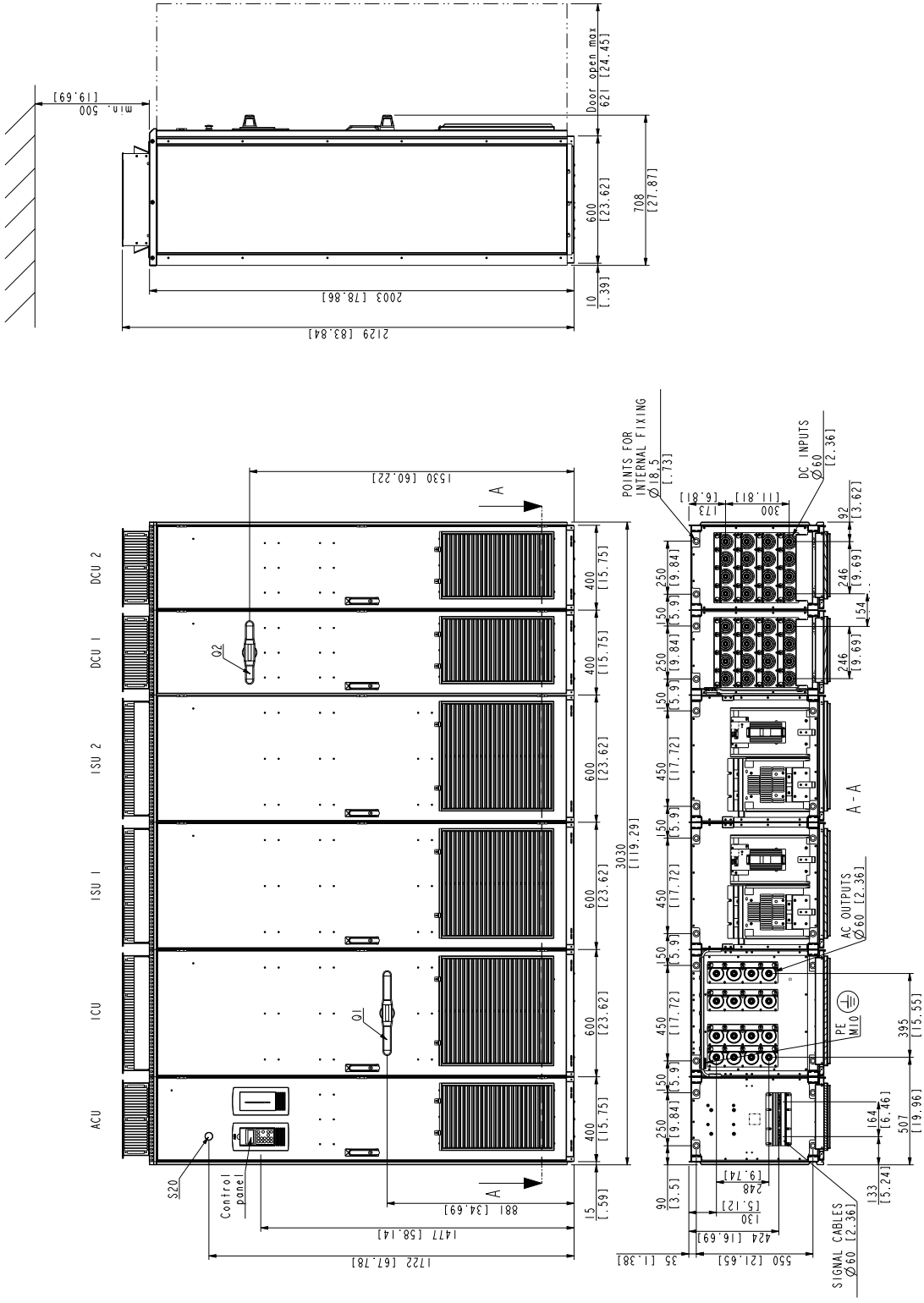
Frame 2 × R8i

2 × R8i – 4 DC inputs (option +4H382) or 5 DC inputs (option +5H382):

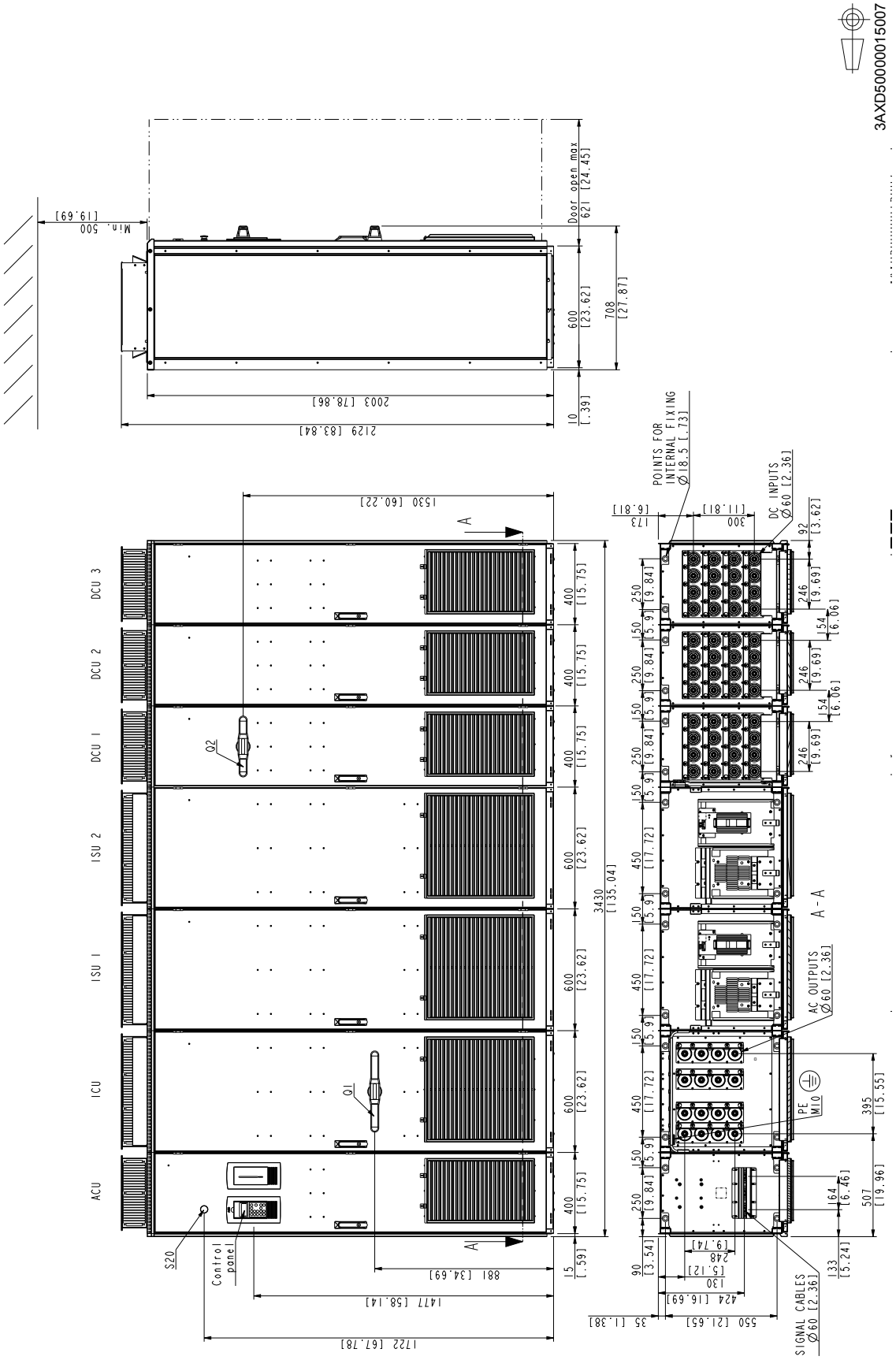


2 × R8i – 8 DC inputs (option +8H382) or 10 DC inputs (option +10H382):

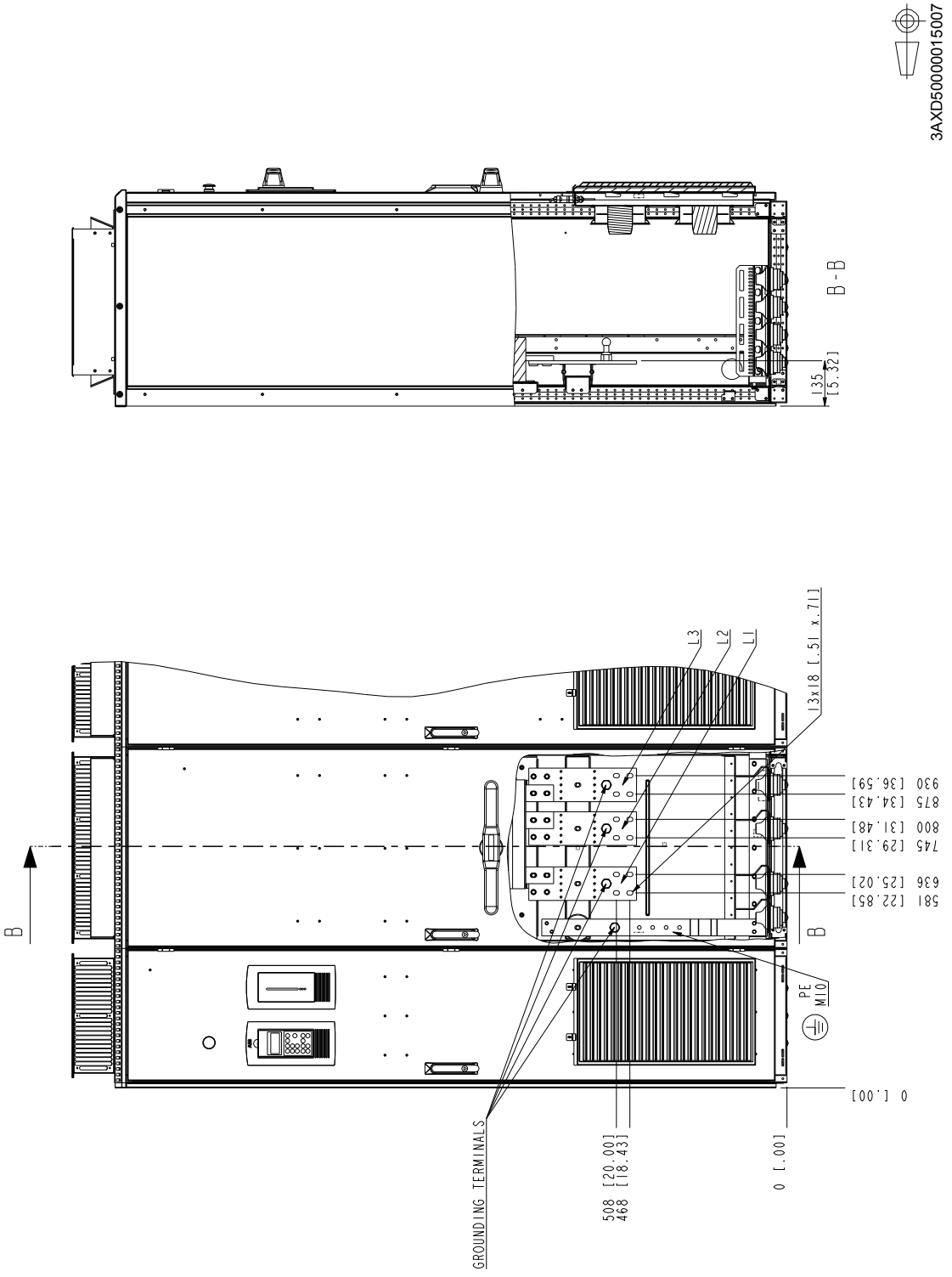
3AXD50000015007



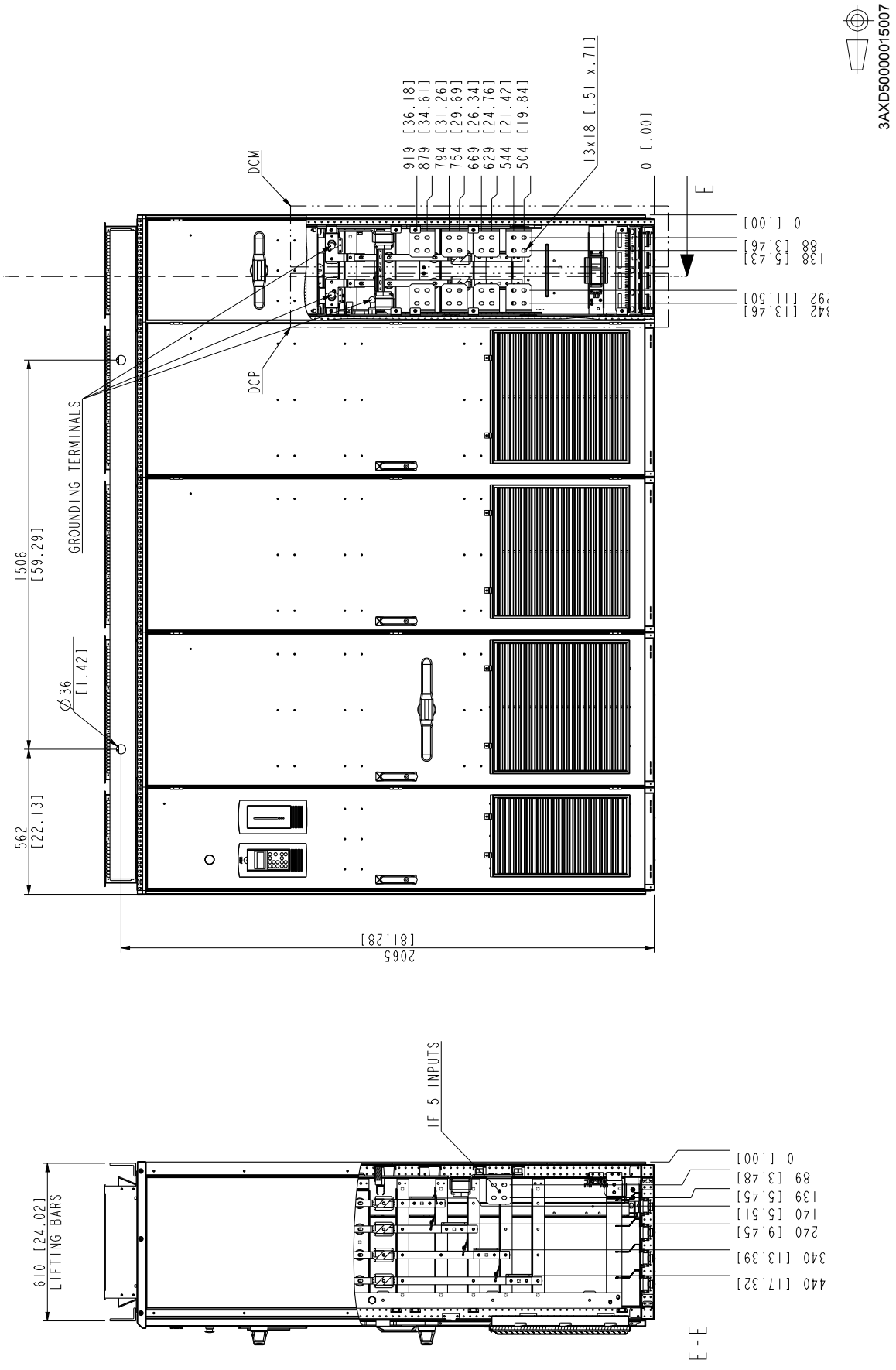
2 × R8i – 12 DC inputs (option +12H382) or 15 DC inputs (option +15H382):



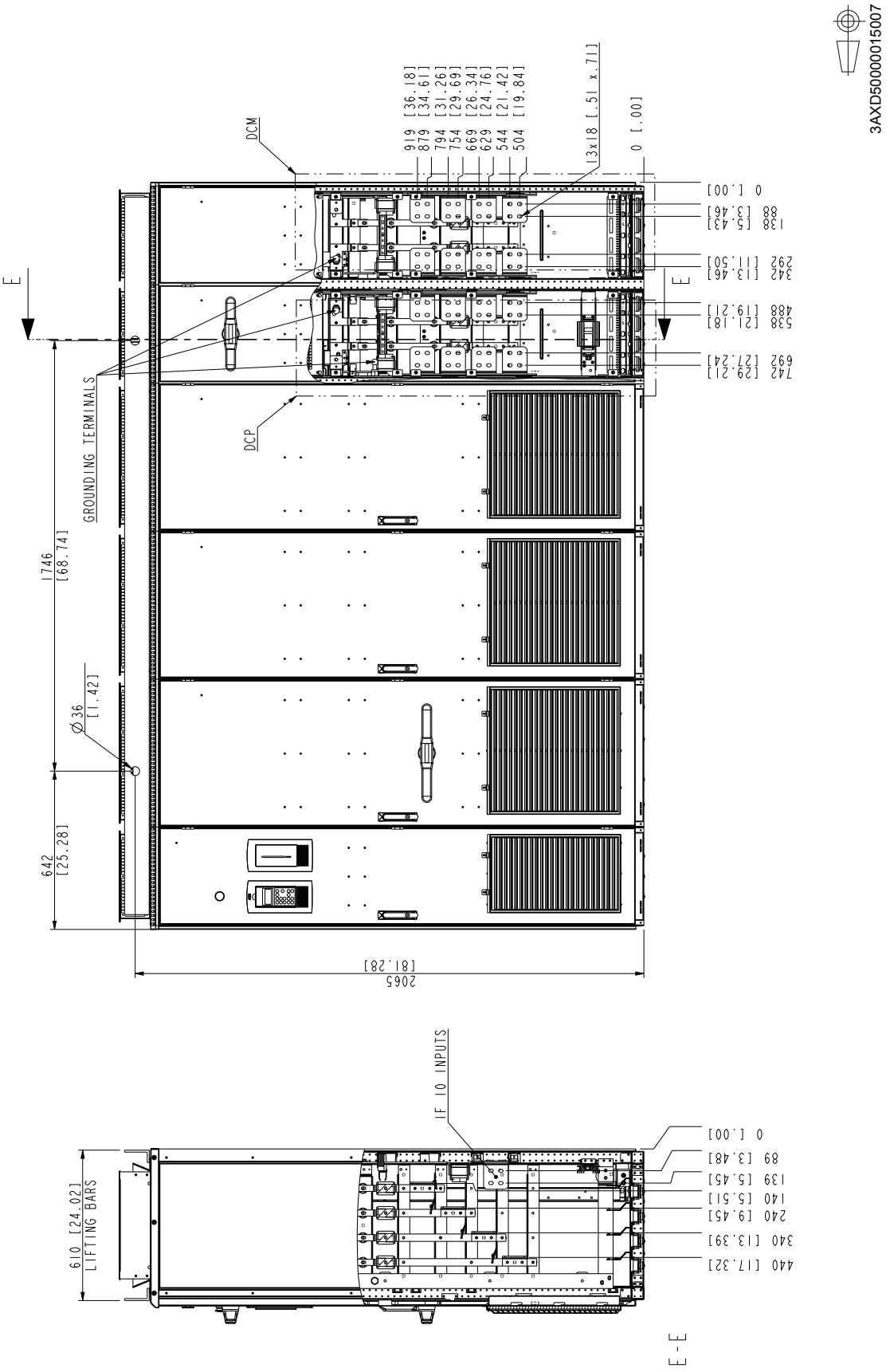
2 × R8i – AC output terminals:



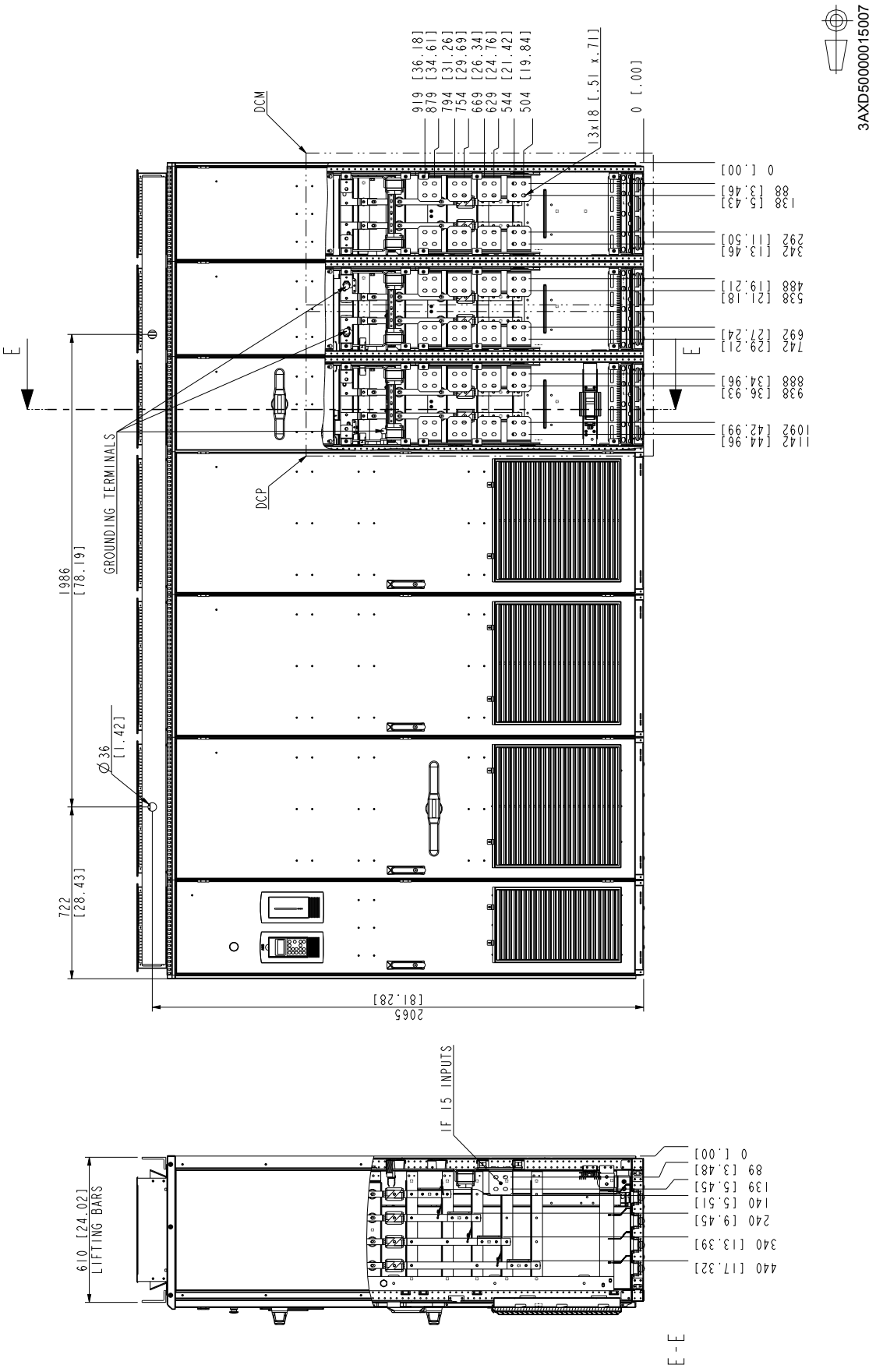
2 × R8i – DC terminals of units with 4 DC input terminals (option +4H382) or 5 DC input terminals (option +5H382):



2 × R8i – DC terminals of units with 8 DC input terminals (+8H382) or 10 DC input terminals (+10H382):

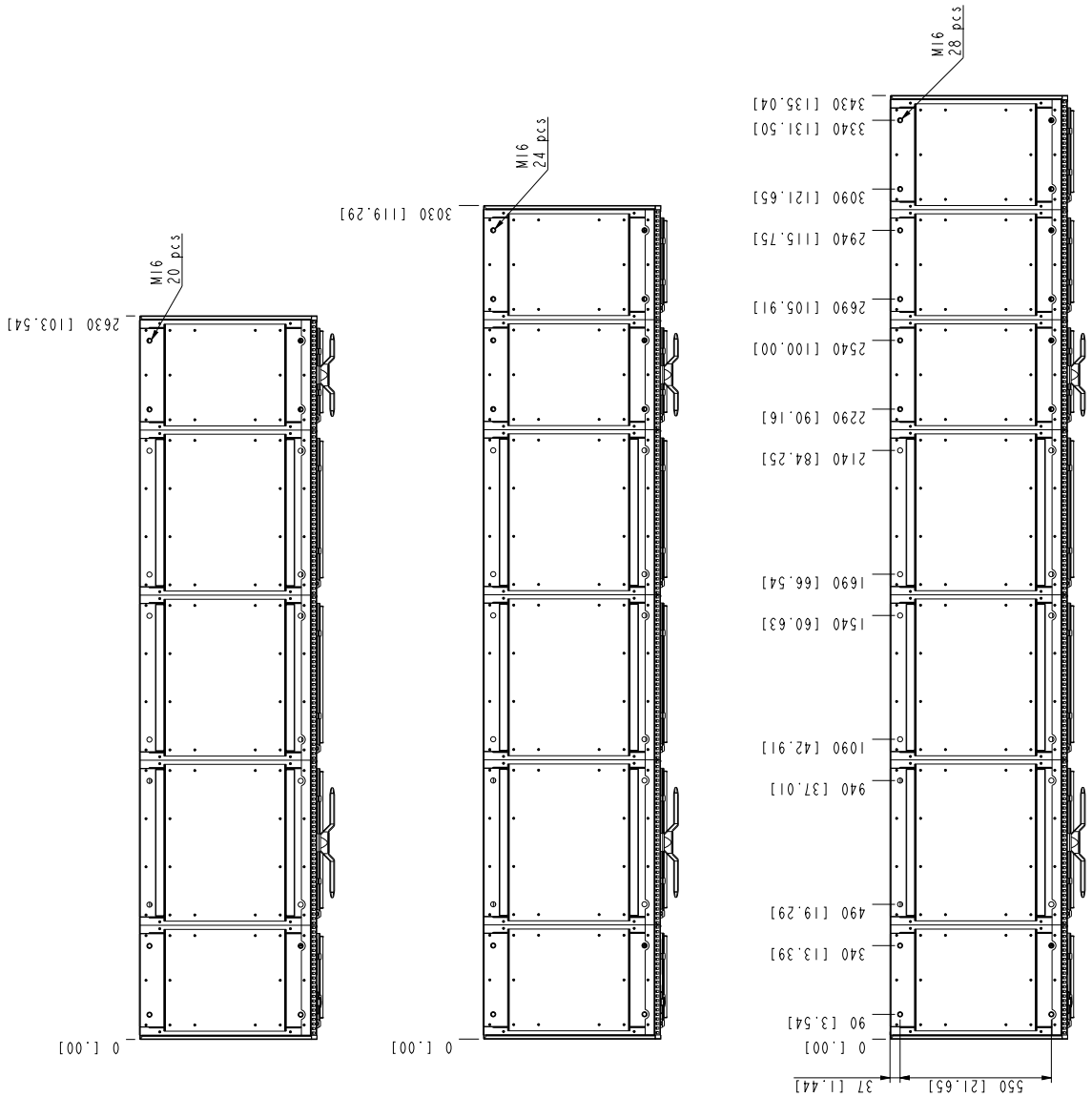


2 × R8i – DC terminals of units with 12 DC input terminals (+12H382) or 15 DC input terminals (+15H382):



2 × R8i – Top view of fastening points:

3AXD50000015007



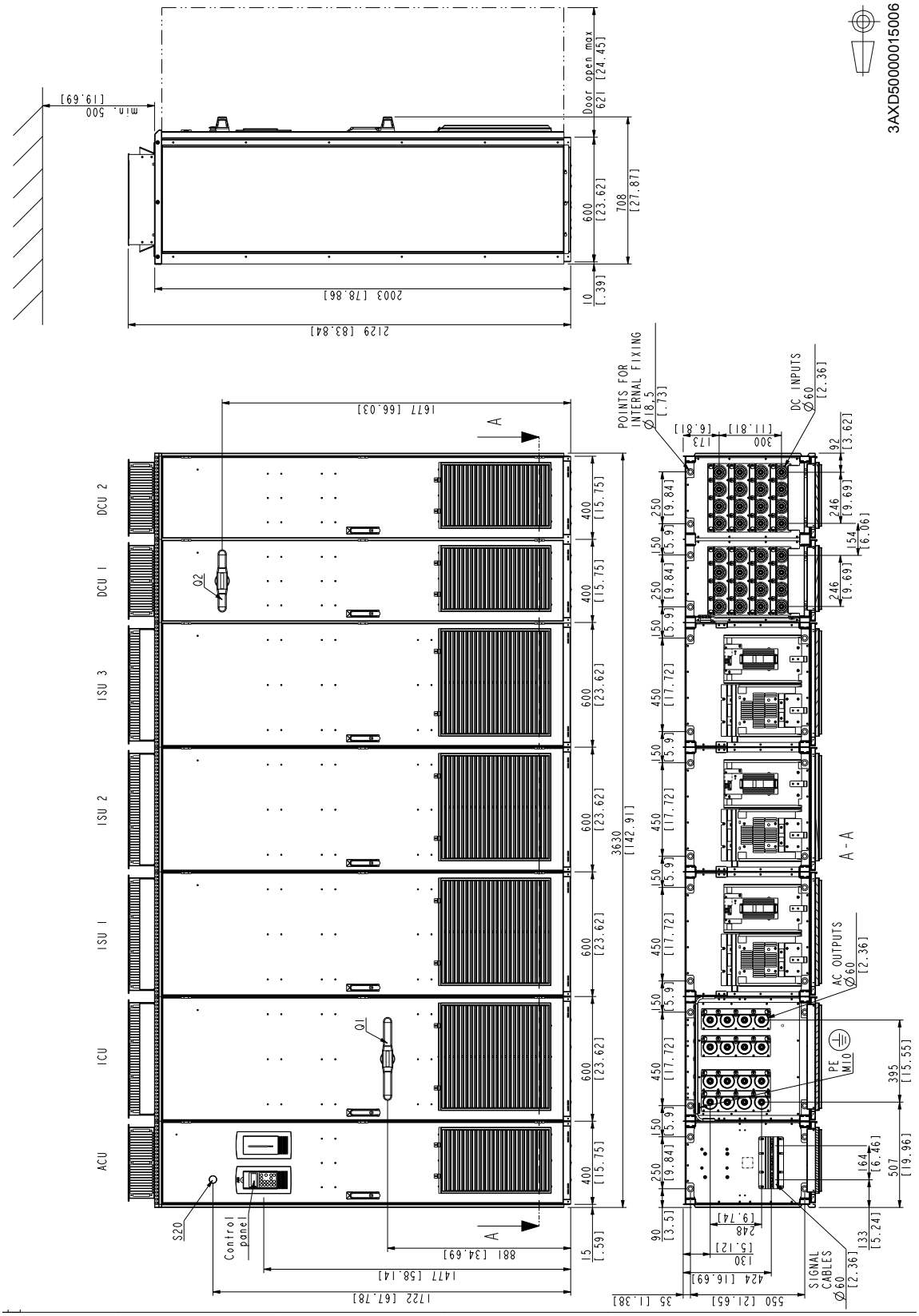
4 DC inputs (+4H382) or
5 DC inputs (+5H382)

8 DC inputs (+8H382) or
10 DC inputs (+10H382)

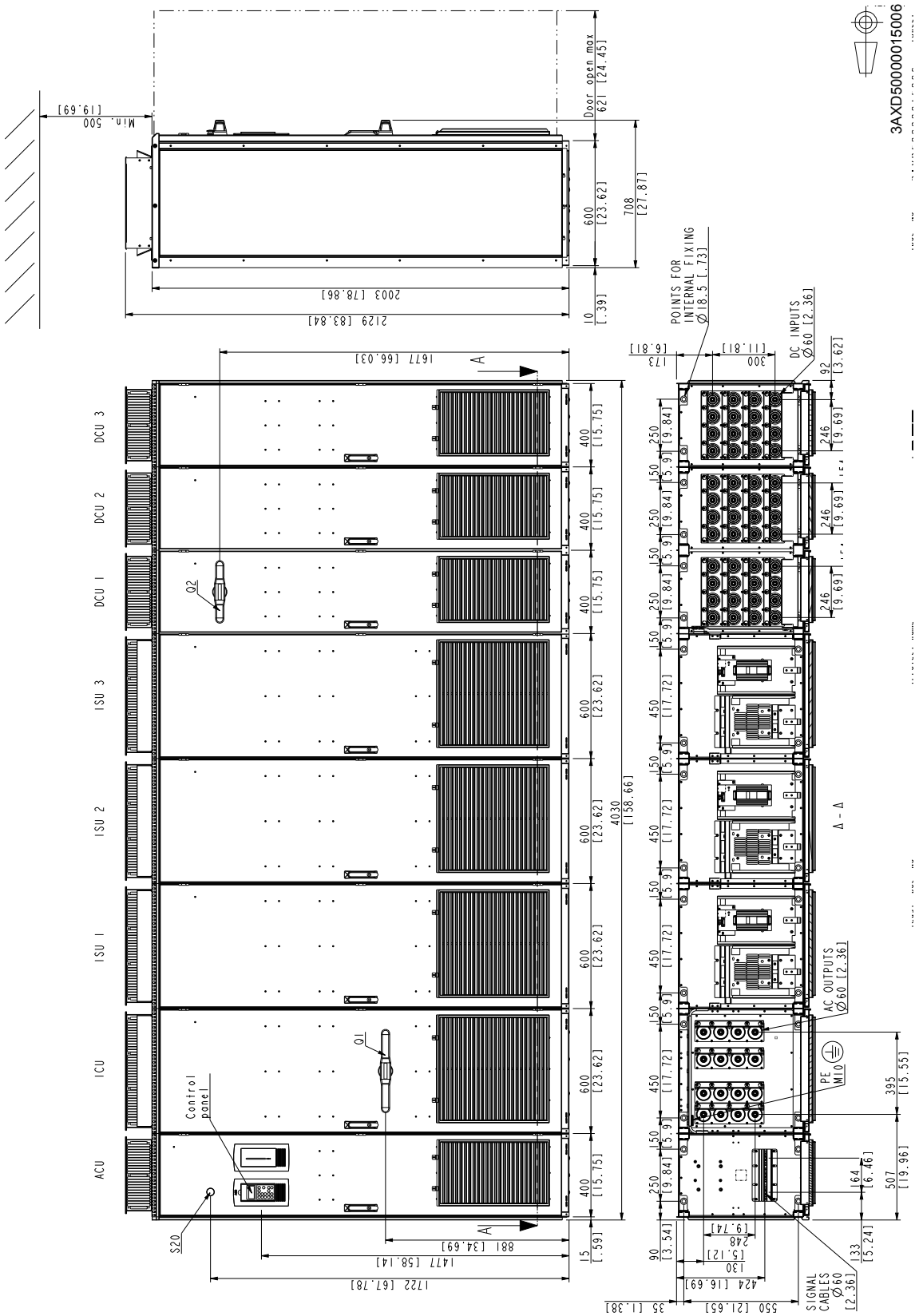
12 DC inputs (+12H382) or
15 DC inputs (+15H382)

Frame 3 × R8i

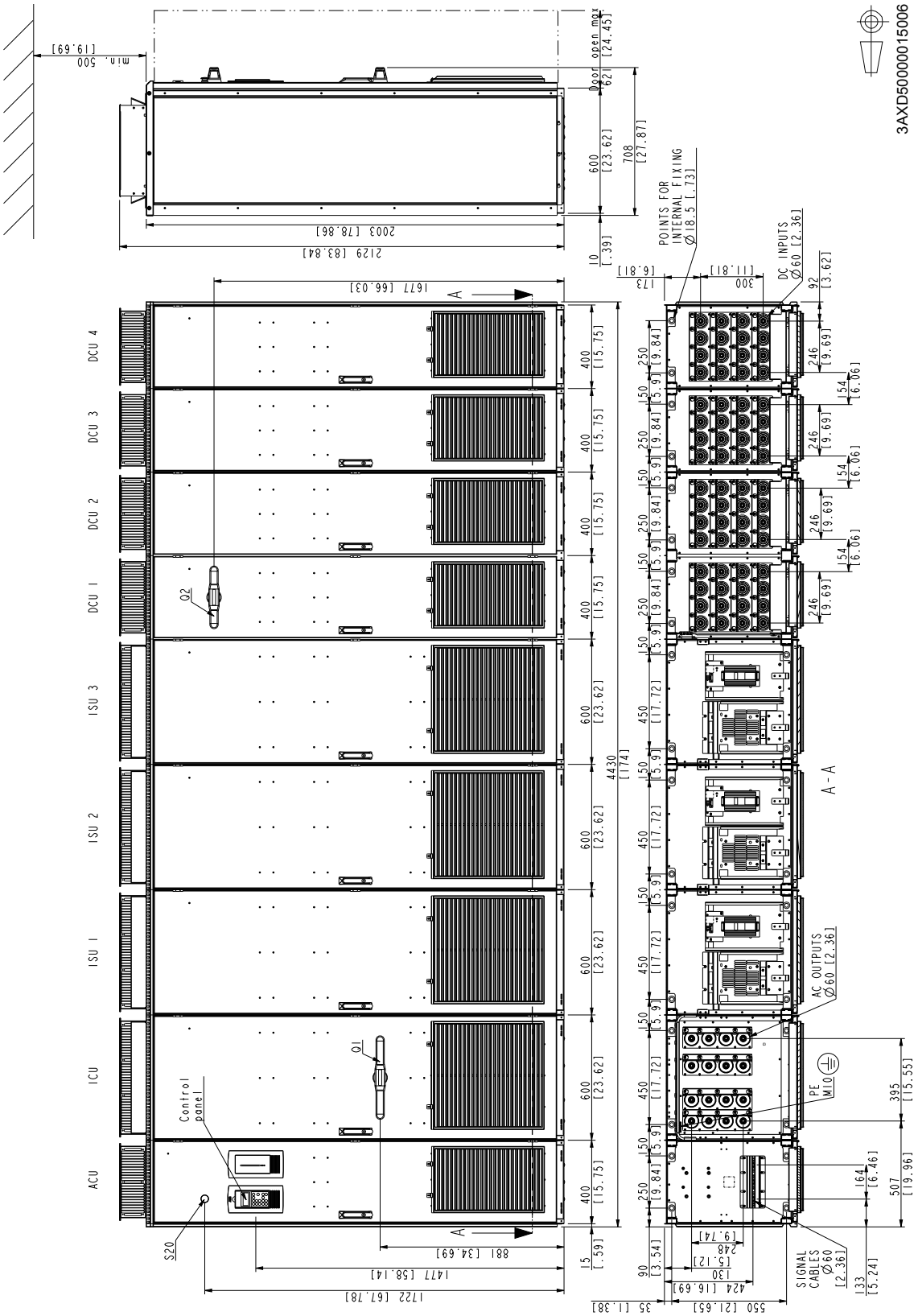
3 × R8i – 8 DC inputs (option +8H382) or 10 DC inputs (option +10H382):



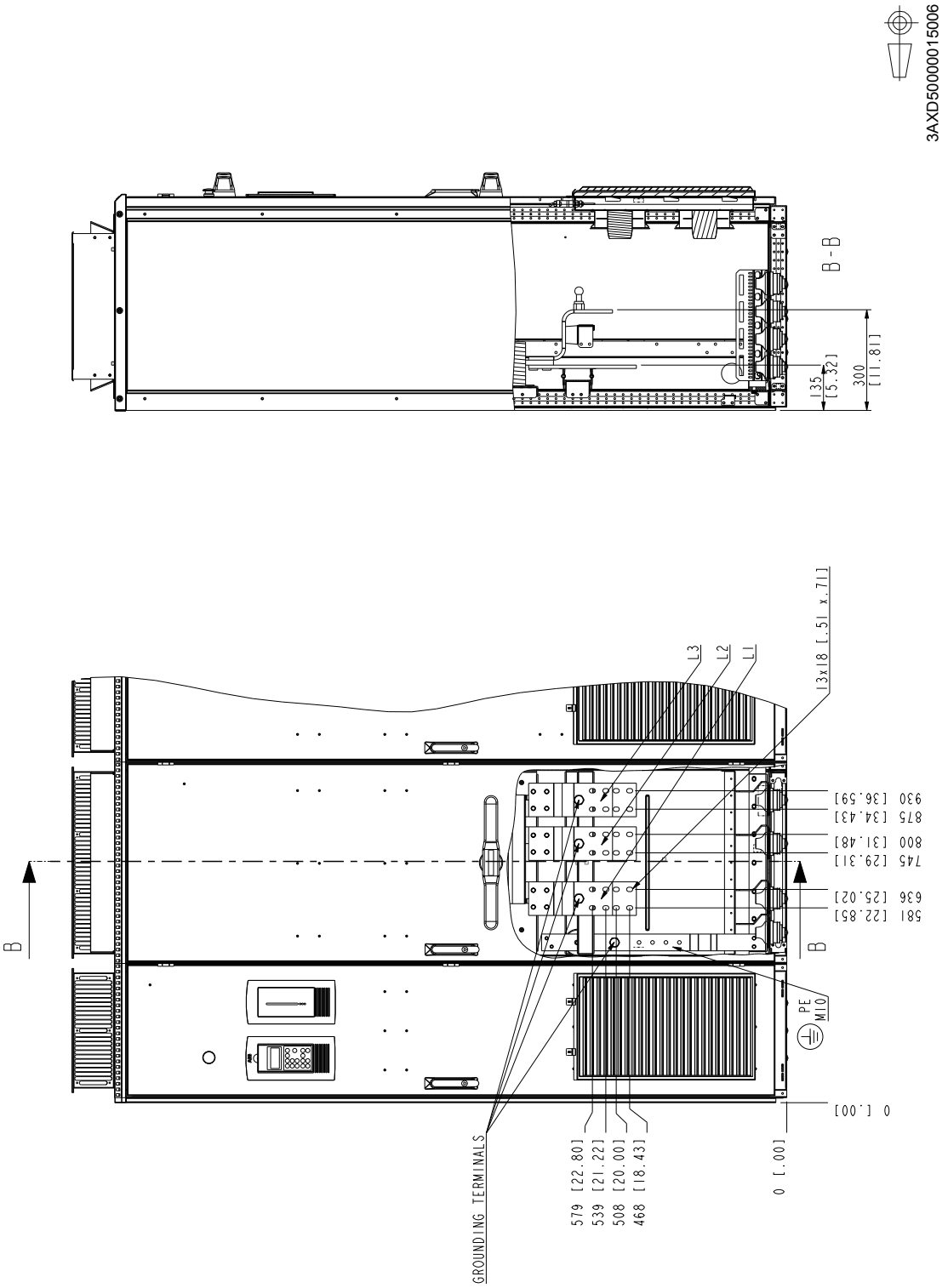
3 × R8i – 12 DC inputs (option +12H382) or 15 DC inputs (option +15H382):



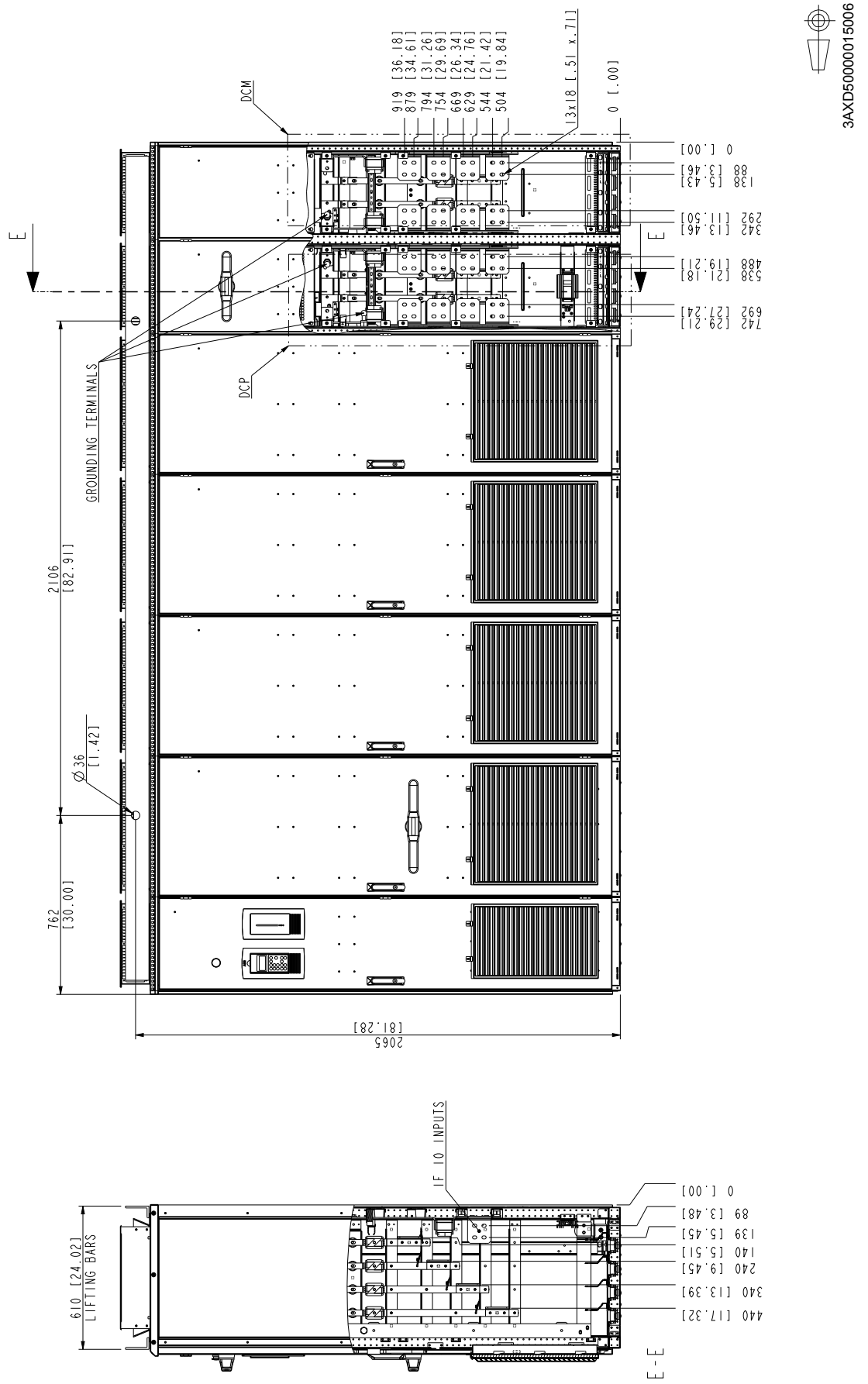
3 × R8i – 16 DC inputs (option +16H382) or 20 DC inputs (option +20H382):



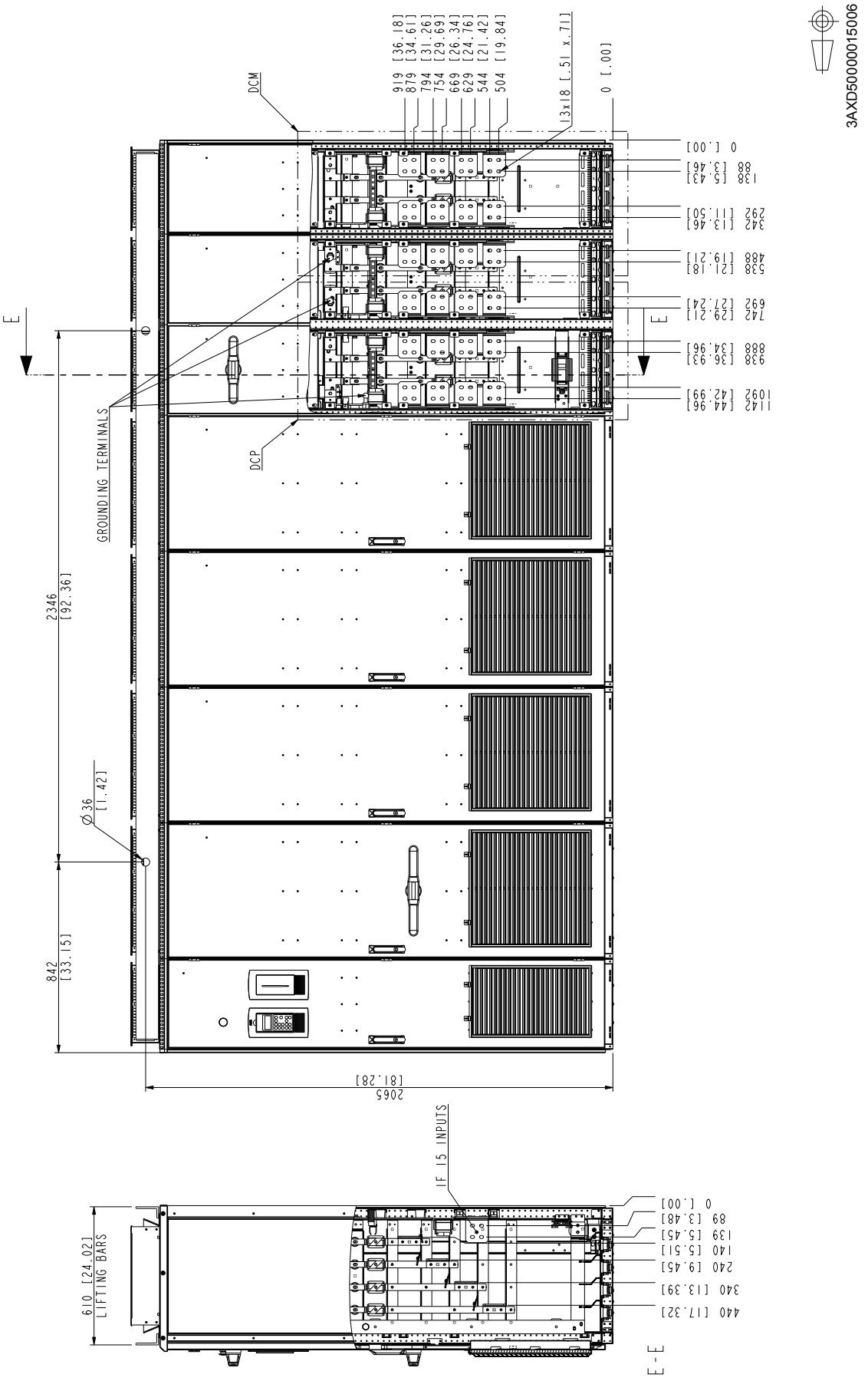
3 × R8i – AC input terminals:



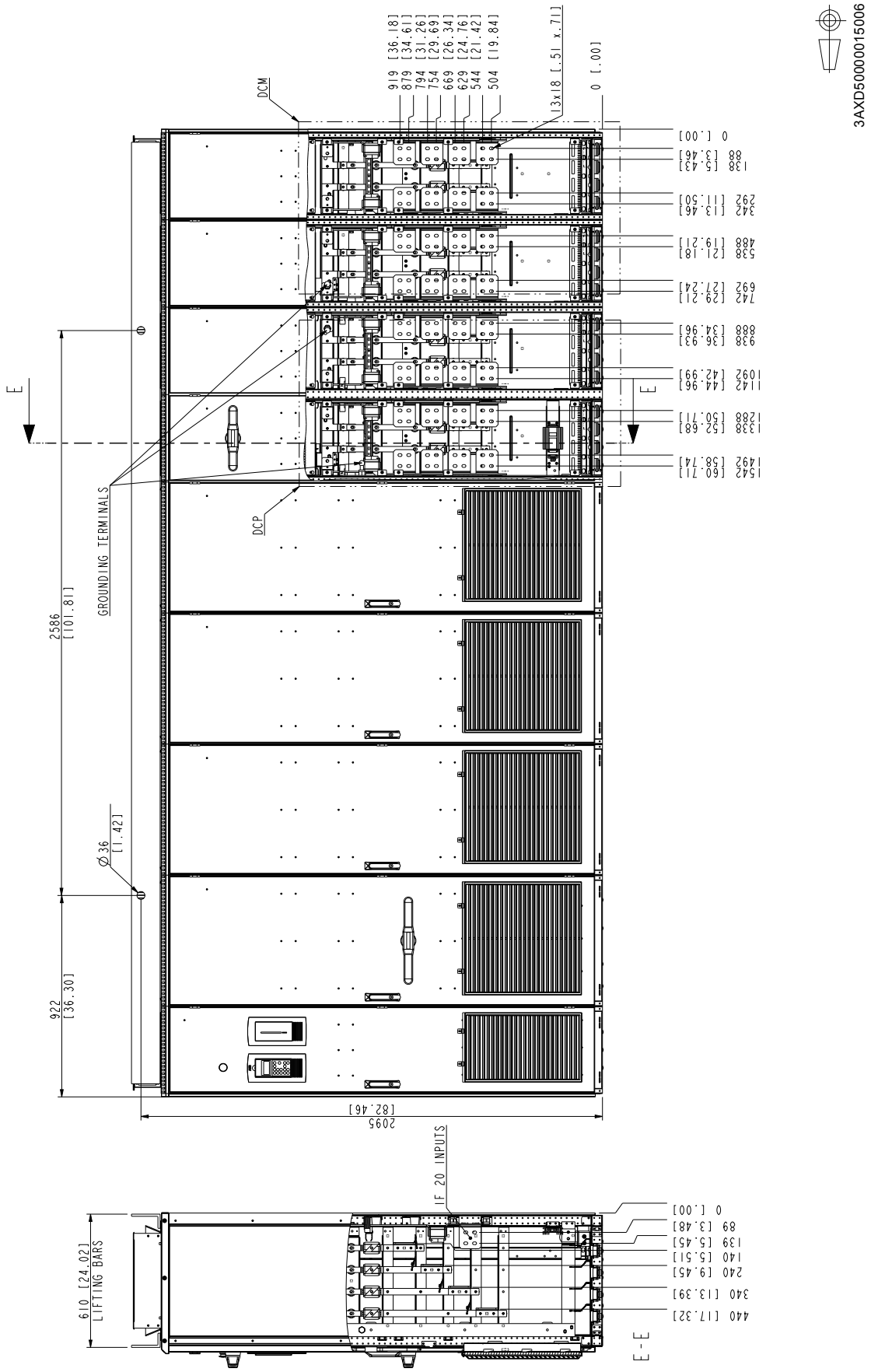
3 × R8i – DC terminals of units with 8 DC input terminals (option +8H382) or 10 DC input terminals (option +10H382):



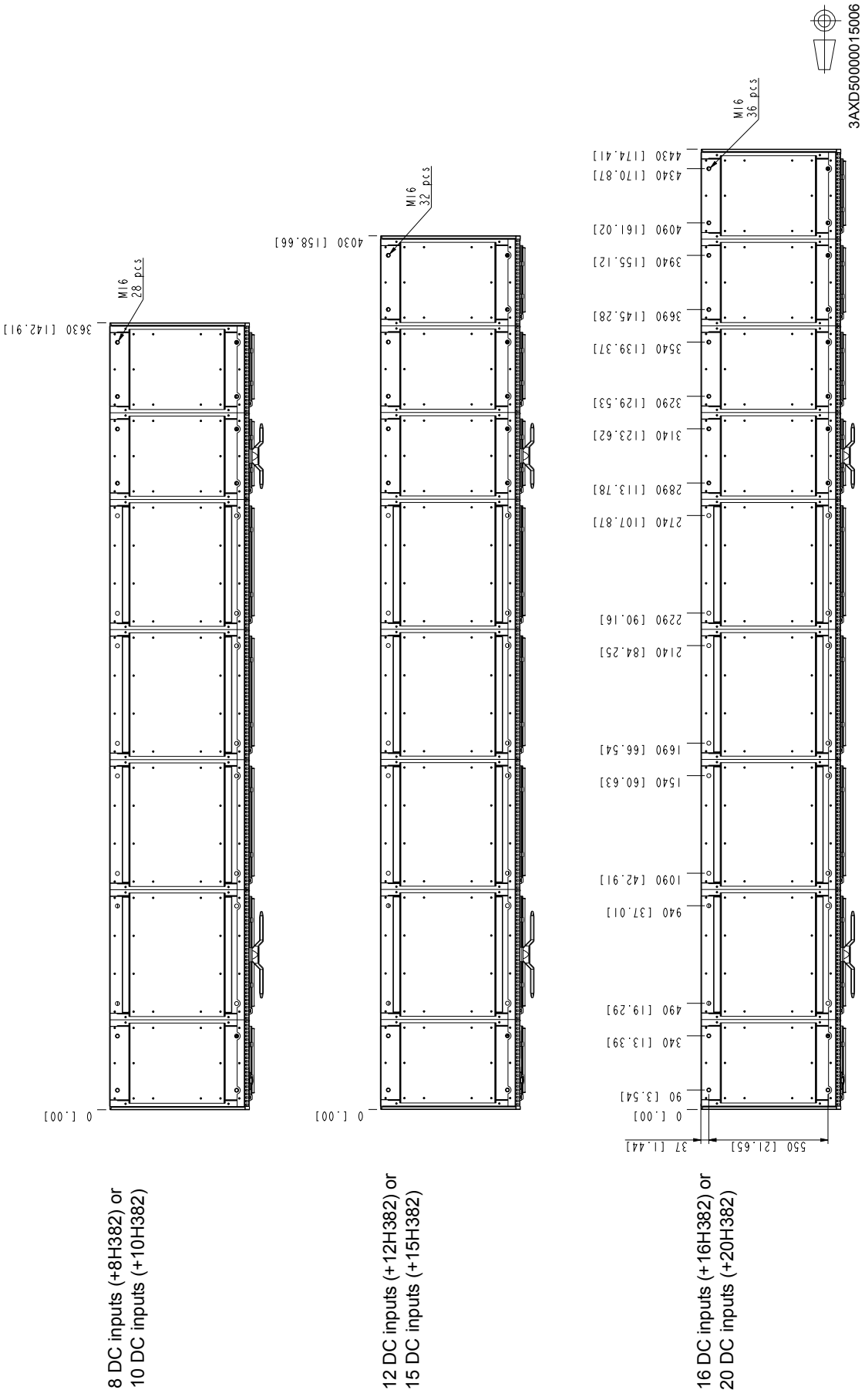
3 × R8i – DC terminals of units with 12 DC input terminals (option +12H382) or 15 DC input terminals (option +15H382):



3 × R8i – DC terminals of units with 16 DC input terminals (option +16H382) or 20 DC input terminals (option +20H382):



3 × R8i – Top view of fastening points:



Further information

More information about ABB products for solar applications on the Internet: www.abb.com/solar.

Contact us

www.abb.com/solar

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