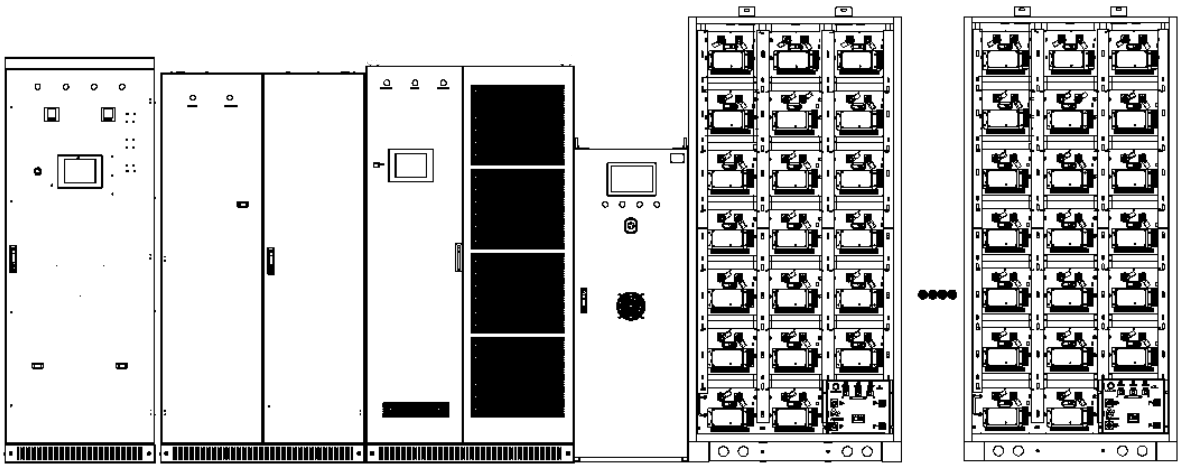
Installation Manual of Energy Storage system

Storion-TB (187.5-500) (Indoor, M38210-S)



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Please keep this manual safe and strictly follow all safety and operating instructions in this manual. Do not install or operate the system before reading this manual.

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Preface

Summary

The Storion-TB (187.5-500) lithium-ion battery industrial and commercial indoor energy storage system has been developed by AlphaESS for many years and has been successfully applied in many fields. It is a high-tech product with excellent quality and stable performance used in power supply today.

This manual is specifically designed to address product installation issues. The document contains a lot of product related installation information, including safety instructions, product introduction, and product installation.

Symbolic Conventions

The following symbols may appear in this article, please note that they represent the following meanings:

Label	Description
	Indicates potential risks that, if not avoided, may cause the system to malfunction or malfunction.
	Indicates a moderate potential danger, which could lead to system damage or personal injury if not avoided.
	Indicates a high potential danger that, if not avoided, may result in death or serious injury to personnel.
	Supplementary explanation of key information in the main text. "Explanation" is not a safety warning information and does not involve personal, system, or environmental injury information.

Terminology

1. Battery Management System (BMS)

Used to monitor the operational information of battery cells, battery packs, and system units (such as voltage, current, temperature, battery protection parameters, etc.), intelligently evaluate remaining power (SOC), health status (SOH), and accumulated released energy, playing a role in protecting battery safety.

2. Energy Management System (EMS)

Including data collection and monitoring systems, automatic power generation control and economic dispatch control, power system status and safety analysis.

3. Battery System (BESS)

The combination of batteries connected in series and parallel within the battery system and the Battery Management System (BMS) is used to connect the DC side of the PCS.

4. Energy Storage System (ESS)

A combination of a battery system and an PCS that can be used as an independent power source or directly controlled by a monitoring system.

5. Photovoltaic (PV)

The abbreviation of solar PV power system is a new type of power generation system that utilizes the of semiconductor materials in solar cells to directly convert solar radiation energy into electrical energy.

6. PV combiner box

Users can connect a certain number of PV panels with the same specifications in series to form a series of PV panels, and then connect several PV series in parallel

to the PV combiner box. After converging in the PV combiner box, they output through a DC and use it in conjunction with energy storage inverters to form a complete PV power generation system.

7. Grid connected system

Grid connected systems typically consist of PV strings, PCSs, battery systems, and the power grid. When the electricity generated by the PV string is sufficient, the remaining electricity can be fed into the grid. When the electricity generated by the PV string and battery system is insufficient, the grid can supply power to the load.

8. Off grid system

Off grid systems are suitable for areas without a grid or where the grid power is unstable. Off grid systems typically consist of PV strings, energy storage inverters, battery systems, and generators. When the battery energy is sufficient, the load is powered by PV and battery power. When the battery energy is insufficient, the battery system is charged, and the load is powered by a generator.

Version Information

Version	Date	Content
V01	2023.11.27	New indoor version
V02	2024.07.15	Updated for UK use

Catalogue

1. Safety Instructions

Statement

This manual contains important information about product installation, please read it carefully before operation.

Please keep this manual safe for installation, operation, and maintenance.

Please strictly follow the instructions in this manual for installation, operation, and maintenance to avoid product damage, personal injury, and property damage.

Before the installation personnel leave the site, it is necessary to shut down the system (battery, PCS, etc.) before debugging the unfinished system.

When a system malfunctions during normal operation, please first refer to the troubleshooting table to troubleshoot the problem. If the problem is not resolved, please contact the AlphaESS engineer in a timely manner. Before the AlphaESS engineer replies, be sure to shut down the system (battery, PCS, etc.).

To ensure optimal reliability and meet warranty requirements, the energy storage system must be installed, operated, and maintained in accordance with the instructions in this manual. Our company does not assume any responsibility for violating general safety operation requirements or violating product safety standards for design, production, and use. If this causes damage to the product, it is not covered by the warranty.

1.1 Installer Qualifications

1.Installers / Operators must hold a professional qualification certificate authorised by AlphaESS or AlphaESS.

2.Installers / Operators must be familiar with the product, including its composition and working principle.

3.Installers / Operators must be familiar with the product manual and strictly follow the instructions for installation, operation, and maintenance.

4.When carrying out any product related work, please ensure that at least two Installers / Operators are present. Do not perform maintenance work before the product is powered off.

1.2 Personal Safety

1.Erect clear signs at circuit breakers such as PVs, batteries, PCSs, and distribution boxes to prevent accidents caused by accidental closing.

2.Erect warning signs or set up safety warning tapes near the operating area.

3.When conducting electrical connections, trial runs, or product maintenance on the system, it is necessary to use a multimeter to measure the electrical parameters of the product to ensure that they meet the requirements. Please use a multimeter correctly to ensure personnel safety.

4.There is high voltage in the system, and accidental contact may pose a risk of fatal electric shock. Therefore, protective measures must be taken when conducting live testing.

5.Ensure that the connection and usage of the system comply with relevant regulations to prevent arcing or electric shock accidents.

During installation, operation, and maintenance, the following installation tools and protective equipment are required.

Table 1 Installation Tools

Number	Name	Model specifications (accuracy)	Unit	Quantity
1	Diagonal pliers	/	Pcs	1
2	Screwdriver	2/4/6/8mm	Pcs	1
3	Cable tie	/	Pcs	1
4	Multimeter	DC 1000V	Pcs	1
5	Impact drill	/	Pcs	1
6	Socket wrench	Socket wrench set	Pcs	1
7	Open end wrench	Open end wrench set	Pcs	1
8	Socket torque wrench	/	Pcs	1

Table 2 Protective Equipment

Number	Name	Number	Name
1	Safety shoes	4	Protective goggles
2	Safety helmet	5	Dust mask
3	Safety gloves		

1.3 Product Safety

1.The warning signs contain important information for the safe operation of the product, ensuring that the warning signs are clear and visible, and human damage is strictly prohibited. If there is any damage, it should be replaced immediately.

2.The system must remove the key after formal operation or maintenance is completed.

3.Please avoid unnecessary contact with the circuit board to prevent device damage caused by contact or improper operation of the circuit board or other static sensitive components.

4.Please avoid opening the product for maintenance or repair on rainy or humid days.

During maintenance, all products must be powered off and maintained strictly in accordance with the relevant requirements of this manual.

1.4 Electrical Safety

1.4.1 Grounding Requirements

1.When installing the product, the protective ground wire must be installed first. When disassembling, the protective ground wire must be removed last.

2.The system should be permanently grounded. Before operating the system, the electrical connections of the system should be checked to ensure that it is reliably grounded.

3.Do not damage the grounding conductor.

It is strictly prohibited to install the system before grounding.

1.4.2 Wiring Requirements

1.The use of cables in high-temperature environments may cause aging and damage to the insulation layer. The distance between the cable and the periphery of the heating device or heat source area should be at least 30mm.

2.Similar cables should be tied together, and different types of cables should be laid at least 30mm apart. It is prohibited to wrap or cross lay each other.

3.All cables used in the product must be securely connected, have good insulation, and have appropriate specifications.

4.When the communication line must pass through the power line, try to maintain a 90 ° angle between the two types of cables.

1.5 Installation Environment

Table 3 Installation Environment

Environmental parameters				Installation environmental conditions	Environmental conditions for transportation and storage		Remarks
Project		Parameter	Unit		Storage	Transport	
Climatic conditions	Temperature	low temperature	℃	-10	0	-20	
		high temperature	℃	+50	+35	+45	
	Voltage	low voltage	kPa	79.5	/		
		high voltage	kPa	106	/		
	Humidity	Low relative humidity	%	0	0	0	When the temperature is below 20 ℃
		High relative humidity	%	90	80	90	
		Condensation	Yes/No	nothing	nothing		Within the relative humidity range of 0~90%, there is no condensation generated inside the product.
	Altitude	Low altitude	m	0	0	0	When the altitude exceeds 3000m and exceeds the maximum limit, it shall be used in accordance with the provisions of 5.11.2 in GB/T3859.2-1993.
		High altitude	m	3000	3000	3000	
Remarks	For the installation environment conditions of the system, the system performance will be affected when the temperature is below 0 ° C and above 40 ° C						

	To the limit.

The following scenarios do not allow installation:

1. Regions with high humidity and salinity, such as coastal and desert areas.
2. Flood prone areas.
3. Earthquake prone areas (additional safety measures are required here).
4. Regions with frequent changes in environmental temperature.
5. Places above an altitude of 3000 meters.
6. Places with explosive or potentially explosive environments.
7. Places with highly flammable materials or gases.
8. Places close to water sources (such as faucets, drainage pipes, sprinklers, etc.).
9. A place with fragile and uneven support surfaces.
10. Places that do not meet fire safety requirements, such as places without fire sand or dry powder fire extinguishers.

The indoor temperature for installing the system should be controlled between 15 ℃ and 25 ℃.

1.6 Transportation Requirements

When moving large products without dismantling transportation packaging boxes, use a forklift to lift the PCS, battery rack, etc. from the bottom and move them. Please refer to Figure 1-1.

When handling batteries or high voltage boxes, it is recommended to have two people handle them to avoid falling due to the weight of the product. Avoid contact with liquids during transportation. Please refer to Figure 1-2.

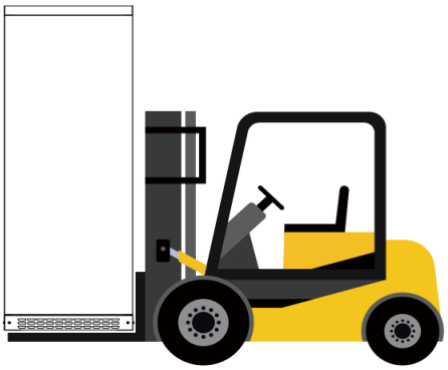


Figure 1-1 Large Product Handling

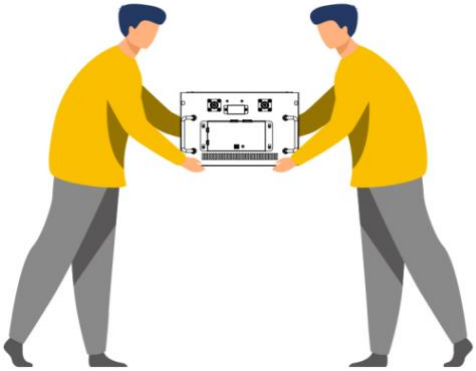


Figure 1-2 Small Product Handling

Before moving, please ensure that the product is securely fastened. When transporting products, they should be placed upright and not inverted or stacked. The vertical tilt angle should not exceed 30 °, and other items are not allowed to be stacked on top.

When installing and maintaining batteries, please be careful when using a hydraulic lift to prevent the battery module from falling off. It is recommended that all operators wear protective shoes with high safety factors and protection strength to avoid foot injuries.

1.7 Installation location

1.7.1 PCS &Transformer (PWT-500K) & STS (PWD-800K)

When installing the PCS transformers (PWT-500K) &STS (PWD-800K), ensure that there is sufficient space for ventilation, heat dissipation, and installation and maintenance. Please refer to Figure 1-3 for specific installation location requirements.

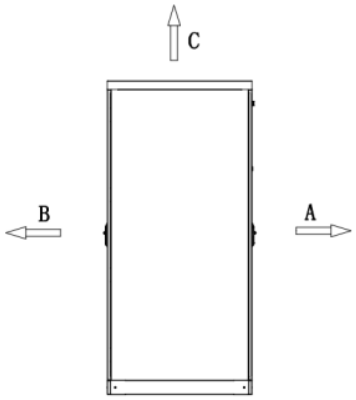


Figure 1-3 Schematic diagram of installation positions for inverters & transformer (PWT-500K)&STS (PWD-800K)

A ⩾ 800mm, ensure that the front door of the cabinet can be fully opened, ensure ventilation and heat dissipation, and have sufficient space for operation and maintenance.

B ⩾ 800mm, ensure that the back door of the cabinet can be fully opened, ensure ventilation and heat dissipation, and have sufficient space for operation and maintenance.

C ⩾ 300mm, ensure ventilation and heat dissipation above the cabinet, and have sufficient space for operation and maintenance.

It is strictly prohibited to align the back door of the PCS with the battery, in order to prevent the heat emitted by the PCS from directly blowing towards the battery, causing the battery temperature to be too high or damaging the battery.

1.7.2 DC Junction Box

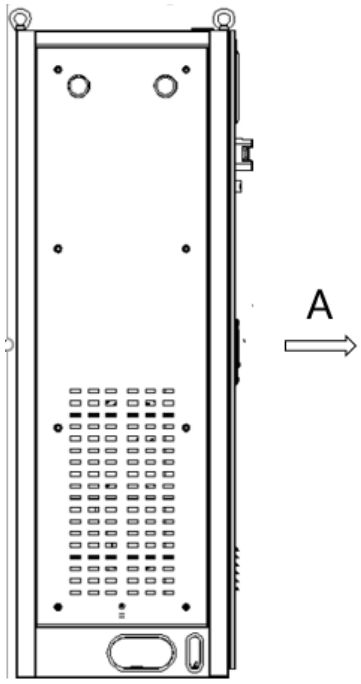


Figure 1 Installation position of DC Junction Box

A ⩾ 800mm, ensure that the door can be fully opened and there is enough space for operation and maintenance.

1.7.3 Battery Rack

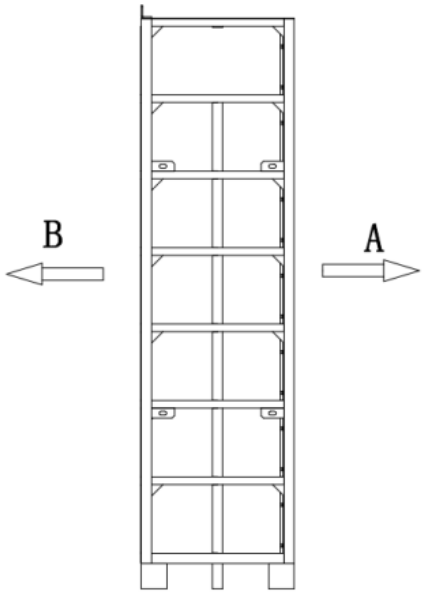


Figure 1 Installation position of battery rack

A ⩾ 800mm, ensure that there is sufficient space on the front of the battery rack for operation and maintenance.

B ⩾ 80mm, ensure battery ventilation and heat dissipation.

2. Product Introduction

2.1 Product Introduction

The AlphaESS Storion-TB (187.5-500) energy storage system supports two application modes: dual power and off grid.

The schematic diagram of the grid connected system is as follows:

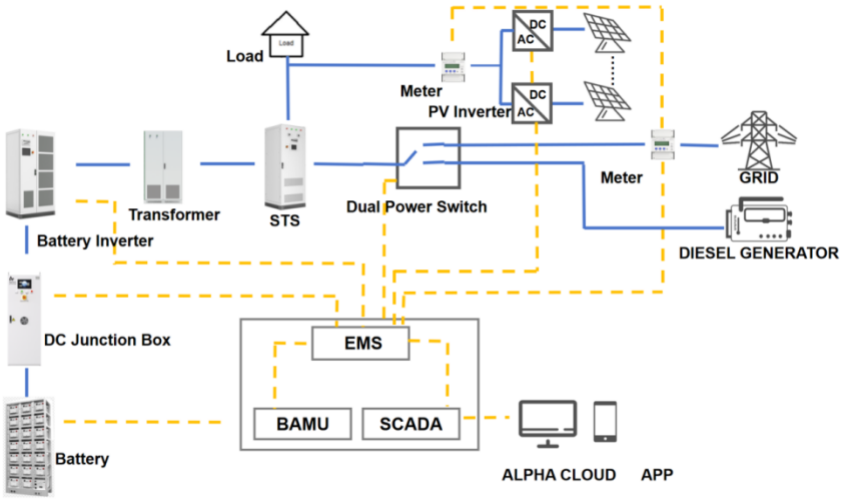


Figure 2-1 Schematic diagram of of dual power switching system

The schematic diagram of the off grid system is as follows:

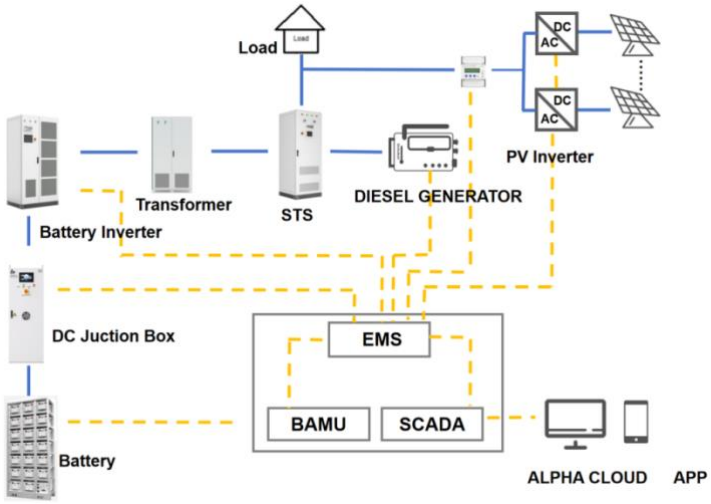


Figure 2-2 Schematic diagram of off grid system

The dashed box is an optional configuration, depending on the system scheme.

"- - - - - - - - ″ represents communication line "_____" represents power line

2.2 Product Features

The lithium iron phosphate battery produced by AlphaESS has the characteristics of long life and high reliability, which can meet the application needs of various energy storage systems.

The battery system adopts a three-level BMS architecture, supporting system energy expansion.

The system is designed with high modularity, making it easy to assemble, transport, and maintain.

The system adopts real-time balancing technology to ensure high consistency between battery modules.

The system is designed as a detachable cabinet structure, which is compact, flexible, easy to install and test, and can meet the application needs of different working environments and types of work.

The system has advanced thermal management technology, enabling it to operate in the most suitable temperature environment.

The system has local and remote monitoring and control functions.

The system achieves flexible scheduling of the power system through communication between BMS, PCSs, and monitoring systems.

2.3 Product Composition

The appearance of the Storion-TB (187.5-500) energy storage system, please refer to Figure 2-3.

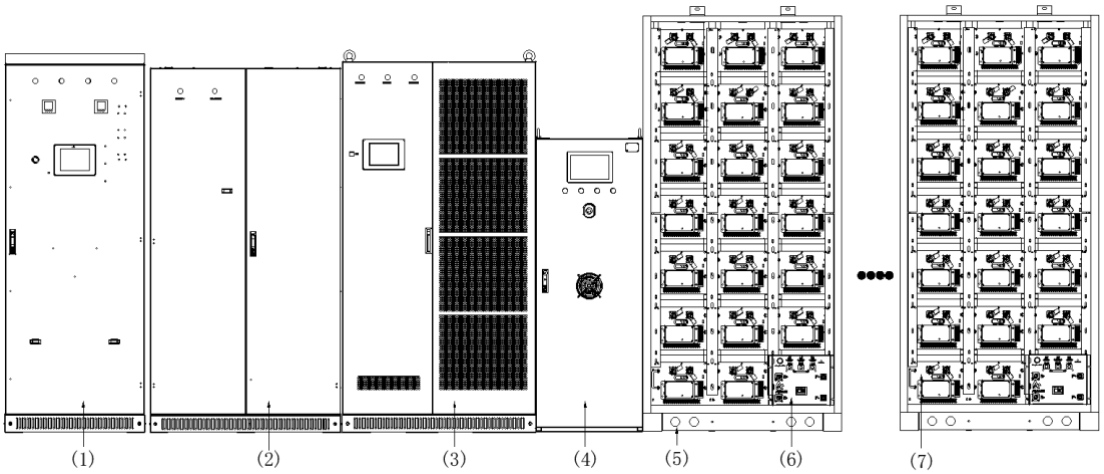


Figure 2-3 Storion-TB (187.5-500) system

Table 4 Composition of Storion-TB (187.5-500) System Products

Number	Name
1	STS (PWD-800K)
2	Transformer (PWT-500K)
3	PWS1- (187.5K-500K)
4	DC Junction Box (including TOP BMU Box)
5	Battery rack
6	High voltage box
7	Battery

2.4 Product Component Introduction

2.4.1 Battery System

2. 4. 1. 1 **Battery**

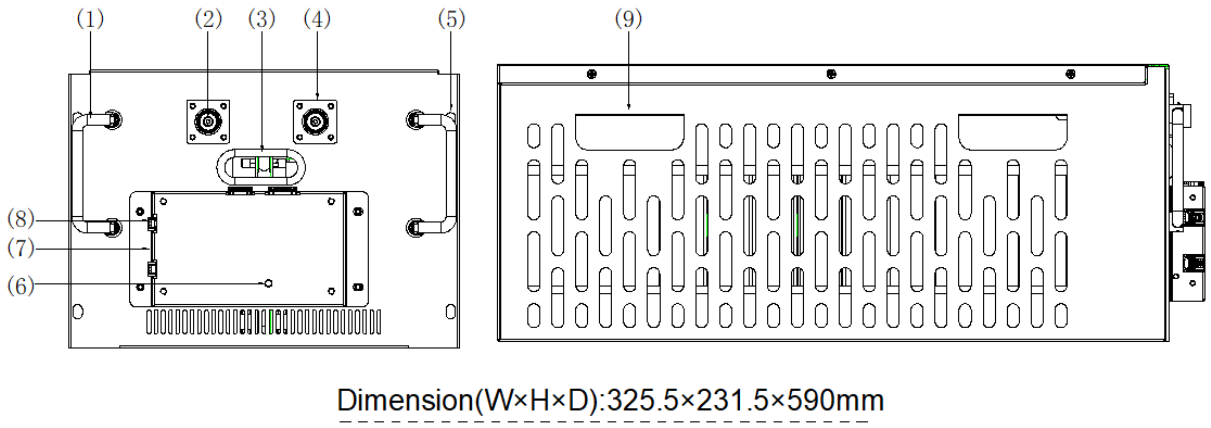


Figure 2-4 Battery schematic diagram

Table 5 Appearance Introduction

Number	Description	Number	Description
1	Battery handle x2	6	Indicator light
2	Battery negative terminal	7	BLMU
3	Acquisition line outlet	8	CAN communication between batteries x2
4	Battery positive terminal	9	Handling hole
5	Installation point x4		

Table 6 Technical Parameters

Number	Description	Technical parameter	Remarks
1	model	M38210-S	
2	Cell grouping method	12S2P	
3	Rated voltage	38.4V	
4	Voltage range	36-43.2V	
5	Rated capacity	210Ah	Maximum charging/discharging

			current 0.5C
6	Rated energy	8.1kWh	
7	Working power consumption	＜ 2W	
8	Sleep power consumption	＜ 100mW	Battery sleep state
9	Maximum charging/discharging current	105A	Constant current mode
10	internal resistance	＜ 10m Ω	Factory Default
11	Environmental temperature for transportation/storage	-20 ℃~45 ℃	
12	Working temperature range	-10 ℃~50 ℃	
13	Communication mode	CAN	
14	weight	62kg	
15	Permissible working environment humidity	15%~85%	

2.4.1.2 High voltage box

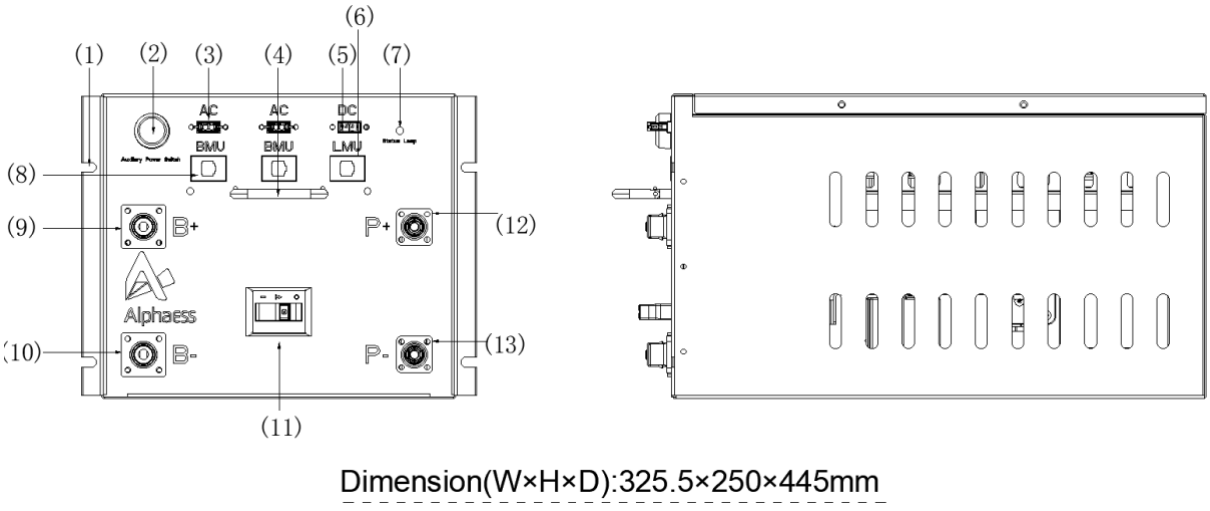


Figure 2-5 Schematic diagram of high voltage box

Table 7 Appearance Introduction

Number	Description	Number	Description
1	Installation point x4	8	BMU communication port x2
2	AC auxiliary power switch	9	Battery Positive input
3	AC auxiliary power interface x2	10	Battery Negative input
4	Handle	11	Molded case circuit breaker
5	24V DC power supply	12	Positive output to DC Junction box
6	LMU communication port	13	Negative output to DC Junction box
7	Status indicator light		

Table 8 Technical Parameters

Number	Description	Technical parameter
1	Model	HV900105-III
2	Working voltage range	600~900V
3	Module Connection	17~20 M38210-S series connection
4	Rated current	105A
5	Weight	20kg
6	Power dissipation	＜ 10W
7	Colour	RAL7035

2. 4. 1. 3 TOP BMU Box (including EMS)

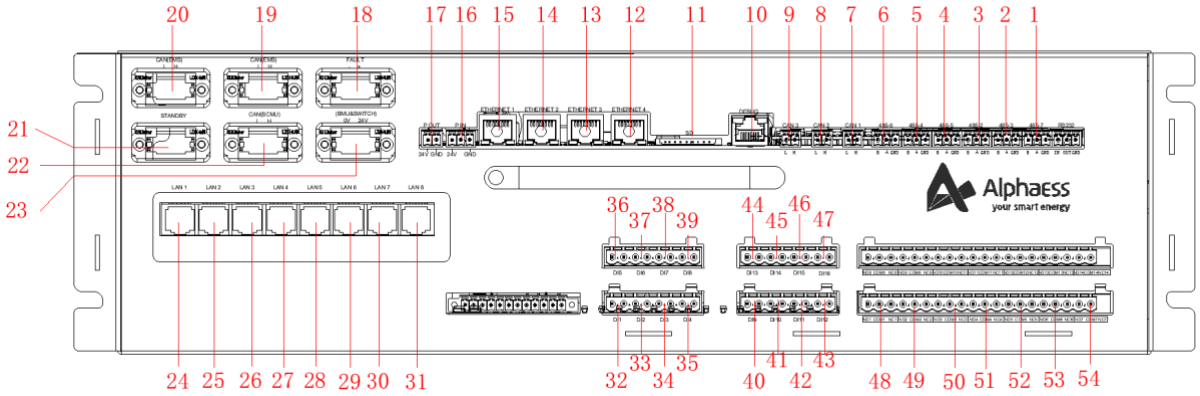


Figure 2-6 Schematic diagram of TOP BMU Box

Table 9 Interface Definition

Number	Description	Number	Description
1	Air conditioning RS485 communication port	28	Spare
2	UPS/oil engine RS485 communication port	29	Spare
3	PV RS485 communication port	30	Switch EMS communication port
4	Electricity meter RS485 communication port	31	Switch EMS communication port
5	SCADA RS485 communication port	32	DI1 emergency stop signal
6	RS485 communication port of charging station	33	DI2 combiner cabinet switch feedback
7	EMS CAN communication adapter port	34	DI3 fire fault
8	Reserved	35	DI4 fire warning
9	Reserved	36	DI5 fire action
10	Burn port	37	DI6 dual power main signal

11	SD card slot	38	DI7 dual power backup signal
12	Spare	39	DI8 surge protector feedback
13	Spare	40	DI9 water immersion signal
14	EMS PCS communication port	41	DI10 access control signal
15	EMS SCADA communication port	42	DI11 K1 signal
16	EMS power input	43	DI12 K2 signal
17	Power output	44	DI13 K3 signal
18	Fault indicator light	45	DI14 K4 signal
19	BMU external scheduling reservation	46	DI15 temperature feedback signal
20	EMS CAN communication interface	47	DI16 distribution switch signal
21	Reserved	48	Opening of DO1 combiner cabinet
22	BMS communication	49	DO2 diesel generator startup
23	BMS power input	50	DO3 PCS shutdown signal
24	Switch SACDC communication port	51	DO4 distribution switch opening
25	Switch PCS communication port	52	DO5 backup
26	Switch STS (PWD-800K) LAN port	53	DO6 backup
27	Spare	54	DO7 backup

Table 10 Technical Parameters

Number	Description	Technical parameter
1	Size (length × Wide × High	485× 131 × 197 mm
2	communication	RS-485, Ethernet, CAN

3	Working voltage	24V
4	Power consumption	＜ 30W

2.4.2 PCS

2.4.2.1 Function Introduction

A bidirectional energy storage converter is a conversion device between the power grid and the battery, which can charge and discharge the battery. It is possible to invert the direct current from the battery into alternating current that can be integrated into the grid, and also to rectify the alternating current from the grid into direct current that can be charged into the battery. The bidirectional energy storage converter can be used in grid connected or off grid mode.

2.4.2.2 Appearance Introduction

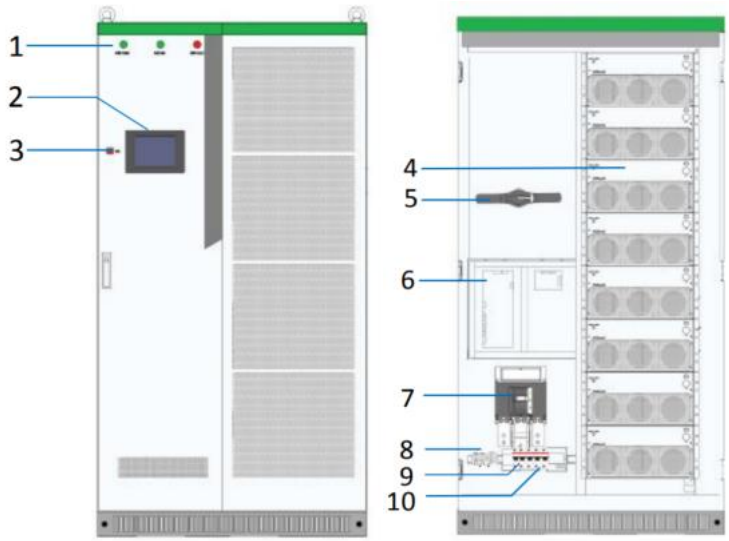


Figure 2-7 Appearance diagram of PCS

Table 11 Component List of PCSs

Number	Name	Description
1	Indicator light	When the fault light malfunctions, it turns red and goes off normally; The operation indicator light and power indicator light are green
2	Touch screen	

3	Emergency stop button (EPO)	
4	PCS-AC power module	187.5kW 3 units/250kW 4 units/312.5kW 5 units 375kW 6 units/437.5kW 7 units/500kW 8 units
5	Battery DC switch	
6	U2 main control board	
7	AC switch	
8	Wiring terminal block	
9	Surge protector switch	
10	Auxiliary power supply switch	

After opening the baffle, you can see the wiring terminal block, AUX auxiliary power switch, and surge protector switch.

Table 12 Technical Parameters

Number	Project	PWS1-187.5K	PWS1-250K	PWS1-312.5K	PWS1-375K	PWS1-437.5K	PWS1-500K
	AC side						
1	Rated output power	187.5kW	250kW	312.5kW	375kW	437.5kW	500kW
2	Output overload power	206.25kW	275kW	343.75kW	412.5kW	481.14kW	550kW
3	Voltage range	400V ± 10%					
4	Output current	270A (Max. 297A)	360A (Max. 396A)	450A (Max. 495A)	540A (Max. 594A)	630A (Max. 693A)	720A (Max. 729A)
5	Wiring method	3-phase 4-wire system (including transformer (PWT-500K))					
6	Frequency	50Hz/60Hz					

7	Output THDU	<2%					
8	Power factor	0.99/1-1~1					
9	Overload capacity	100%~110% long-term; 110%~120% for 1 minute; 120%~150% 200 milliseconds					
	Battery side						
10	Battery voltage range	600-900V					
11	Maximum current	327A	436A	546A	655A	764A	873A
12	Maximum power	187.5kW	250kW	312.5kW	375kW	437.5kW	500kW
	System parameter						
16	Maximum efficiency	97.3%					
17	Dimensions (width x height x length)	800 × 2160 × 800mm					
18	Weight	350kg	400kg	450kg	500kg	550kg	600kg
19	Altitude	3000m					
20	Protection level	IP20					
21	Noise	70dB					
22	Ambient temperature	-25 ℃~+50 ℃ (derate above 45 ℃)					
23	Cooling	Air-cooled					
24	Humidity	0-95% (without condensation)					
25	Communication interface	Ethernet/RS-485/CAN					

2.4.3 DC Junction Box

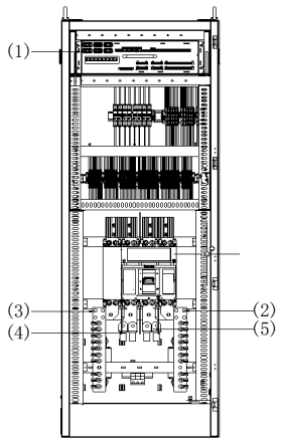


Figure 2 Internal schematic diagram of 1250A DC Junction Box

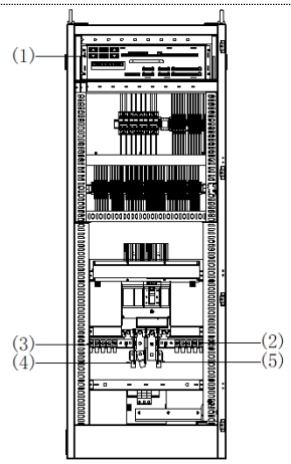


Figure 2 Internal schematic diagram of 630A DC Junction Box

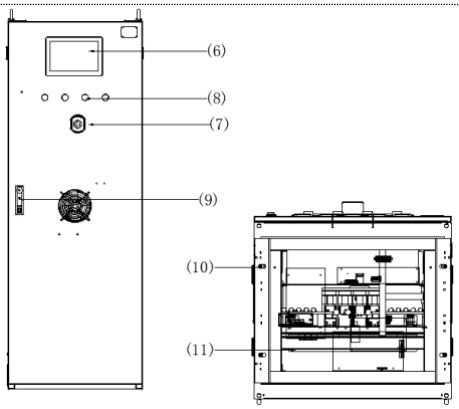


Figure 2-10 External schematic diagram of DC Junction Box

Table 13 Internal Introduction of DC Converter Cabinet

Number	Description	Number	Description
1	TOP BMU Box	7	Emergency stop
2	10 × Battery input negative pole	8	Indicator light
3	10 × Battery input positive pole	9	Door lock
4	4 × Battery output positive pole	10	Installation holes
5	4 × Battery output negative pole	11	Grounding bar
6	SCADA		

Table 14 Technical Parameters

Number	Description	Technical parameters of 1250A combiner cabinet	Technical parameters of 630A combiner cabinet
1	weight	160kg	140kg
2	Maximum working voltage	1000V	1000V

3	Maximum operating current	1250A	630A
4	colour	RAL7035	RAL7035

2.4.4 Battery Rack

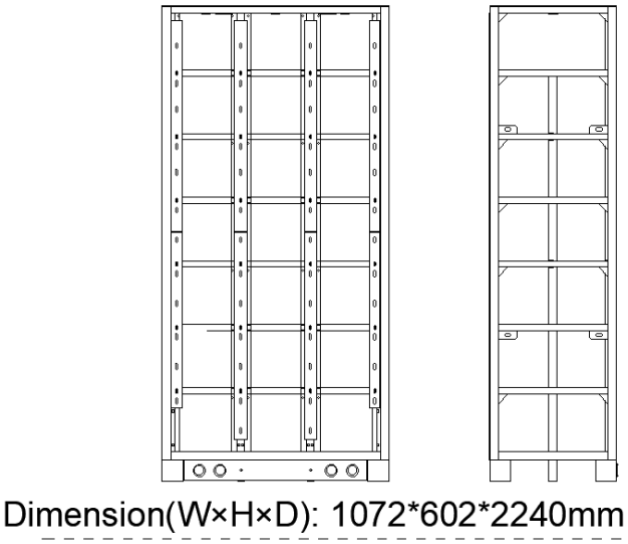


Figure 2-11 Schematic diagram of battery rack

Table 15 Technical Parameters

Number	Description	Technical parameter
1	Weight	220kg
2	Colour	RAL7035

2.4.5 Electricity Meter

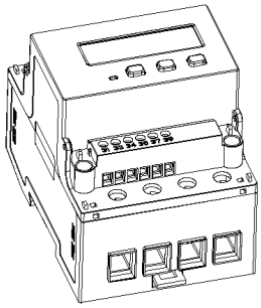


Figure 2-12 Schematic diagram of the appearance of the electricity meter

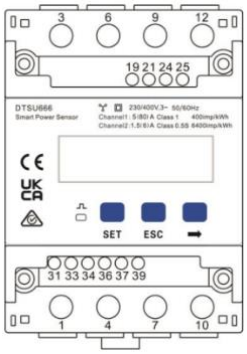


Figure 2-13 Front view of electricity meter

Table 16 Description of Electricity Meter Ports

Number	Name	Description
1	Power Port 1	Connect to L1
2	Power Port 4	Connect to L2
3	Power Port 7	Connect to L3
4	Power Port 10	Connect to N
5	CT1 sampling cable wiring port 31	S1 connected to CT1
6	CT1 sampling cable wiring port 32	S2 connected to CT1
7	CT2 sampling cable wiring port 33	S1 connected to CT2
8	CT2 sampling cable wiring port 34	S2 connected to CT2
9	CT3 sampling cable wiring port 35	S1 connected to CT3
10	CT3 sampling cable wiring port 36	S2 connected to CT3
11	Electricity meter communication port 485A wiring port 19	Connect to the combiner cabinet or other meters through twisted pair shielded wires to achieve communication between products
12	Electricity meter communication port 485B wiring port 21	
13	Electricity meter communication port 485A wiring port 24	Connect to the combiner cabinet or other meters through twisted pair shielded wires to achieve communication between products
14	Electricity meter communication port 485B wiring port 25	

3. Installation

3.1 Product Installation

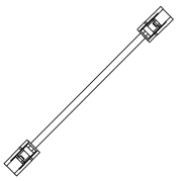
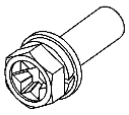
Before unpacking all products, please check the packaging for any obvious signs of damage. If there are signs of damage, please do not open the packaging, check the system model, and contact the dealer as soon as possible.

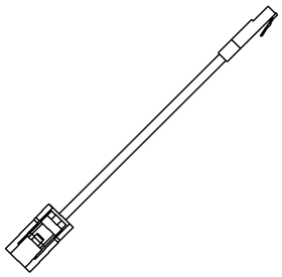
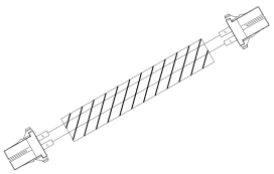
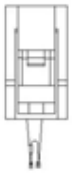
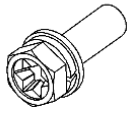
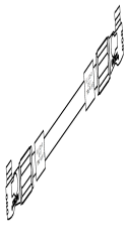
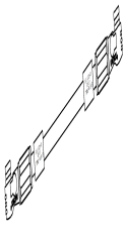
After unpacking, please check whether each product is intact and undamaged. If there is obvious damage to the appearance, please contact the dealer as soon as possible.

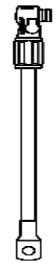
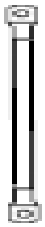
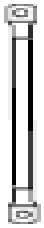
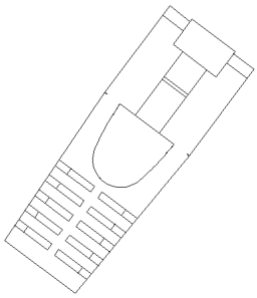
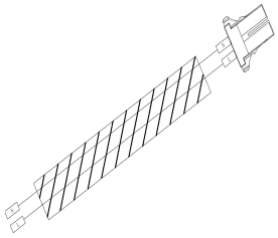
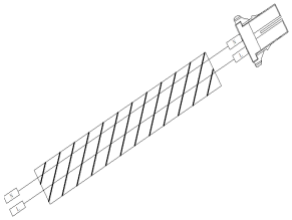
3.1.1 Parts List

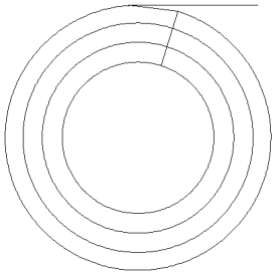
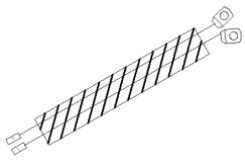
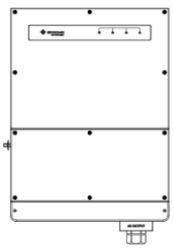
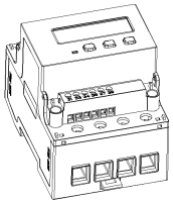
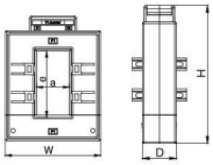
Please check the parts list before installing the product. Power lines and communication lines should not be randomly connected. Please check the material number before wiring.

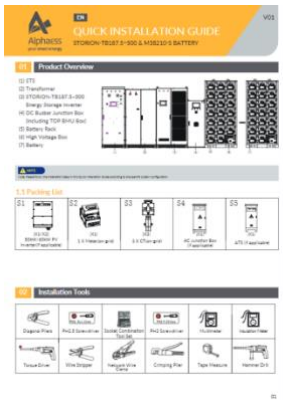
Table 17 Parts List

Battery			
			
A1 33200251 1 pcs Length 420mm Battery to battery power line	A2 33300132 1 pcs Length 350mm Battery to battery communication line	A3 40100088 4 pcs Specification M6 * 16mm Battery installation screws	

High voltage box			
			
B1 33300084 1 pcs Length 500mm Communication harness from battery to high voltage box	B2 33000036 1 pcs Length 2200mm High voltage box - High voltage box communication line	B3 33500814 1 pcs High Voltage Box - High Voltage Box AC Auxiliary Source Line	B4 33500096 1 X terminal resistor
			
B5 40100088 4 pcs Specification M6 * 16mm Battery installation screws	B6 33200597 1 pcs Length 540mm Battery to positive pole power line of high voltage box	B7 33200573 1 pcs Length 740mm Battery to negative pole power line of high voltage box	B8 33300084 2 pcs Length 740mm Battery to battery crossover communication line
Accessories package			

			
C1 33201921 Length 8000 mm N pcs (N=number of battery clusters) Positive pole power line of high voltage box DC Junction Box	C2 33201922 Length 5000 mm N pcs (N=number of battery clusters) Negative power line of high voltage box DC Junction Box	C3 33202023 Length 4000 mm 1 pcs (power ≤ 250kW) 2 pcs (312.5 kW<power ≤ 500 kW) DC Junction Box - positive pole power line of PCS	C4 33202024 Length 4000 mm 1 pcs (power ≤ 250kW) 2 pcs (312.5 kW<power ≤ 500 kW) DC Junction Box - negative power line of PCS
			
C5 33500056 1 pcs Terminal resistance of high voltage box	C6 33500831 Length 5000mm 1 pcs AC auxiliary source line from high voltage box to busbar terminal block	C7 33500850 Length 5000mm 1 pcs DC power supply line from high voltage box to busbar terminal block	C8 33000149 1 pcs Length 7500mm Communication line from busbar cabinet to PCS

			
C9 33000154 Length 4500mm 1 pcs Communication harness from high voltage box to combiner cabinet	C10 33300129 Length 100000mm 1 pcs 0.75 twisted pair cable 100m	C11 33000023 Length 5000mm 1 pcs High voltage box to High voltage box connection (used for face-to-face layout)	C12 33500849 Length 7000mm 1 pcs Connecting cabinet to PCS auxiliary source harness
			
C13 33000048 Length 7900mm 1 pcs Busbar cabinet to STS (PWD-800K)			
System			
			

S1 AC combiner cabinet (optional)	S2 PV inverter (optional)	S3 1 X electricity meter (grid connected mode - DC), 2 X electricity meter (grid connected mode - AC/Hybrid)	S4 3 X CT (grid connected mode - DC); 6 X CT (grid connected mode AC/Hybrid)
			
S5 ATS cabinet (optional)	1 X Quick Install Manual		

3. 1. 2 PCS, Transformer (PWT-500K), STS (PWD-800K)

After using a forklift or other tools to move the PCS, transformer (PWT-500K), and STS (PWD-800K) to the installation position, fix their base with M13 screws. Please refer to Figures 3-1, 3-2, and 3-3.

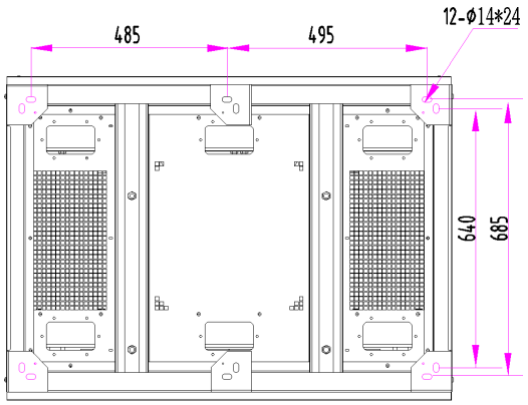


Figure 3-1 Schematic diagram of transformer (PWT-500K) base

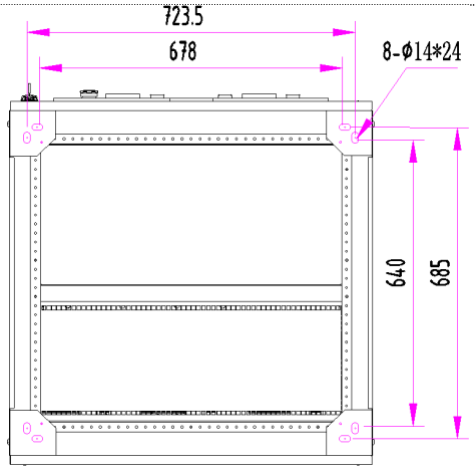


Figure 3-2 Schematic diagram of STS (PWD-800K) base

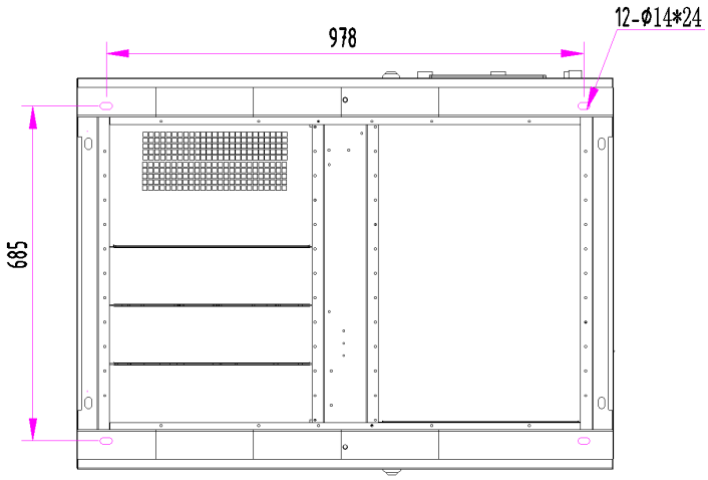


Figure 3-3 Schematic diagram of PCS base

The wiring hole is located at the bottom of the PCS, and the cable is threaded into the cable slot through the wiring hole on the base.

When the PCS needs to be fixed on the channel steel, it needs to be marked on the channel steel Φ 14 holes, and fix the PCS to the channel steel with screws, please refer to Figure 3-4.

When the PCS needs to be fixed to the concrete ground, holes need to be drilled on the ground and screws need to be used to fix the PCS to the concrete ground, please refer to Figure 3-5. Connect the grounding point in the lower right corner of the PCS to the on-site grounding point using a grounding wire, and then tighten it with a bolt.

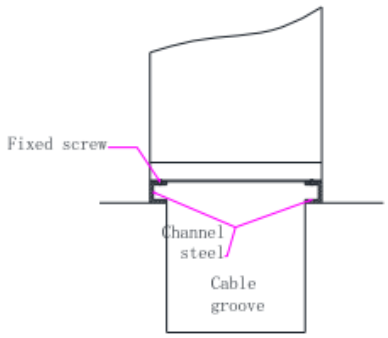


Figure 3 Fixed on channel steel

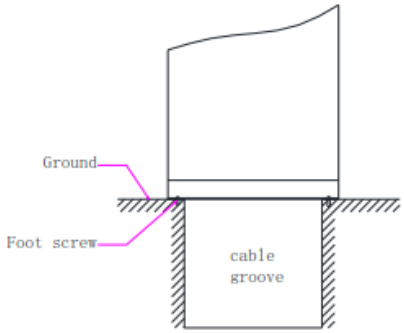


Figure 3 Fixed on concrete ground

3.1.3 DC Junction Box

Install according to the on-site situation. For specific installation location requirements, please refer to 1.7.2. Fix the DC Junction Box with bolts (1, 2, 3, 4) on the ground, ensuring that the bolts are tightened. After fixing the busbar, use a grounding wire to reliably ground the busbar (point A is the grounding bar). Please refer to Figure 3-6 and Figure 3-7 for fixed points and grounding points.

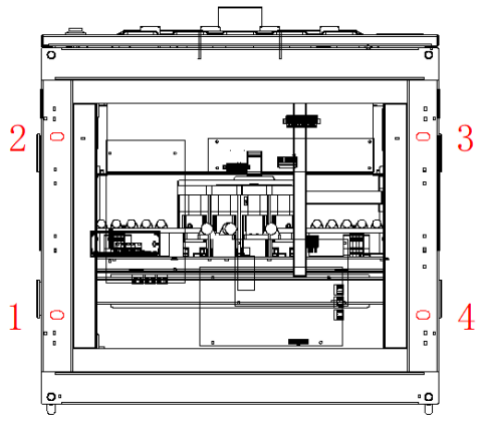


Figure 3-6 Schematic diagram of fixed points

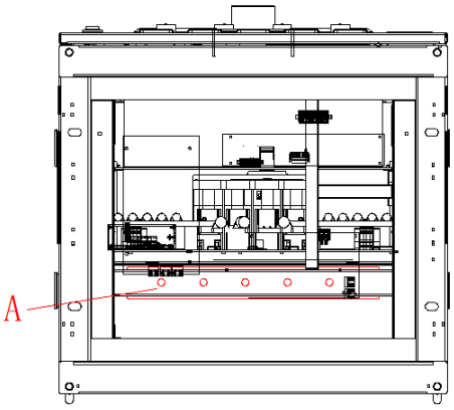


Figure 3-7 Schematic diagram of grounding points

3.1.4 Battery Rack

Install according to the on-site situation. Please refer to 1.7.3 for specific installation location requirements. Secure the battery rack to the ground with bolts, ensuring that the bolts are securely fastened. After fixing the battery rack, use a grounding wire to reliably ground the battery rack. Please refer to Figure 3 for the fixed points (1/2/3/4) and grounding points (A).

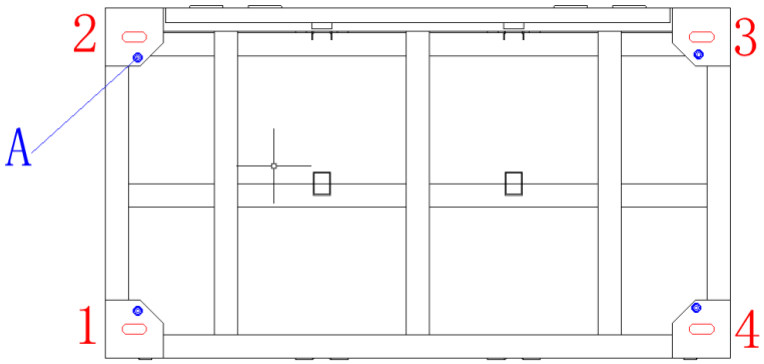


Figure 3 Schematic diagram of grounding points and fixing points

Please confirm if all PCSs, DC Junction Boxs, battery racks, etc. have been reliably grounded. If not connected or loose, it may cause electric shock. It is recommended to apply paint on the outside of the grounding terminal for protection after installing the grounding wire.

3.1.5 Battery

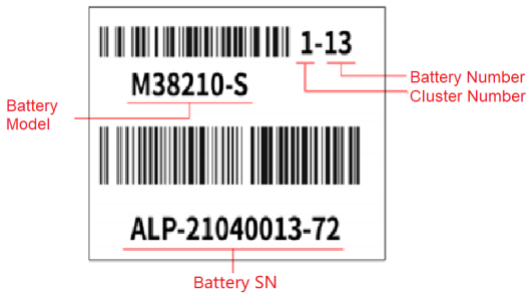


Figure 3-10 Battery Information Label

Figure 3-9 Battery Pack

Step 1: Open all battery packaging

Step 2: Check the battery SN on the
battery label

Step 3: Remove the sheet metal parts on the surface of the battery rack, as shown in Figure 3-15.

Step 4: Place the same cluster of batteries on the same battery rack, with serial numbers 01 to N, and secure the batteries to the battery rack using matching screws. After installing a battery rack, please check if the installed batteries have the same cluster number. Taking a cluster of 20 batteries as an example, the placement positions are shown in Figures 3-11 and 3-12.

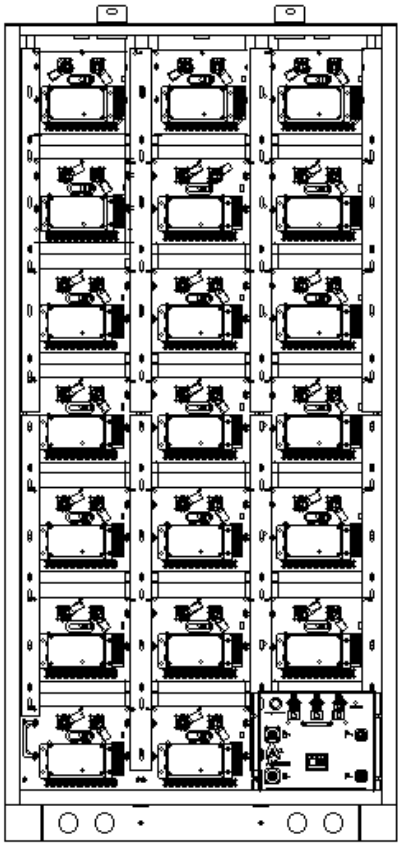


Figure 3-11 Placement of a Cluster of

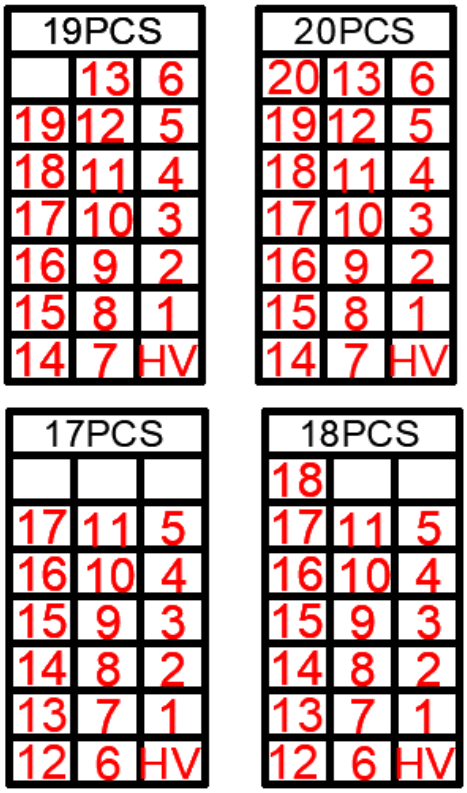


Figure 3-12 Table of battery placement

Step 5: Install the removed battery rack sheet metal parts back into their original positions.

Step 6: If there are multiple battery racks, please repeat steps 1-5 to install other batteries and battery racks, and the spacing between each device should be $0 \leqslant A \leqslant 500$, please refer to Figure 3-13.

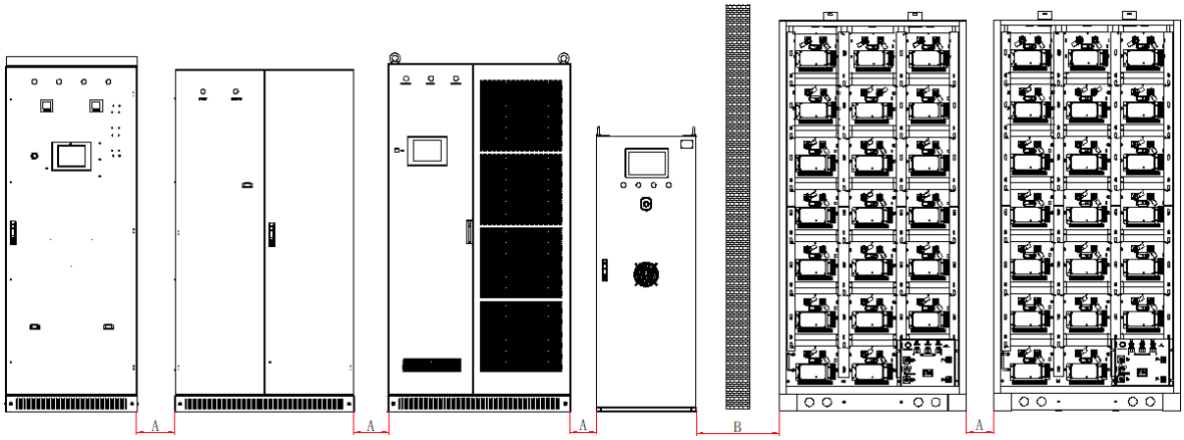


Figure 3 System Placement

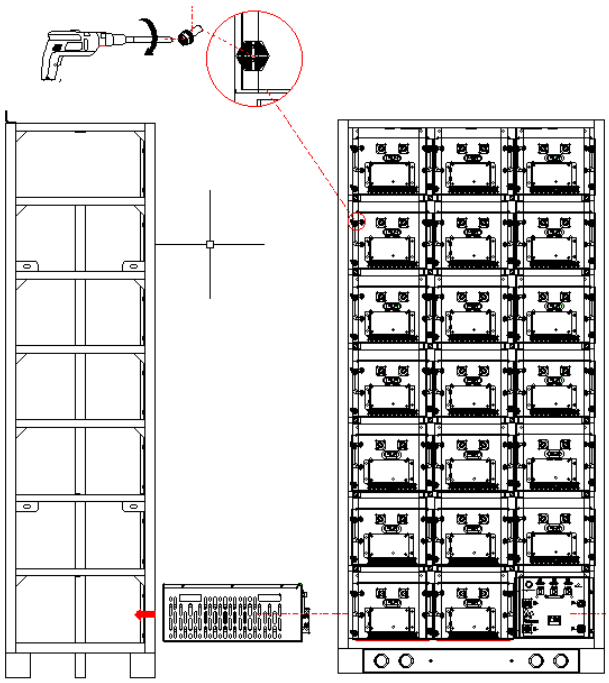


Figure 3 Installation diagram of battery and high voltage box

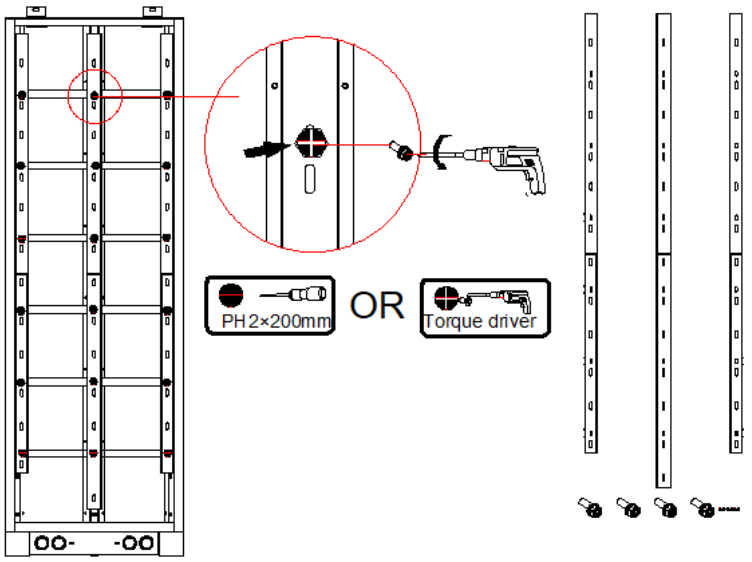


Figure 3 Schematic diagram of dismantling sheet metal parts on the surface of battery racks

After installation, the grounding resistance should be measured to be less than 4 Ω.

3.1.6 Electricity Meter

Install according to the on-site situation.

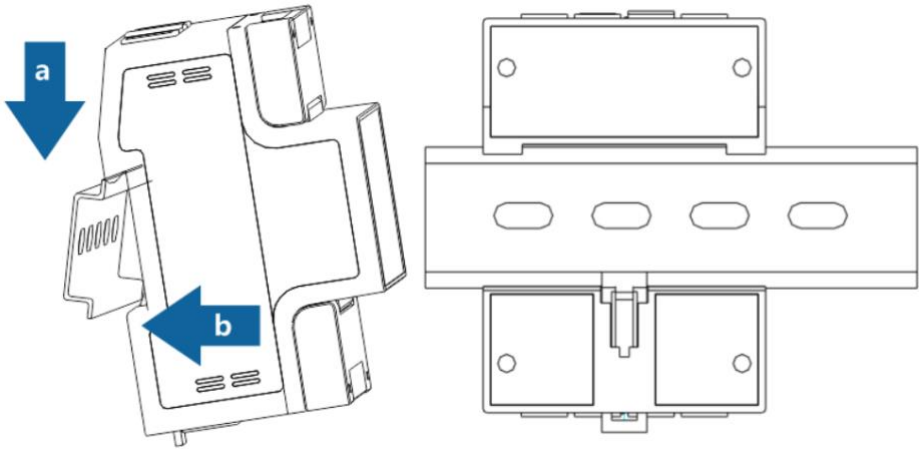


Figure 3 Schematic diagram of electricity meter installation

3.2 Electrical Connections

3.2.1 Communication Line Connection

3.2.1.1 Battery Side Communication Connection

1.Please use the communication cables A1, B1, and B8 from the battery parts and high voltage box parts list to connect the communication between each cluster of batteries and the high voltage box, and complete the communication connection within the cluster. Please refer to Figure 3-17.

2.Please use the terminal resistor B4 from the high voltage box parts list to insert it into the COM port of the last battery in each cluster, as shown in Figure 3igure 3-17.

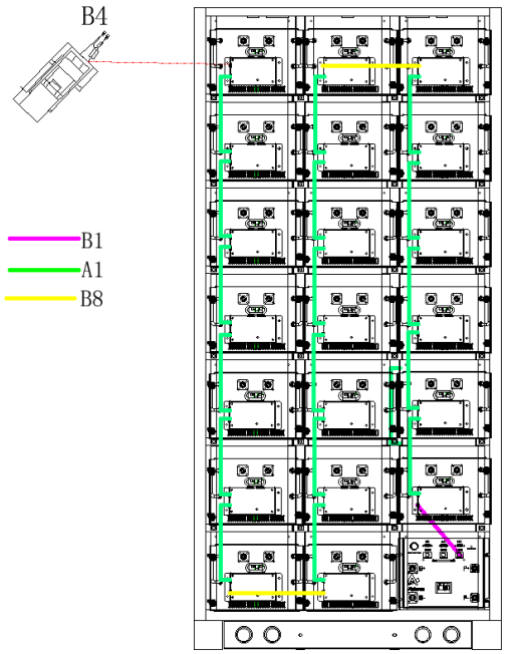


Figure 3 Communication Connection between Batteries

3.If there are multiple clusters of batteries, please use communication cable B2 from the high voltage box parts list to connect the high voltage boxes (BMU ports) of each cluster to each other. Please refer to Figure 3-18.

4.Please connect the last BMU port of the high voltage box without connecting the communication line to the terminal resistor C5 in the parts list. Please refer to Figure 3-18.

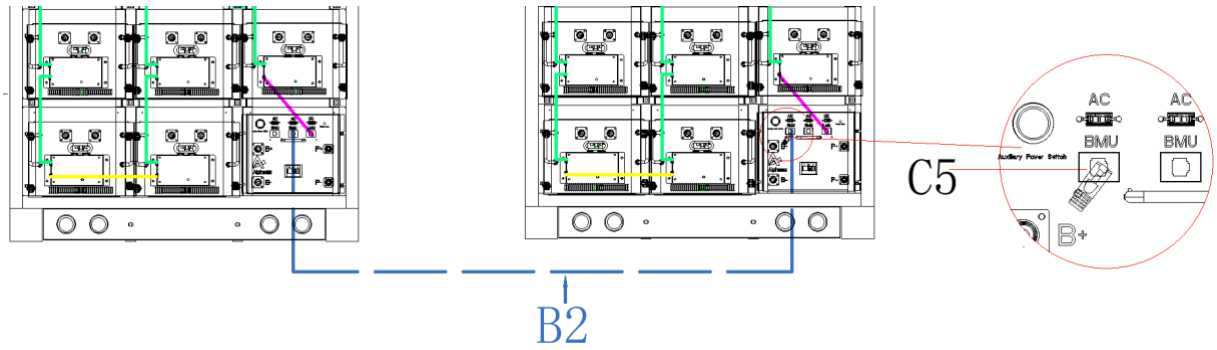


Figure 3-18 High voltage communication line connections between clusters

3.2.1.2 Communication Wiring Related to DC Junction Box

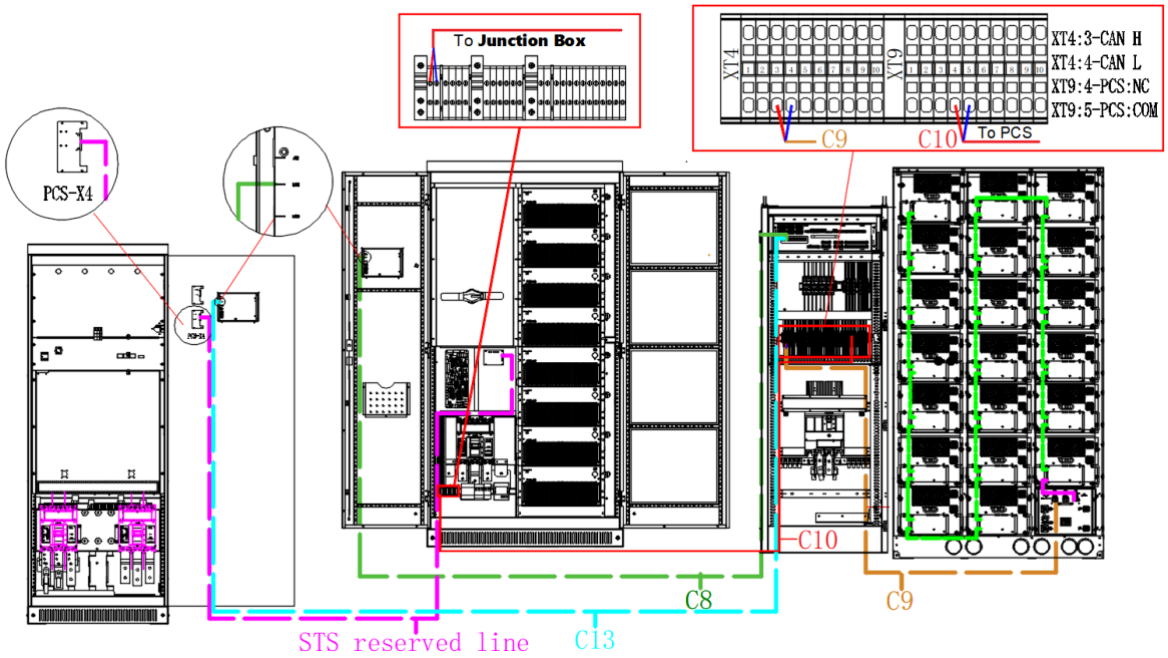


Figure 3-19 DC side communication line connection

1. After opening the door of the combiner cabinet, you can see the wiring terminal block of the DC Junction Box. Connect the high voltage box (BMU port) and the terminal block of the DC Junction Box (XT4:3 (CAN H)/XT4:4 (CAN L)) using the wire harness C9 in the accessory package. Please refer to Figure 3-19.
2. After opening the PCS cabinet door, connect the communication between PCS and the DC Junction Box. Use the wiring harness C8 in the accessory package to connect the PCS screen LAN port and TOP BMU LAN port (at the switch), please refer to Figure 3-19.

3. Connect the PCS to the dry contact wire harness of the DC Junction Box. Use the twisted pair shielded wire C10 in the wire harness package to connect the PCS terminal (P1:1/P1:2) and the combiner cabinet terminal block (XT9:4 (NC)/XT9:5 (COM)). Please refer to Figure 3-19.
4. After opening the door of the STS (PWD-800K) cabinet, connect the communication between the STS (PWD-800K) and the DC Junction Box. Use wire harness C13 in the accessory package to connect the STS (PWD-800K) screen LAN port and the TOP BMU LAN port (at the switch). Please refer to Figure 3-19.
5. Connect STS (PWD-800K) to PCS communication, connect STS (PWD-800K) (PCS-X4) to the X4 motherboard of PCS, remove the PCS cover to see the X4 motherboard of PCS, and then connect it. The network cable for connection has been reserved in the STS (PWD-800K) cabinet, please refer to Figure 3-19.

3.2.1.3 Communication Wiring Between PCS and Transformer (PWT-500K)

The communication harness connection between PCS and transformer (PWT-500K) is as follows:

Table 18 PCS&Transformer (PWT-500K) connection definition

PCS	Transformer (PWT-500K)
P1:19	P1:1
P1:20	P1:2
P1:11	P1:3
P1:13	P1:4
P1:17	P1:5
P1:18	P1:6

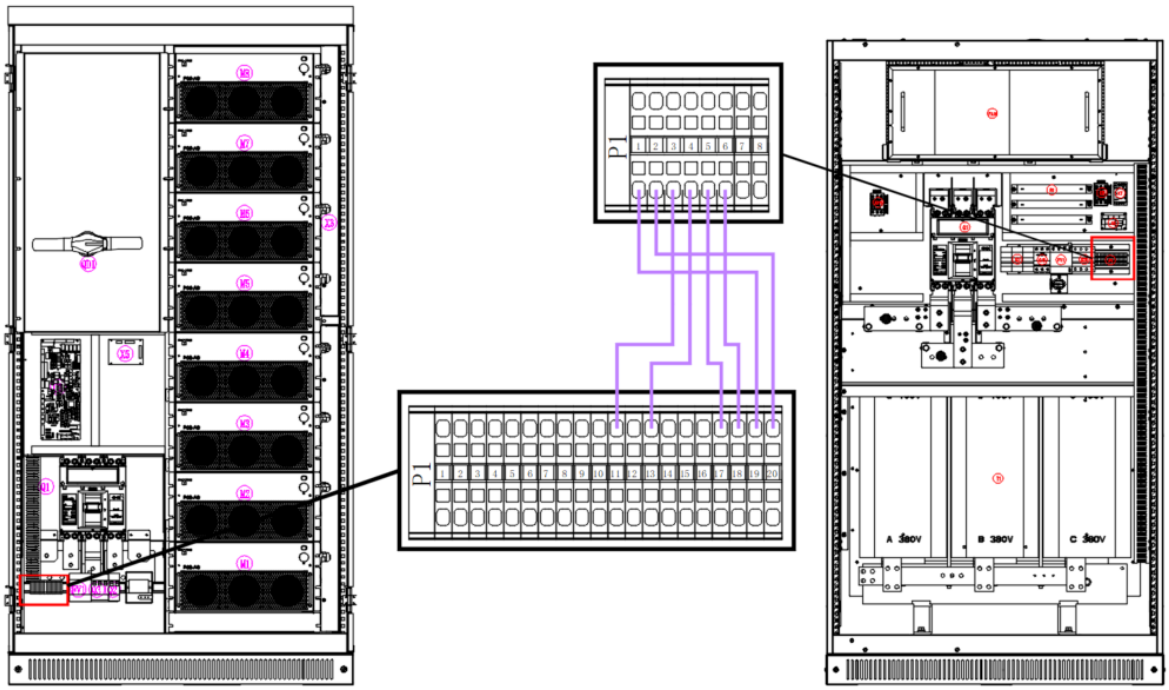


Figure 3 Communication Wiring between PCS and Transformer (PWT-500K)

3.2.1.4 Communication Wiring Related to ATS Cabinet

The ATS cabinet is optional, and if equipped, the communication harness connection is as follows:

Table 19 Interface Definition of ATS Cabinet&DC Junction Box

ATS cabinet	Combiner cabinet
X1:1	XT6:3
X1:2	XT6:4
X1:3	XT6:5
X1:4	XT6:6

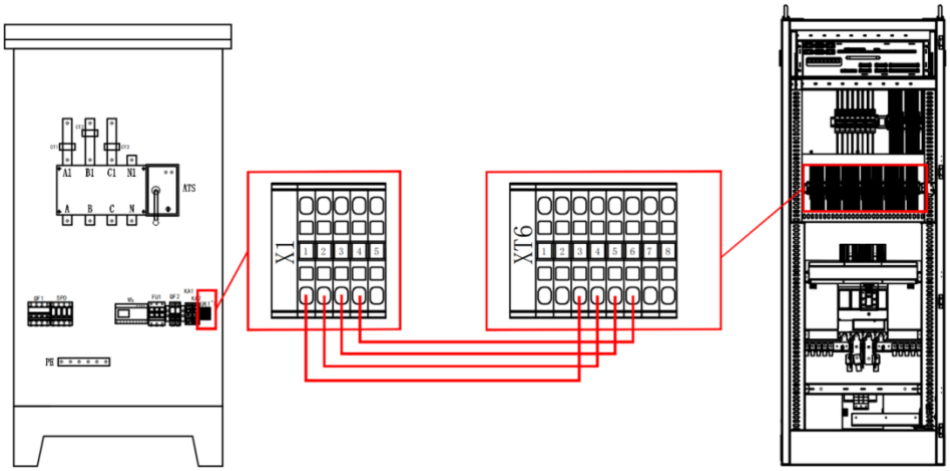


Figure 3 ATS Dry Contact Wiring

3.2.1.5 Communication Wiring Related to PV Inverters

1. PV inverters are optional, and if configured, communication definitions are shown in Table 20:

Connect the communication harness between the PV inverter and the combiner cabinet. Use twisted pair shielded wire C10 in the harness package to connect the PV inverter terminals (3/4) and the combiner cabinet terminal block (XT3:7 (RS485-A)/XT3:8 (RS485-B). Please refer to Figure 3-22.

Table 20 Definition of Communication Port (6PIN) for PV Inverters

Number	Communication Port Definition	Explain
1	RS485-A1	EMS communication connection port or communication connection port for multiple inverters
2	RS485-B1	
3	RS485-A1	
4	RS485-B1	
5	RS485-A2	spare
6	RS485-B2	

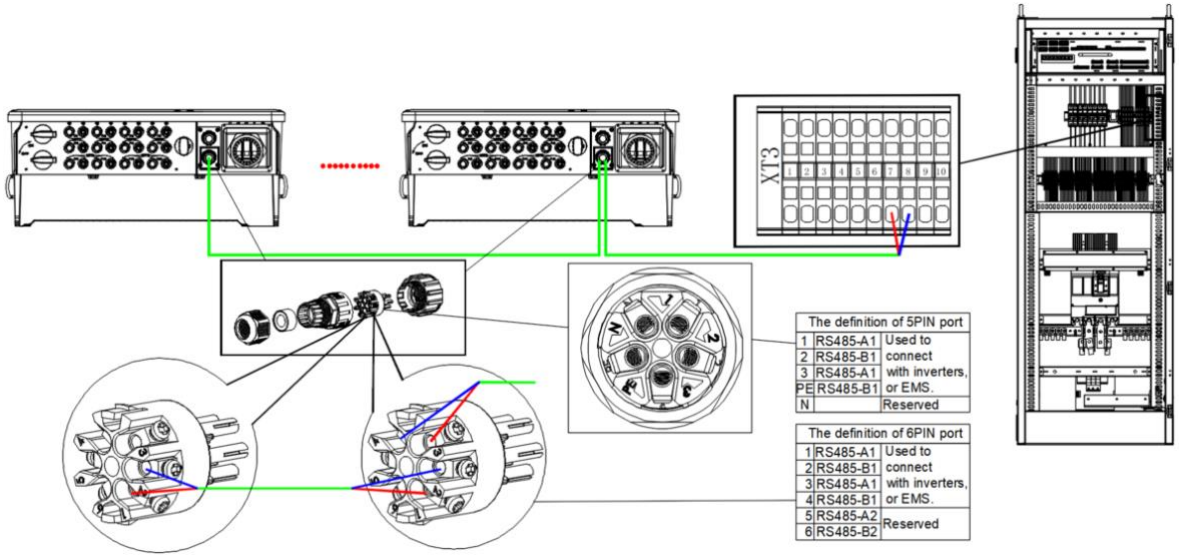


Figure 3 PV inverter communication line connection

2. PV inverters may have different communication ports in different regions. The following are the illustrations and definitions of the 5PIN communication interface:

Table 21 Definition of Communication Port (5PIN) for PV Inverters

Number	Communication Port Definition	Explain
1	RS485-A1	EMS communication connection port or communication connection port for multiple inverters
2	RS485-B1	
3	RS485-A1	
PE	RS485-B1	
N		spare

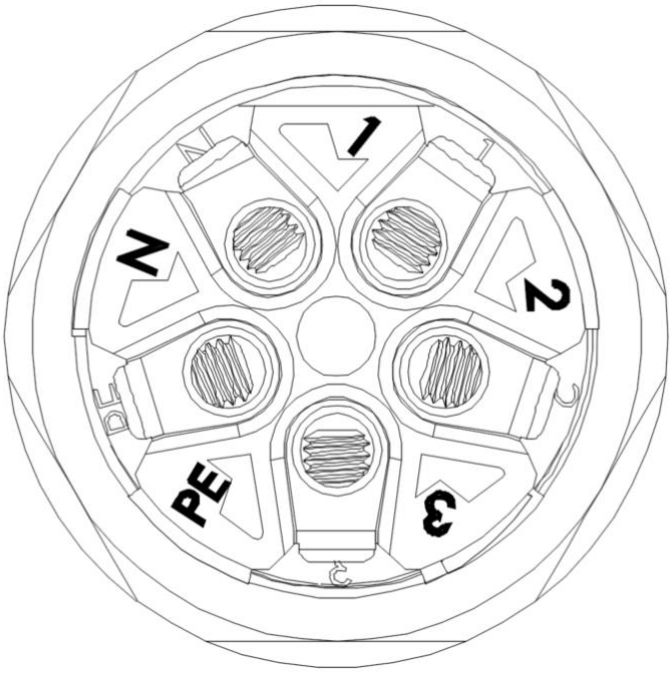


Figure 3 5PIN communication interface diagram

3. When communicating with a single inverter, it is necessary to turn the 120 ohm terminal resistor dial switch next to the RS485 communication port of the inverter to ON (default to OFF); When communicating with multiple inverters, it is necessary to

connect all inverters through RS485 communication lines in a hand held manner, and turn the 120 ohm terminal resistor dial switch next to the RS485 communication port of the inverter to ON (default to OFF). The shielding layer of the communication line should be grounded at a single point, as shown in Figure 3-24

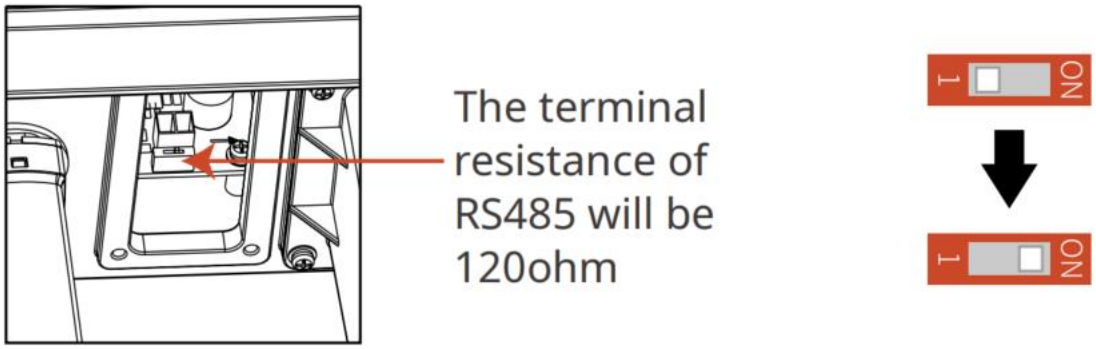


Figure 3 PV inverter communication line connection

3.2.1.6 DC Junction Box Auxiliary Source Wiring

1. For the auxiliary source wiring of the DC Junction Box, please use the harness C12 in the accessory package to connect the STS (PWD-800K) load side and the terminal block (XT1:1 (L)/XT1:2 (N)) of the combiner cabinet. Please refer to Figure 3-25.

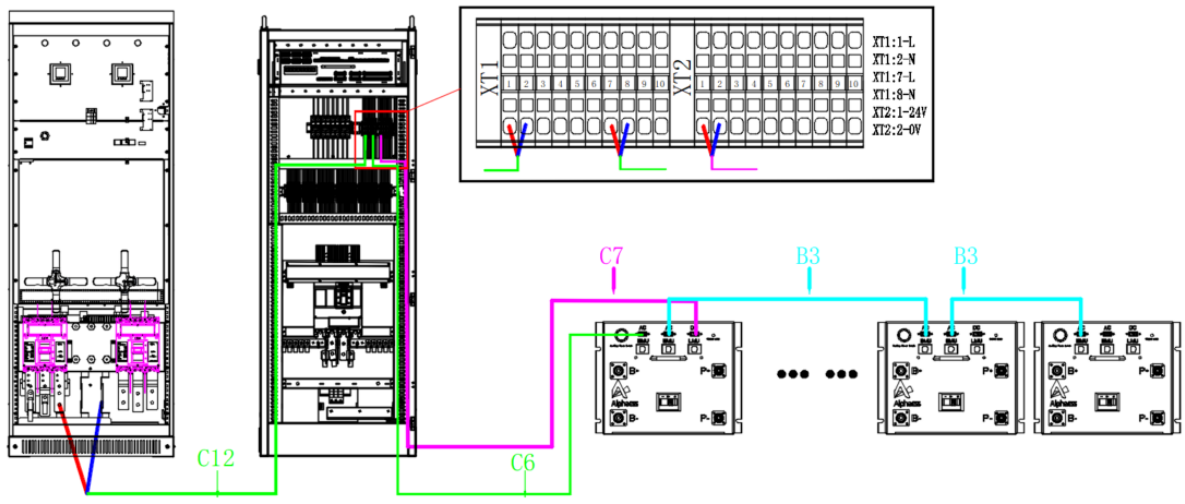


Figure 325 High voltage box auxiliary source line connection

2. Connect the auxiliary source line of the high voltage box. Please use harness C6 in the accessory package to connect the terminal block (XT1:7 (CANH)/XT1:8 (CANL)) of the combiner cabinet to the high voltage box (AC port). If there are

multiple clusters of batteries, please use power line B3 in the high voltage box parts list to connect the high voltage boxes (AC ports) of each cluster to each other. Please refer to Figure 3-25.

3. Connect the 24V power line of the busbar cabinet. Please use the wire harness C7 in the accessory package to connect the terminal block (XT2:1 (24V)/XT2:2 (0V)) of the busbar cabinet to the high voltage box (DC port). Please refer to Figure 3-25.

3.2.1.7 Dry Contact Wiring of Diesel Generators

Diesel generator dry contact wiring, please use the wire harness C10 in the accessory package to connect the diesel generator dry contact and the terminal block (XT9:2 (NO)/XT9:3 (COM)) of the combiner cabinet. Please refer to Figure 3-26**.**

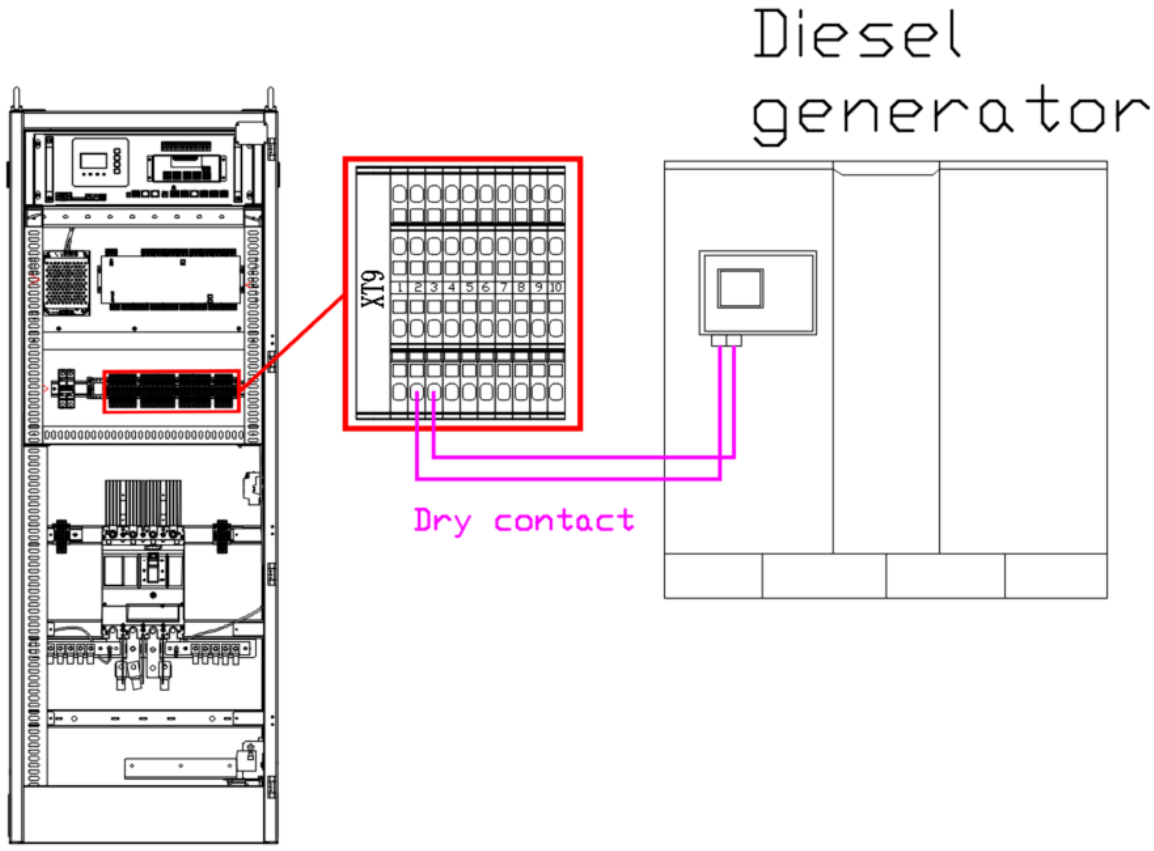


Figure 326 Diesel Generator Dry Contact Wiring Diagram

3. 2. 2 Power Line Connection

3. 2. 2. 1 Battery Side Connection

1.Please use A3 in the battery parts list and B6 and B7 power lines in the high voltage box parts list to complete the power line connection within the battery cluster. Please refer to Figure 27.

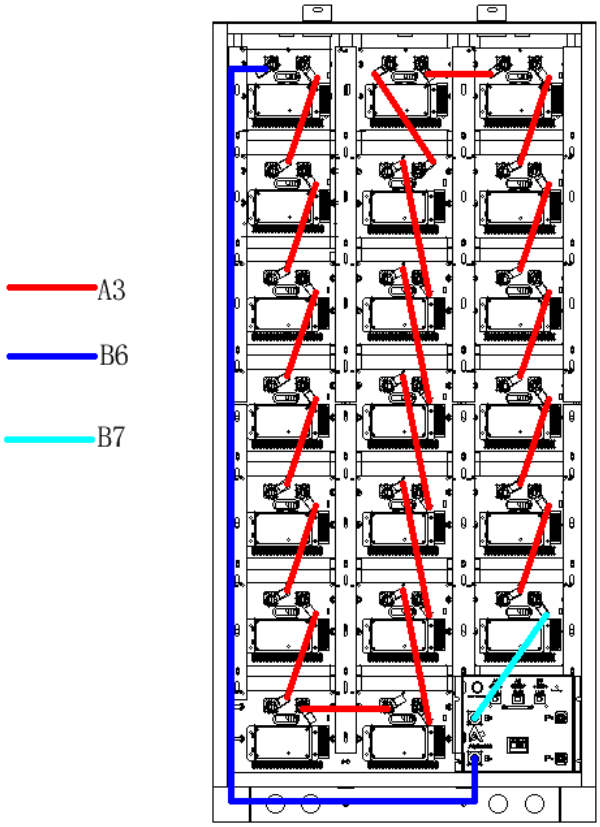


Figure 327 Connection of power lines within the battery cluster

2.Please use the power lines C1 and C2 in the parts list of the accessory package to complete the power line connection from the high voltage box to the combiner cabinet. Please use the power lines C3 and C4 in the parts list of the accessory package to complete the power line connection from the high voltage box to the combiner cabinet. Please refer to Figure 28.

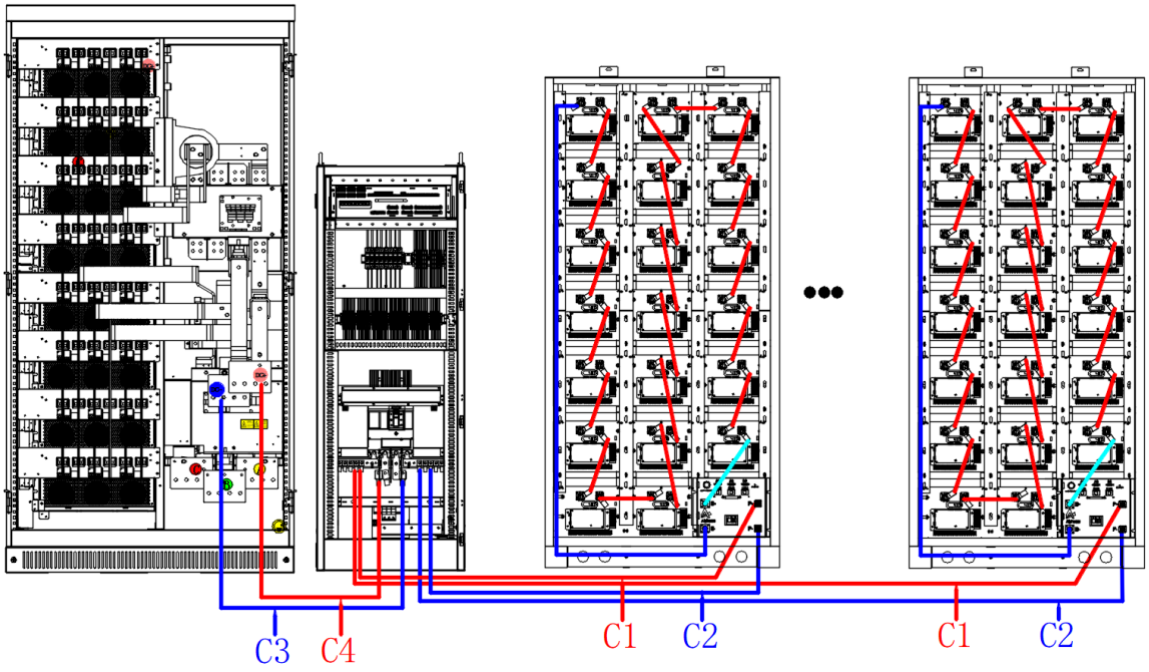


Figure 328 Connection of DC side power line

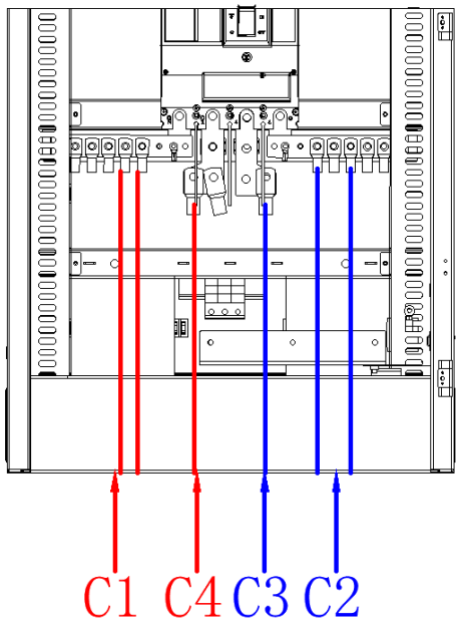


Figure 3-29 Wiring diagram of 630A DC Junction Box

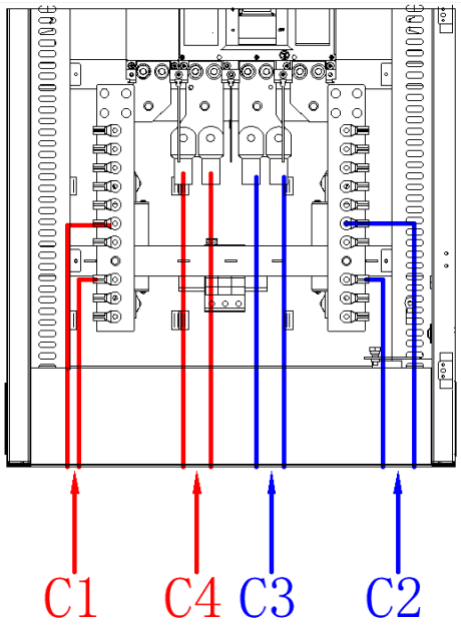


Figure 3-30 Wiring diagram of 1250A DC Junction Box

Attention: According to the specific system configuration of the combiner cabinet, refer to the wiring of the 630A and 1250A combiner cabinets in the following figure. These two combiner cabinets only have different power line wiring.

For wiring requirements, single core or multi-core cables with appropriate wire diameters should be selected. The wiring should comply with national electrical specifications or other local standards.

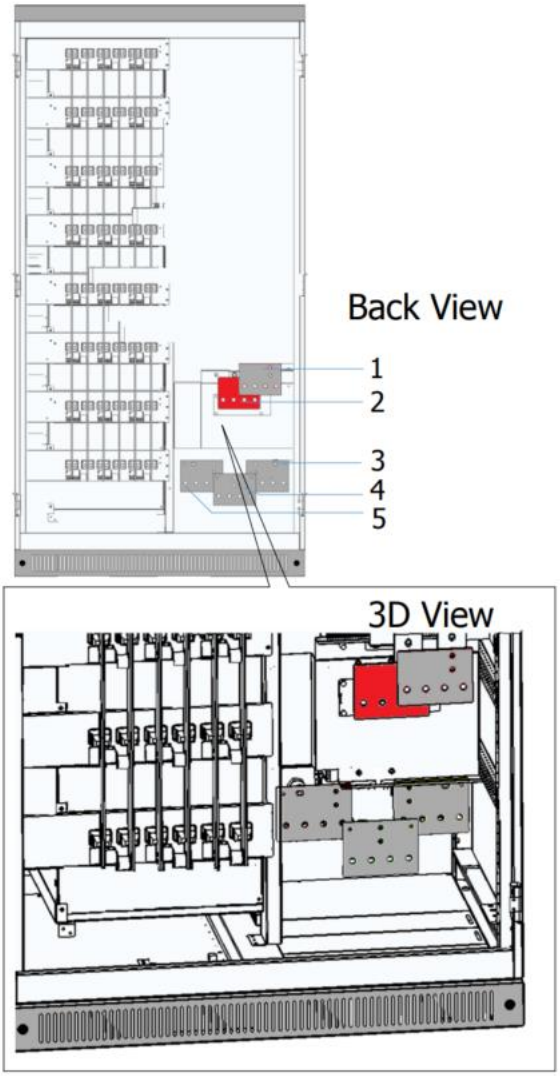


Figure 3 Schematic diagram of copper busbar for PCS wiring

Table 22 Description of Copper Bars for PCS Wiring

Number	Name	Description
1	Battery positive electrode (aperture φ 13.00)	Battery positive input terminal
2	Battery negative electrode (aperture φ 13.00)	Battery negative input terminal
3	L1 phase (grid) (aperture) φ 13.00)	A-phase
4	L2 phase (grid) (aperture) φ 13.00)	B-phase
5	L3 phase (grid) (aperture) φ 13.00)	C-phase

3.2.2.2 PV Side Connection

1.Measure the voltage of the PV system using a multimeter to ensure that the PV voltage is within the input voltage range of the PV inverter.

2.Disconnect the switch on the PV inverter and confirm that there is no voltage between the positive and negative poles of the PV input before wiring.

3.Connect the PV positive electrode to the "DC+″ of the PV connector on the PV inverter (please refer to the PV inverter user manual for details).

4.Connect the PV negative electrode to the "DC -″ of the PV connector on the PV inverter (please refer to the PV inverter user manual for details).

5.The AC output of the PV inverter is connected to the input side of the circuit breaker in the AC combiner cabinet, and the inverter corresponds to the circuit breaker in sequence.

6.Confirm that the wiring is secure.

7.PV inverter grounding (please refer to PV inverter user manual for details)

Table 23 PV Cable Description

Rated power	Recommended dimensions for copper core DC cables
60kW	AWG2

Please refer to Figure 3-32 for PV connection.

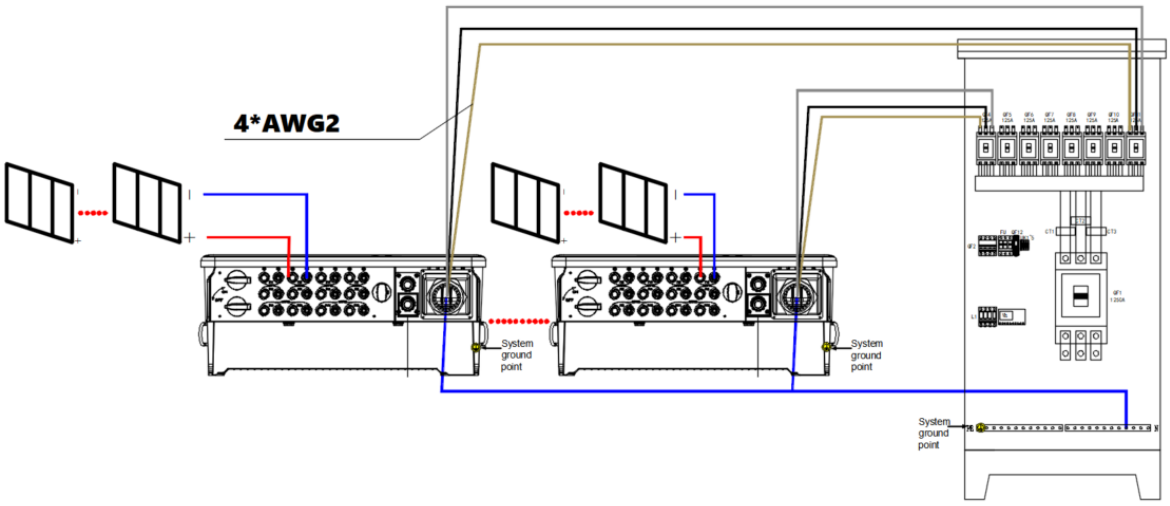


Figure 3 PV side wiring

PV inverters are numbered and must be connected one by one. For example, "1+" corresponds to "1-", "2+" corresponds to "2-", and so on.

3.2.2.3 AC Side Connection

1.Ensure that the phase sequence of the AC side wiring is correct.

2.Disconnect the AC circuit breaker in the PCS, transformer (PWT-500K), and STS (PWD-800K) cabinet.

3.Use a multimeter to measure and ensure that the cable connected to the copper bar has no voltage.

4.In grid connected mode, the L1/L2/L3 phase, N-phase, and PE of the AC circuit breaker on the grid side of the STS (PWD-800K) cabinet are connected to the L1/L2/L3 phase, N-phase, and PE of the AC output of the grid (or ATS cabinet), respectively.

5.In off grid mode, the L1/L2/L3 phase, N-phase, and PE of the grid side AC circuit breaker of the STS (PWD-800K) cabinet are connected to the L1/L2/L3 phase, N-phase, and PE of the diesel engine (or ATS cabinet) AC output, respectively.

6.Confirm that the wiring is secure.

Table 11 AC Cable Description

Rated power	Recommended size of copper core cable (mm ²)
500kW	⩾ 4 * 95 (load side); ≥ 4 * 120 (grid side);

Before wiring, please use a multimeter to measure the AC side voltage and ensure that there is no voltage at the connection point.

All cables should be connected to the outside through the inlet hole at the bottom of the PCS.

3.2.2.3.1 AC Wiring for PCS, Transformer (PWT-500K), and STS (PWD-800K)

For the power cable connection between PCS, transformer (PWT-500K), and STS (PWD-800K) equipment, please refer to Figure 3-35 for AC side wiring. Figure 3-33 and Figure 3-34 are the power cable model specifications.

Line number	Transformer	STS	Line mark color	Number
W112	TRANS-a	STS Q1-2	Brown	4*AWG3/0
W113	TRANS-b	STS Q1-4	Black	4*AWG3/0
W114	TRANS-c	STS Q1-6	Grey	4*AWG3/0
W115	TRANS-n	STS-N	Blue	4*AWG3/0

Figure 3 Power Cable Connection between Transformer (PWT-500K) and STS (PWD-800K)

Line number	PCS	Transformer	Line mark color	Number
W109	PCS Q1-2	TRANS-A	Brown	4*AWG3/0
W110	PCS Q1-4	TRANS-B	Black	4*AWG3/0
W111	PCS Q1-6	TRANS-C	Grey	4*AWG3/0

Figure 3 Power Cable Connection between PCS and Transformer (PWT-500K)

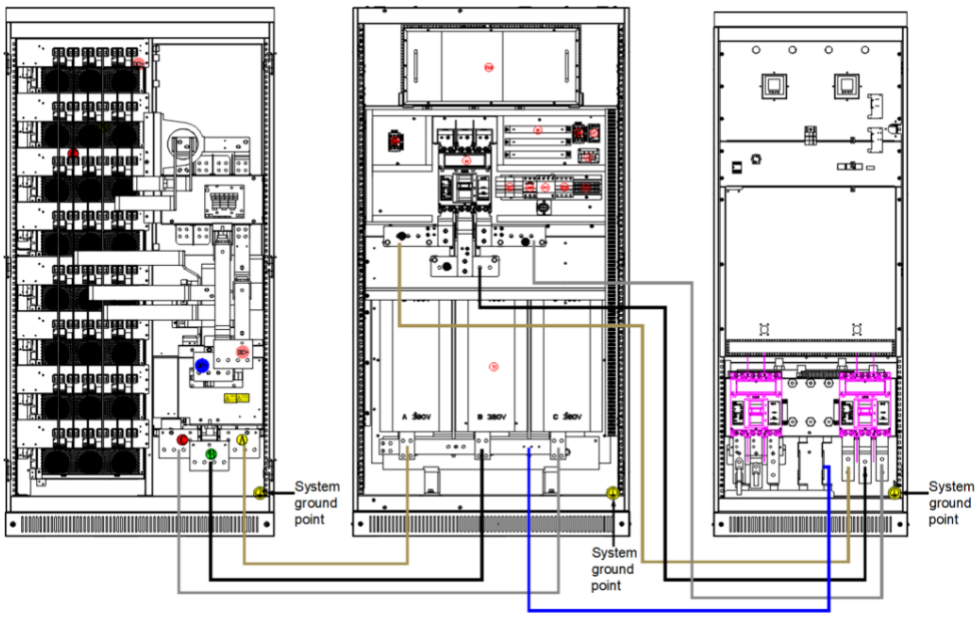


Figure 3 Power Cable Connection between PCS, Transformer (PWT-500K), and STS (PWD-800K)

3.2.2.3.2 AC Wiring in PV Grid Connection Mode

The AC combiner cabinet is connected to the power grid side. Please refer to Figure 3-36 for AC side wiring.

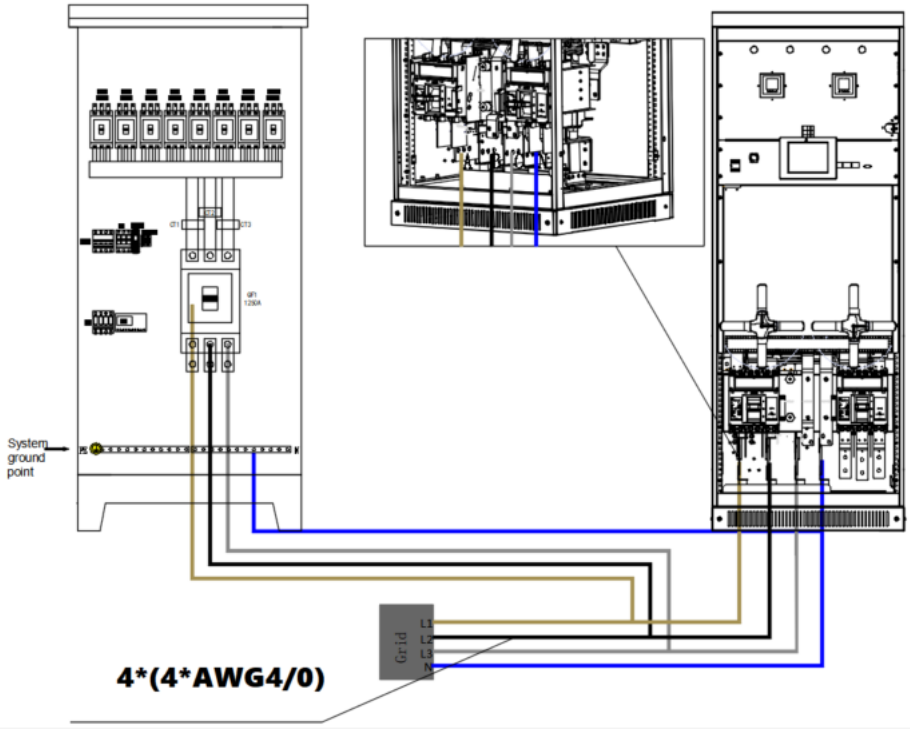


Figure 3 AC side wiring diagram for PV grid connection mode

3.2.2.3.4 PV off Grid Mode AC Wiring

Connect the AC busbar cabinet to the load side, please refer to Figure 3-37 for AC side wiring.

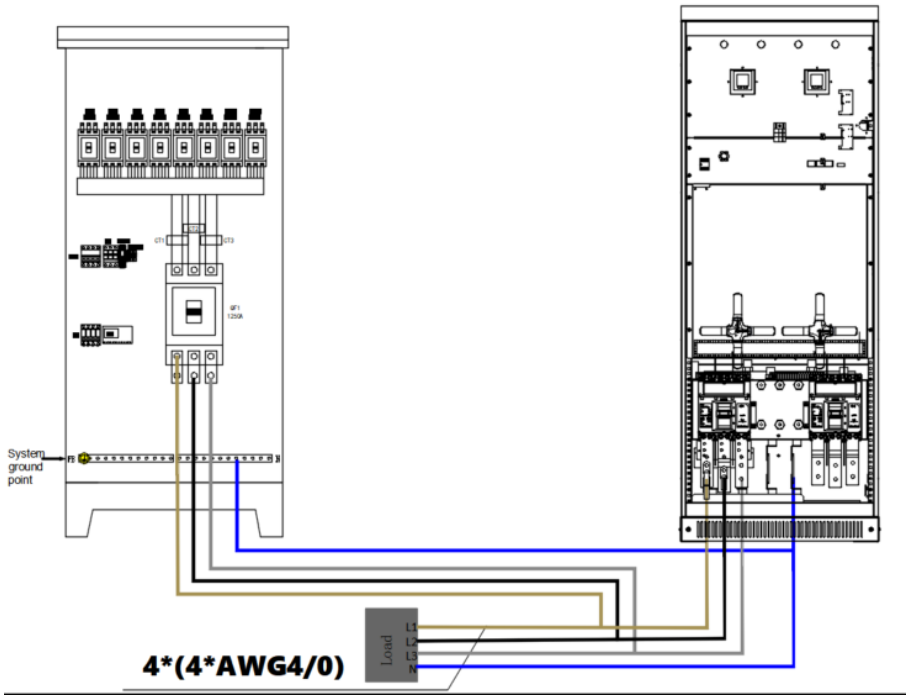


Figure 3: AC side wiring diagram for PV off grid mode

3.2.2.3.5 Dual Power AC Side Wiring

1. The L1/L2/L3 and N phases on the grid side are connected to the A1/B1/C1 and N1 phases of the AC input in the ATS cabinet, respectively;

2. The L1/L2/L3 and N phases of the diesel engine are connected to the A2/B2/C2 and N2 phases of the AC input in the ATS cabinet, respectively;

Please refer to Figure 3-38 for AC side wiring.

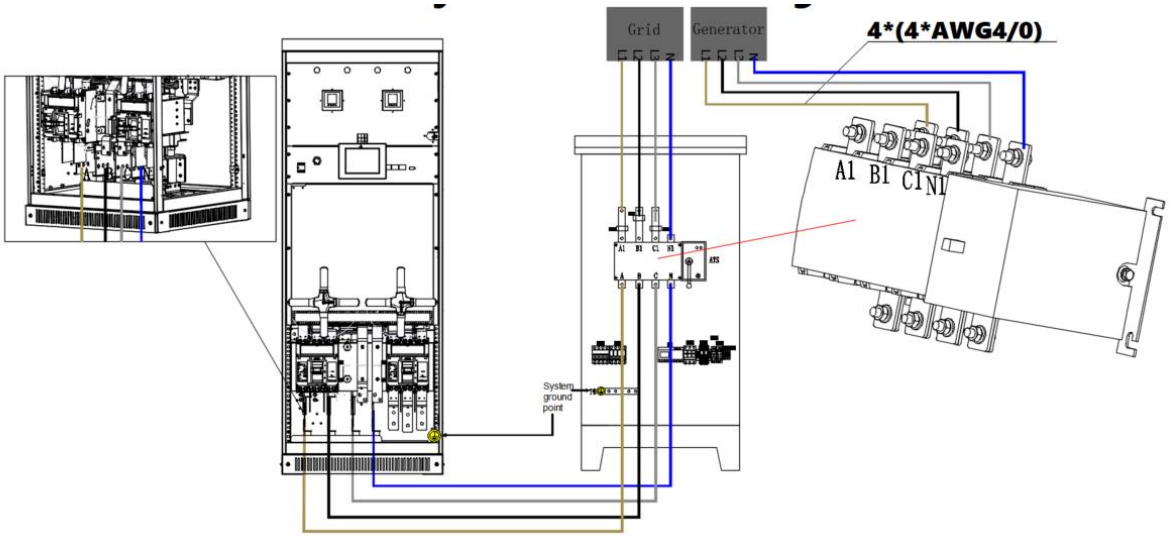


Figure 3 AC Coupled Dual Power Supply System AC Side Wiring Diagram

3.2.3 Electricity Meter Connection (grid connection)

Please refer to the diagram below to connect the electricity meter and CT.

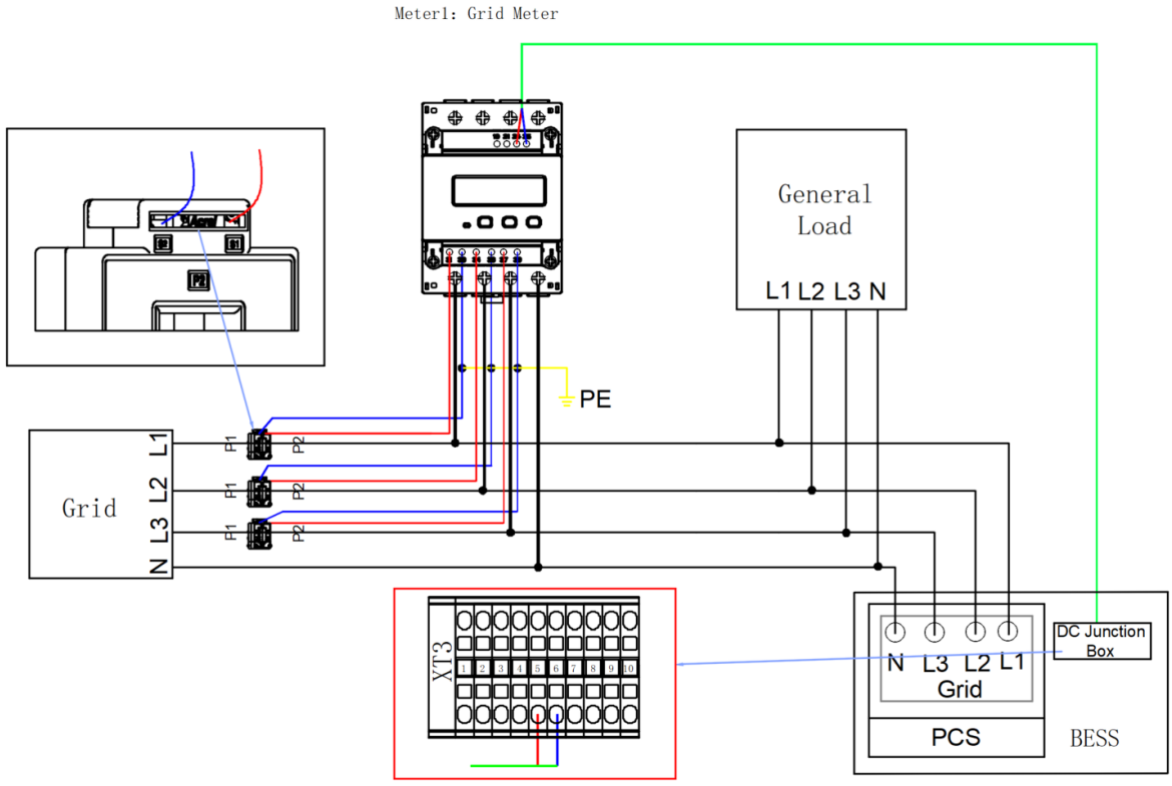


Figure 3 Electricity meter wiring diagram (DC mode)

1.The L1/L2/L3/N phases of the power grid are respectively connected to the 1/4/7/10 terminals of the meter (providing power supply and voltage sampling for the meter).

2.The L1 phase of the power grid enters and exits from the P1 side of the meter CT, and is connected to the L1 phase of the power grid side of the STS (when STS is not configured, this is the transformer). The secondary port S1 of the meter CT is connected to the meter port 31, and the secondary port S2 of the meter CT is connected to the meter port 33. Please refer to Figure 3.

3.The L2 phase of the power grid enters and exits from the P1 side of the meter CT, and is connected to the L2 phase of the power grid side of the STS (when STS is not configured, this is the transformer). The secondary port S1 of the meter CT is connected to the meter port 34, and the secondary port S2 of the meter CT is connected to the meter port 36. Please refer to Figure 3.

4.The L3 phase of the power grid enters and exits from the P1 side of the meter CT, and is connected to the L3 phase of the power grid side of the STS (when STS is not configured, this is the transformer). The secondary port S1 of the meter CT is connected to the meter port 37, and the secondary port S2 of the meter CT is connected to the meter port 39. Please refer to Figure 3.

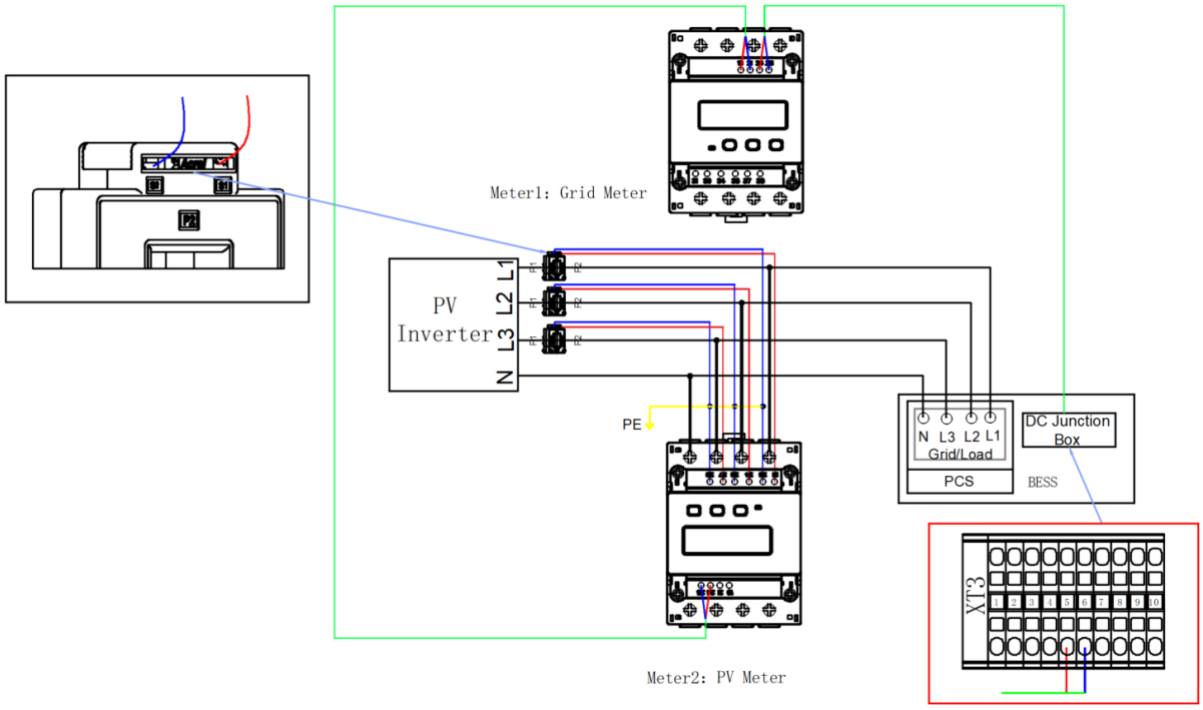


Figure 30 Electricity meter wiring diagram (AC/Hybrid mode)

1.The L1/L2/L3/N phases of the power grid are respectively connected to terminals 1/4/7/10 of meter 1. (Provide power supply and voltage sampling to the electricity meter)

2.The L1/L2/L3/N phases of the PV inverter are respectively connected to terminals 1/4/7/10 of meter 2.

3.The L1 phase of the PV inverter enters and exits from the P1 side of the meter CT, and is connected to the L1 phase of the grid side of the STS (when STS is not configured, this is the transformer). The secondary port S1 of the meter CT is connected to the meter port 31, and the secondary port S2 of the meter CT is connected to the meter port 33. Please refer to Figure 3.

4.The L2 phase of the PV inverter enters and exits from the P1 side of the meter CT, and is connected to the L1 phase of the grid side of the STS (when STS is

not configured, this is the transformer). The secondary port S1 of the meter CT is connected to the meter port 34, and the secondary port S2 of the meter CT is connected to the meter port 36. Please refer to Figure 3.

5.The L3 phase of the PV inverter enters and exits from the P1 side and P2 side of the meter CT, and is connected to the L3 phase on the grid side of the STS (when STS is not configured, this is the transformer). The secondary port S1 of the meter CT is connected to the meter port 37, and the secondary port S2 of the meter CT is connected to the meter port 39. Please refer to Figure 3.

The fuse is connected in series to the phase wire connection of the meter, and the fuse base is a guide rail type that needs to be equipped with its own guide rail.

The communication cable of the electricity meter should be connected to the terminal block of the combiner cabinet (XT3:5/XT3:6).

3.2.4 Sealing the Inlet Hole

After wiring is completed, block the incoming holes with fireproof mud or other flame-retardant and well sealed materials.

4. Start and Operating

For detailed information, please refer to the user manual.

5. Technical Contacts

If you have any technical questions about our products, please contact us. Contact information can be found on the homepage of this manual. Please provide the following information to quickly assist you in resolving the issue.

A. System SN
B. System configuration
C. Product ID
D. Software version number
E. Fault information
F. PV module information

Attachment 1

PV Inverter (optional)

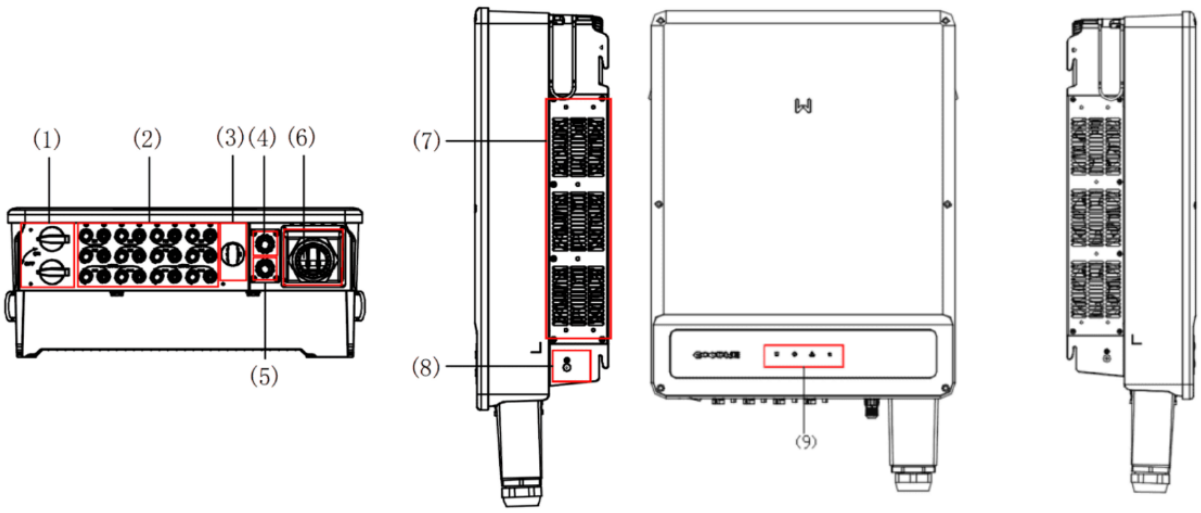


Figure 1 Schematic diagram of PV inverter

Table 1 Definition of PV inverter ports

Number	Description	Number	Description
1	DC switch (optional)	7	Fan
2	PV input port	8	External protection grounding point
3	WIFI or 4G or GPRS port (optional)	9	Indicator light
4	USB or DRED port		
5	RS485 communication port		
6	AC output port		

Attachment 2

ATS Cabinet (optional)

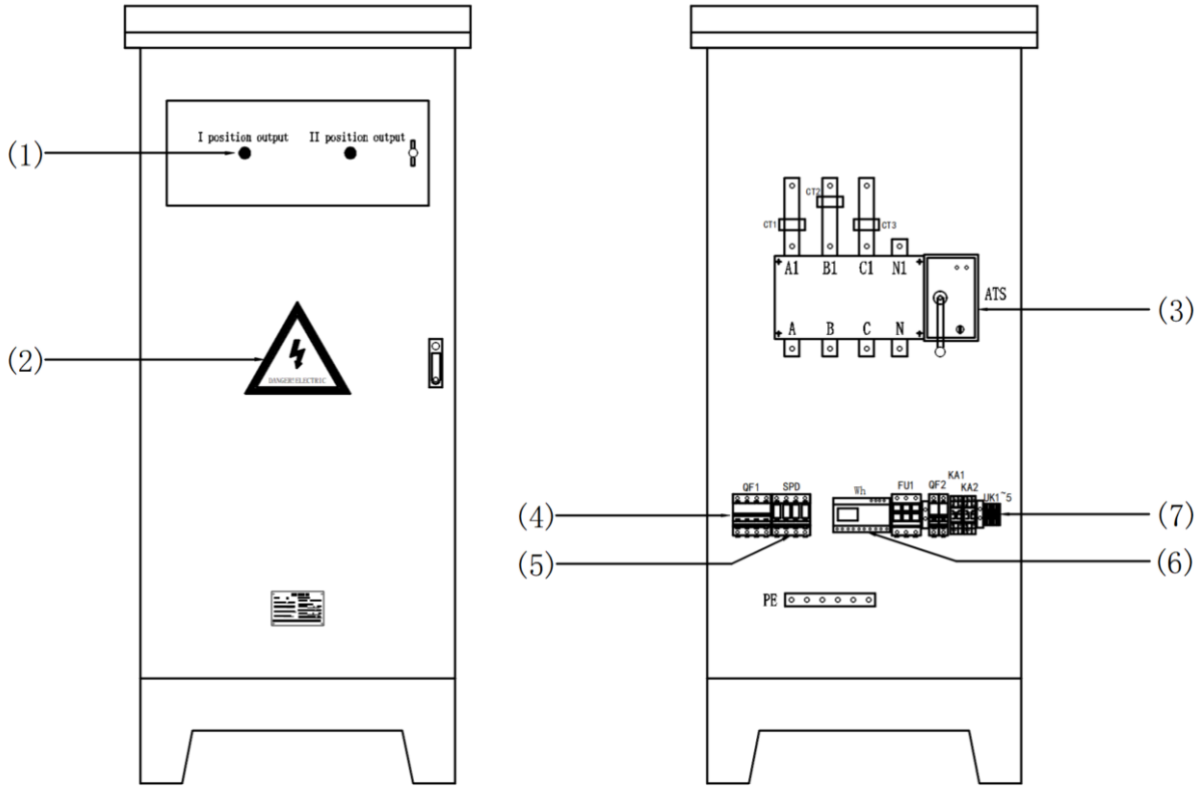


Figure 2 Schematic diagram of ATS cabinet

Table 2 Introduction to ATS cabinet ports

Number	Description	Number	Description
1	Switch position indicator light	5	Surge protector
2	Electric hazard sign	6	AC meter
3	Automatic transfer switch	7	Terminal
4	Surge circuit breaker		

Attachment 3

AC Combiner Cabinet (optional)

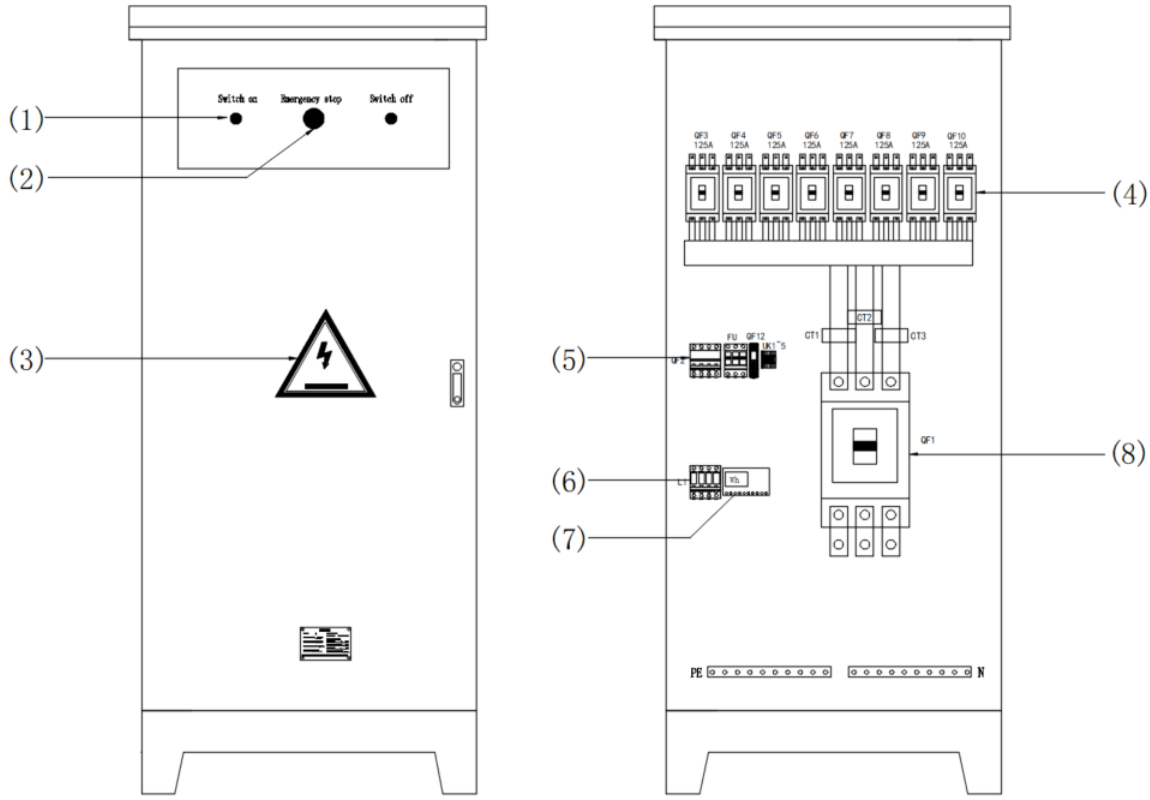


Figure 3 Schematic diagram of AC combiner cabinet

Table 3 Introduction to AC combiner cabinets

Number	Description	Number	Description
1	Switch status indicator light	5	Surge circuit breaker
2	Emergency stop switch	6	AC meter surge protector
3	Electric hazard sign	7	AC meter
4	Input molded case circuit breaker	8	Output molded case circuit breaker

Attachment 4

System Installation Torque Meter

Number	Position	Specifications and materials	Quantity	Torque (Nm)
1	Fixed at the bottom of the rack	1. Bolt - GB 5781-2000 Hexagonal Head Bolt Full Thread Grade C M12x40 2. Flat washer GB 97.1-2002 M12 Flat washer A-grade color zinc plated ROHS 3. Spring washer GB 93-87 M12 standard spring washer coated with colored zinc ROHS	4pcs * number of clusters	40 ± 10%
2	Fixation of battery rack	1. Screw GB/T 9074.13-88 2. Cross recessed hexagonal head combination screw M8x30 color zinc plated ROHS	2pcs * number of clusters	10 ± 10%
3	Fixed bottom of the busbar cabinet	1. Bolt GB 5781-2000 hex head bolt - full thread - M10x45- color zinc plated - strength grade 8.8-ROHS 2. Flat washer GB 97.1-2002 M10 flat washer A-grade color zinc plated ROHS 3. Spring washer GB 93-87 M10 standard spring washer coated with colored zinc ROHS	4pcs	20 ± 10%
4	Battery rack grounding	Screw, cross hexagonal three in one, M6 * 12, stainless steel 304	1 pcs * number of clusters	5 ± 10%
5	Fixation of high voltage box insertion	Screw, cross hexagonal three in one, M6 * 14, stainless steel	4pcs * number of clusters	4 ± 10%
6	Power module fixation	Metal fastener M3 * 15 GB/T818-2000 SUS304 white polishing	4pcs	0.7 ± 10%
7	Grounding of busbar cabinet	Nut, flange, M8, GB/T 6187.1-2000	1pcs	10 ± 10%

8	At the power supply of the DC module	Router power cord (incoming and outgoing)	4pcs	0.4 ± 10%
9	Switch side wiring introduced by PCS side battery	M8 * 35 carbon steel, 4.8 grade bolt, white zinc plated (T50) M10 * 35 carbon steel, 4.8 grade bolt, white zinc plated	A total of 2pcs, positive and negative	1. 10 ± 10% (T50) 2. 20 ± 10% (T100)
10	Switch side wiring introduced by the PCS client's PV combiner box	M8 * 35 carbon steel, 4.8 grade bolt, white zinc plated (T50) M10 * 35 carbon steel, 4.8 grade bolt, white zinc plated	A total of 2pcs, positive and negative	1. 10 ± 10% (T50) 2. 20 ± 10% (T100)
11	Switch measurement wiring introduced by PCS client load	M8 * 35 carbon steel, 4.8 grade bolt, white zinc plated M8 * 35 carbon steel, 4.8 grade bolt, white zinc plated	Three phases with a total of 3pcs	10 ± 10%
12	Switch side wiring introduced by the PCS client's power grid	M8 * 35 carbon steel, 4.8 grade bolt, white zinc plated (T50) 2. M10 * 35 carbon steel, 4.8 grade bolt, white zinc plated	5pcs in total, 3L/1N/1PE	1. 10 ± 10% (T50) 2. 20 ± 10% (T100)

Please follow the recommended torque values in the table. If there are any special or abnormal situations, please provide feedback to AlphaESS engineers.

2. Attachment 5