ABB SOLAR INVERTERS

PVS800-57B central inverters

Hardware manual

List of related manuals

Hardware manuals and guides	Code (English)
PVS800-57B central inverters hardware manual	3AXD50000048300
PVS800-57B central inverters commissioning and maintenance manual	3AXD50000048331
Firmware manuals and guides	
PVS800-57B central inverters firmware manual	3AXD50000048332
Option manuals and guides	
ACx-AP-x assistant control panels user’s manual	3AUA0000085685
BCU-02/12/22 control units hardware manual	3AUA0000113605
Drive composer start-up and maintenance PC tool user's manual	3AUA0000094606
FENA-01/-11/-21 Ethernet adapter module user’s manual	3AUA0000093568
FSCA-01 RS-485 adapter module user’s manual	3AUA0000109533

Hardware manual

PVS800-57B central inverters

3AXD50000048300 Rev C
EN
EFFECTIVE: 2019-09-18

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6. Technical data

7. Dimension drawings

8. Control unit

Further information

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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. Obey these safety instructions to prevent injury or death, or damage to the 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.

The manual uses these warning symbols:

	**Electricity warning** – Electrical hazards which can cause injury or death, or damage to the equipment.
	**General warning** – Conditions, other than those caused by electricity, which can cause injury or death, or damage to the equipment.
	**Electrostatic sensitive devices warning** – Risk of electrostatic discharge which can cause damage to the equipment.
	**Hearing loss warning** – Risk of hearing loss due to high volumes. Wear hearing protection.

Installation and maintenance safety

Electrical safety

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

WARNING! Obey these instructions to prevent injury or death, or damage to the equipment.

- **If you are not a qualified electrician, do not do electrical installation or maintenance work.**
- Obey all installation safety standards. This can require, among other things, the use of personal protection equipment (PPE), such as arc-proof clothing, arc-proof masks, protective footwear, protective gloves, eye protection and hearing protection. High power inverter installations have high fault currents. Select appropriate arc-proof clothing (for example, in the US, a rating of 40 cal/cm^2 is required).
- Standard IEC/EN 62109-2 (section 4.8.3.6) requires that, as the inverter is not provided with full protection against shock hazards on the photovoltaic generator, you install and use the inverter in a closed electrical operating area only. There is no RCD protection inside the inverter.
- Do not do work on the photovoltaic generator, or the inverter, or its input or output cables, when the inverter is connected to an electrical power system, or to the photovoltaic generator. Voltage may be present when the panels are exposed to light.
- Before you do work in 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 optional AC disconnector or optional breaker do not isolate the AC output cables and terminals of the inverter from the electrical power system. The optional DC disconnector does not isolate the DC input fuses, cables or terminals from the DC voltage supplied by the photovoltaic generator. There are service access areas that remain energized during service, but sufficient guards are provided for indirect contact.
- There are more than one live circuits. Refer to the single line diagram.
- Before you do work in the inverter cabinet, turn off or isolate the auxiliary voltage supply from the inverter.
- The inverter auxiliary power can be supplied from an external source (standard) or from internal auxiliary power transformers. Make sure that auxiliary power is disconnected.
- Do not operate the inverter with the doors open, even in fault tracking conditions. The inverter doors act as arc hazard protection. If a highly unlikely arc flash incident happens when the inverter doors are open, even the arc-flash proof protection equipment might not provide sufficient protection.
- Before you do work on the inverter, apply a temporary grounding for work (AC and DC side).
- Do not do work on the control cables when power is applied to the inverter or to the external control circuits. Externally supplied control circuits can cause dangerous voltages in the inverter even when the main power on the inverter is off.
- Live parts in the inverter cabinet are protected against direct contact when all protective plastic covers and metallic shrouds are in place.

- Do not do insulation or voltage withstand tests on the inverter or inverter modules.
- The installation must be done according to the local requirements (for example, ANSI/NFPA 70, Canadian Electrical Code, and so on).
- Utility interconnection may require approval from the authority with local jurisdiction.

Note: With DC side functional grounding (negative as standard, positive functional grounding optional), one of the poles of the photovoltaic generator is grounded, and therefore, the other pole has full voltage against ground (up to 1000 V).

Grounding

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

WARNING! Obey these instructions to prevent injury or death, damage to the equipment and electromagnetic interference.

- Only qualified electricians are allowed to do grounding work.
- Always ground the inverter and adjoining equipment. Correct grounding also decreases electromagnetic emissions and interference. Follow the site's policy on disconnecting the inverter from AC and DC.
- The minimum cross section of the grounding conductor must be at least half of the cross section of the line conductor or fulfill the local regulations. Refer to standard IEC 60364-5-54.
- In a multiple-inverter installation, connect each inverter separately to the protective earth (PE) busbar of the switch board or the transformer.
- Avoid grounding loops and keep grounding cables at least 0.5 m away from the AC cables, as current can be generated to a grounding loop by the electromagnetic coupling from the supply cables.
- When you use shielded AC power cables, connect the cable shields to the protective earth (PE) to meet safety regulations.
- External EMC filters are not permitted at the AC output of the inverter.
- Do not install the inverter on a TN (grounded) system.

Note:

- You can use power cable shields as grounding conductors only if their conductivity is sufficient.
- The normal touch current of the inverter can be more than 3.5 mA AC or 10 mA DC. Use a fixed protective earth connection. Refer to standard IEC/EN 62109, 5.2.5.

Electric welding

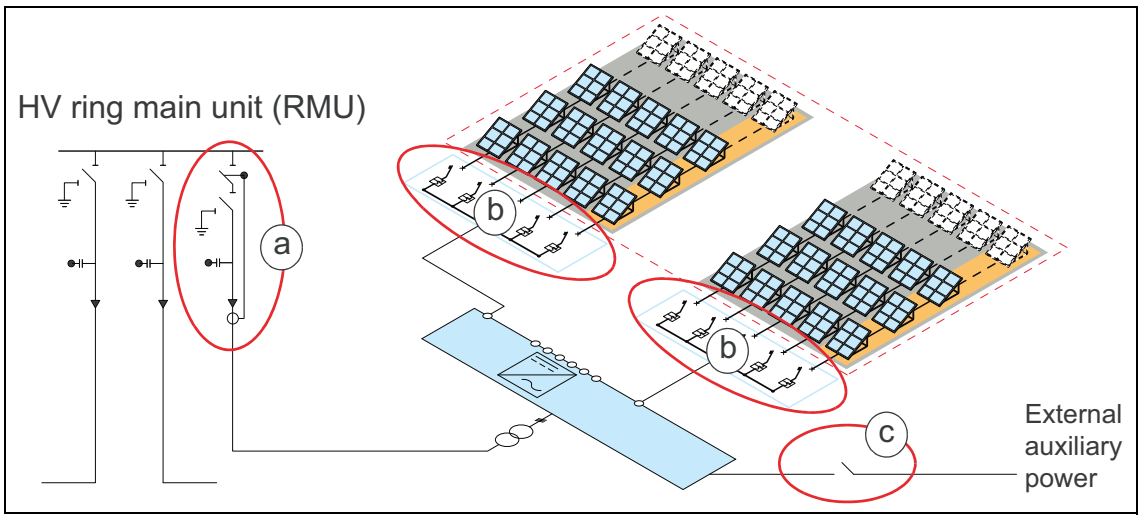
WARNING! Do not fasten the cabinet by electric welding and do not do any welding work on the inverter housing when inverters are installed. The welding circuit can cause damage to electronic circuits in the cabinet. It can also cause damage to the doors or the cabinet itself. ABB does not assume any liability for damages caused by electric welding.

Electrical safety precautions

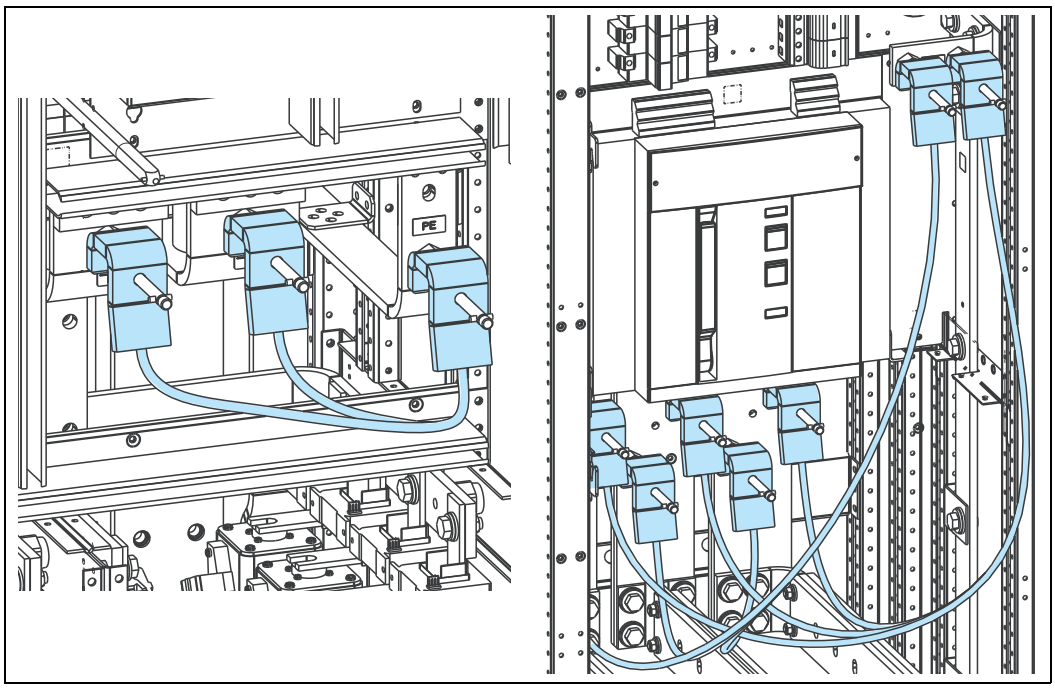
These precautions are for all personnel who work on the inverter, its input and output cables, the transformer or the photovoltaic modules.

WARNING! Obey these instructions to prevent injury or death, or damage to the equipment. You must be a qualified electrician to do installation and maintenance work. Review these steps before you do installation or maintenance work on the inverter.

1. Prepare for the work. Make sure that you have a work order. Select the applicable personal protective equipment.
2. Clearly identify the work location and equipment. Make sure that there is an escape route available in case of an emergency.
3. Disconnect all power sources and secure against reconnection. (Not all disconnectors provide sufficient isolation against voltage surges.)
   - Disconnect the inverter from the AC supply (normally a disconnector or a breaker on the HV side of the main transformer), because the optional AC disconnector or breaker of the inverter do not remove the voltage from the AC output busbars of the inverter (a).
   - Disconnect the inverter from the DC power supply (usually the DC switches of the solar array junction boxes or the DC combiner box), because the optional DC disconnector does not remove the voltage from the inverter input busbars or fuses (b).
   - Disconnect the possible UPS or other auxiliary external power supplies (c).
   - Make sure that reconnection is not possible. Lock all of the disconnectors in the open position and attach a warning notice to them (lockout-tagout).
   - After you disconnect the inverter, wait for at least 5 minutes to let the capacitors discharge before you continue.



4. Make sure that there is no voltage present.
   - Use a voltage detector with nominal voltage of 1000 V DC and minimum withstand voltage of 2000 V DC (in rare fault cases the voltage on the DC terminal can be two times the system voltage). The detector must have a self-testing feature to ensure that it works correctly. Notice the weather conditions of the site when you do the measurements: do not measure in wet conditions. Do not use a multimeter.
   - Make sure that the voltage between the inverter AC output terminals (L1, L2, L3) and the grounding (PE) busbar is close to 0 V. Measure every phase-to-phase and phase-to-ground voltage (L1-L2, L1-L3, L2-L3, L1-GND, L2-GND and L3-GND).
   - Make sure that the voltage between the inverter power 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 DC+ and DC- and the grounding (PE) busbar is close to 0 V.
5. Install temporary grounding. Connect the AC and DC busbars to the PE with a temporary grounding tool. Temporary grounding must withstand the available short circuit current of the AC or DC supply. One temporary grounding device may not be enough on the AC side. 25 mm ball grounding terminals are provided in some cases. The temporary grounding cables must be dimensioned to withstand the prospective current of the system until the upstream protection device clears the fault current. The temporary grounding cables should be tied tightly to the busbars or the frame unit as the forces of the short circuit current can cause the temporary grounding cables to move hazardously.



6. Protect any other energized parts in the work location against contact. Take special precautions when you work near bare conductors.
7. Ask the person in charge of work for a permit to work. After you finish the work, make sure that the inverter is clean from inside and that all the tools have been removed from inside the inverter, remove the temporary grounding and inform the person responsible that the work is complete. After you make sure that the voltage can be connected, close all the doors of the inverter, and close the disconnectors. When connecting voltage back on, do not stand right next to the inverter. Also make sure that there is an escape route available in case of an emergency.

General safety

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

WARNING! Obey these instructions to prevent injury or death, or damage to the equipment.

- Move the inverter power module carefully:
  - Use safety shoes with a steel toe cap and protective gloves.
  - Use caution when you move an inverter power module. Do not tilt the module. The module is heavy. Careless handling of the power module may cause it to topple over resulting in bodily injury and/or damage to the equipment.
  - Obey the instructions in all related PVS800-57B manuals.
- Be aware of the cooling fan blades. The fans can operate for a few seconds after you disconnect the electrical supply. Do not stick fingers or other objects into the fans.
- Be aware of hot surfaces. Some parts in the inverter cabinet, such as the heat exchangers are hot after you disconnect the electrical supply.
- Make sure that the debris from the installation work does not go into the inverter. Electrically conductive debris in the unit can cause damage.
- Do not open the doors of the inverter when water, sand or dust can blow into the unit. Water, sand or dust in the inverter can cause damage in the unit.

Printed circuit boards

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

Fiber optic cables

WARNING! Obey these instructions to prevent injury or death, or damage to the equipment.

- Handle the fiber optic cables with care.
- When you disconnect the cables, hold the connector, not the cable.
- 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 permitted bend radius is 35 mm (1.4 in.).

Safe start-up and operation

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

WARNING! Obey these instructions to prevent injury or death, or damage to the equipment.

- Keep all doors of the inverter closed during operation. It is good safety practice to keep inverter and inverter housing doors locked to prevent unauthorized access. Give the keys only to authorized personnel.
- Before you start the inverter, close the optional AC and DC disconnectors, auxiliary power main switch +AC-Q30 and connect possible external auxiliary power sources.
- During operation, do not open the AC or DC disconnectors.
- Before you adjust the inverter and put it into service, make sure that all of the equipment is suitable for operation.
- The maximum allowed number of power-ups by applying power is five in ten minutes.
- Do not use the inverter in a manner not specified in this manual.
- Do not stay close to the inverter while the inverter is starting up or in running state. Adjust the start-up delay in a way that you have sufficient time to vacate the inverter room.

Notes:

- This inverter is intended for operation in an environment with a maximum ambient temperature of 60 °C (140 °F).
- If the **Inverter enable** signal is active, and the Start command is active, the inverter starts immediately after a fault reset. For more information, see the *PVS800-57B central inverters Firmware manual* (3AXD50000048332 [EN]).

2

Introduction to the manual

Contents of this chapter

This chapter describes the intended audience and contents of the manual. It has a flowchart of the steps to examine the delivery, and install and commission the inverter. The flowchart refers to sections in this manual and in other manuals.

Applicability

This manual is applicable to PVS800-57B central inverters.

Target audience

This manual is intended for persons who plan the installation of, 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.

Contents of the manual

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

Introduction to the manual – Introduction to the manual.

Operation principle and hardware description – The operation principle and construction of the inverter in brief.

Planning the mechanical installation – Instructions on how to plan the mechanical installation.

Planning the electrical installation – Instructions on how to plan the electrical installation, select the cables, route the cables and protect the inverter.

Technical data – The technical data for the inverter.

Dimension drawings – The dimension drawings of the inverter and inverter foundation.

Control unit – Information on the control unit.

Related documents

Refer to the inner front cover.

Categorization by frame size and option code

Instructions, technical data, dimensions and weights which concern a certain inverter frame sizes are marked with the frame size (n × R8i). To identify your unit, refer to *Type designation labels* on page *27*.

The instructions and technical data which concern optional components are marked with option codes, for example, +K475. The options included in the inverter can be identified from the type designation label. Refer to *Type designation key* on page *28*.

Terms and abbreviations

Term/Abbreviation	Explanation
AC500	ABB programmable logic controller (PLC) series
ACS-AP-I	Control panel type
Aux.	Auxiliary
BAMU	Auxiliary measuring unit
BCU	Control unit
BINT	Power module interface board
CPU	Central processing unit
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
FENA	Optional Ethernet adapter module for EtherNet/IP, Modbus TCP and PROFINET IO protocols
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.
FSCA	Optional Modbus RTU adapter module
HMI	Human-machine interface
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 device 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.
ISU	Inverter supply unit
I/O	Input/Output
LCL	Line filter
MEMI	EMC filter board
MGND	Solar array and grounding monitoring board
MIRU	Solar array insulation resistance measuring unit
MPPT	Maximum power point tracking. Inverter software function that automatically operates the photovoltaic generator at its maximum power point.
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.
PLC	Programmable logic controller
PSL2	Protocol used in optical fiber communication inside ABB inverters
PV	Photovoltaic

Term/Abbreviation	Explanation
R8i	Inverter power module
SCADA	Supervisory control and data acquisition
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.

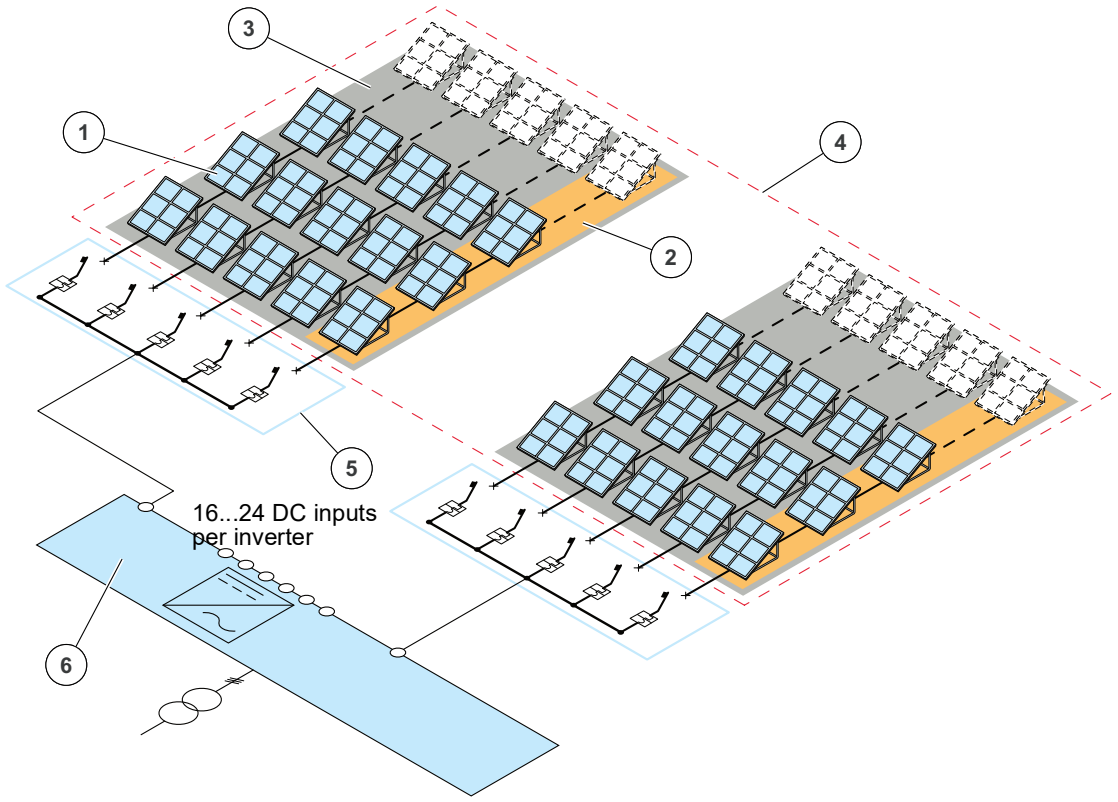
Product overview

The PVS800-57B is a central inverter for indoor use that converts, adjusts and transfers the power from a solar generator to the electrical power system.

The inverter has an air-cooled cabinet for indoor use. Cooling air flows in through the gratings at the lower part of the cabinet front. The air outlet is at the cabinet roof.

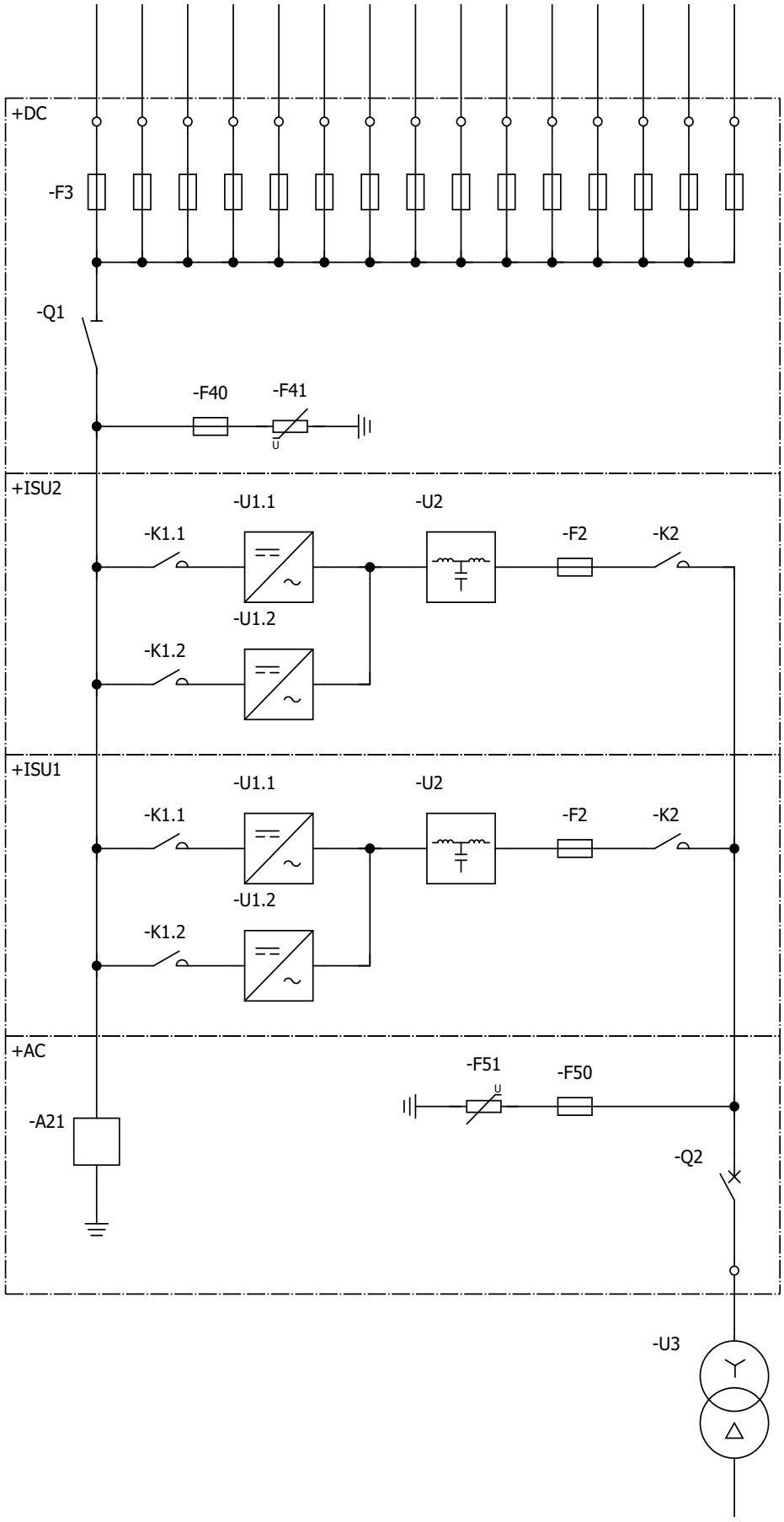
Block diagram of a solar generator system

The solar module string arrays are connected to the electrical power system through an inverter.



No.	Description
1.	Solar module (photovoltaic module)
2.	Solar string
3.	Solar array
4.	Solar generator
5.	Solar array junction box
6.	Inverter (PVS800-57B)

Simplified main circuit diagram

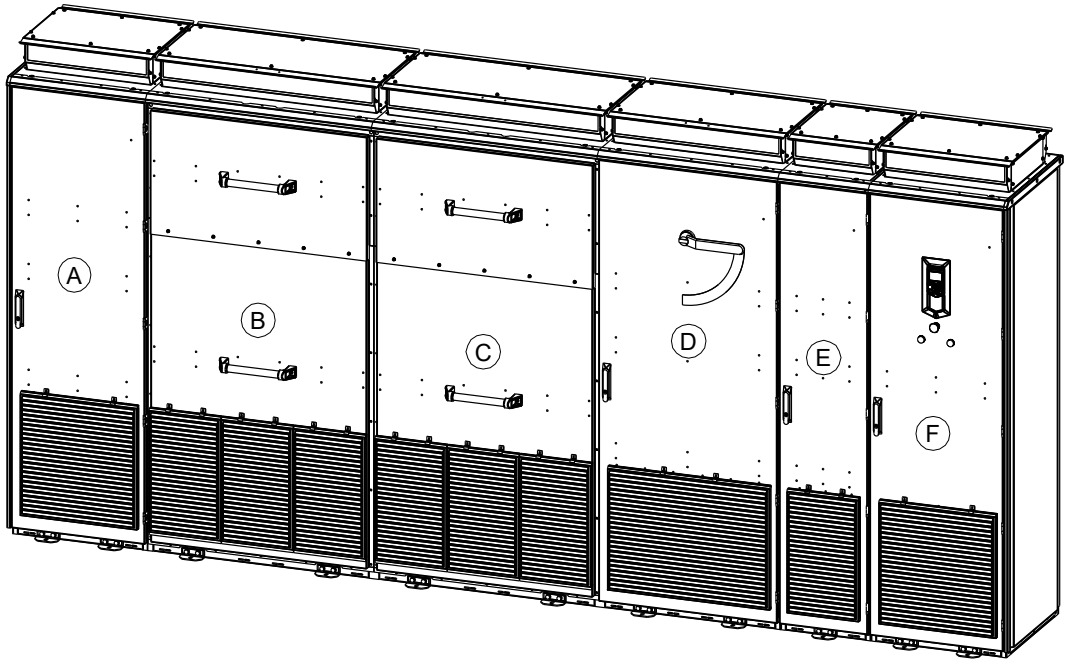


Code	Description	Code	Description
F2	AC fuses	K2	AC contactors
F3	DC input fuses	U1	Power modules
F40	Backup fuse for SPD	U2	LCL filters
F41	DC side SPD	Q1	DC disconnector
F50	Backup fuse for SPD	Q2	AC breaker
F51	AC side SPD	A21	Grounding option
K1	DC contactors		

Layout overview

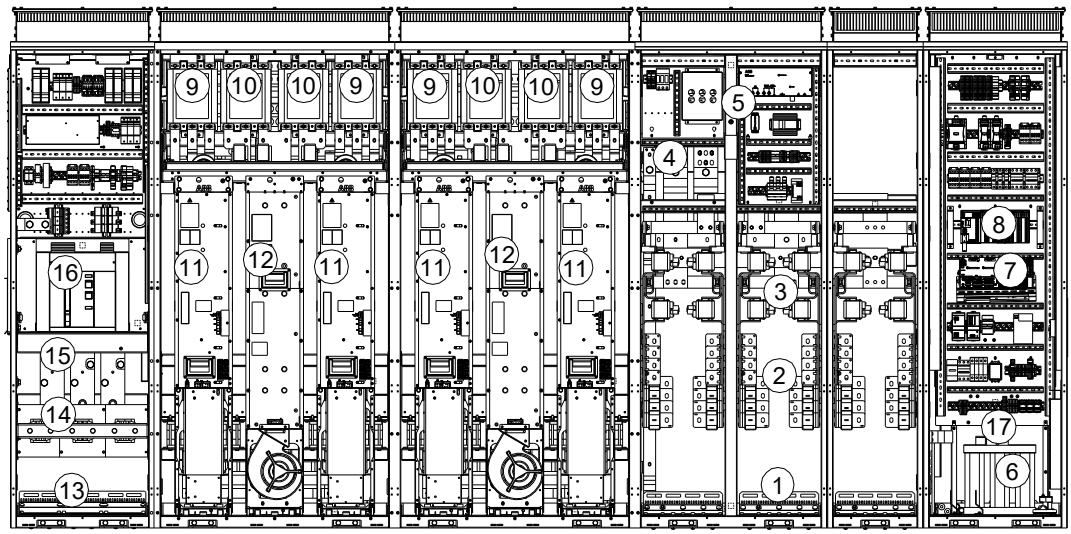
An example of the inverter construction is shown below. An optional DC cabinet is displayed in these figures. Cabinet order and door opening direction can also be different.

Front view



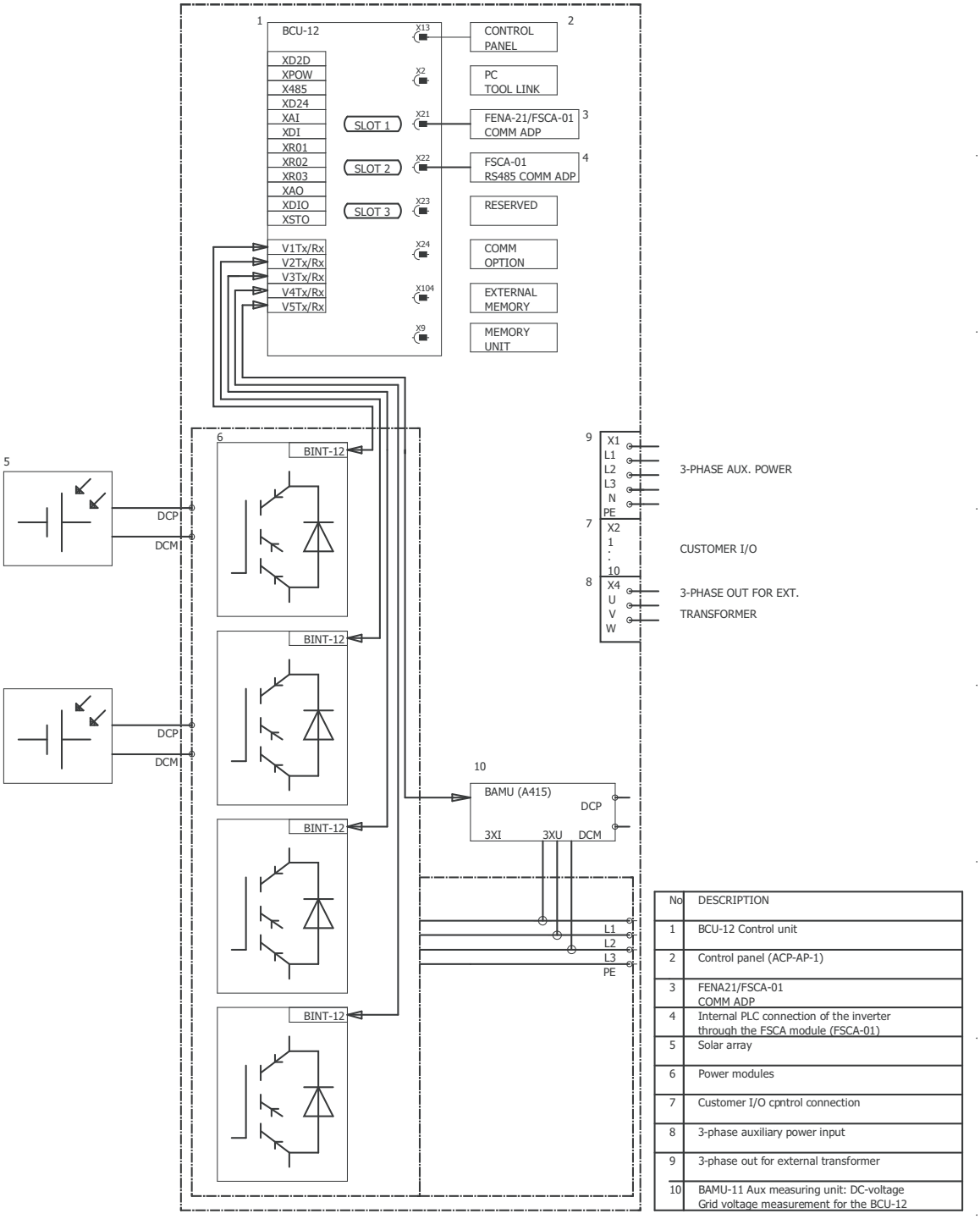
Item	Description
A	AC cabinet
B	ISU cabinet 1
C	ISU cabinet 2
D	DC cabinet 1
E	Optional DC cabinet 2
F	AUX cabinet

Front view



No.	Description	No.	Description
1.	DC cable lead-throughs	10.	AC contactor
2.	DC input cable terminals (fuse protected)	11.	Inverter power module
3.	Input DC fuses	12.	LCL filter
4.	Temporary grounding points for the DC busbars	13.	AC output cable lead-throughs
5.	DC main switch	14.	AC output cable terminals
6.	Aux. transformer	15.	Temporary grounding points for the AC busbars
7.	Main control board	16.	AC breaker
8.	PLC	17.	User I/O connection terminals
9.	DC contactor		

Overview of power and control connections

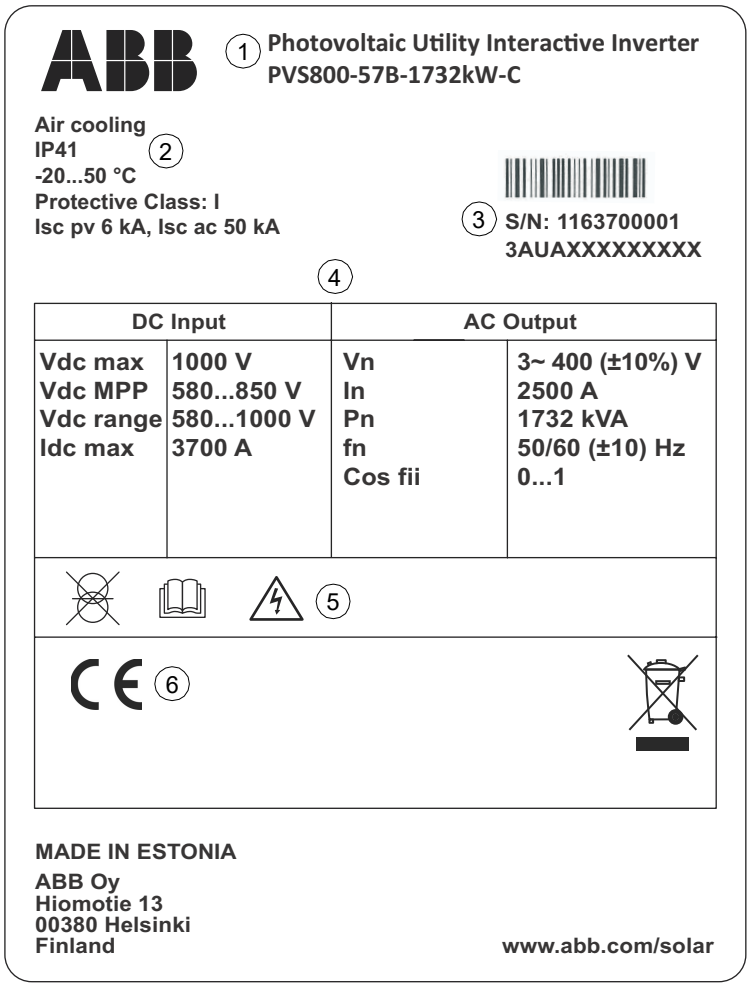


No	DESCRIPTION
1	BCU-12 Control unit
2	Control panel (ACP-AP-1)
3	FENA21/FSCA-01 COMM ADP
4	Internal PLC connection of the inverter through the FSCA module (FSCA-01)
5	Solar array
6	Power modules
7	Customer I/O cpntrol connection
8	3-phase auxiliary power input
9	3-phase out for external transformer
10	BAMU-11 Aux measuring unit: DC-voltage Grid voltage measurement for the BCU-12

Type designation labels

Inverter label

The type designation label of the inverter includes the ratings, valid markings, a type designation and a serial number. The type designation label is attached to the front cover of the inverter cabinet.



No.	Description
1	Type designation, refer to *Type designation key* on page *28*.
2	Degree of protection and short-circuit capacity
3	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 are unique to the unit.
4	Ratings of inverter
5	Warning and instruction symbols
6	Valid certification markings

Type designation key

The type code tells the specification and configuration of the inverter:

- The first 19 digits are the basic code, which describes the basic construction of the inverter. The fields of the basic code are separated with hyphens.
- The option codes follow the basic code. Each option code starts with an identifying letter (common to the product series) and is followed by descriptive digits. The option codes are separated by plus signs.

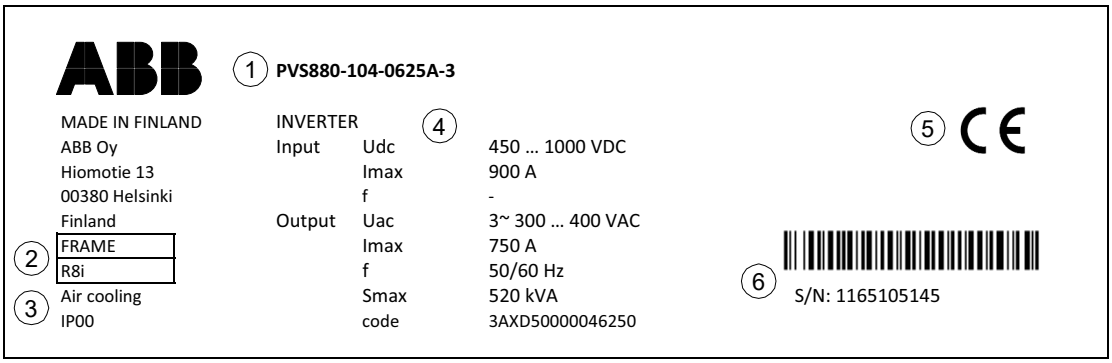
The selections are listed below. For more information, contact your local ABB representative.

Basic code

Digit	Name/description	Alternatives	Description
1…6	Product series	PVS800	PVS800 product series (ABB central inverter)
8…9	Construction	57B	Cabinet-built indoor inverter
11…17	Size	Refer to section *Ratings* on page *46*.	Inverter nominal AC power in kW at nominal ambient temperature
19	Voltage rating	C	Inverter AC voltage range: 380 V - 400 V

Inverter module label

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



No.	Description
1	Type designation, refer to *Type designation key* on page *28*.
2	Frame size
3	Degree of protection
4	Ratings of the inverter module
5	Valid certification markings
6	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 are unique to the unit.

Option codes

Code	Description
Fieldbus	
K458	Modbus RTU communication adapter
K475	Ethernet adapter (Ethernet IP, Modbus/TCP, Profinet) 2-port
K486	ABB remote monitoring
AC section options	
G440	AC current transformers, 3 pcs
E203	Additional EMC filtering (IEC61000-6-4/FCC)
F253	AC disconnector
F296	AC breaker, motorized, remote controlled
DC section options	
F282	Grounding, positive DC (Functional Grounding)
F314	Floating DC (fuses on both poles)
16H382	16 fused DC inputs, possible to connect 16 DC inputs
20H382	20 fused DC inputs, possible to connect 17…20 DC inputs
24H382	24 fused DC inputs, possible to connect 21…24 DC inputs
0F291	No DC fuses. Inverter delivered without DC fuses, with empty fuse holders.
G420	DC input fuse blown indicator (one common output signal for all indicators, not with 0F291)
G417	DC input current measurement from each DC input
F305	DC disconnector
F309	DC input fuses 200 A
F310	DC input fuses 250 A
F311	DC input fuses 315 A
F312	DC input fuses 355 A
F313	DC input fuses 400 A
Auxiliary power options	
G429	Terminals for external auxiliary transformer max. 32 A fuse (delivered with max. fuse rating)
G415	Internal auxiliary power supply with internal transformer
G396	External auxiliary power supply with internal transformer, 173 V AC
G397	External auxiliary power supply with internal transformer, 200 V AC
G398	External auxiliary power supply with internal transformer, 350 V AC
Construction and features	
C230	DC cabinet on the right side
C231	DC cabinet on the left side
C232	Doors open to right
C176	Doors open to left
G300	Cabinet heaters
H357	Cable lead-throughs (IP42 cable lead-throughs for AC and DC main cables)
Specialities	
P902	Customized
P956	45 °C ratings (maximum active current limited always to 2600 A)

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Planning the mechanical installation

Contents of this chapter

This chapter describes the mechanical installation of the inverter. Always obey all local regulations.

Safety

Refer to *Safety instructions* on page 9.

For instructions on how to move the inverter, refer to *PVS800-57B commissioning and maintenance manual* (3AXD50000048331 [English]).

Unpacking and checking the installation site

Refer to *Technical data* on page 45 for the permitted operating conditions, and *Dimension drawings* on page 61.

For information on how to unpack and install the inverter, refer to the *PVS800-57B commissioning and maintenance manual* (3AXD50000048331 [English]).

Planning the mounting of the inverter

For detailed mounting drawings, refer to *Dimension drawings* on page 61. For more information, refer to the *PVS800-57B commissioning and maintenance manual* (3AXD50000048331 [English]).

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Planning the electrical installation

Contents of this chapter

This chapter contains the instructions that you must obey when you select the cables, 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.

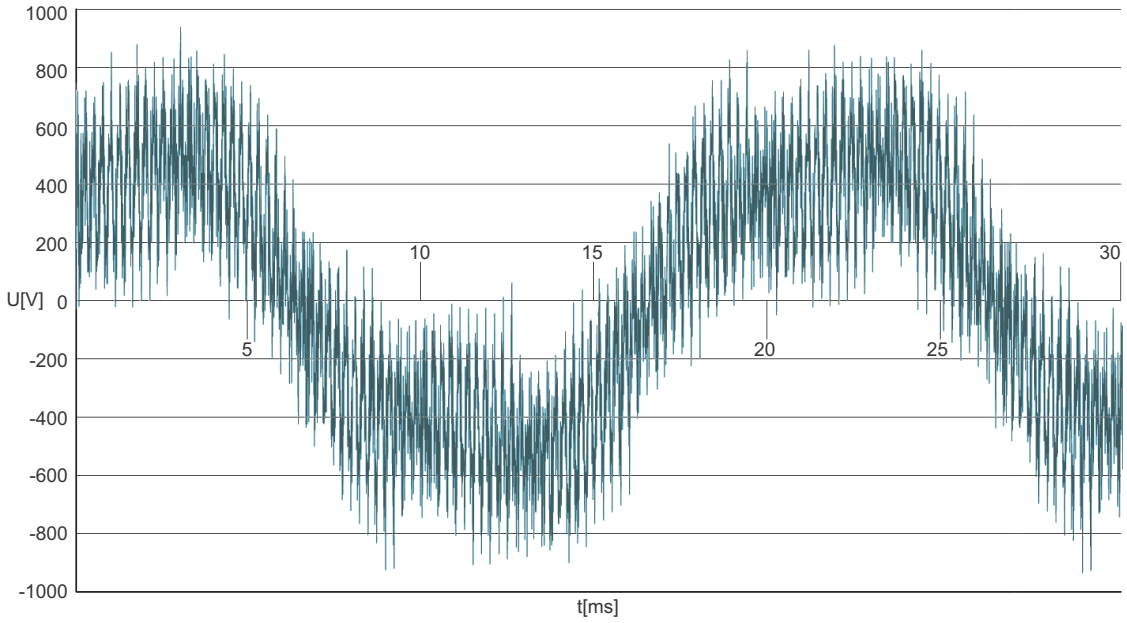
Selecting the transformer

Transformers designed for photovoltaic applications are available from ABB. Galvanically isolate each inverter from other inverters, and medium and low voltage networks with a dedicated transformer or winding. If you intend to connect inverters in parallel, 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. Obey all country-specific requirements.

Requirements for the transformer

These are the transformer requirements for any transformer connected to the AC main supply of the inverter. This can mean a main transformer that connects the inverter to a MV (or LV) network or an external auxiliary power transformer that is tapped to an AC supply (possible with option +G429).

- 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 inverter-side winding is at least 2.0 kV against ground. A typical voltage waveform against ground:



- If several inverters are connected to the same transformer:
  - Each inverter requires a separate galvanically isolated winding.
  - The impedance between the inverter windings must be more than 10%.
- Voltage rise time withstand level (d*u*/d*t*) of the inverter-side winding is at least 1000 V per microsecond against ground.
- Recommended rated short-circuit impedance (X_k) for each inverter is 4...8%
- Withstands current DC components of at least 0.5% of the nominal rated current preferably without using an air gap
- Withstands the worst case of 3% total harmonic distortion generated by the inverter.

ABB recommends 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 a specific transformer notation. ABB recommends using traditional notations, such as Dy11d0, etc.

The AC side of the inverter is designed only for IT (floating) networks, do not ground the neutral (star) point of the transformer on the inverter side or connect it to the neutral points of other windings.

Selecting the grid disconnecting device

The inverter is equipped with a hand-operated grid disconnecting device or an AC breaker which isolates the inverter and the solar generator from the electrical power system. The grid disconnecting device does not isolate the AC output busbars or internal auxiliary transformers from the electrical power system. Before you do installation and maintenance work on the inverter, isolate the AC output cables and busbars from the electrical power system with an AC disconnector outside the inverter, for example, an HV breaker on the HV side of the transformer.

Refer to *Ratings* on page *46* and *AC output connection specification* on page *53* for the correct current and voltage dimensioning for each product. If you do not know the installation-specific short-circuit current of the grid, use the value in *AC output connection specification* on page *53* for adequate short-circuit current capability of the grid disconnecting device. The grid disconnecting devices must be lockable.

Selecting the DC input disconnecting device

As standard, the inverter has a hand-operated DC input disconnecting device. The DC input disconnecting device does not isolate the DC input conductors or terminals of the inverter from the input voltage. The junction boxes must have breakers for the isolation or other suitable devices between the PV generator and inverter, for example, a separate disconnector box.

Refer to *Ratings* on page *46* and *DC input connection data* on page *54* for the correct current and voltage dimensioning for each product. If you do not know the installation-specific short-circuit value for each DC-side DC input disconnecting device, refer to *DC input connection data* on page *54* for adequate short-circuit current capability of the DC input disconnecting devices. Make sure that the DC-side DC input disconnecting devices can handle the back feed current. The DC input disconnecting devices must be lockable.

Compatibility of the solar generator and inverter

Make sure that:

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

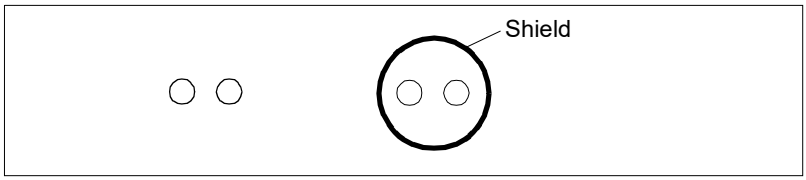
Selecting the power cables

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* on page *45* for the rated currents.
- Select a cable rated for at least 90 °C (194 °F) maximum permissible temperature of conductor in continuous use. Local regulations may require a higher temperature rating.
- 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 and a DC input cable rated for at least 1000 V DC.

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.

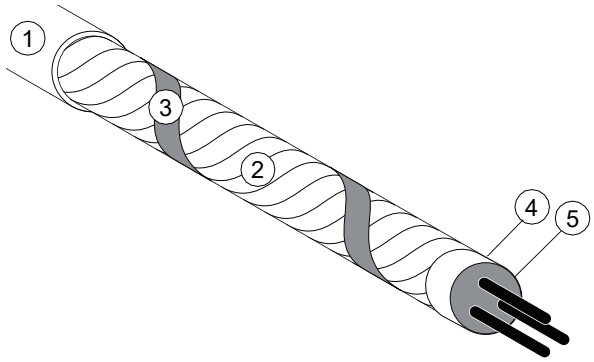
Note: When continuous metal conduit is employed, shielded cable is not required. The conduit must have bonding at both ends as with cable shield.

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

Sufficient shield conductivity to suppress emissions

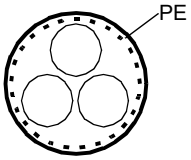
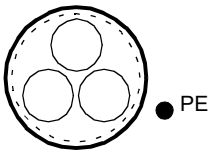
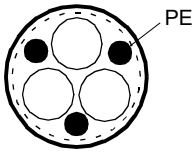
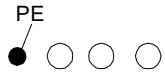
To effectively suppress radiated and conducted radio-frequency emissions, the cable shield conductivity must be at least 1/10 of the phase conductor conductivity. The requirements are easily met with a copper or aluminum shield. The minimum requirement of the cable shield is shown below. It consists 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.



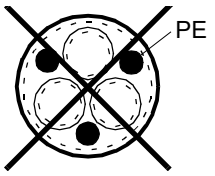
1	Insulation jacket
2	Copper wire screen
3	Helix of copper tape or copper wire
4	Inner insulation
5	Cable core

Recommended AC output power cable types

This section presents the power cable types that can be used for the inverter AC output. Make sure that the selected cable type also complies with local/state/country electrical codes.

	Symmetrical shielded cable with three phase conductors and a concentric PE conductor as shield. The shield must meet the requirements of IEC 61439-1.
	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.
	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.

Not allowed AC output power cable types

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

Typical DC input power cable sizes

The typical minimum DC input cable sizes based on the number of inputs and the nominal input current. The calculations are based on the current-carrying capacities and correction factors of IEC 60364. 90 °C cables, ground cabling (installation method D2) and maximum temperature of 40 °C in the ground are assumed. The cables must have sufficient cooling distances, with a maximum of four cables touching each other.

If minimum cable size is not mentioned, there is no standard cable available. Contact your cable manufacturer for special cable availability. Calculate the cable dimensioning based on local regulations and installation conditions.

Number of inputs	Single cabling	
	Min. cable size – Cu	Min. cable size – Al
16	300 mm^2	-
18	300 mm^2	-
20	300 mm^2	-
22	300 mm^2	-
24	300 mm^2	-

Typical AC output power cable sizes

Typical AC cable sizes based on the nominal output current. The calculations are based on the current-carrying capacities and correction factors of IEC 60364. 90C cables, tray cabling (installation method F) and a maximum temperature of 50 °C in the air are assumed. The cables must have sufficient cooling distances, with three loaded conductors on trefoil distance between bundles 0.25m.

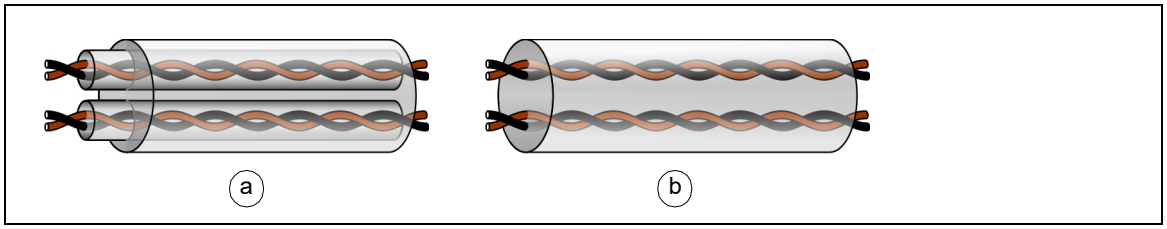
Cables per phase	Min. cable size – Cu	Min. cable size – Al
5	300 mm^2	-
6	240 mm^2	300 mm^2
7	185 mm^2	240 mm^2
8	150 mm^2	185 mm^2
9	120 mm^2	150 mm^2
10	120 mm^2	150 mm^2

Selecting the control cables

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



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

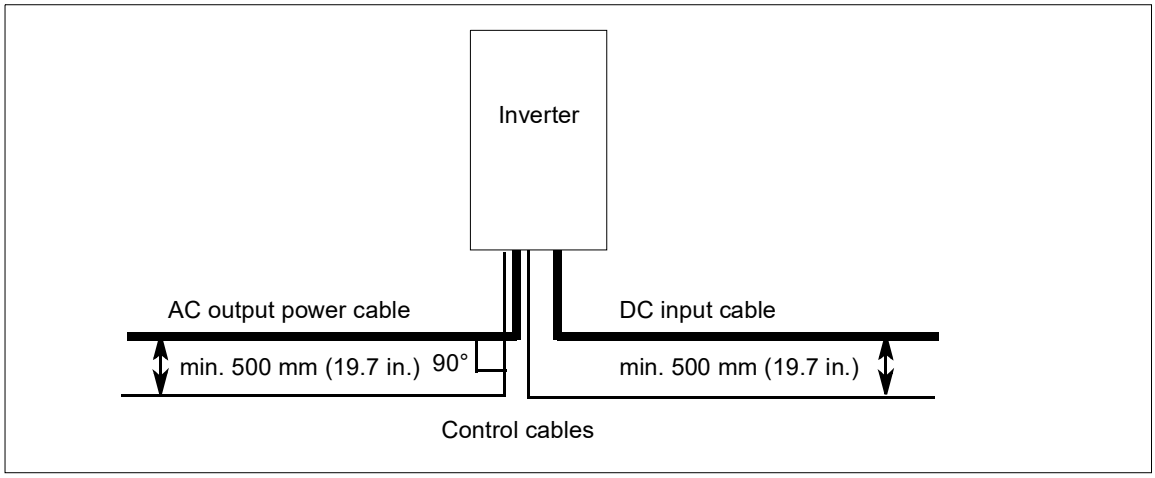
The cable type with braided metallic screen (for example, ÖLFLEX by LAPPKABEL, Germany) has been tested and approved by ABB.

Routing the cables

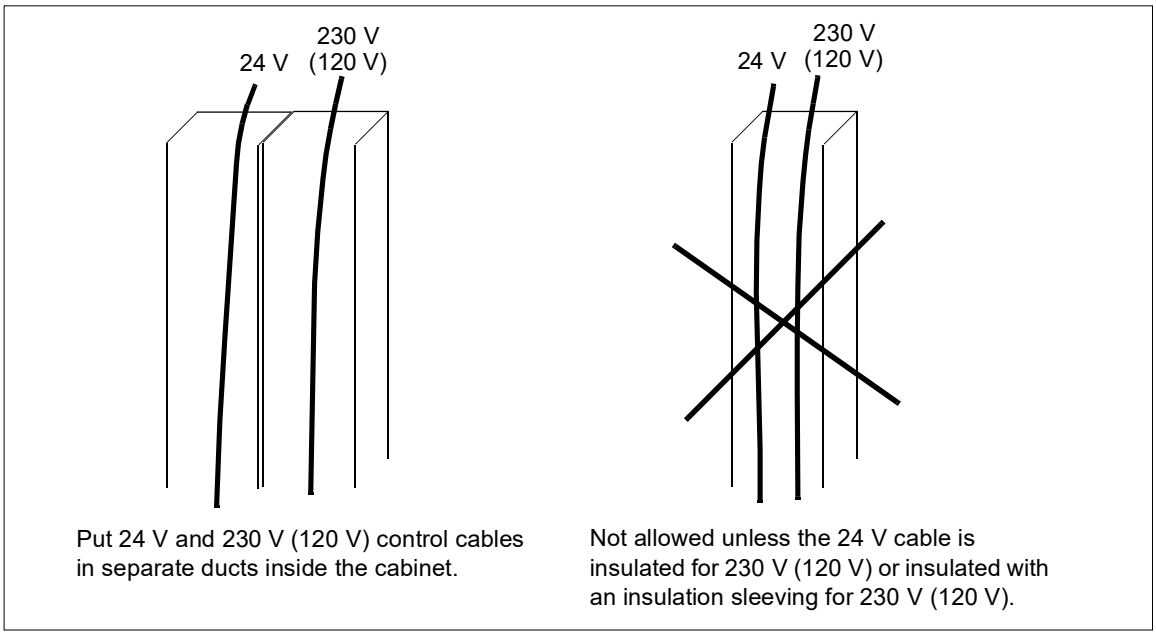
Install the DC power cable, output AC power cable and the control cabling on separate routes. The cable trays must have good electrical bonding to each other and to the grounding electrodes.

Where control cables cross power cables, make sure that you set them at an angle as near to 90 degrees as possible. Do not run additional cables through the inverter.

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



Separate control cable ducts



Put 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).

Protecting in short-circuit situation and against thermal overload

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

The inverter has internal AC fuses or optionally an AC breaker, which restrict inverter damage in case of a short-circuit in 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 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 ratings. Refer to chapter *Technical data* on page *45*.

To protect inverters delivered without input DC fuses (option +0F291), obey the instructions in section *Inverters without input DC fuses (option +0F291)* on page *44*.

For the recommended DC input fuse options, refer to *DC input fuse recommendations* on page *50*.

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.

Protecting the DC input cable against thermal overload

The input DC fuses protect the DC input cables against thermal overload when the cable is dimensioned according to inverter input DC fuse ratings. Refer to chapter *Technical data* on page *45*.

To protect inverters delivered without input DC fuses (option +0F291), obey the instructions in section *Inverters without input DC fuses (option +0F291)* on page *44*.

For the recommended DC input fuse options, refer to *DC input fuse recommendations* on page *50*.

When the option (+G417) for DC input current monitoring is selected, the DC input cable current can be monitored with SCADA or an automation system to achieve additional protection.

Protecting against ground faults in the DC input cable or solar generator

The inverter has an insulation resistance measurement board which monitors the insulation. Because of the leakage currents of inverters and characteristics of the PV array, many ground fault monitoring devices do not work properly with them and non-PV-specific monitoring devices are not recommended.

Insulation monitoring device

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 operates, 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 inverter trips or generates an alarm depending on the parameter settings. The measured insulation resistance value can be read from the inverter parameters.

Note: The insulation monitoring device measures the insulation resistance of the solar generator also when the inverter does not operate. To disable the monitoring device during inverter operation, refer to the firmware manual.

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.

Use the monitoring device only:

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

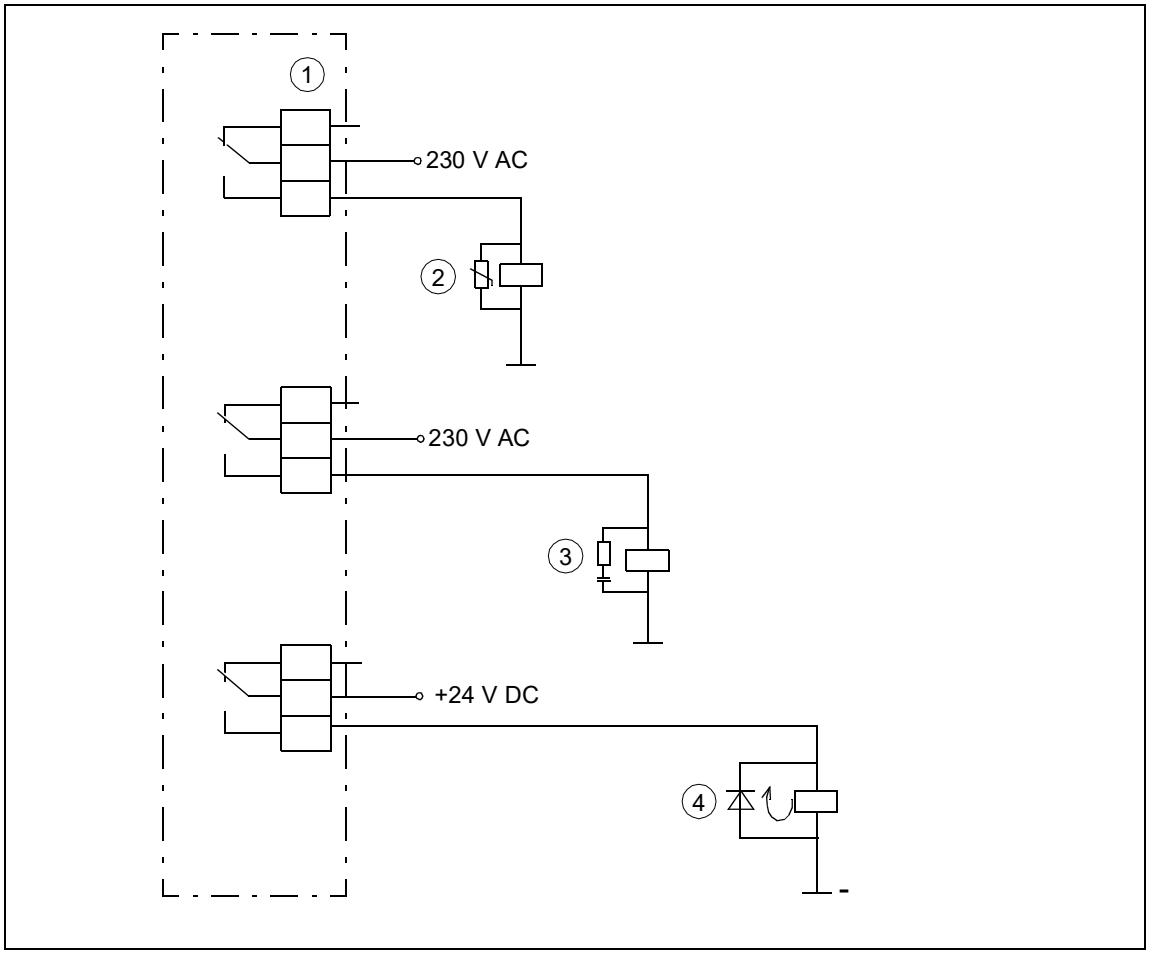
Only one insulation monitoring device may be used in each interconnected IT system. When an insulation or voltage test is to be carried out, the device is to be isolated from the system for the test period.The ground fault monitoring function is not a personnel safety or fire protection feature.

Protecting the contacts of relay outputs

Inductive loads (relays, contactors and motors) cause voltage transients when switched off.

When you connect inductive loads to the customer I/O, equip the loads with noise attenuating circuits (varistors, RC filters [AC] or diodes [DC]) to minimize the EMC emissions at switch-off. If they are not suppressed, the disturbances can connect capacitively or inductively to the other conductors in the control cable and cause a malfunction.

Install the protective component as close to the inductive load as possible. Do not install protective components at the relay outputs.



1) Relay outputs, 2) varistor, 3) RC filter, 4) diode

Inverters 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.

For the recommended DC input fuse options, refer to *DC input fuse recommendations* on page *50*.

6

Technical data

Contents of this chapter

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

Ratings

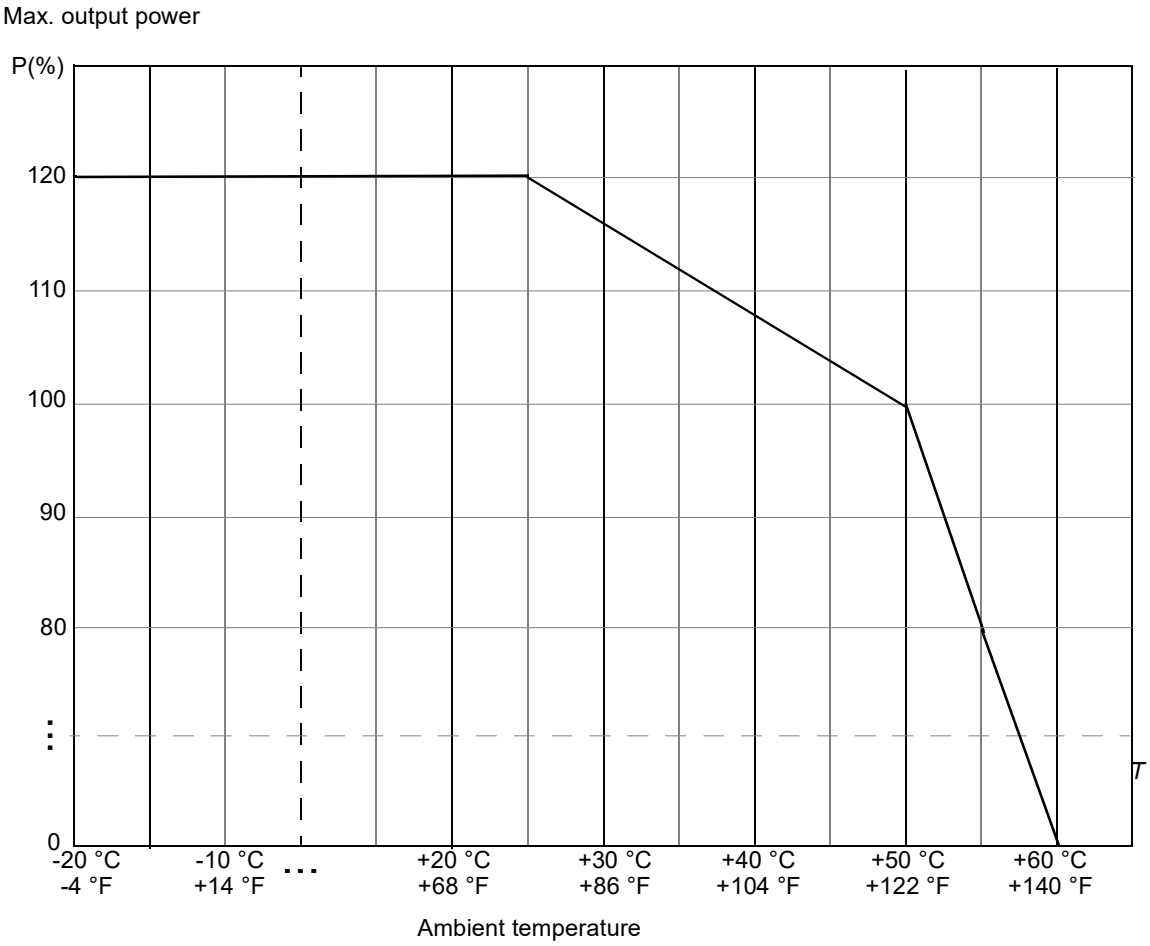
Solar inverter type	PVS800-57B-1645kW-C	PVS800-57B-1732kW-C
Concept	4 × R8i module	4 × R8i module
Input data (DC)		
Maximum input power ($P_{PV, max}$)	2468 kW	2598 kW
DC voltage range, mpp ($U_{DC, mpp}$)	550…850 V	580…850 V
DC voltage range (U_{DC})	550…1000 V	580…1000 V
Maximum DC current ($I_{DC, max}$)	3700 A	3700 A
Output data (AC)		
Nominal output voltage ($U_{AC, N}$)	380 V	400 V
Nominal AC output power ($P_{AC, N}$)	1645 kW	1732 kW
Maximum AC output power ($P_{AC, MAX}$)	1975 kW	2078 kW
Nominal AC current ($I_{AC, N}$)	2500 A	2500 A
Maximum AC current ($I_{AC, MAX}$)	3000 A	3000 A
Output frequency	50/60 Hz	50/60 Hz
Harmonic distortion, current	< 3%	< 3%
Power factor range	0…1 (leading and lagging)	0…1 (leading and lagging)
Efficiency		
Weighed efficiencies		
• Euro-ETA (1	98.3%	98.4%
• Maximum efficiency (1	98.5%	98.5%
Own power consumption		
In operation (max)	1800 W	
In stand-by	60 W	
Environmental limits		
Degree of protection	IP41	
Ambient temperature range (nominal ratings)	-20 °C…+50 °C (-4 °F…+122 °F)	
Maximum ambient temperature	+60 °C (+140 °F)	
Maximum noise	< 85 dB(A) at one meter	
Dimensions and weight		
Width / Height / Depth	4030 / 2150 / 720 mm (125.20 / 93.15 / 59.80 in.)	
Weight without optional DC cabinet	2700 kg (5950 lbs)	
Weight with optional DC cabinet	2900 kg (6400 lbs)	

1) Without auxiliary power consumption.

Derating

Temperature derating

The nominal power (100%) of the inverter is reached in +50 °C. In lower temperatures, the inverter can supply up to 120% power. If the ambient temperature exceeds the nominal ambient temperature, the load capacity (current and power) of the inverter decreases.



Use the following correction factors when you calculate the available inverter power at different temperatures:

- -20…+25 °C (-4…+77 °F), the power vs temperature ratio is 0 P(%) per 1 °C.
- 25…50 °C (77…122 °F), the power vs temperature ratio is -0.8 P(%) per 1 °C.
- 50…55 °C (122…131 °F), the power vs temperature ratio is -4 P(%) per 1 °C.
- 55…60 °C (131…140 °F), the power vs temperature ratio is -16 P(%) per 1 °C.

Altitude derating

The inverter load capacity (current and power) decreases if the installation site altitude is higher than 1000 meters (3281 ft). This is due to the fact that air is thinner in higher elevation which decreases the cooling capacity. To calculate the altitude effect for installations at higher than 1000 m, add 0.5 °C per 100 m to the inverter temperature derating curves (for example, an installation altitude of 1400 m adds 2 °C). When you calculate the available inverter power, account for the different ratios of P(%) per °C at different inverter operating temperatures (refer to *Temperature derating* on page *47*).

Derating example:

This example calculation is for a site at 1600 m with an ambient temperature of 35 °C:

1. Calculate the altitude corrected temperature: 35 °C + 3 °C = 38 °C.

2. Calculate the inverter power difference with relation to the nominal (50 °C) value with the altitude corrected temperature: (50 °C – 38 °C) * 0.8 P(%)/°C = 9.6 P(%).

3. Add the result to the inverter nominal power (100 P(%)): 100 P(%) + 9.6 P(%) = 109.6 P(%).

4. Based on the calculation, in these conditions the inverter can produce 109.6% of its nominal power.

In the unlikely event that the total equivalent temperature (site °C + altitude °C) exceeds the nominal temperature of 50 °C, contact ABB for information.

Fuses

Solar inverter type	PVS800-57B-1645kW-C	PVS800-57B-1732kW-C
DC		
DC input fuses - 16 DC inputs		
• Nominal current (I_N)	315 A	
• Quantity	32 (optionally 16)	
• Max $I_{SC, PV}$	357 A	
DC input fuses - 18 DC inputs		
• Nominal current (I_N)	250 A	
• Quantity	36 (optionally 18)	
• Max $I_{SC, PV}$	317 A	
DC input fuses - 20 DC inputs		
• Nominal current (I_N)	250 A	
• Quantity	40 (optionally 20)	
• Max $I_{SC, PV}$	285 A	
DC input fuses - 22 DC inputs		
• Nominal current (I_N)	200 A	
• Quantity	44 (optionally 22)	
• Max $I_{SC, PV}$	259 A	
DC input fuses - 24 DC inputs		
• Nominal current (I_N)	200 A	
• Quantity	48 (optionally 24)	
• Max $I_{SC, PV}$	237 A	
AC		
AC fuse		
• Type	SC33AR55V20CTF	
• Body	33 screw fuse	
• Nominal current (I_N)	2000 A	
• Quantity	6	

Decrease the maximum input power in proportion to the number of unused inputs, if you use the recommended fuse sizes and input numbers. The maximum short-circuit current from the PV array per input is the same even if some of the inputs are not used.

DC input fuse recommendations

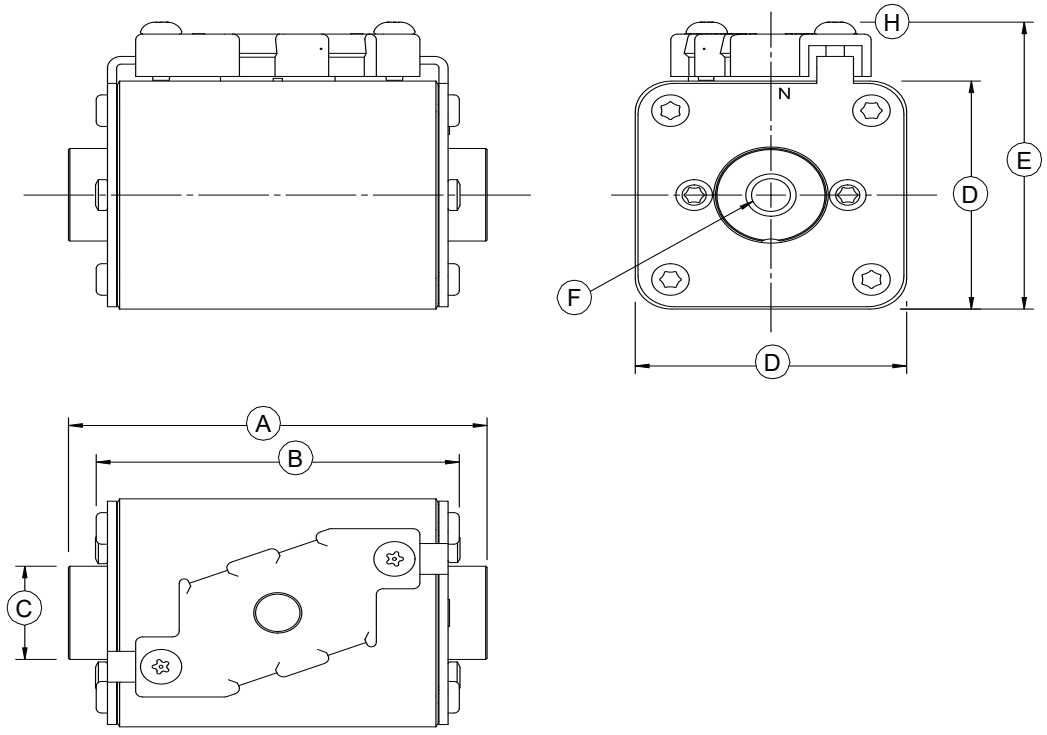
The DC inputs are designed for Bussmann PV fuses. The table lists the mechanically suitable fuses for different input options.

Number of inputs (1										X = Standard fuses O = Optional fuses
Fuses in + and -					Fuses only in + or -					
16	18	20	22	24	16	18	20	22	24	Type
										PV-160AF2
			X	X				X	X	PV-200AF2
	X	X				X	X			PV-250AF2
X					X					PV-315AF3
										PV-355AF3
										PV-400AF3

1) Total number of input in the inverter. Applicable for 1645kW and 1732kW types.

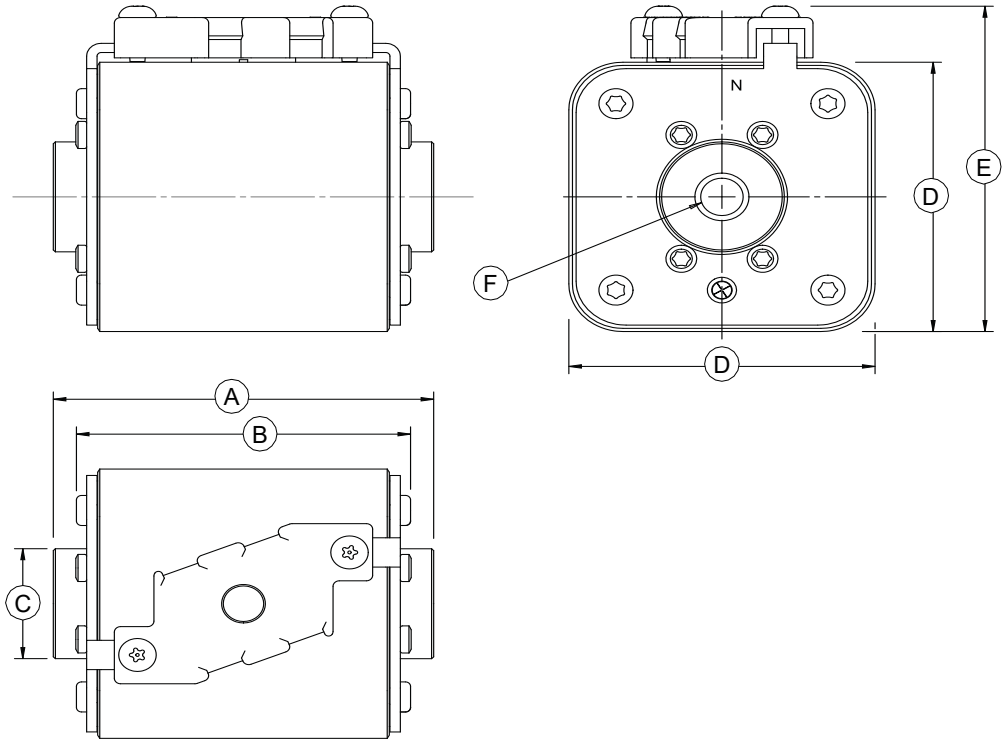
2) Fuses require special mechanics which are not compatible with other fuse body sizes.

Dimensions of the recommended fuses (mm). 1 mm



Size [mm]	A	B	C	D	E	F
2	91.3	81.8	24	61	77	Thread hole M10, 9.5 mm deep

Dimensions of the recommended fuses (mm). 1 mm

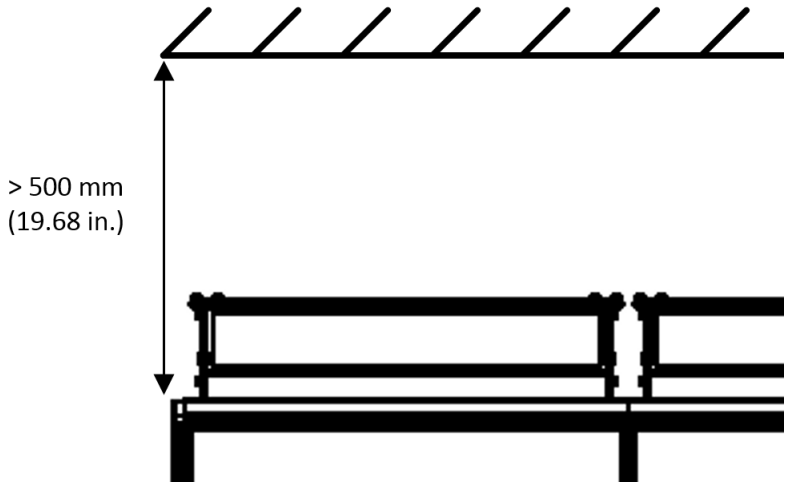


Size [mm]	A	B	C	D	E	F
3	91.4	82.5	30	76	92	Thread hole M12, 9.5 mm deep

Free space requirements

For cabinet dimensions, refer to *Dimension drawings* on page *45*.

Adequate free space above the inverter has to be reserved for installation and cooling.



Required free space in from of the inverter for door opening, power module and LCL filter replacement is 850 mm.

Cooling data

Required cooling air flow

- Main circulation: 8000 m^3/h (4720 ft^3/min)
- 1 ISU cabinet 3900 m^3/h
- AC cabinet: 1300 m^3/h
- DC cabinet: 615 m^3/h
- Optional DC cabinet: 245 m^3/h
- AUX cabinet: 260 m^3/h
- Total: 10000 m^3/h (5880 ft^3/min)

Terminal and lead-through data for the AC power connections

- Cable lead-throughs 30 pcs
- Cable outer diameter 8…60 mm (0.31…2.36 in)/lead-through
- Tightening torques: *M12 70 N·m (51.6 lbf·ft)

Terminal and lead-through data for the DC power connections

16 DC inputs

- Cable lead-throughs 32 pcs
- Cable outer diameter 5…60 mm (0.20…2.36 in)/lead-through
- Tightening torques: *M12 70 N·m (51.6 lbf·ft)

24 DC inputs

- Cable lead-throughs 48 pcs
- Cable outer diameter 5…60 mm (0.20…2.36 in)/lead-through
- Tightening torques: *M12 70 N·m (51.6 lbf·ft)

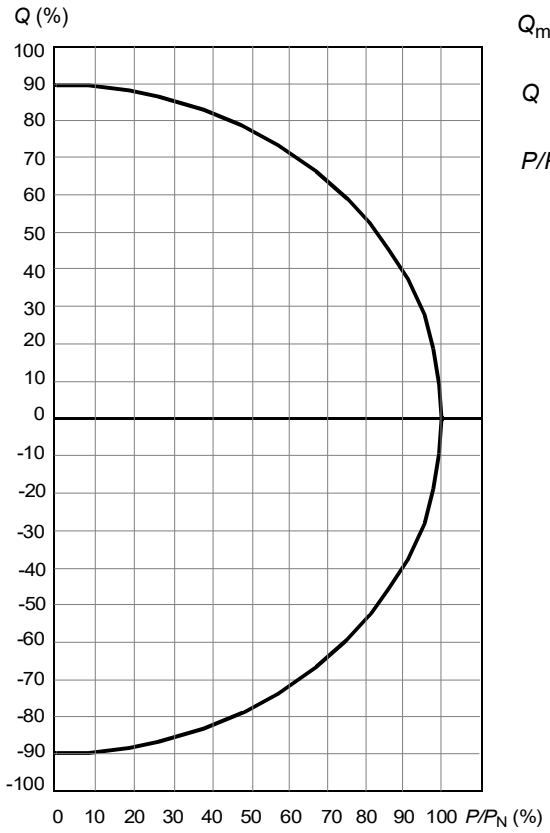
Terminal and lead-through data for the control cables

I/O cables	Cable outer diameter: • 5…7 mm (0.2…0.28 in) 6 pcs • 10…14 mm (0.39…0.55 in) 2 pcs Max. conductor size: 1.5 mm^2/AWG 16 Tightening torques: 0.2…0.4 N·m (1.8…3.6 lbf·in)
Aux. power cables	Cable outer diameter: • 20…26 mm (0.79…1.02 in) 2 pcs • 10…14 mm (0.39…0.55 in) 2 pcs Tightening torques: *M12 70 N·m (51.6 lbf·ft)

AC output connection specification

Voltage	PVS800-57B-1645kW-C: 380 V AC 3-phase ± 10% PVS800-57B-1732kW-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, refer to *Selecting the transformer* on page *33*.
Short-circuit withstand strength (IEC 60439-1)	Maximum allowable prospective short-circuit current is 50 kA when protected by fuses given in fuse tables. When temporary grounding for work is applied (one set of 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 40 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	45 to 65 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. 0%
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. Refer to *Ratings* on page *46*.



$$Q_{max} = 0.9 * \sqrt{10\,000 - P_{act}^2}$$

Q	Reactive power in percentage of nominal active power
P/P_N	Relative active power

Current	Refer to *Ratings* on page *46*.
Max. output fault current (AC short-circuit test)	Peak: 7.0 kA Duration: 3 ms 3 cycles: 1.5 kA
Overvoltage category (IEC 62109, IEC 60664-1)	OVC III
Harmonic distortion	THD current < 3% at nominal load

DC input connection data

Maximum DC power (P_{pv})	Refer to *Ratings* on page *46*.
Maximum DC current ($I_{max(DC)}$)	Refer to *Ratings* on page *46*.
Maximum DC voltage ($U_{max(DC)}$)	1000 V DC
Operational DC voltage range, $U_{mppt(DC)}$	PVS800-57B-1645kW-C: 550…1000 V DC PVS800-57B-1732kW-C: 580…1000 V DC
Voltage ripple	< 3%
Overvoltage category (IEC 62109, IEC 60664-1)	OVC II
Short-circuit withstand strength	6 kA
Allowed electrical system types	Negative grounding as standard. Positive grounding with option +F282. Floating DC with option +F314.
Maximum backfeed current	24 inputs: peak 18 kA, 3 cycles 1900 kA, duration 600 µs

Auxiliary power supply data

3-phase fused output from the mains +G429

Voltage	380/400 V AC depending on the voltage class of the inverter
Frequency	50/60 Hz
Protection	IEC: 32 A gG type fuses (option +G429)
Max. conductor size (0X12)	50 mm^2/AWG 1/0
Allowed electrical system	IT (ungrounded) system
Overvoltage category (IEC 62109, IEC 60664-1)	OVC III

Control unit connection data (BCU-12)

Refer to *Control unit* on page *73*.

Control panel type

ACS-AP-I	Refer to *ACx-AP-x assistant control panels user's manual* (3AUA0000085685 [English])

Protection classes

Protection class	**Classification**
Degrees of protection	IP41
Protective class (IEC 62109-1)	I
Overvoltage category (IEC 62109-1)	OVC II PV and OVC III Mains
Environmental category	Indoor conditioned

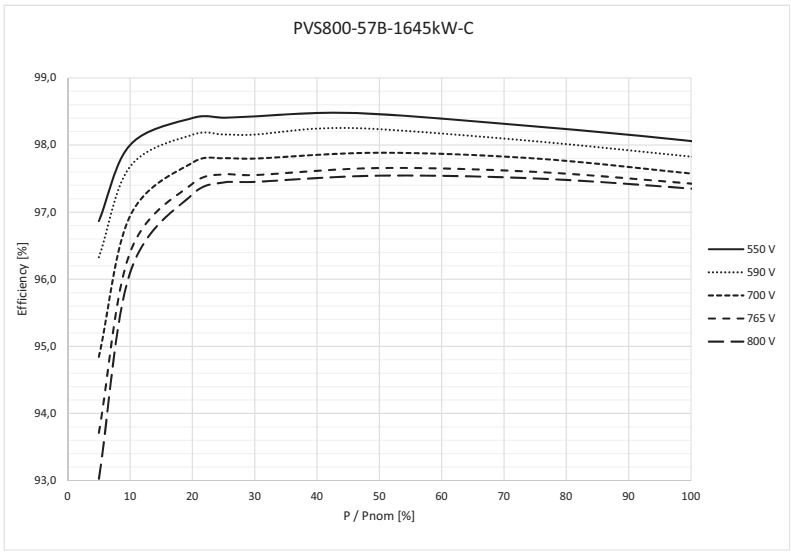
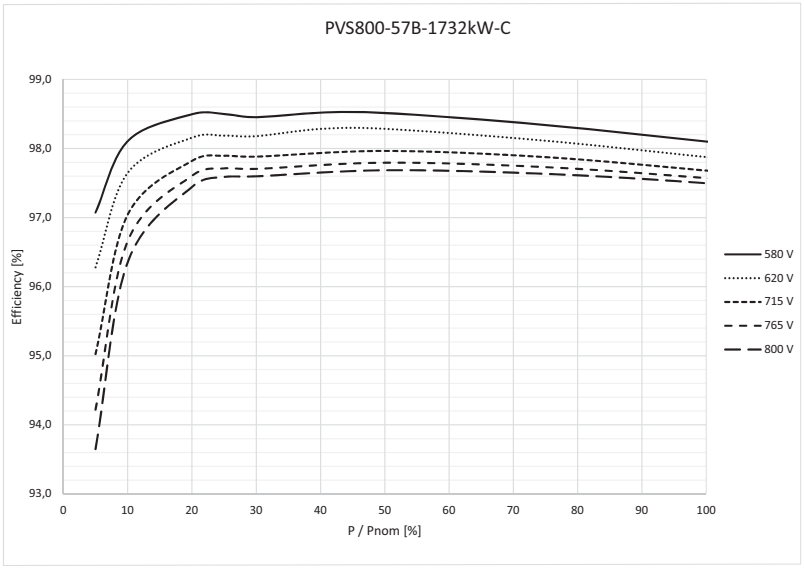
Efficiency

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

Note: Inverter efficiency cannot be calculated from inverter software parameter values.

Maximum efficiency					
DC voltage	**550 V**	**590 V**	**700 V**	**765 V**	**800 V**
PVS800-57B-1645kW-C	98.5	98.2	97.9	97.7	97.5
DC voltage	**580 V**	**620 V**	**715 V**	**765 V**	**800 V**
PVS800-57B-1732kW-C	98.5	98.3	98.0	97.8	97.7

European efficiency					
DC voltage	**550 V**	**590 V**	**700 V**	**765 V**	**800 V**
PVS800-57B-1645kW-C	98.3	98.0	97.6	97.4	97.2
DC voltage	**580 V**	**620 V**	**715 V**	**765 V**	**800 V**
PVS800-57B-1732kW-C	98.4	98.1	97.7	97.5	97.4

Efficiency curves	
PVS800-57B-1645kW-C	
PVS800-57B-1732kW-C	

Ambient conditions

Environmental limits for the inverter are given below. The inverter is to be used in indoor environment.

Note: If the installation has ventilation ducts directly to outdoors, the back flow of moist and dusty air must be prevented.

	Operation installed for stationary use	**Storage** in the protective package	**Transportation** in the protective package
Installation site altitude	0…2000 m (0…6562 ft) above sea level, with derating above 1000 m (3281 ft). See section *Altitude derating* on page *48*. For installation above 2000 m (6562 ft), contact ABB.	-	-
Air temperature	-20…+50 °C (-4…+104 °F). No condensation allowed. Output derated in the range 50…60 °C (104…122 °F). See section *Derating* (page *47*). If the operating temperature falls below 0 °C (32 °F), cabinet heater option +G300 has to be used. No frost allowed.	-40…+70 °C (-40…+158 °F)	-40…+70 °C (-40…+158 °F)
Relative humidity	5 to 95%	Max. 95%	Max. 95%
Environmental category	Indoor conditioned		
Wet conditions	Not to be used in wet locations. The installation location must be dry.		
Pollution degree	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…106 kPa 0.7…1.05 atmospheres	70…106 kPa 0.7…1.05 atmospheres	60…106 kPa 0.6…1.05 atmospheres
Vibration (IEC 60068-2)	Max. 1 mm (0.04 in.) (5…13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2…100 Hz) sinusoidal	Max. 1 mm (0.04 in.) (5…13.2 Hz), max. 7 m/s^2 (23 ft/s^2) (13.2…100 Hz) sinusoidal	Max. 3.5 mm (0.14 in.) (2…9 Hz), max. 15 m/s^2 (49 ft/s^2) (9…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	Not allowed	Not allowed

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	AIR-TEX G-150

Busbars	Tin-plated copper or aluminum
Fire safety of materials (IEC 60332-1)	Insulating materials and non-metallic items: mostly self-extinguishing
Package	• Frame: Wood or plywood • Plastic wrapping: PE-LD • Bands: PP or steel
Disposal	The main parts of the inverter can be recycled to preserve natural resources and energy. Product parts and materials should be dismantled and separated. Generally all metals, such as steel, aluminum, copper and its alloys, and precious metals can be recycled as material. Plastics, rubber, cardboard and other packaging material can be used in energy recovery. Printed circuit boards and DC capacitors need selective treatment according to IEC 62635 guidelines. To aid recycling, plastic parts are marked with an appropriate identification code. For further information on environmental aspects and recycling instructions for professional recyclers, contact your local ABB distributor. End of life treatment must follow international and local regulations.

Applicable standards

Standard	Name	Type
EN/IEC 62109-1:2010	*Safety of power converters for use in photovoltaic power systems. Part 1: General requirements*	Pending
EN/IEC 62109-2:2011	*Safety of power converters for use in photovoltaic power systems. Part 2: Particular requirements for inverters*	Pending
EN/IEC 61000-6-2:2005	*Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity for industrial environments*	Pending
EN/IEC 61000-6-4:2007	*Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments*	Pending
EN55011:2016 (CISPR11:2015)	*Industrial scientific and and medical equipment (ISM) radio frequency disturbance characteristics limits and methods of measurement*	Pending

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 assessed according to standards IEC/EN 62109-1 and IEC/EN 62109-2.

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 IEC/EN 61000-6-2 and EN55011 cover requirements stated for electrical and electronic apparatus intended for use in industrial environments. In addition, the IEC/EN 61000-6-4 standard can be fulfilled as an option (+E203).

Compliance with international EMC standards

- IEC/EN 61000-6-2
- EN 55011
- CISPR 11
- IEC/EN 61000-6-4 as an option (+E203)

Disclaimers

Generic disclaimer

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

Cybersecurity disclaimer

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

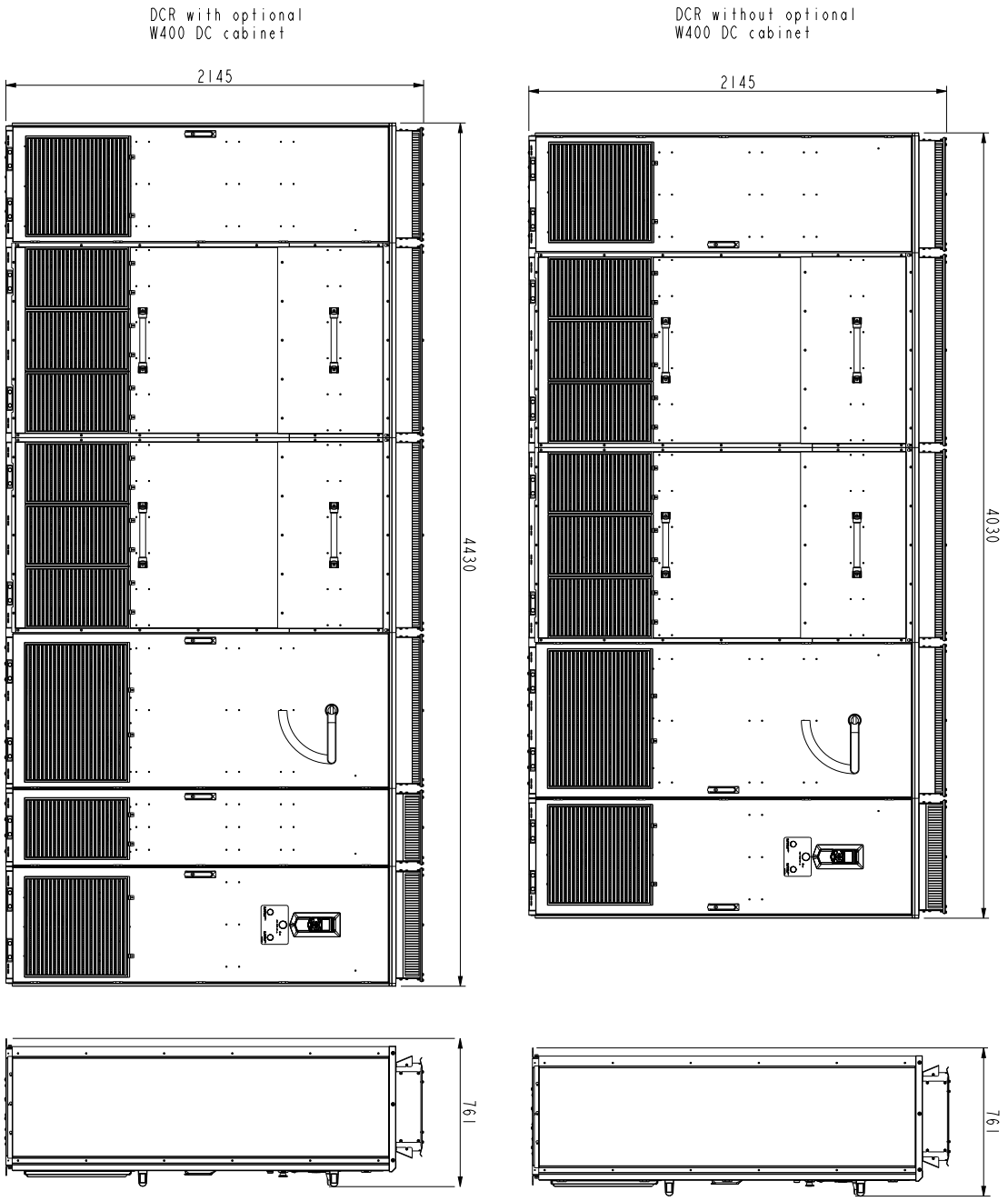
7

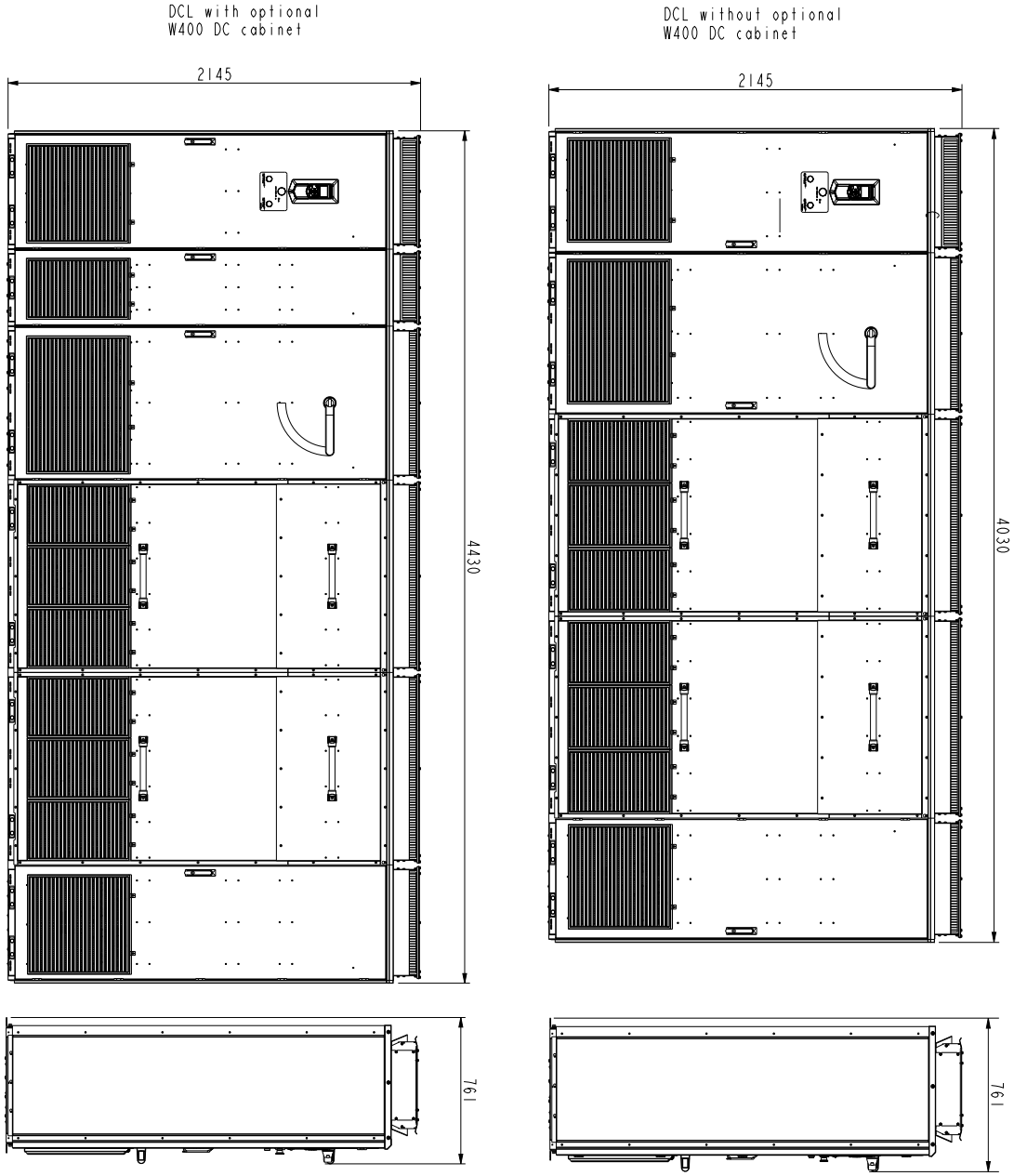
Dimension drawings

Contents of this chapter

This chapter contains dimension drawings with dimensions in millimeters and [inches].

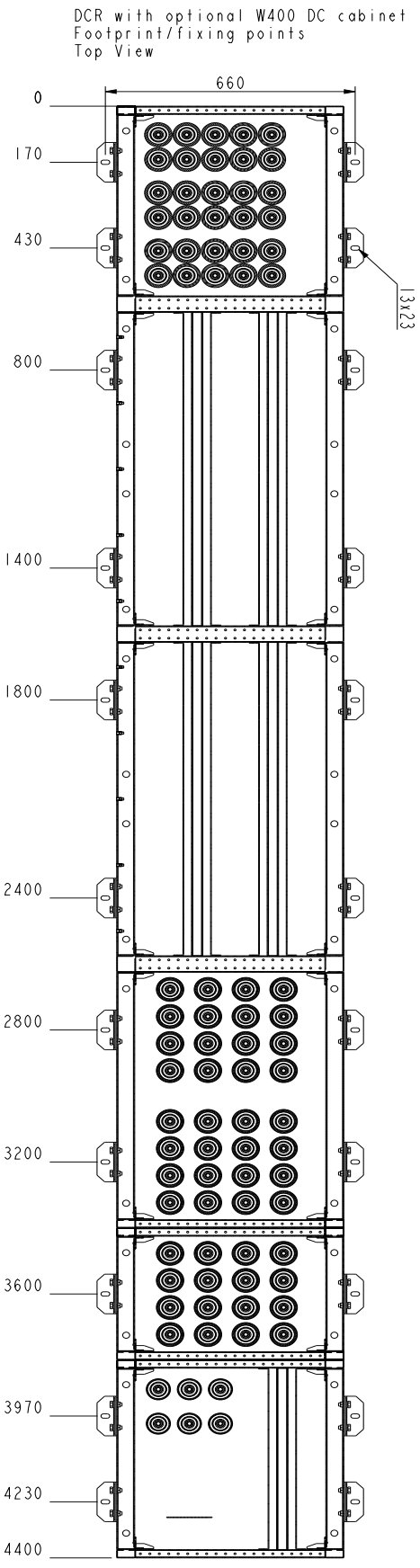
Cabinet dimensions

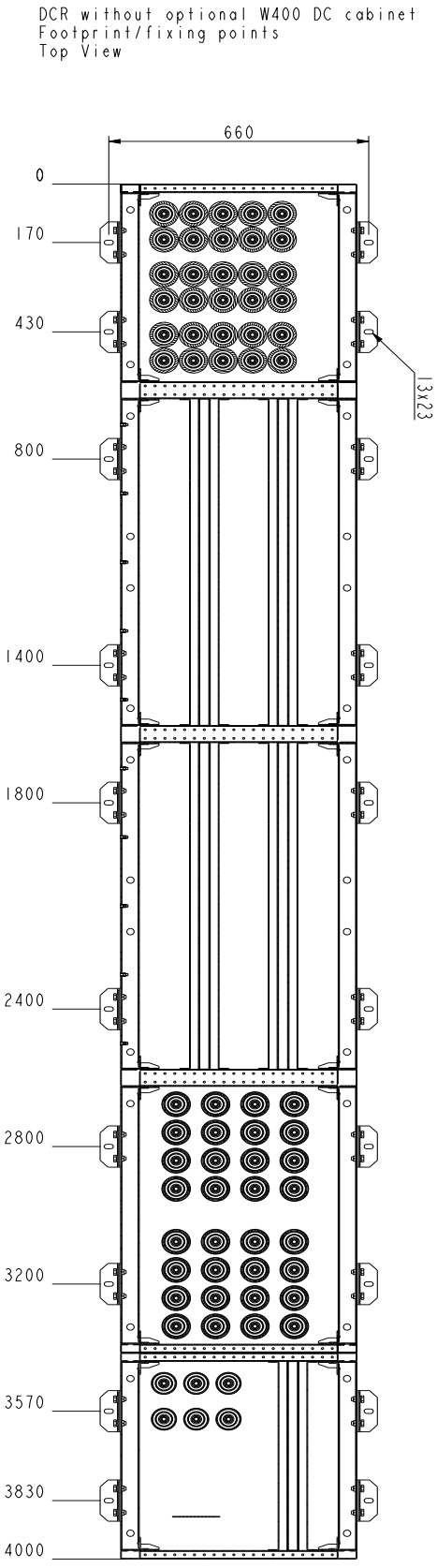



DCL with optional
W400 DC cabinet
2145
4430
761
DCL without optional
W400 DC cabinet
2145
4030
761

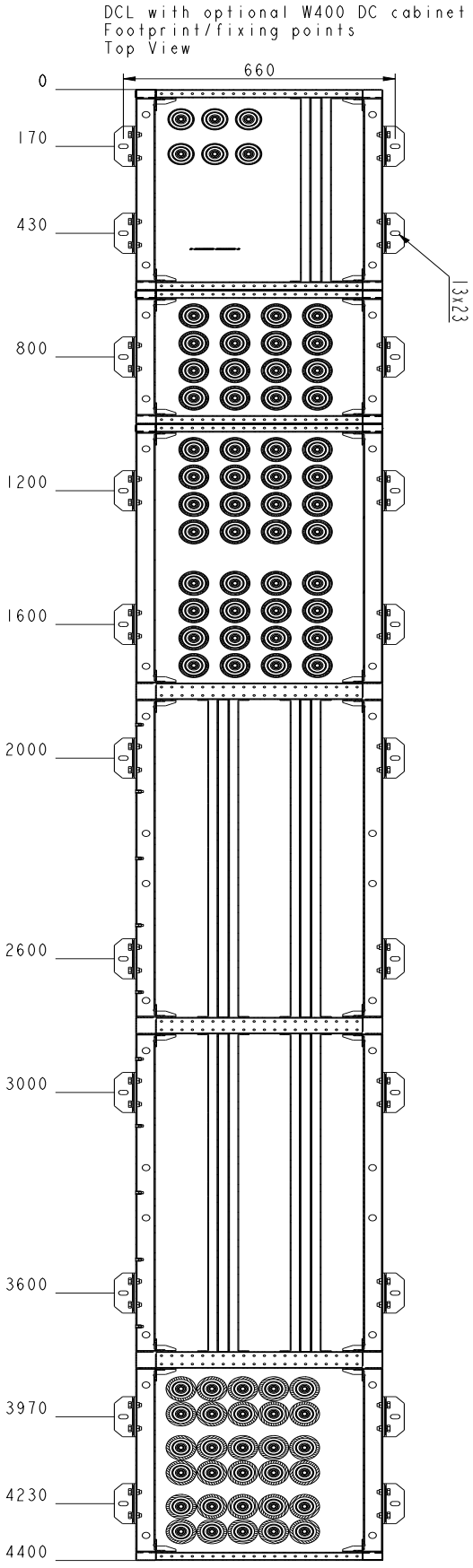
Cabinet attachment points

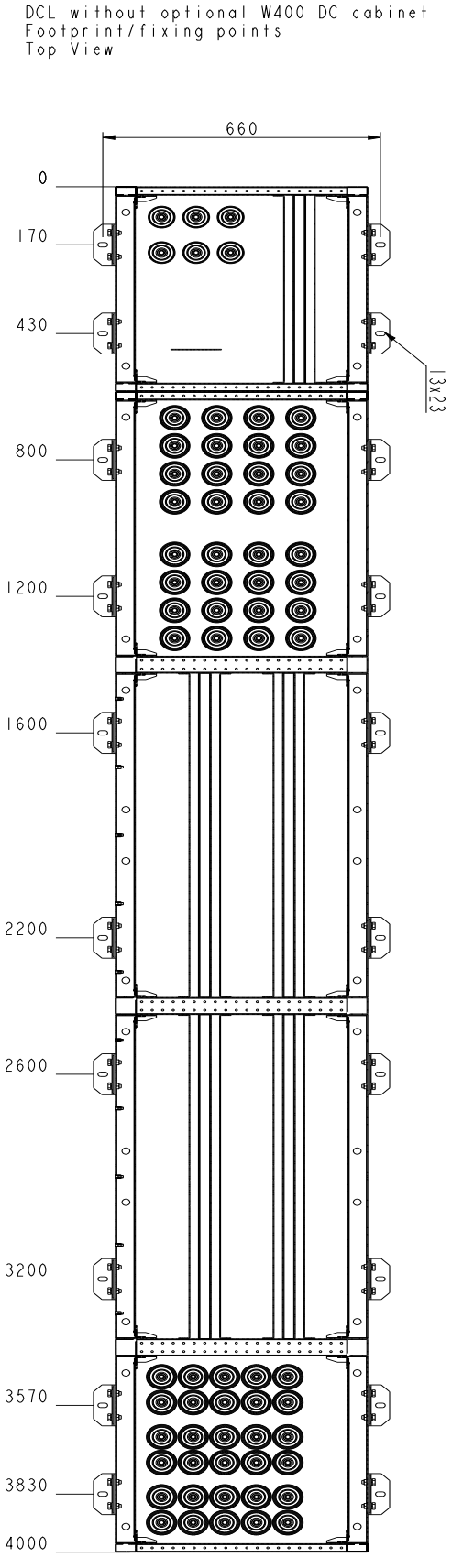
Note: Cable lead-throughs only with option +H357.





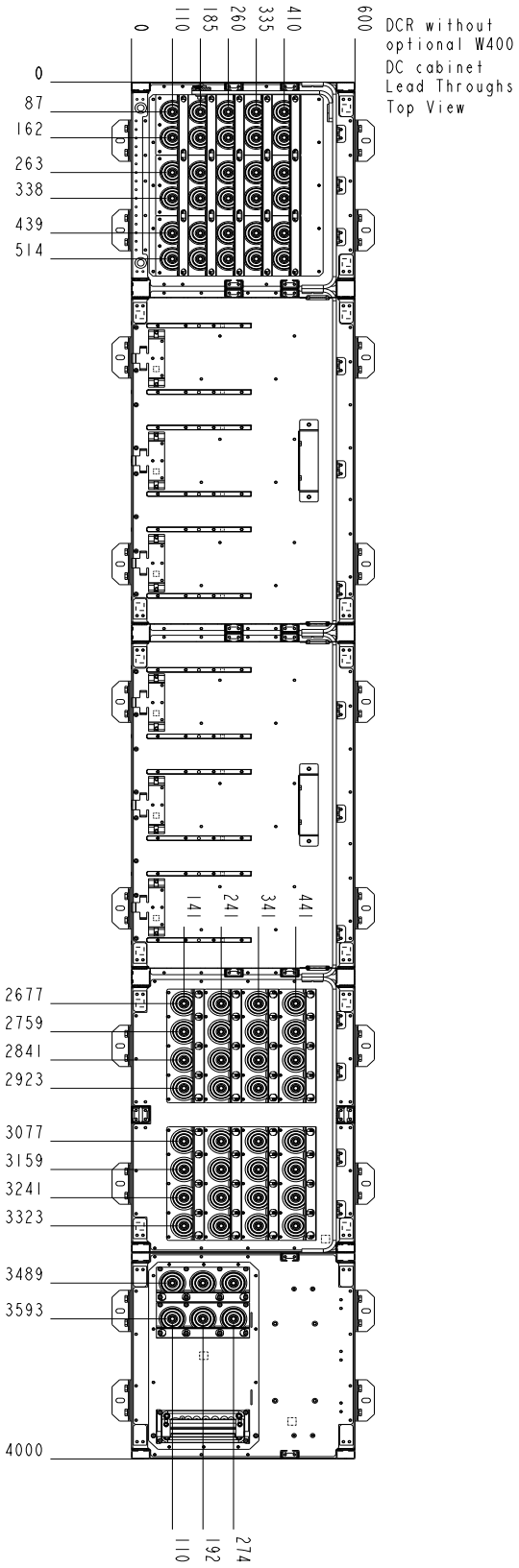
Note: Cable lead-throughs only with option +H357.

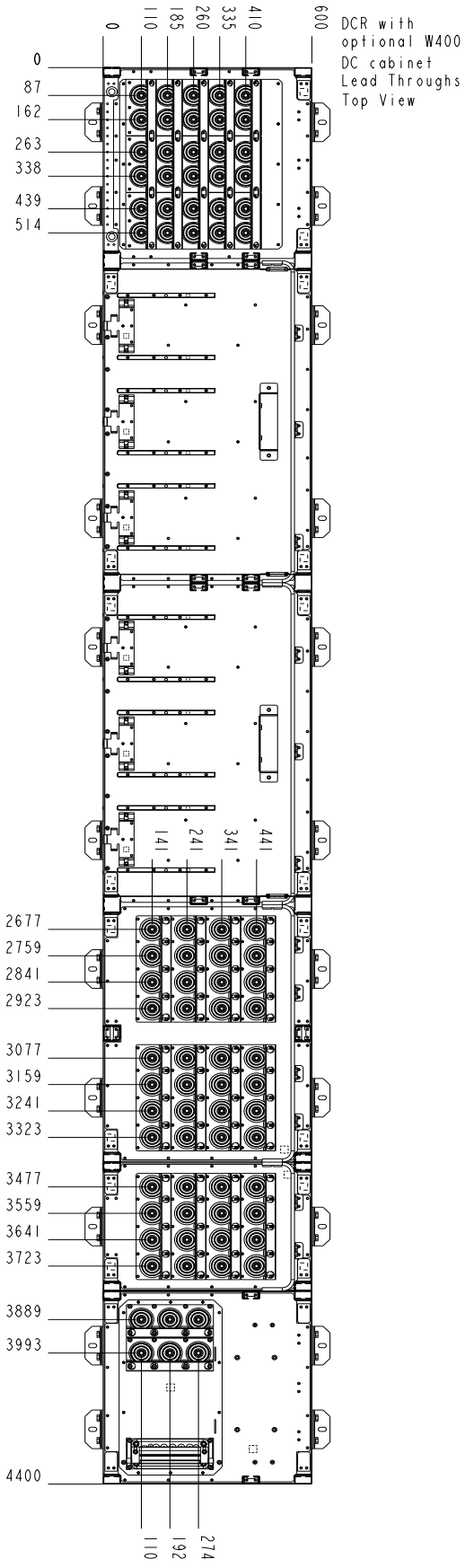




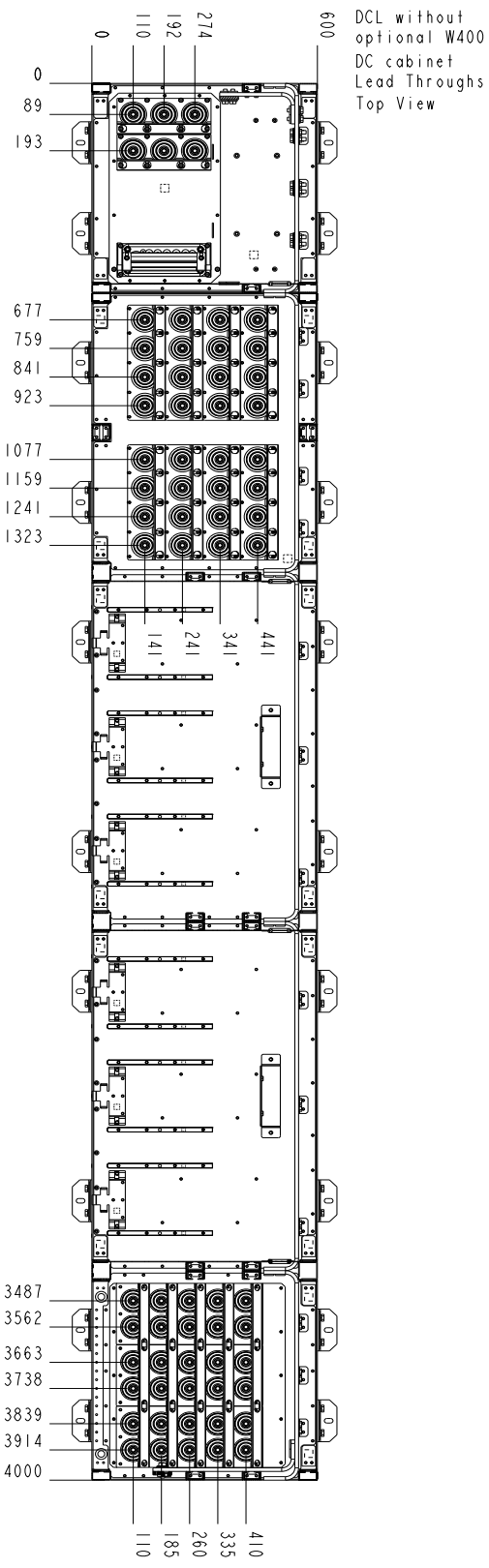
AC and DC cabling lead-throughs

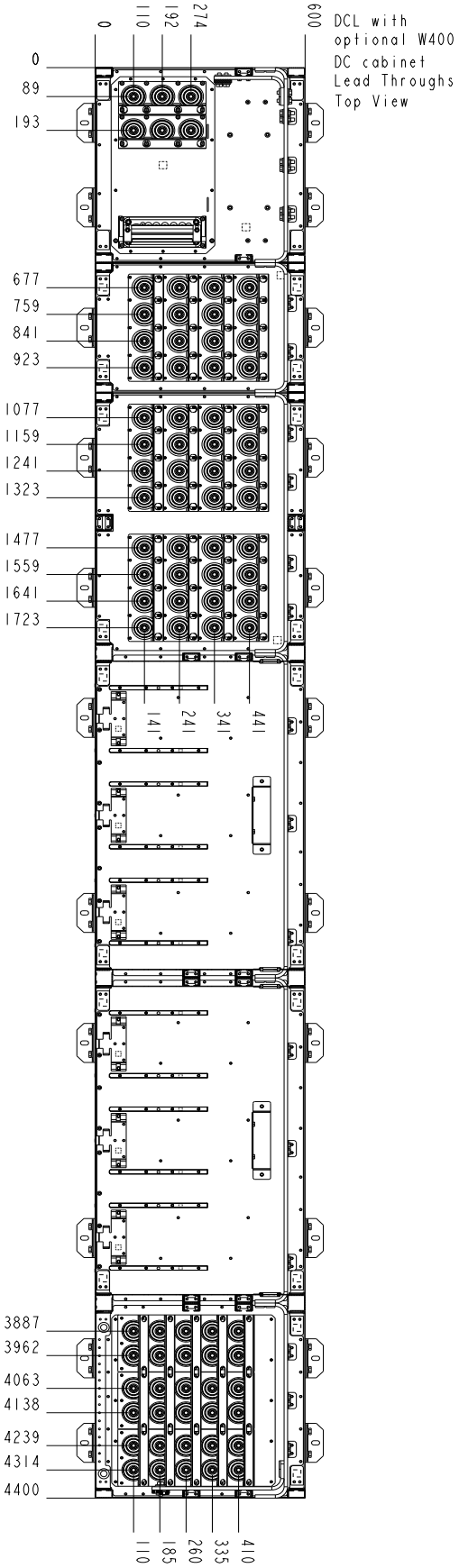
Note: Cable lead-throughs only with option +H357.





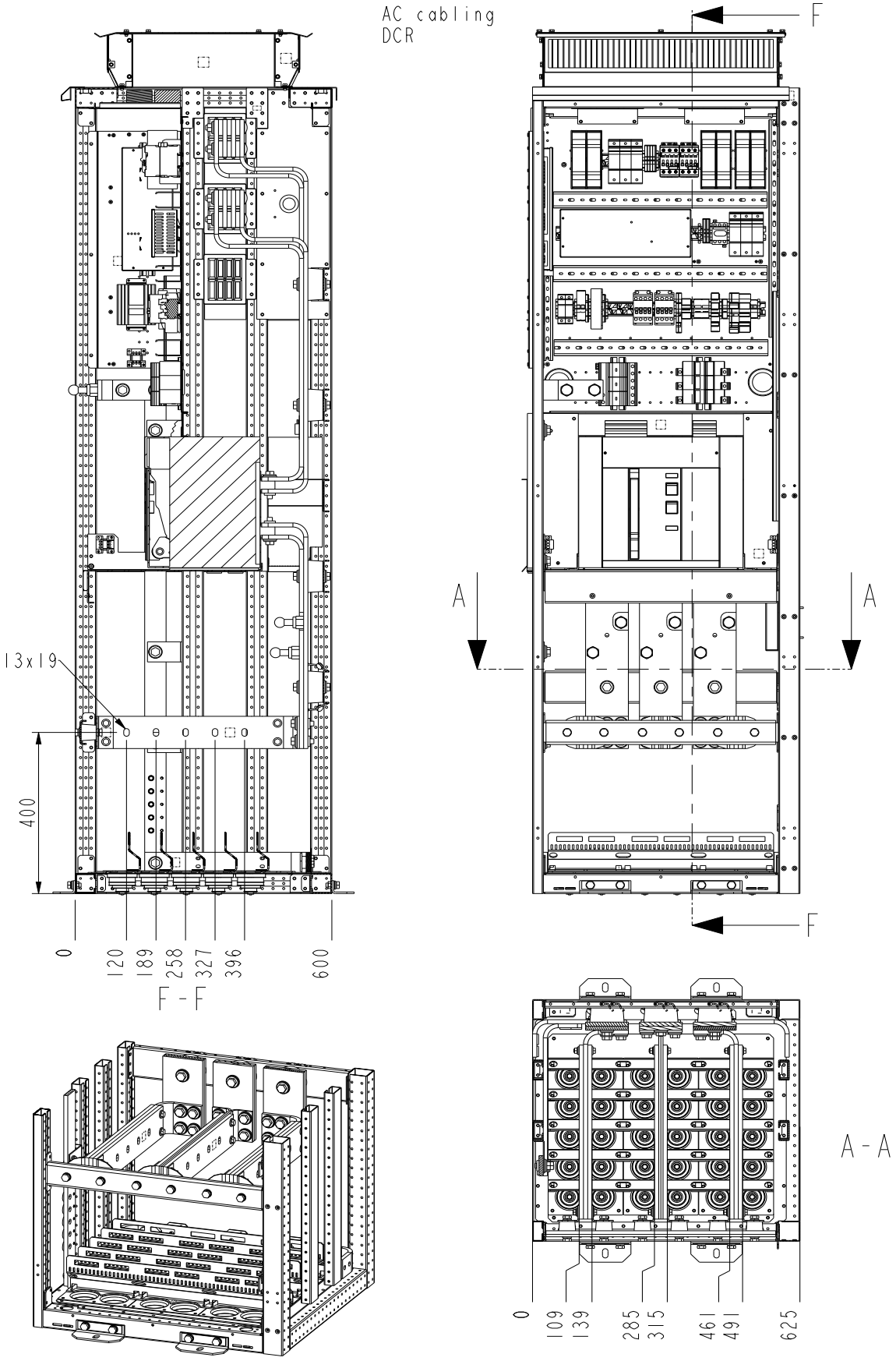
Note: Cable lead-throughs only with option +H357.



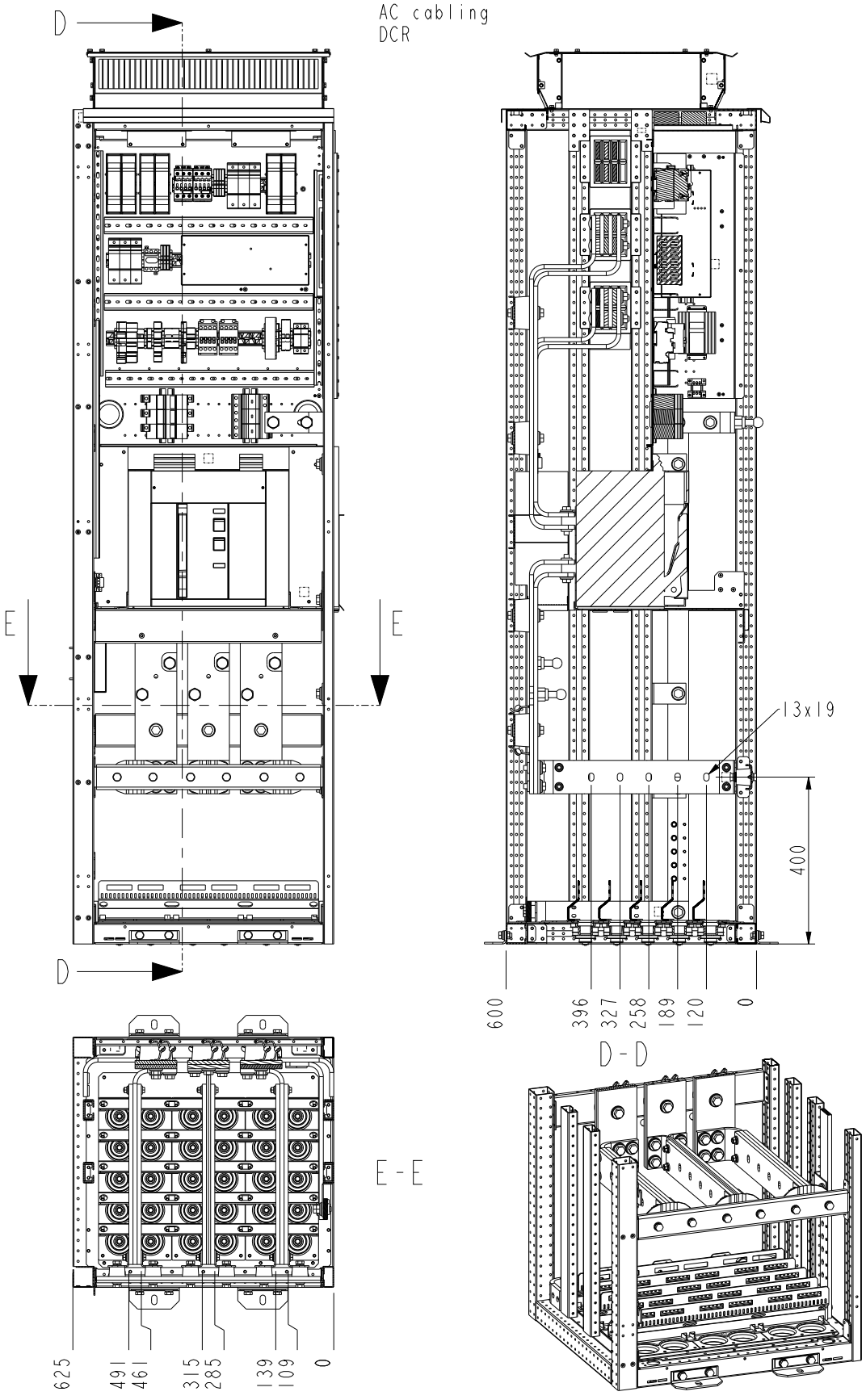


AC cabling

Note: Cable lead-throughs only with option +H357.

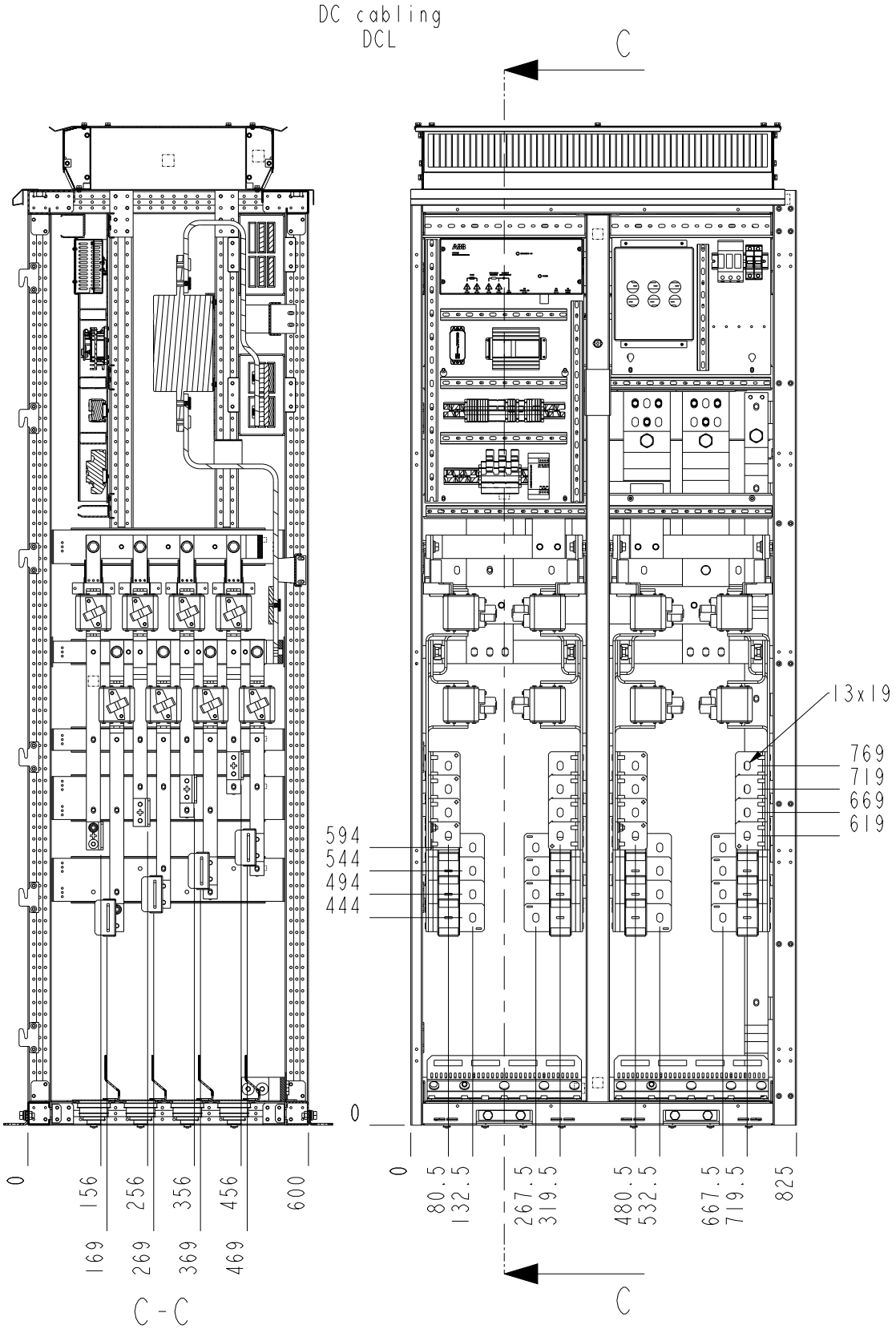


Note: Cable lead-throughs only with option +H357.

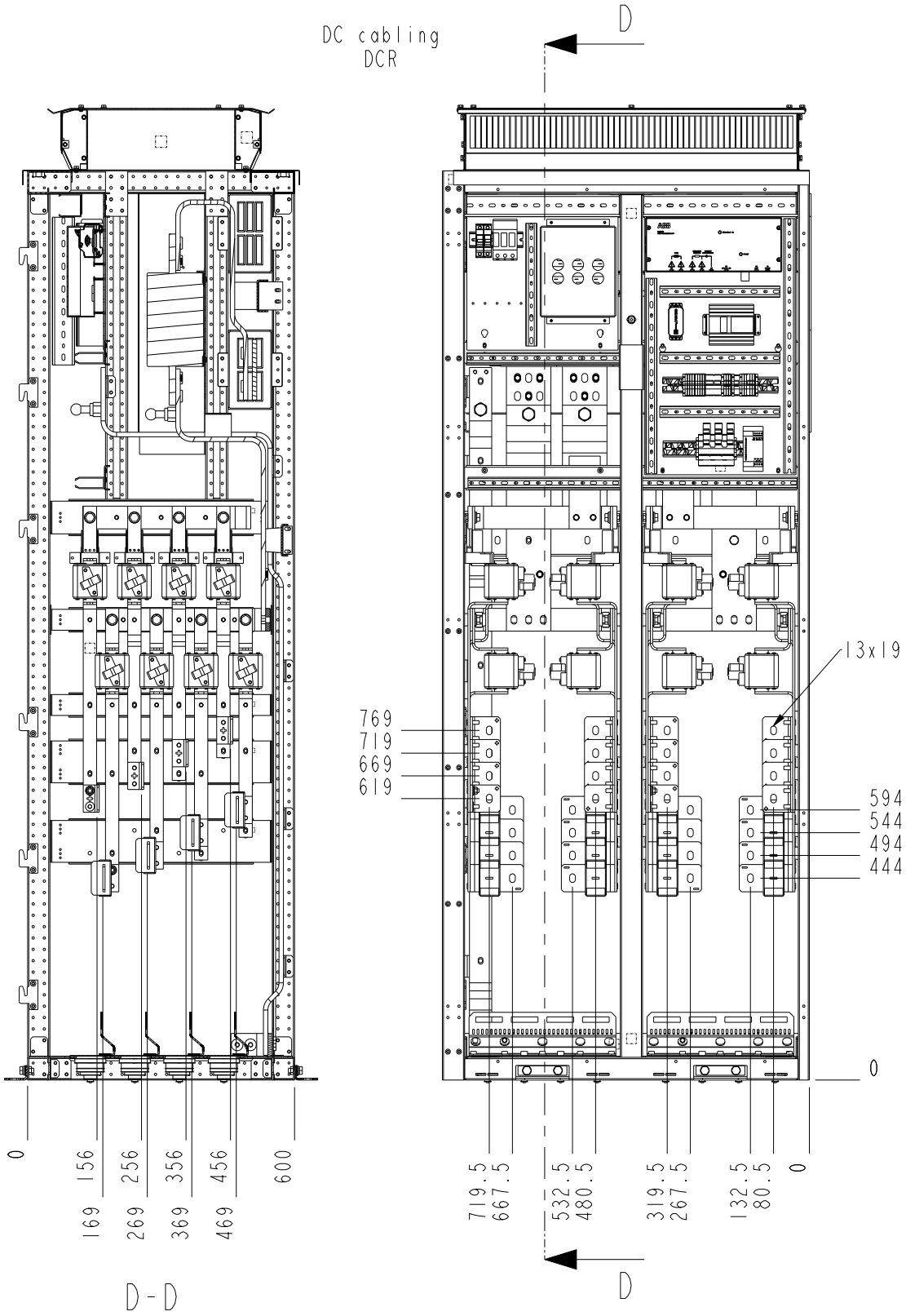


DC cabling

Note: Cable lead-throughs only with option +H357.



Note: Cable lead-throughs only with option +H357.



8

Control unit

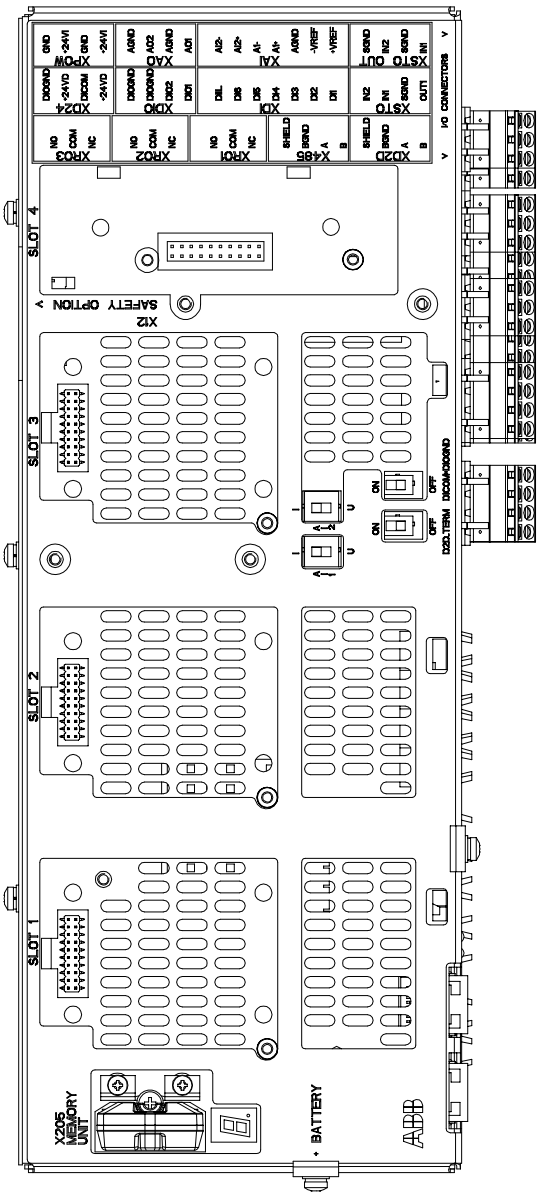
Contents of this chapter

This chapter describes the connections of the BCU control unit and AC500 PLCs, and contains the specifications of the inputs and outputs of the control unit.

BCU control unit

The BCU-12 control unit is used in the PVS800-57B inverter. The BCU is mounted separately from the inverter module(s), and connected to the module(s) by fiber optic cables.

Layout and connections



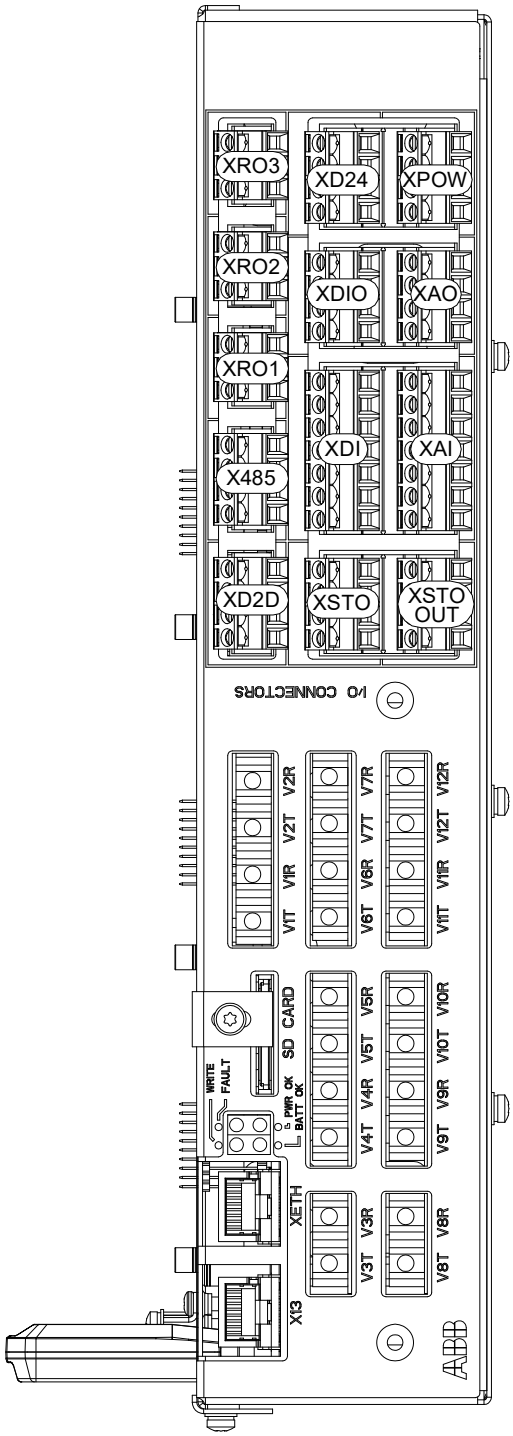
Item	Description
I/O	I/O terminals (refer to *I/O terminals* on page *75*)

SLOT 1	Fieldbus adapter module connection
SLOT 2	Used for internal connections
SLOT 3	Reserved
SLOT 4	Not in use

X205	Memory unit connection
BATTERY	Not in use (Holder for real-time clock battery)

AI1	Mode selector for analog input AI1 (I = current, U = voltage)
AI2	Mode selector for analog input AI2 (I = current, U = voltage)
D2D TERM	Not in use
DICOM = DIOGND	Ground selection. Determines whether DICOM is separated from DIOGND (ie. the common reference for the digital inputs floats).

7-segment display Multicharacter indications show as repeated sequences of characters	
o	(“U” shows briefly before “o”.) Control program startup in progress.
U	(Flashing) Firmware cannot be started. Memory unit missing or corrupted.
L	Firmware download from PC to control unit in progress.
1	At power-up, the display may show short indications of, e.g. “1”, “2”, “b” or “U”. This is normal. If the display ends up showing any other value than those described, it indicates a hardware failure.
2	



I/O terminals

Terminal	Description
XAI	Analog inputs
XAO	Analog outputs
XDI	Digital inputs
XDIO	Digital input/outputs
XD2D	Not in use
XD24	+24 V output (for digital inputs)
XETH	Ethernet port
XPOW	External power input
XRO1	Relay output RO1
XRO2	Relay output RO2
XRO3	Relay output RO3
XSTO	Not in use
XSTO OUT	Not in use
X12	Not in use
X13	Control panel connection
X485	Not in use

V1T/V1R, V2T/V2R	Fiber optic connection to inverter modules 1 and 2 (VxT = transmitter, VxR = receiver)
V3T/V3R … V7T/V7R	Fiber optic connection to inverter modules 3…7 (BCU-12/22 only) (VxT = transmitter, VxR = receiver)
V8T/V8R … V12T/V12R	Fiber optic connection to inverter modules 8…12 (BCU-22 only) (VxT = transmitter, VxR = receiver)

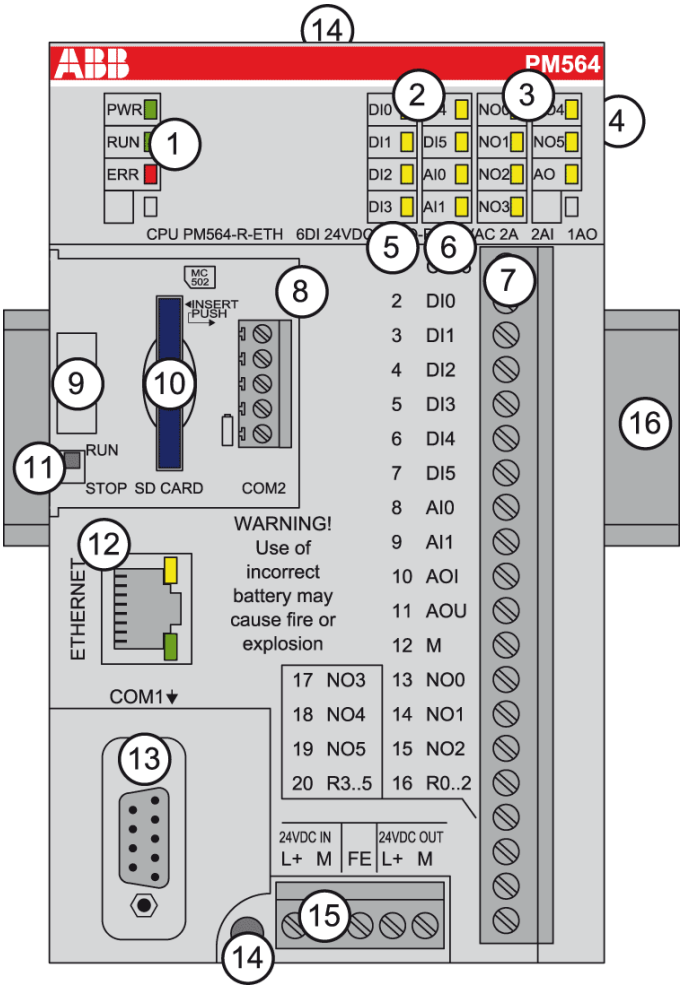
SD CARD	Data logger memory card for inverter module communication

BATT OK	Not in use
FAULT	The control program has generated a fault. Refer to the firmware manual of the inverter unit.
PWR OK	Internal voltage supply is OK
WRITE	Writing to memory card in progress. Do not remove the memory card.

AC500 PLC

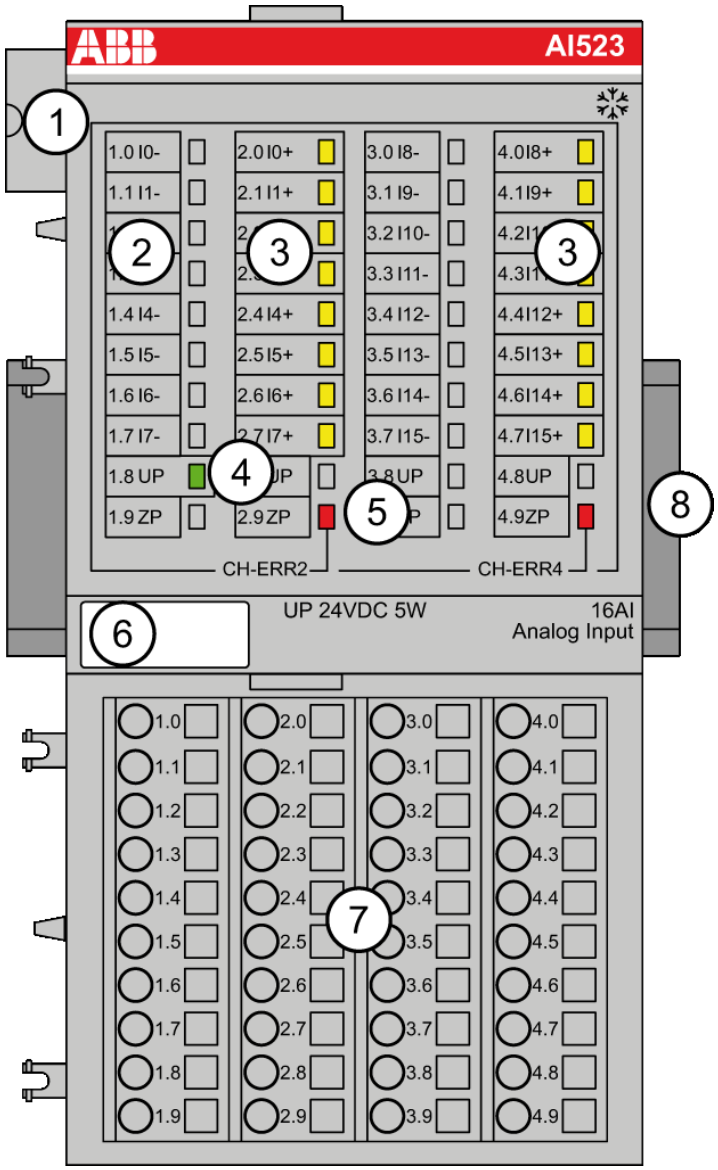
The diagrams that follow show the interfaces of the AC500 units.

ABB PM564



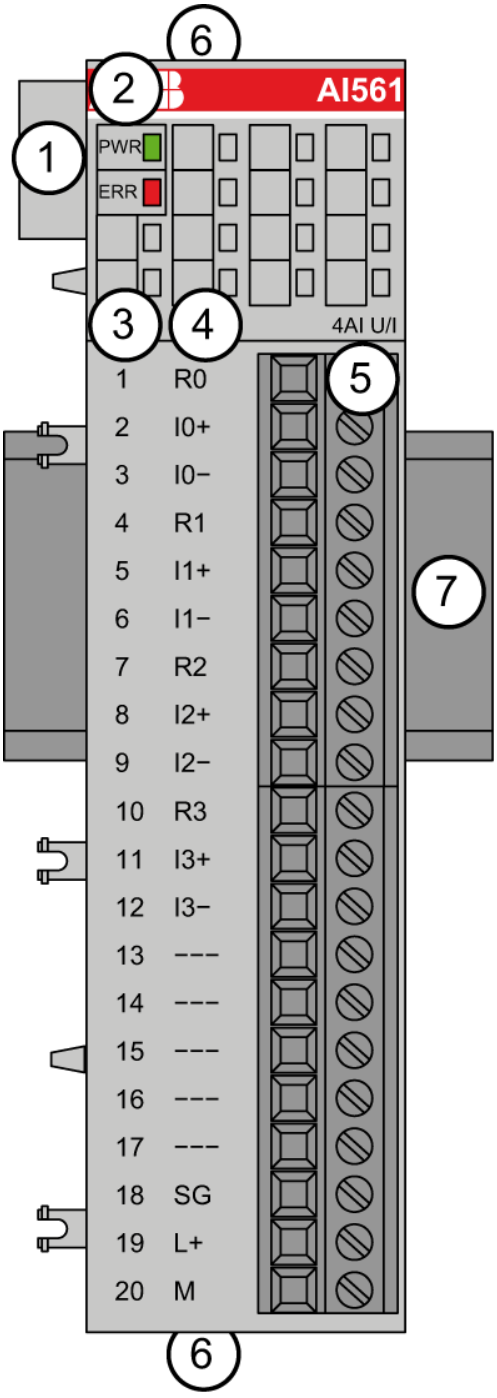
No.	Description
1.	3 LEDs show the status of the CPU
2.	6 yellow LEDs show the status of the digital input signals 2 yellow LEDs show the status of the analog input signals
3.	6 yellow LEDs show the status of the digital output signals 1 yellow LED shows the status of the analog output signal
4.	I/O bus for additional I/O modules
5.	Terminal number
6.	Allocation between terminal number and signal name
7.	Terminals for the input and output signals (20-pin, not removable)
8.	5-pin removable connector for COM2 (optional)
9.	Handle for opening the cover for the expansion modules
10.	SD memory card slot (optional)
11.	RUN/STOP switch
12.	Ethernet interface
13.	9-pin SUB-D jack (COM1) for RS-485 connection
14.	2 holes for wall mounting with screws
15.	5-pin removable connector for power supply (24 V DC or 100-240 V AC depending on model)
16.	DIN rail

ABB AI523



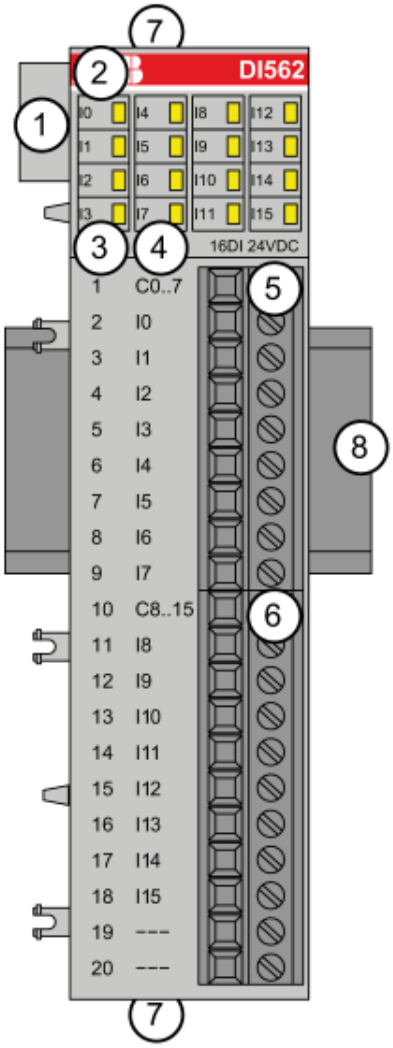
No.	Description
1.	I/O bus
2.	Allocation between terminal No. and signal name
3.	16 yellow LEDs show the signal status at the analog inputs (I0...I15)
4.	1 green LED shows the status of the process supply voltage UP
5.	2 red LEDs show errors
6.	Label
7.	I/O terminal unit (TU515/TU516) with 40 terminals (screw-type or spring terminals)
8.	DIN rail

ABB AI561



No.	Description
1.	I/O bus
2.	1 green LED shows power supply state
3.	1 red LED shows errors
4.	Terminal number
5.	Allocation of signal name
6.	Terminal block for input signals (20-pole)
7.	DIN rail

ABB DX571



No.	Description
1.	I/O bus
2.	16 yellow LEDs show the status of inputs I0 to I15
3.	Terminal number
4.	Allocation of signal name
5.	Terminal block for input signals (9-pole)
6.	Terminal block for input signals (11-pole)
7.	2 holes for wall-mounting with screws
8.	DIN rail

Default I/O connection table

The default I/O connections of the BCU-12 control unit and the AC500 modules.

BCU-12 (A41)				
Signal name	**Optional**	**Interface type**		**I/O terminal**
#1 GROUND IMPEDANCE		Analog input	4…20 mA	AI1
#1 GROUNDING CURRENT	X	Analog input	4…20 mA	AI2
M1 CABINET FAN SPEED REFERENCE		Analog output	4…20 mA	AO1
M2 CABINET FAN SPEED REFERENCE		Analog output	4…20 mA	AO2
START/STOP STATUS		Digital input	24 V DC	DI1
FPO STATUS		Digital input	24 V DC	DI2
#1 GROUNDING FUSE STATUS	X	Digital input	24 V DC	DI3
24V BUFFERS READY		Digital input	24 V DC	DI4
M1 AUX. PROTECTION DEVICES STATUS		Digital input	24 V DC	DI5
M1 LCL CAP. PRESSURE SENSOR		Digital input	24 V DC	DI6
M2 AUX. PROTECTION DEVICES STATUS		Digital input/output	24 V DC	DIO1
M2 LCL CAP. PRESSURE SENSOR		Digital input/output	24 V DC	DIO2
CONTACTOR CONTROL DUPLICATION		Relay output	max. 240 V AC, 2 A	RO1
#1 GROUNDING CONTACTOR CONTROL	X	Relay output	max. 240 V AC, 2 A	RO2
#1 MIRU ENABLE		Relay output	max. 240 V AC, 2 A	RO3

AC500 module PM564-RP (A500)				
Signal/parameter name	**Optional**	**Interface type**		**I/O terminal**
MAIN CIRCUIT SPD STATUS		Digital input	24 V DC	DI0
SMOKE DETECTOR		Digital input	24 V DC	DI1
SPARE DI1 (MV TRANSFORMER DI1)	X	Digital input	24 V DC	DI2
SPARE DI2 (MV TRANSFORMER DI2)	X	Digital input	24 V DC	DI3
SPARE DI3 (MV TRANSFORMER DI3)	X	Digital input	24 V DC	DI4
SPARE DI4 (MV TRANSFORMER DI4)	X	Digital input	24 V DC	DI5
CONTROL SECTION HUMIDITY		Analog input	0…10 V DC	AI0
		Analog input	0…10 V DC	AI1
		Analog output	0…10 V / 4…20 mA	AOI
GREEN STATUS LAMP		Relay out	24 V DC / max. 240VAC, 2A	RO0
YELLOW STATUS LAMP		Relay out	24 V DC, 10 mA / max. 240VAC, 2A	RO1
RED STATUS LAMP		Relay out	24 V DC / max. 240VAC, 2A	RO2
CONTROL SECTION HEATING		Relay out	24 V DC / max. 240VAC, 2A	RO3
POWER SECTION HEATING		Relay out	24 V DC / max. 240VAC, 2A	RO4
SPARE RO1 (MV BREAKER OPEN COMMAND)		Relay out	24 V DC / max. 240VAC, 2A	RO5

AC500 module AI523 #1 (A510)				
Signal/parameter name	**Optional**	**Interface type**		**I/O terminal**
M1 DC CURRENT MEASUREMENT		Analog input	±4 V DC / ±10 V DC	AI0
M1 DC SECTION HUMIDITY		Analog input	0…20 mA / 4…20 mA	AI1
M1 AC SECTION HUMIDITY		Analog input	4…20 mA	AI2
M1 LCL SECTION TEMP.		Analog input	PT100	AI3
M1 AC SECTION TEMP.		Analog input	PT100	AI4
M1 DC SECTION TEMP.		Analog input	PT100	AI5
LCL AIR CHANNEL TEMP.		Analog input	PT100	AI6
MAIN AIR CHANNEL TEMP.		Analog input	PT100	AI7
M2 DC CURRENT MEASUREMENT		Analog input	±4 V DC / ±10 V DC	AI8
M2 DC SECTION HUMIDITY		Analog input	4…20 mA	AI9
M2 AC SECTION HUMIDITY		Analog input	4…20 mA	AI10
M2 LCL SECTION TEMP.		Analog input	PT100	AI11
M2 AC SECTION TEMP.		Analog input	PT100	AI12
M2 DC SECTION TEMP.		Analog input	PT100	AI13
SPARE AI2 (MV TRANSFORMER AI1)	X	Analog input	±4 V DC / PT100	AI14
SPARE AI3 (MV TRANSFORMER AI2)	X	Analog input	±4 V DC / PT100	AI15

AC500 module AI523 #2 (A511)				
Signal / parameter name	**Optional**	**Interface type**		**I/O terminal**
M1 DC INPUT CURRENT 1	X	Analog input	±4 V DC / ±10 V DC	AI0
M1 DC INPUT CURRENT 2	X	Analog input	±4 V DC / ±10 V DC	AI1
M1 DC INPUT CURRENT 3	X	Analog input	±4 V DC / ±10 V DC	AI2
M1 DC INPUT CURRENT 4	X	Analog input	±4 V DC / ±10 V DC	AI3
M1 DC INPUT CURRENT 5	X	Analog input	±4 V DC / ±10 V DC	AI4
M1 DC INPUT CURRENT 6	X	Analog input	±4 V DC / ±10 V DC	AI5
M1 DC INPUT CURRENT 7	X	Analog input	±4 V DC / ±10 V DC	AI6
M1 DC INPUT CURRENT 8	X	Analog input	±4 V DC / ±10 V DC	AI7
M2 DC INPUT CURRENT 1	X	Analog input	±4 V DC / ±10 V DC	AI8
M2 DC INPUT CURRENT 2	X	Analog input	±4 V DC / ±10 V DC	AI9
M2 DC INPUT CURRENT 3	X	Analog input	±4 V DC / ±10 V DC	AI10
M2 DC INPUT CURRENT 4	X	Analog input	±4 V DC / ±10 V DC	AI11
M2 DC INPUT CURRENT 5	X	Analog input	±4 V DC / ±10 V DC	AI12
M2 DC INPUT CURRENT 6	X	Analog input	±4 V DC / ±10 V DC	AI13
M2 DC INPUT CURRENT 7	X	Analog input	±4 V DC / ±10 V DC	AI14
M2 DC INPUT CURRENT 8	X	Analog input	±4 V DC / ±10 V DC	AI15

AC500 module AI561 #1 (A520)				
Signal/parameter name	**Optional**	**Interface type**		**I/O terminal**
M1 DC INPUT CURRENT 9	X	Analog input	±4 V DC / ±5 V DC	AI0
M1 DC INPUT CURRENT 10	X	Analog input	±4 V DC / ±5 V DC	AI1
M1 DC INPUT CURRENT 11	X	Analog input	±4 V DC / ±5 V DC	AI2
M1 DC INPUT CURRENT 12	X	Analog input	±4 V DC / ±5 V DC	AI3

AC500 module AI561 #2 (A521)				
Signal/parameter name	**Optional**	**Interface type**		**I/O terminal**
M2 DC INPUT CURRENT 9	X	Analog input	±4 V DC / ±5 V DC	AI0
M2 DC INPUT CURRENT 10	X	Analog input	±4 V DC / ±5 V DC	AI1
M2 DC INPUT CURRENT 11	X	Analog input	±4 V DC / ±5 V DC	AI2
M2 DC INPUT CURRENT 12	X	Analog input	±4 V DC / ±5 V DC	AI3

AC500 module DX572 #1 (A530)				
Signal/parameter name	**Optional**	**Interface type**		**I/O terminal**
M1 DC SWITCH STATUS		Digital input	24 V DC	DI0
M1 AC SWITCH FEEDBACK		Digital input	24 V DC	DI1
M1 LCL OVERHEATING STATUS		Digital input	24 V DC	DI2
M1 AC CONTACTOR STATUS		Digital input	24 V DC	DI3
M1 DC CONTACTOR STATUS		Digital input	24 V DC	DI4
M1 48 VDC STATUS		Digital input	24 V DC	DI5
M1 48 VDC BUFFER STATUS		Digital input	24 V DC	DI6
M1 CABINET FAN STATUS		Digital input	24 V DC	DI7
M1 AC DOOR STATUS		Digital input	24 V DC	DI8
M1 DC DOOR STATUS		Digital input	24 V DC	DI9
M1 DC INPUT FUSES STATUS		Digital input	24 V DC	DI10
M1 AC BREAKER TRIPPED	X	Digital input	24 V DC	DI11
SPARE DI5		Digital input	24 V DC	DI12
SPARE DI6		Digital input	24 V DC	DI13
ACTIVE POWER LIMITATION SIGNAL		Digital input	24 V DC	DI14
REACTIVE POWER LIMITATION SIGNAL		Digital input	24 V DC	DI15

AC500 module DX572 #3 (A531)				
Signal / parameter name	**Optional**	**Interface type**		**I/O terminal**
M2 DC SWITCH STATUS		Digital input	24 V DC	DI0
M2 AC SWITCH FEEDBACK		Digital input	24 V DC	DI1
M2 LCL OVERHEATING STATUS		Digital input	24 V DC	DI2
M2 AC CONTACTOR STATUS		Digital input	24 V DC	DI3
M2 DC CONTACTOR STATUS		Digital input	24 V DC	DI4
M2 48 VDC STATUS		Digital input	24 V DC	DI5
M2 48 VDC BUFFER STATUS		Digital input	24 V DC	DI6
M2 CABINET FAN STATUS		Digital input	24 V DC	DI7
M2 AC DOOR STATUS		Digital input	24 V DC	DI8
M2 DC DOOR STATUS		Digital input	24 V DC	DI9
M2 DC INPUT FUSES STATUS		Digital input	24 V DC	DI10
M2 AC BREAKER TRIPPED	X	Digital input	24 V DC	DI11
SPARE DI7		Digital input	24 V DC	DI12
SPARE DI8		Digital input	24 V DC	DI13
SPARE DI9		Digital input	24 V DC	DI14
SPARE DI10		Digital input	24 V DC	DI15

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3AXD50000048300 Rev C (EN) 2019-09-18