

EPCS125-AM (-F)-SK (Europe & Australia Versions, without VG Terminal) PCS



Technical Specification

Version	V3.1
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1 Introduction to PCS

The PCS realizes rectification and inversion through a three-phase three-level converter.

The rectified output is converted from three-phase AC to DC and injected into the energy storage system, while the inverted output is filtered to generate three-phase AC for use by AC loads or integration into the grid.

Operation exclusively in "on-grid" model with anti-islanding function, under no circumstances does this inverter allow operation in off-grid/island mode.

1.1 Features

Efficient conversion

- Charge and discharge conversion time $\leq 100\text{ms}$;
- The highest conversion efficiency is 98.5%.

Flexible application

- Compatible with three-phase three-wire/four-wire system, customized communication bus can monitor all module data.

Battery friendly

- Different battery clusters can work completely independently, avoiding circulation between battery clusters and improving service life;
- Support 30+BMS protocol.

Fully featured

- Support reactive power compensation, three-phase unbalance compensation.

Easy maintenance

- Group series scheme, the fault branch does not affect the operation of other branches;

Safe and stable

- Perfect fault protection function;
- Low battery circulation, multi-parallel automatic current sharing;
- Support stable operation in the grid environment with 20% THDu.

2 Model Description

Figure2-1 Model number

E PCS 125 - A M - (F)
1 2 3 4 5 6

Table 2-1 Model description

Serial number	Meaning	Value description
1	Brand identity	E: Brand identity
2	Product type identity	PCS: Power conversion system
3	Power level identity	125: Rated at 125kW
4	Converter type	A: Three-phase ACDC conversion
5	Assembly method	M: Modular assembly
6	Wiring position	If there is F, the maintenance side is in front. If there is no F, the maintenance side is in behind.

3 Product Structure

3.1 Product appearance

The appearance and heat dissipation of the PCS module are shown in the following figures. The schematic diagram is only used to show the wind direction and does not represent the actual appearance of the aircraft.

Figure3-1 Heat dissipation for rear-maintenance models

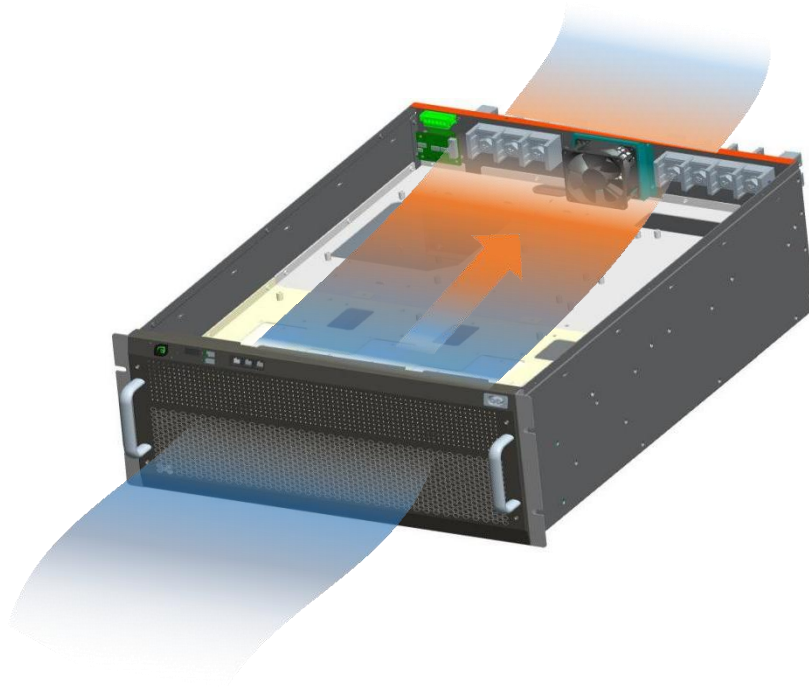
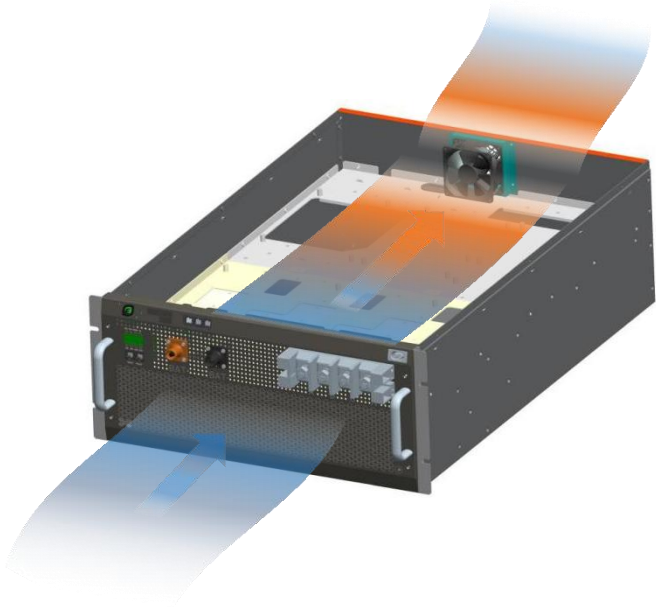


Figure3-2 Heat dissipation for front-maintenance models



3.2 Product dimensions

Figure3-3 Product dimensions (rear-maintenance models)

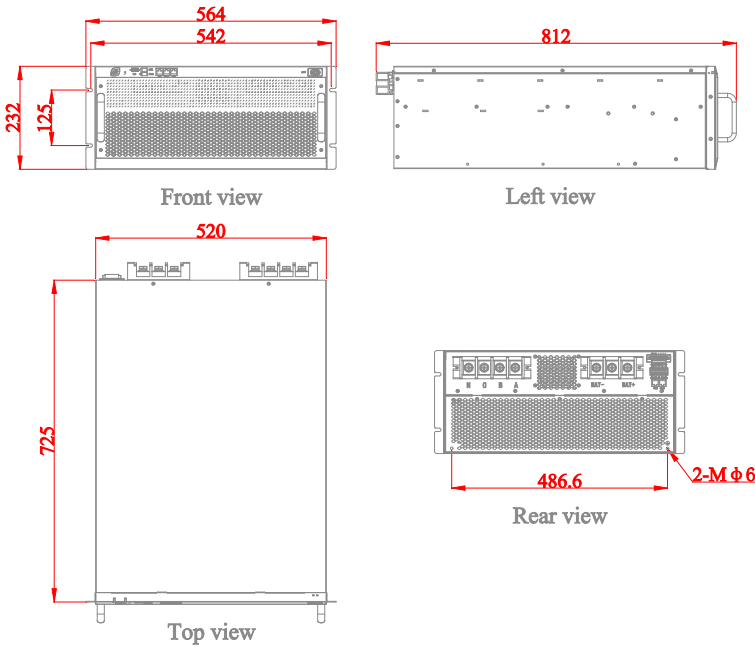
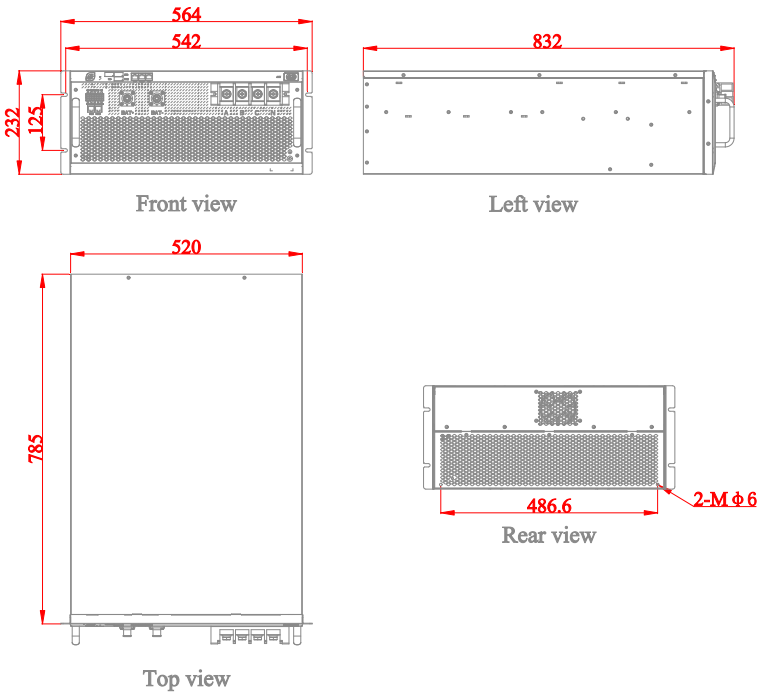


Figure3-4 Product dimensions (front-maintenance models)



4 Product Specification

4.1 Technical parameters

Table 4-1 Technical parameters

Specifications	EPCS125-AM(-F)-SK
DC side	
Operating voltage range (V)	615 ~ 950 (3W+PE) /650 ~ 950 (3W+N+PE)
Full load voltage range (V)	615 ~ 950 (3W+PE) /680 ~950 (3W+N+PE)
Number of inputs	1
Maximum current (A)	203
AC side (on-grid only)	
Rated voltage (V)	230/400
Voltage deviation	- 15% ~ + 15%
AC Output type	(3W+PE) three-phase three-wire/(3W+N+PE) three-phase four-wire
Rated output power (kW)	125
Maximum output power (kW)	138
Maximum current (A)	200
Rated grid frequency (Hz)	50/60(± 5)

Power factor	0.99
Power factor range	-1 lagging ~ +1 leading
Current distortion rate	< 2% (rated power)
DC component	< 0.5%
Overload capacity	110% long term(at rated operating conditions)
Maximum efficiency	98.5%
Protective features	
Features	AC overcurrent protection, AC overvoltage protection, AC short circuit protection, anti-island protection, DC reverse connection protection, etc
General parameters	
Inside dimensions (W × H × D, mm)	Rear-maintenance: 520 × 232 × 725
	Front-maintenance: 520 × 232 × 785
Weight (kg)	Rear-maintenance: 69
	Front-maintenance: 74.5
Altitude (m)	4000m (> 2000m derated use)
Operating temperature	-30°C ~ 55°C (> 45°C derated use)
Storage temperature	-45°C to 70°C
Humidity	0%RH to 95% RH, non-condensing

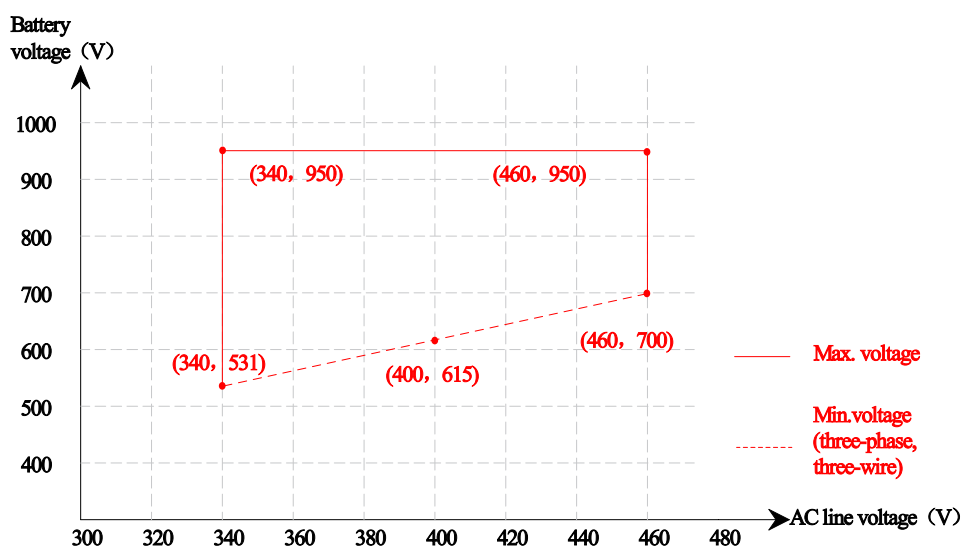
Cooling method	Intelligent forced air cooling
IP Level	IP20
Communication interface	CAN/RS485/Ethernet
Grid support	LVRT/HVRT, active and reactive power control

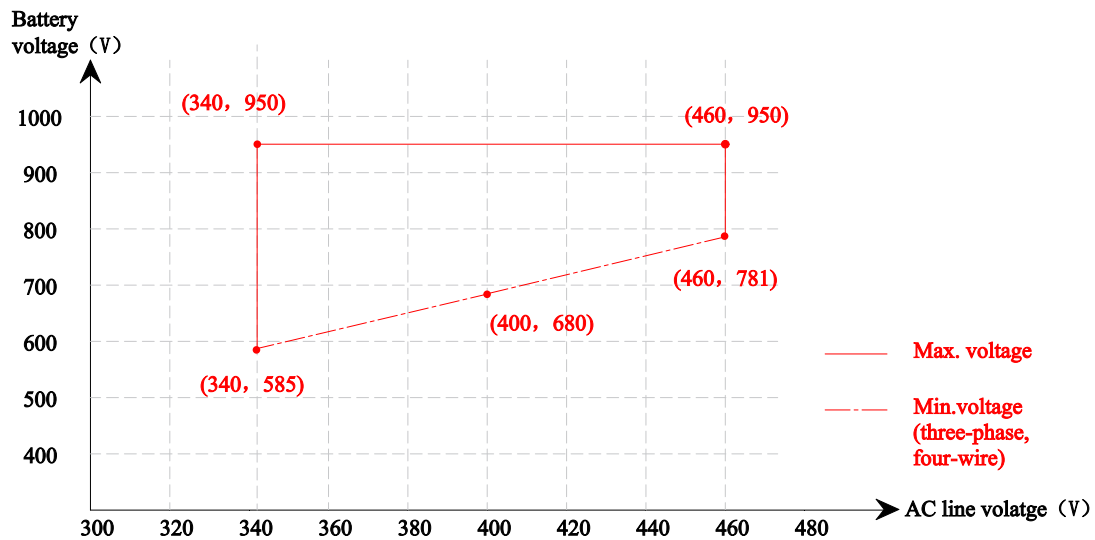
Note: Maximum efficiency is the highest efficiency that can be achieved under the best working condition of the high efficiency version.

4.2 Operating voltage and derating

As shown in the figure below, the three-phase, three-wire and three-phase, four-wire battery voltage-AC voltage graphs are shown in sequence.

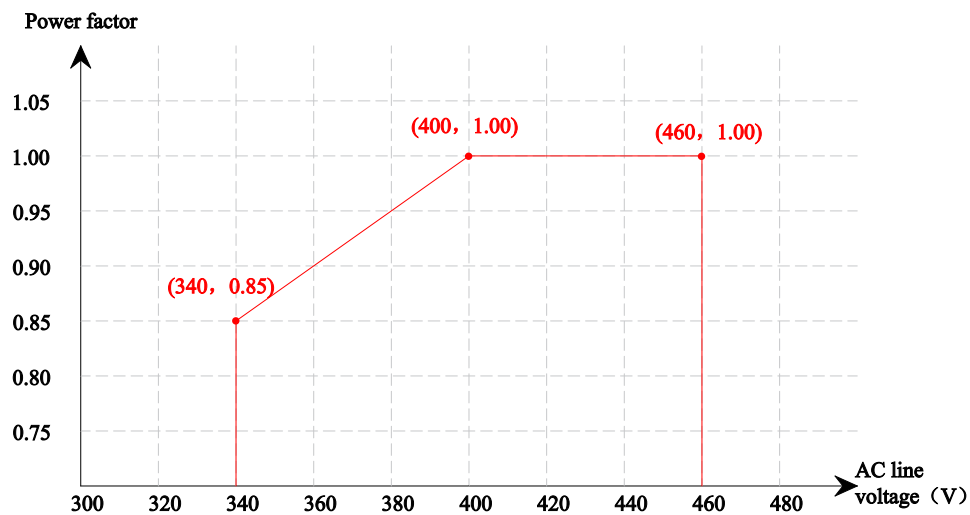
Figure4-1 Battery voltage-AC voltage graphs



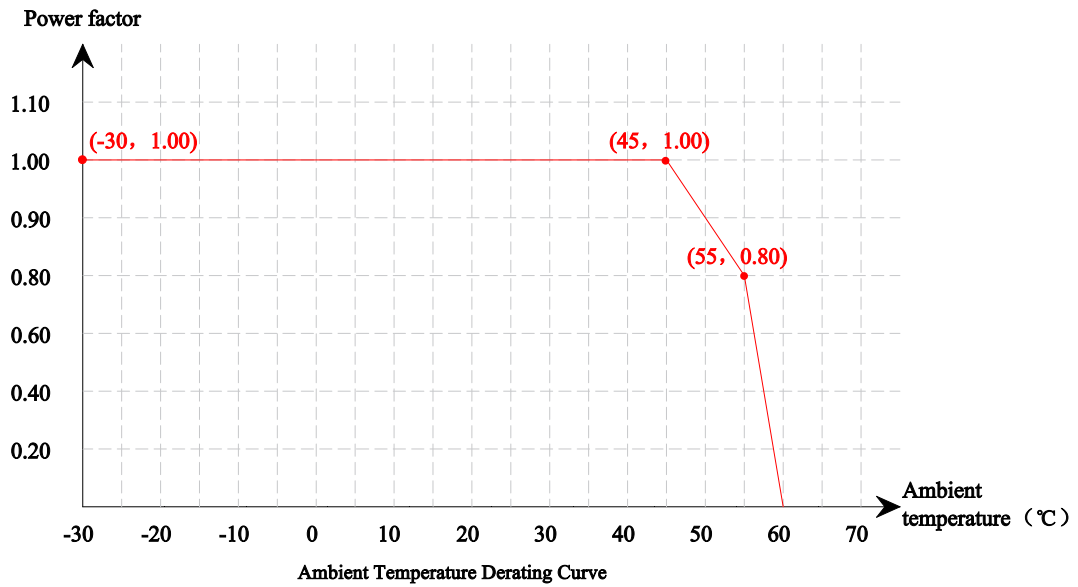
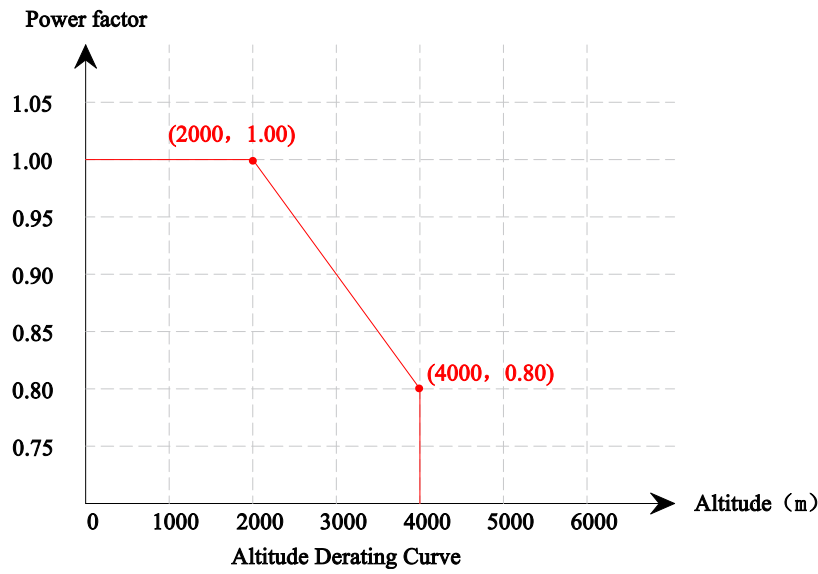


AC voltage, altitude, and ambient temperature derating curves are shown in the following figure.

Figure4-2 Derating curves



AC Voltage Derating Curve



4.3 Efficiency Curve

The following figure illustrates the rectification and inversion efficiencies under different DC voltages when the PCS is used as a current source with 3P3W wiring (the voltage on the AC side is the rated voltage of 400V).

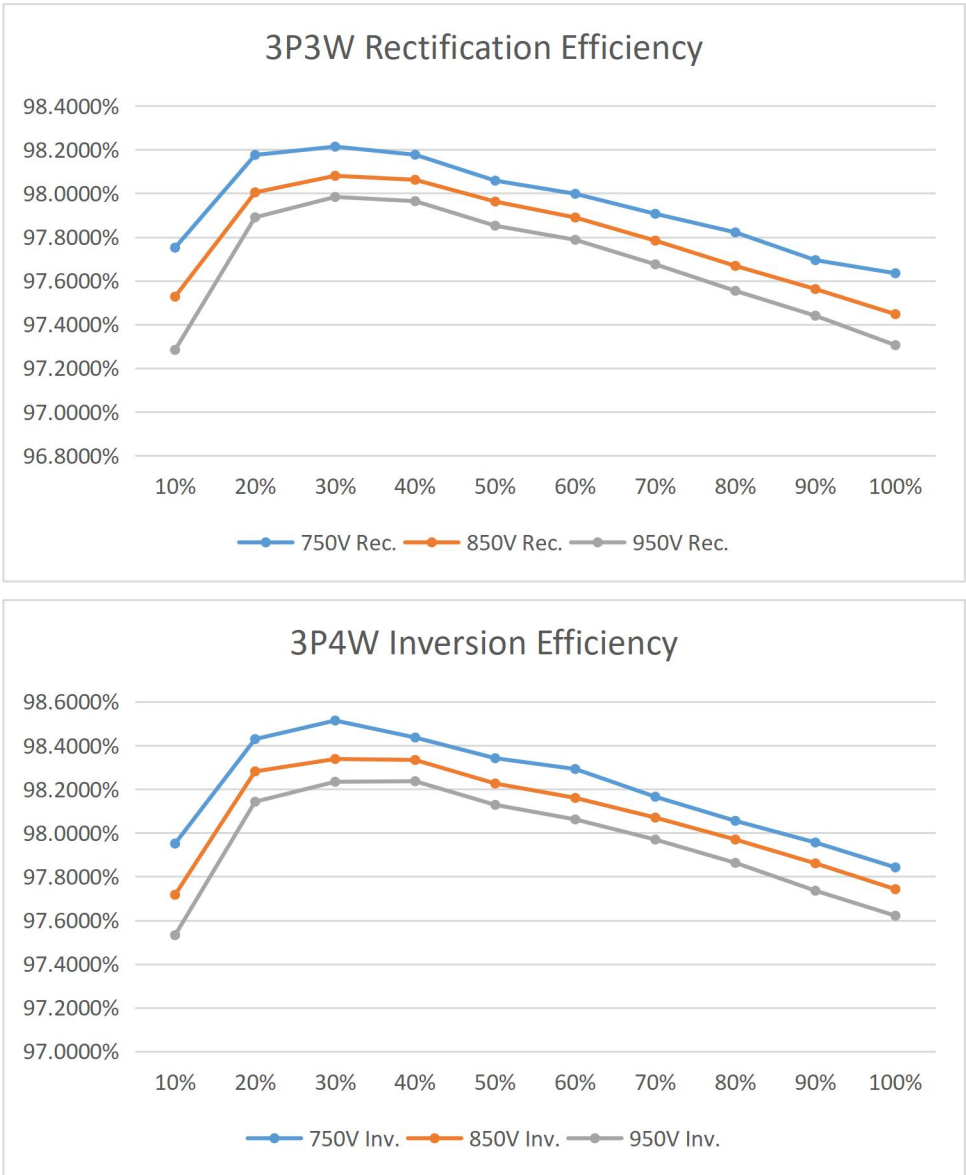
Figure4-3 Current source (3P3W)



Graph analysis: In the above graph, the horizontal axis represents different levels of power, the vertical axis represents different levels of efficiency, and the different broken lines in the graph represent different DC voltage levels.

The following figure illustrates the rectification and inversion efficiencies under different DC voltages when the PCS is used as a current source with 3P4W wiring (the voltage on the AC side is the rated voltage of 400V).

Figure4-4 Current source (3P4W)

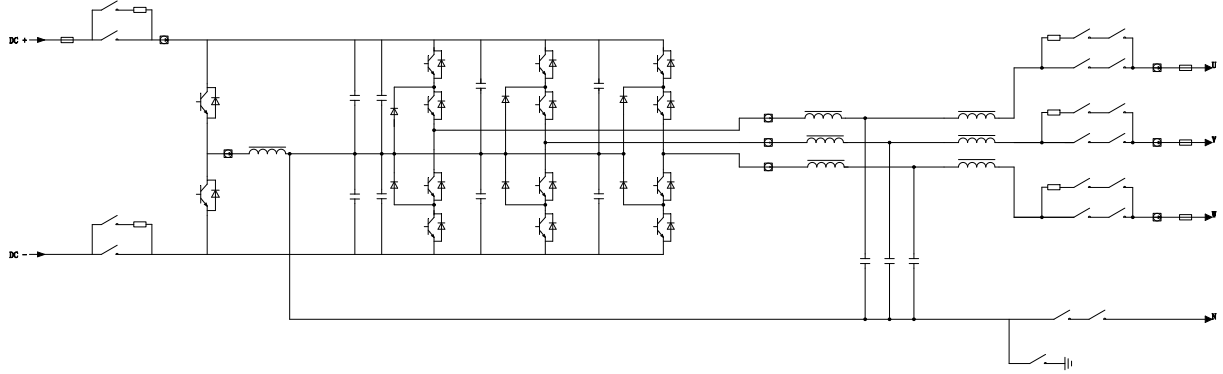


Graph analysis: In the above graph, the horizontal axis represents different levels of power, the vertical axis represents different levels of efficiency, and the different broken lines in the graph represent different DC voltage levels.

Note: The above data are laboratory test results and are for reference only.

4.4 Schematic diagram

Figure4-5 Electrical principles



4.5 Certification Specifications

4.5.1 Safety requirements

Table 4-2 Safety requirements

Serial number	Items		Standards	Remarks
1	Withstand voltage	Power loop - Earth	2120Vdc/1min	Refer to the IEC 62477-1 standard for 2120Vdc
2	Insulation resistance	Input - Earth	1000Vdc, >1MΩ	
		Output - Earth		
3	Contact current	Input - Earth	/	System pastes large leakage current warning label
4	Ground resistance		< 0.1 Ω	
5	Safety certification standard		IEC62477-1	
6	Certification Requirements		CE/CQC	

4.5.2 Requirements for lightning protection

Table 4-3 Lightning protection requirements

Items	Indicator requirements	Requirements
AC side	Line-line 1kV, line-ground 2kV	Apply a 1.2/50us surge signal to the power port
Note: Add corresponding level of surge protectors to the front-end distribution part of the PCS application.		

4.5.3 Reliability environmental requirements

Table 4-4 Reliability environmental requirements

Serial number	Items	Parameters	Units	Use Env.	Transportation Env.	Storage Env.	Remarks
1	Temp.	Low temperature	°C	-30	-40	-40	Derated for use above 45°C.
		High temperature	°C	+55	+70	+70	
2	RH	Low relative humidity	%	0	/	0	/
		High relative humidity	%	95	/	95	
		Condensation	Yes/No	No	/	No	
3	Alt.	Low altitude	m	0	/	0	Derated for use above 2000 m.
		High altitude	m	4000	/	4000	

4.5.4 Packaging and Transportation Testing Requirements

Table 4-5 Packaging and Transportation Testing Requirements

Serial number	Test items	Test conditions/parameters	Adoption of standards
1	Transportation requirements	2M1	GB/T4798.2

5 Ports and Cables

5.1 Port definition

Figure5-1 Rear-maintenance model port schematic

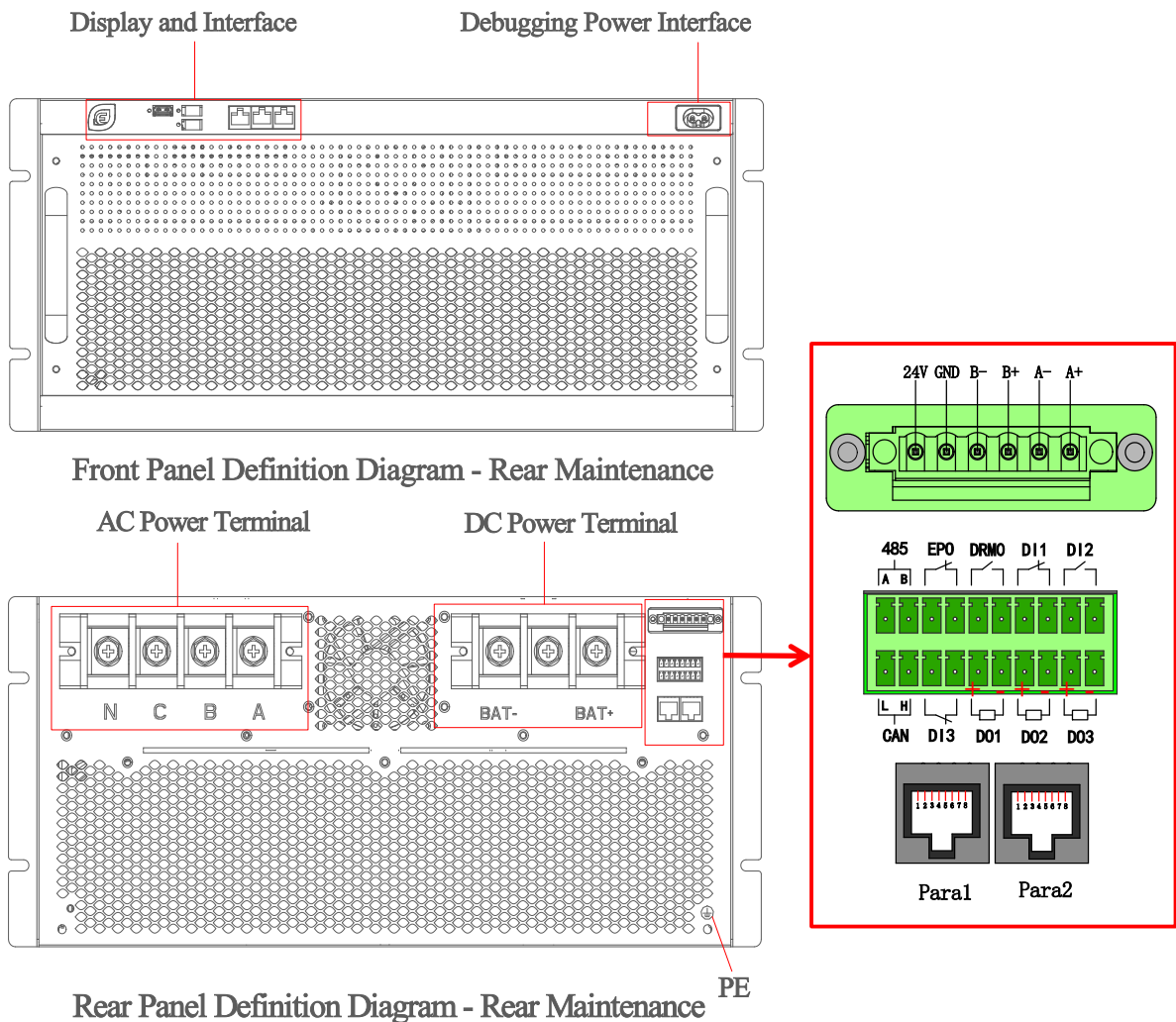


Figure5-2 Front-maintenance model port schematic

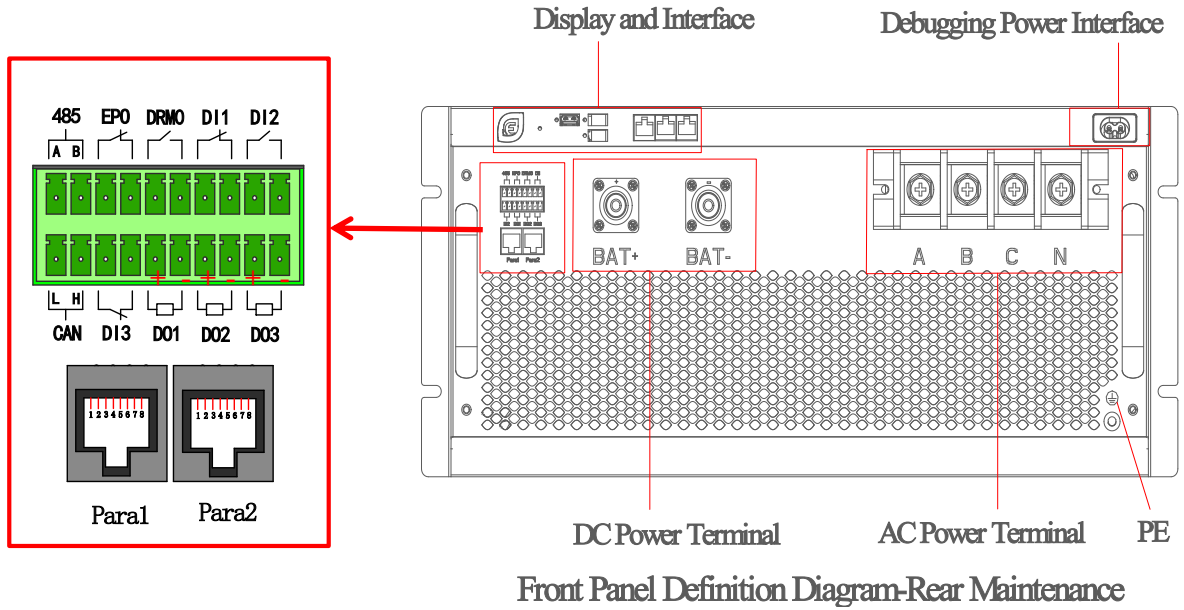


Figure5-3 "Display and Interface" appearance details

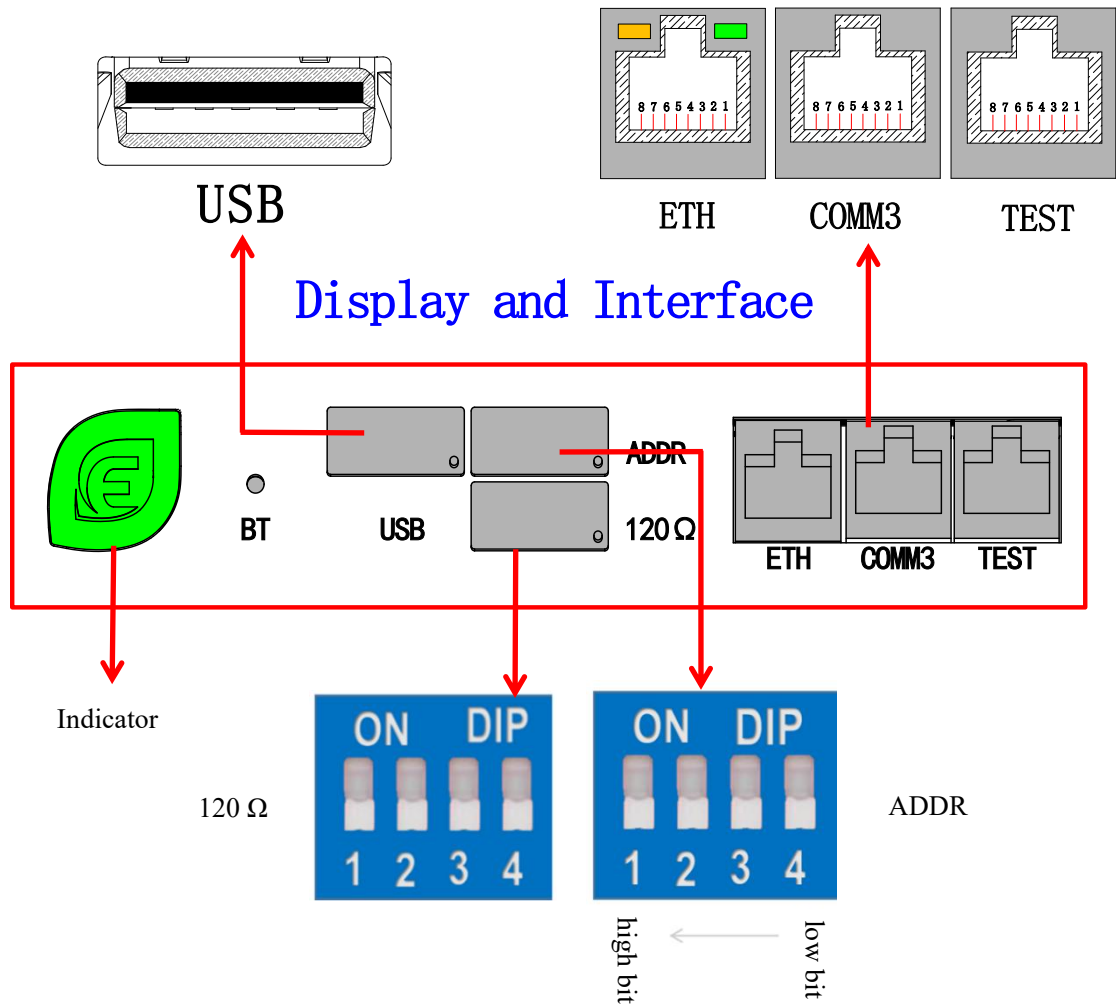


Table 5-1 Display and interface instructions

Name/symbol	Function description
Pilot lamp	- Operating output power is green for a long time; - In standby (0kW operation), the green light blinks 0.5s quickly; - When the system is not powered on and no fault occurs, the green light blinks slowly for 1s. - If the device is faulty, the indicator blinks red.
BT	Bluetooth indicator; Blue light on successful Bluetooth connection.
USB	Reserve USB interface for software/profile upgrades.
ADDR	"ADDR" sets the dip switch for the module address (binary) with the 4th bit as the lowest (carry from right to left)
120 Ω	This interface is a 4-bit binary DIP switch 1.ARM_CAN1 Reserve CAN1 communication matching resistor, dial up to access 120Ω matching resistor; 2 .ARM_CAN2 CAN2 communication matching resistor, dial up to access 120Ω matching resistor (CAN2 in COMM3); 3 .DSP_CAN1 CAN communication matching resistance, PCS parallel communication, dial up to access 120Ω matching resistance (CAN1 in Para) ; 4. DSP_CAN2 CAN communication matching resistor (CAN2 in Phoenix terminal), dial up to access 120Ω matching resistor.
ETH	Ethernet interface: supports Modbus TCP and can connect to the EMS or switch
COMM3	Supports CAN and 485 communication
TEST	Special interface for background debugging
Debugging power interface	220V AC power input (for debugging)
DC (AC) power port	AC/DC side power interface

PE	Ground connector (M6 screws)
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Table 5-2 Display and interface description

Name/symbol	Function description	Remarks
24V/GND	24V DC output interface (reserved). This interface can take power <20W, only for DI/DO use, can not be used as other power supply	Available on rear-maintenance devices only
A+ /A- B+ /B-	Current sampling interface (reserved)	
485	485 communication port	485 communication with EMS is possible
EPO	Emergency power off signal input interface	Default normally closed
DRM0	DRM0 monitoring interface(for Australian standards)	Default normally closed
DI1	BMS fault signal	Default normally closed
DI2	Digital input signal 2	Default normally open
CAN	CAN communication interface	CAN communication with BMS
DI3	External dry contact fault	Default normally closed
DO1	Fault status interface	24V active output signal
DO2	Operating status interface	
DO3	Fan drive interface	
Para1, Para2	PCS parallel interface	PCS Parallel or PCS communicates with STS

Table 5-3 Para1/Para2 port description

PINS	Pin definition	Pin definition instructions
1	CAN1_L	CAN parallel signal

2	CAN1_H	
3	INV_SYNC	Internal power frequency synchronization signal
4	CARRIER_SYNC	Internal carrier synchronization signal
5	GND	Common signal terminal
6	GND	Common signal terminal
7	Not enabled yet	Not enabled yet
8	Not enabled yet	

Para1/Para2 is for PCS parallel use, or for PCS to connect when communicating with STS.

Table 5-4 COMM3 Communication interface description

Pins	Pin definition	Pin description
1	CAN1_H	Reserved
2	CAN1_L	
3	CAN2_H	Can be used to upgrade PCS software (can be used when communicating with EMS via CAN protocol)
4	CAN2_L	
5	485_2B	Can be used to upgrade PCS software. PCS 485 as Modbus Slave, default address 1, baud rate 9600/8/N/1
6	485_2A	
7	485_1B	Reserved
8	485_1A	

5.2 Power port

Figure5-4 Front maintenance models' power port (DC side aviation terminal)

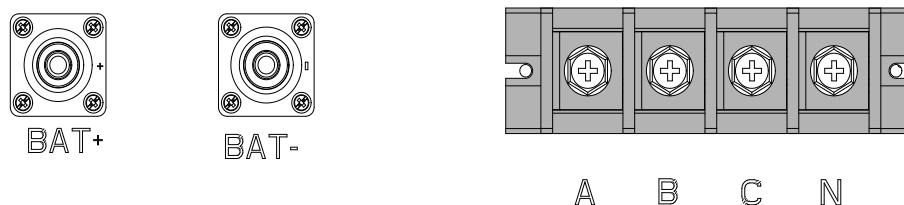


Figure5-5 Rear-maintenance models' power port (conventional terminals)

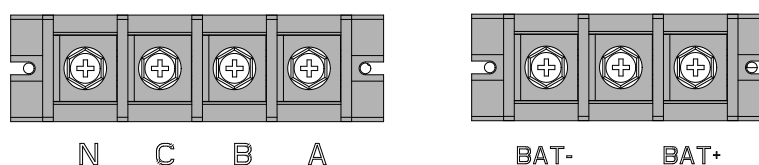


Table 5-5 PCS power conventional terminals description

Terminal symbol	Terminal function Description	Screw specifications	Torque	Remarks
BAT +	DC positive	M10*20	32~34N·m	The front maintenance model DC side is the aviation terminal
BAT -	DC negative	M10*20	32~34N·m	
A	A phase input	M10*20	32~34N·m	
B	B phase input	M10*20	32~34N·m	
C	C phase input	M10*20	32~34N·m	
N	Three-phase four-wire system N line input	M10*20	3~4N·m	

Table 5-6 PCS power conventional terminals description

Cable connection location	Maximum voltage & current	Cable recommended	Cable terminal selection recommendation	Remarks
DC side (positive and negative)	Voltage: 950V Current: 203A	Unipolar: 70mm ²	GTNR70-10	User owned

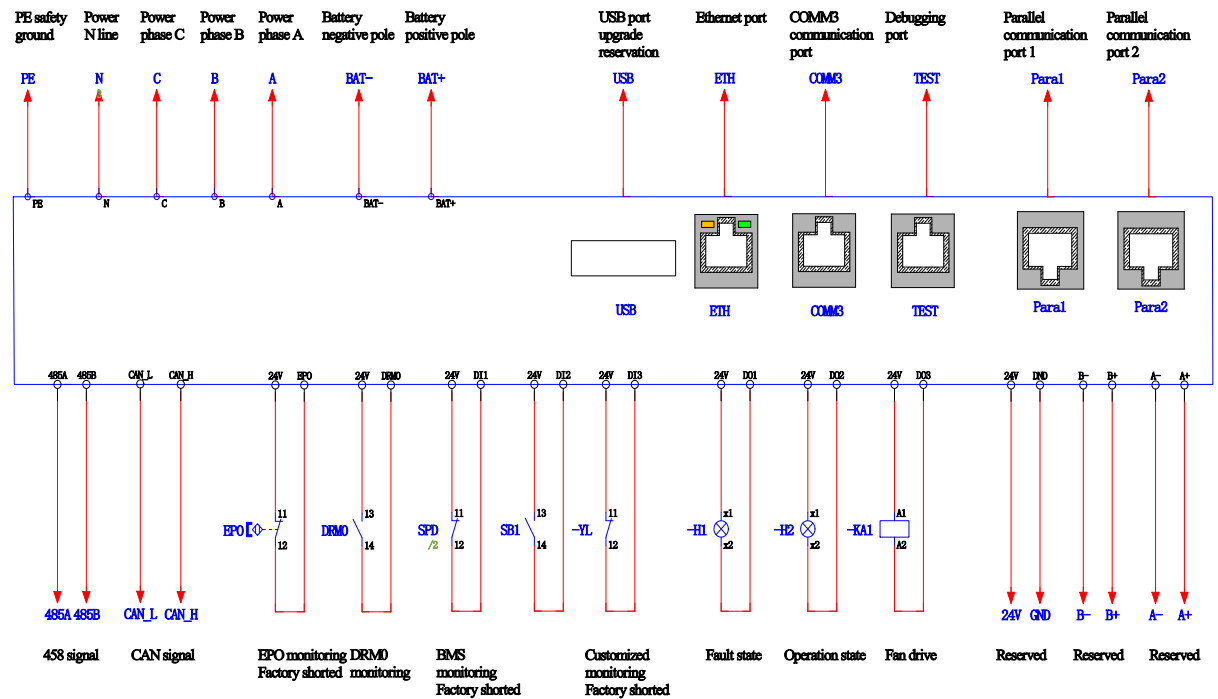
AC side (A, B, C, N)	Voltage: 440V Current: 200A	Single phase: 70mm ²	GTNR70-10	
Protective Ground Wire (PE)	/	Single wire: 35mm ²	GTNR35-6	

Note: The cable diameter must comply with the local cable standards (yellow and green cables can only be used for grounding protection). Factors affecting cable selection include: rated current, cable type, laying method, ambient temperature, and maximum expected line loss.

5.3 PCS module interface definition

The following figure lists all the ports of PCS and introduces their main functions.

Figure5-6 PCS wiring ports



6 Ventilation Requirements

6.1 Module usage requirements in cabinet

Steps for cabinet fan selection:

1. Calculate the total cooling airflow required for all modules based on the *Actual effective air intake area of the cabinet* from Table 6-1.
2. Determine the maximum airflow ($Q_{\max}$) of the cabinet fan.
3. Select the fan specifications and quantity based on the maximum airflow ($Q_{\max}$).

Note:

- Cabinet fan maximum airflow $Q_{\max} = (1.3 \times \text{to } 1.5 \times)$ Total required cooling airflow (when louver, filter cotton, insect screens, or similar components are not installed at cabinet air inlets/outlets).
- Cabinet fan maximum airflow $Q_{\max} = (1.8 \times \text{to } 2.5 \times)$ Total required cooling airflow (when louver, filter cotton, insect screens, or similar components are installed at cabinet air inlets/outlets).

NOTE

- $Q_{\max}$ refers to the airflow of the cabinet fan at zero static pressure.
- The selected fan's maximum airflow must not be less than $Q_{\max}$. If a single fan cannot meet the requirement, multiple fans can be installed in parallel.
- The above is an empirical method for fan selection. For more accurate assessment of cabinet fan suitability, cabinet airflow simulation is recommended.
- Module cooling is achieved via forced air cooling. When used in energy storage cabinet systems, the louver specifications and installation spacing can be referenced in Figure 6-1. The temperature difference (ΔT) between the module intake/exhaust (including cabinet intake/exhaust) should not exceed 15°C .
- When designing a cabinet, the front and rear door panels should increase the effective air intake area under the condition of meeting the corresponding IP protection level, and should be determined

according to the number of modules inside the cabinet. The opening size of the ventilation holes shall not be less than the value specified in Table 6-1.

- It is recommended to install cabinet fans at the exhaust outlet, with a certain distance from the outlet to prevent cross-airflow between modules and fans.

Figure6-1 Module Thermal Space Requirements

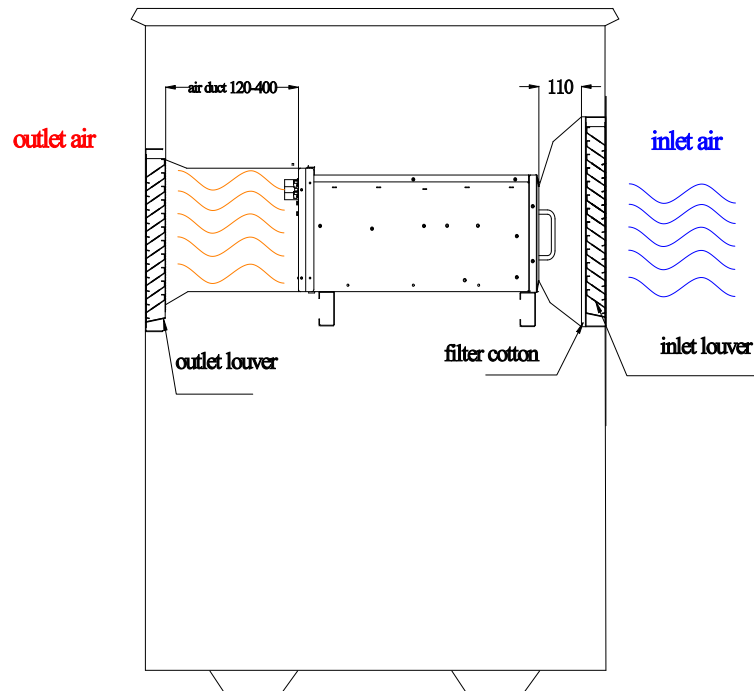


Table 6-1 Ventilation parameters of PCS module in cabinet

Model	Actual effective air volume of the module		Actual effective air intake area of the chassis (m ²)	Actual effective air outlet area of the chassis (m ²)
	(CFM)	(m ³ /min)		
EPCS125-AM-SK	510	14.45	0.066	0.066
EPCS125-AM-F-SK	510	14.45	0.066	0.066

NOTE

- The **Actual effective air intake area of the cabinet** and **Actual effective air outlet area of the cabinet** in the table above refers to the area of the cabinet through holes;
- The parameters in the table above apply only to a single PCS module, and the heat dissipation of other components in the cabinet is not taken into account.