

All-in-one Liquid-cooled ESS Container ECO-E20FT2170LP-2 User Manual



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1. Product Introduction

1.1. Naming Role

ECO-E20FT2170LP-2

1 2 3 4 5 6 7

No.	Symbol	Description
1	ECO	Sunpal ECO Series
2	E	All-in-one system
3	20FT	Standard 20-ft container
4	2170	Rated energy of 2170kwh
5	L	Liquid cooling
6	P	314Ah battery cell
7	2	2-hour system

1.2. Product Overview



Figure 1-1 ECO-E20FT2170LP-2

ECO-E20FT2170LP-2 is an outdoor liquid cooling energy storage container product with an

All-In-One integrated structure, with a rated energy of 2170kWh and a rated power of 1000kW. The system consists of 9 liquid-cooled battery clusters of 1P240S 314Ah cells, 9 modular bidirectional power converters (PCS), 1 vertical 40kW liquid cooling unit, 1 aerosol fire extinguishing system, 1 dynamic environment monitoring system and 1 container-level EMS control system. Each battery cluster is composed of 5 battery packs and 1 high-voltage box and each battery pack is made up of 3.2V 314Ah cells connected in 1 parallel 48 series configuration.

1.3. Specification

DC Side	
Cell type	LFP 314Ah
Pack Capacity	48.23kWh/1P48S
System Capacity	2170.3kWh/9P240S
Rated Voltage	768V
Recommended voltage range	672-864Vdc
AC Side	
Rated Output Power	1000kW
Max Power	1100kW
Nominal Voltage	400Vac/3P+N+PE
Nominal Frequency	50Hz/60Hz
THDi	≤3%
DC component	<0.5%I _{pn}
Power factor	-0.99 lagging ~ 0.99 leading
General	
System Efficiency	≥88%
Charge/Discharge Rate	0.5P
Depth of Discharge	95%DOD(25±2°C)
Cycle Life	≥8000 times (25±2°C,0.5P,95%DOD)
Ingress Protection	IP55
Cooling Method	Liquid cooling + Forced air cooling
Operating Temperature	-25 to 55°C
Relative Humidity	5-95%RH, non-condensing
Noise	≤80dB
Working Altitude	≤4000m (Derated above 2,000m, maximum application altitude≤4000m)
Dimensions (W*D*H)	6058*2438*2591 mm
Weight	28t
Fire Suppression System	PACK-level aerosol+Container-level aerosol, Water spray system
Communication interface	Ethernet/RS485

1.4. Electrical Diagram

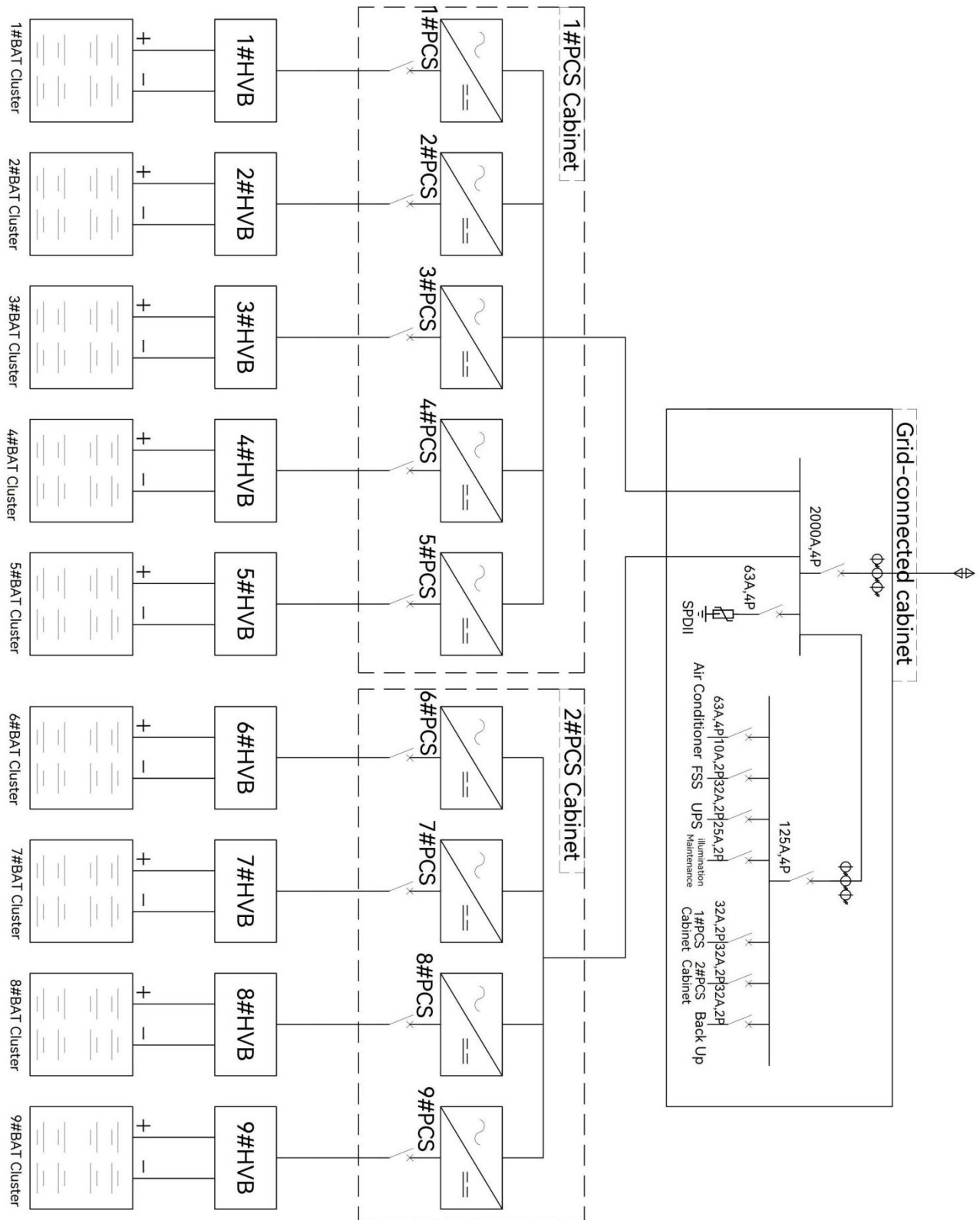


Figure 1-2 Electrical Diagram

1.5. System Communication

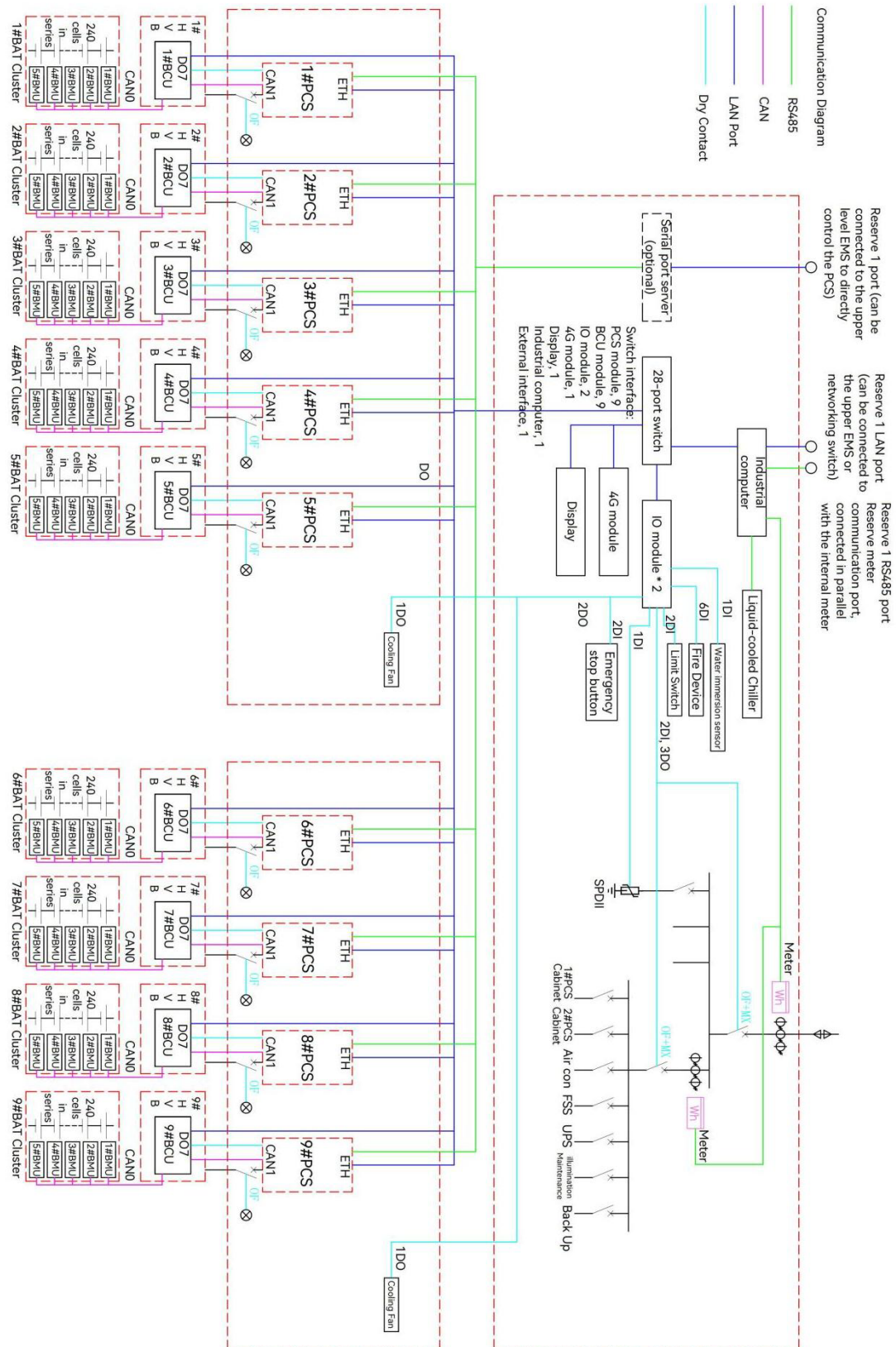


Figure 1-3 System Communication Diagram

1.6. Dimension

Cabinet Dimension(W*D*H): 6058*2438*2591 mm; Weight: 24800kg

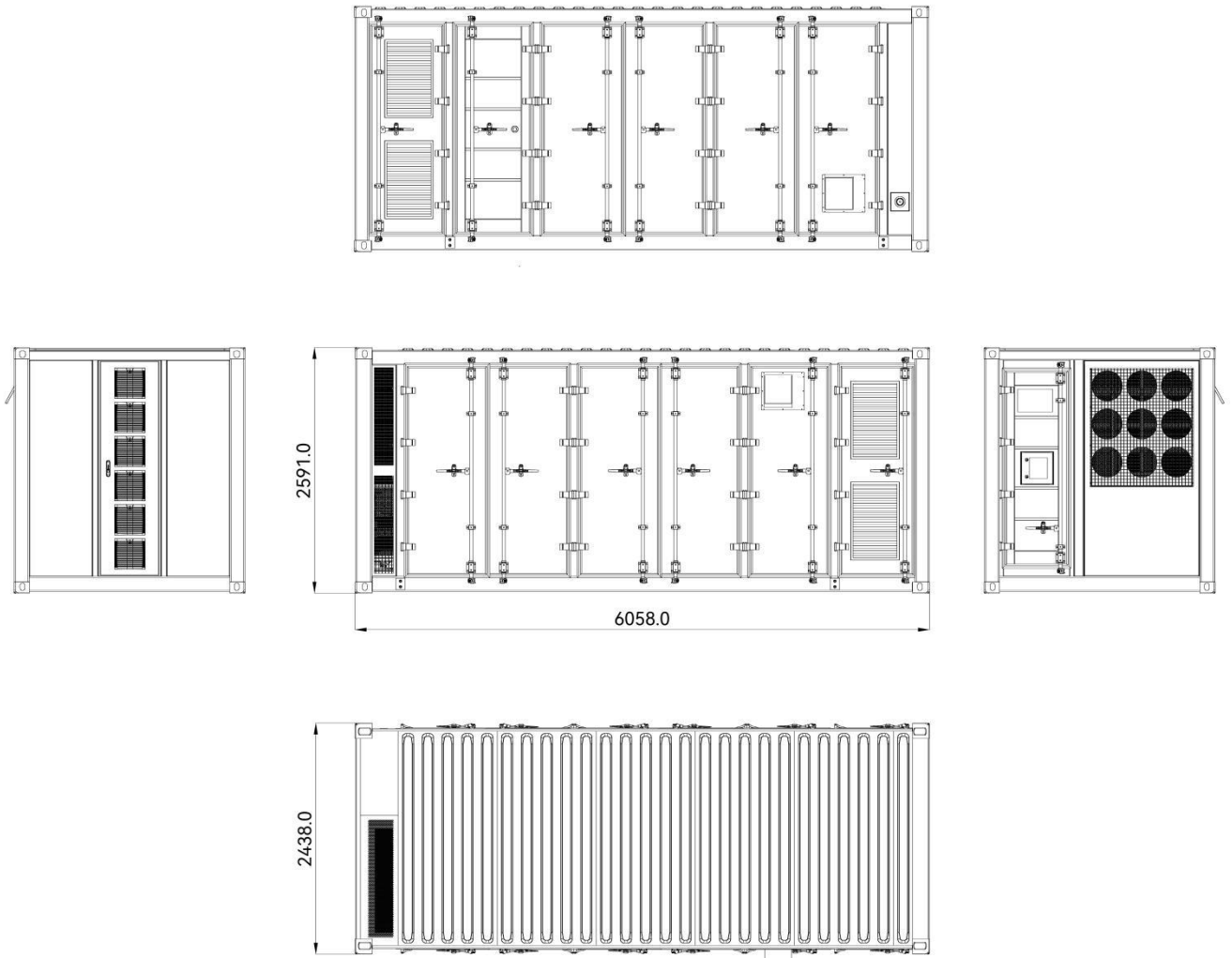


Figure 1-4 Container Dimension

1.7. Components

1.7.1. Explosion Diagram

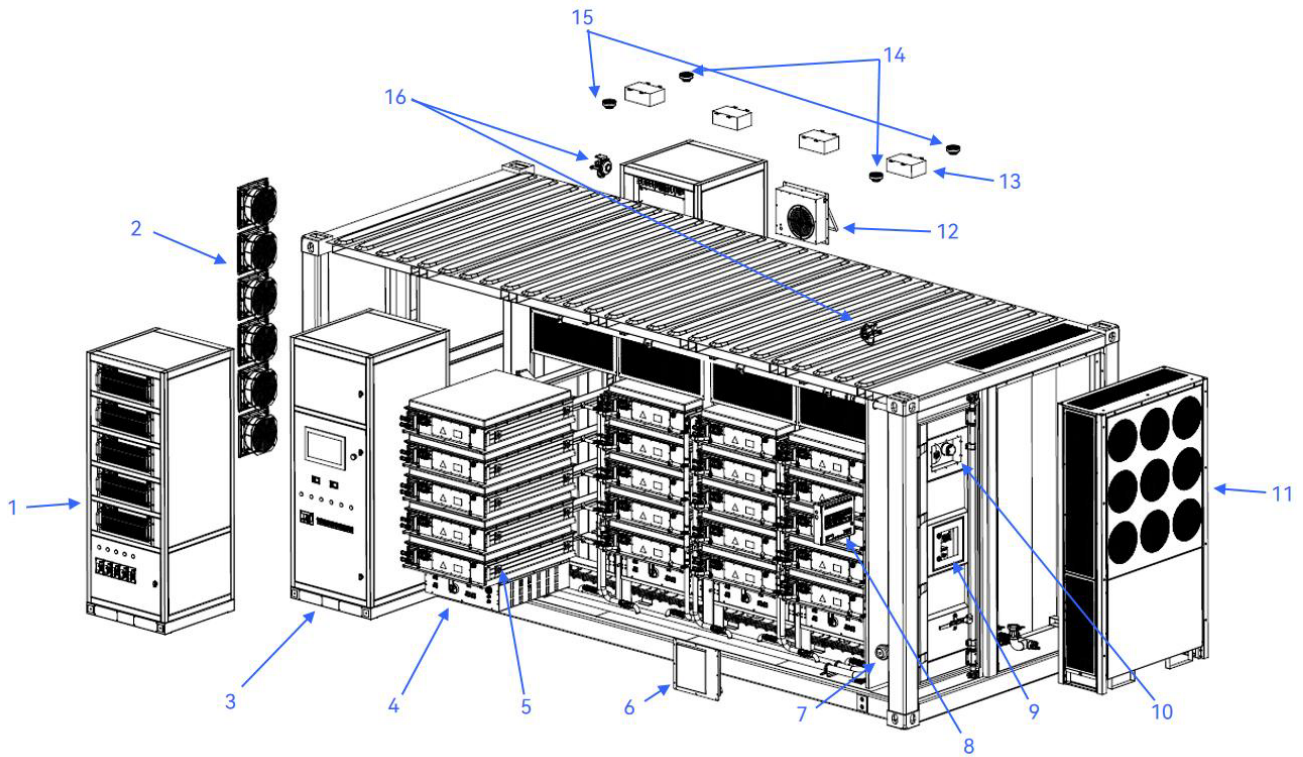


Figure 1-5 Container Explosion Diagram

No.	Item
1	PCS Cabinet
2	Heat Dissipation Fans
3	POC Cabinet
4	High-voltage Box
5	Battery Pack
6	Air Inlet Fan
7	Hydrant Water Inlet
8	Fire Devices Controller

No.	Item
9	Fire Operation Window
10	Fire Alarm Window
11	40kW Liquid-cooled Unit
12	Air Outlet Fan
13	Aerosol *4
14	Temperature Sensor
15	Smoke Sensor
16	Combustible Gas Sensor

1.7.2. PCS

1.7.2.1. Introduction



Figure 1-6 PCS Cabinet

The container includes 2 PCS cabinets, with a total of 9 125kW PCS. Each PCS is connected to one battery cluster and controls the charging and discharging of this battery cluster.



Figure 1-7 PCS

1.7.2.2. PCS Circuit Diagram

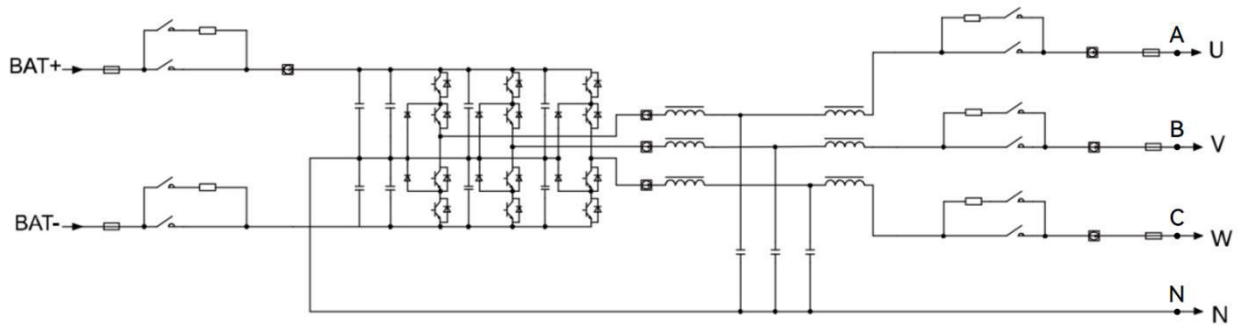


Figure 1-8 PCS Circuit Diagram

1.7.2.3. PCS Dimension & Ports

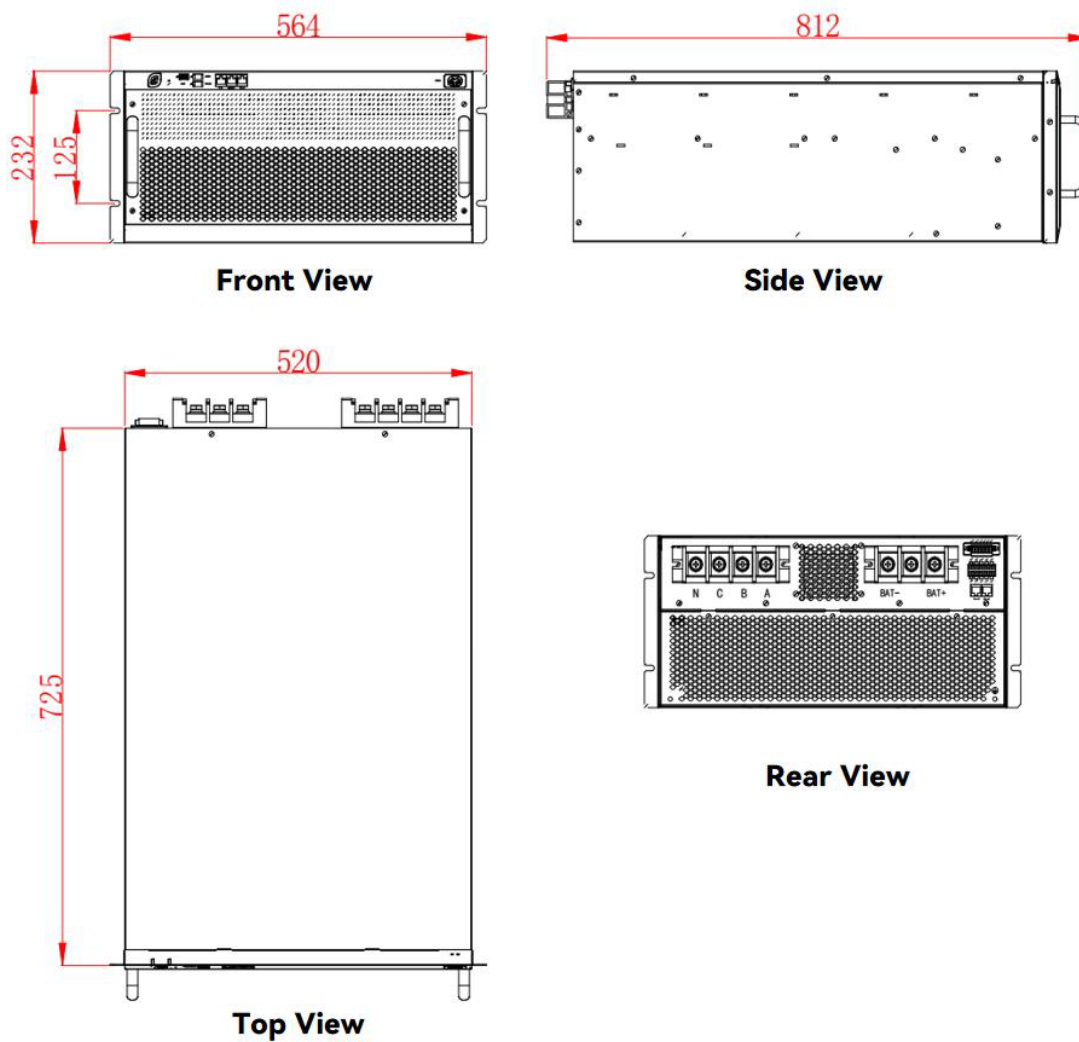


Figure 1-9 PCS Dimension

1.7.2.4. Technical Parameter

DC-side Parameters	
Rated DC power (kW)	125
Number of routes	1
Maximum input current (A)	203
Voltage range (V)	680-950Vdc
Voltage limiting	Support
Current limiting	Support
AC-side Parameters	
Rated output power (kW)	125
Max. output power(kW)	137.5
Rated output current (A)	145
AC wiring	Three-phase four-wire (3L+N+PE)
Isolation	Non-Transformer
Power factor	-1 to+1
Rated voltage (Vac)	AC400V/230V
Voltage range (Vac)	400V(-15%to+15%)
Rated grid frequency(Hz)	50/60
Protection Functions	
DC-side protection	Isolating switch or fuse bank
DC-side control	DC contactor
AC-side protection	Circuit breaker or fuse
AC-side control	AC relay
Comm fault protection	Support
DC over-voltage protection	Support
AC over-voltage protection	Support
Reverse Polarity protection	Support
Overheating protection	Support
LVRT	Fault-ride-through
General Parameters	
Max. efficiency	98.5%
Dimensions(mm)	W520*D785*H232
Weight (kg)	74.5
Cooling method	Air cooling
Standby loss	<0.2% of rated power
No load loss	<0.5% of rated power
Ingress Protection	IP20
Communication protocol	RS485 & Modbus-RTU for EMS; CAN for BMS
Operation environment temperature	-20°C to 55°C (>45°C derating)
Relative humidity	0-95% RH (No condensing)
Attitude	2000m (Derating above 2000m)

1.7.3. Battery Pack

1.7.3.1. Introduction

The container utilizes the ECO-P1P48LP liquid-cooled battery pack, which is equipped with 314Ah cells. It features a 1P48S configuration and employs liquid cooling to maintain a temperature difference among the cells within 3 °C, thereby enhancing operational efficiency and extending the service life of the battery.

1.7.3.2. Dimension & Ports



Figure 1-10 ECO-P1P48LP Battery Pack

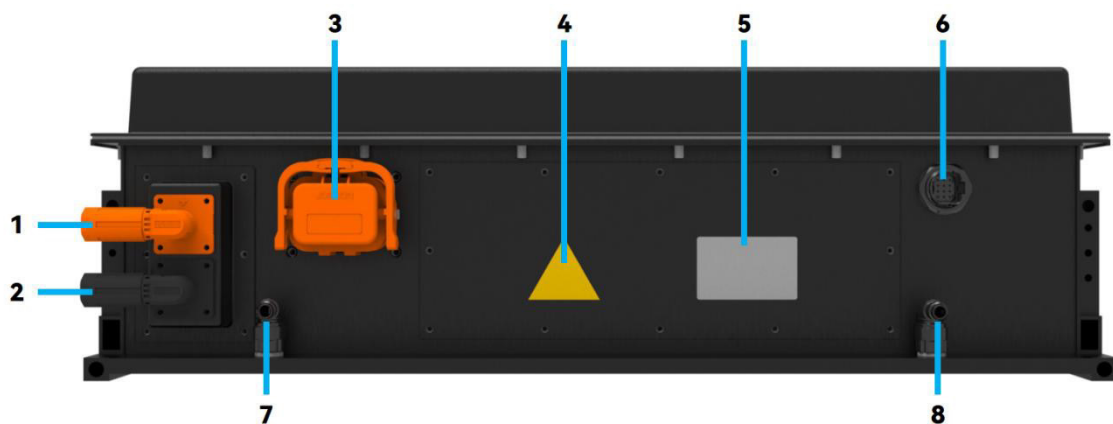


Figure 1-11 Ports of Battery pack

No.	Item	No.	Item
1	Power-in connector	5	Pack nameplate
2	Power-out connector	6	BMS Communication port
3	MSD	7	Liquid cooling inlet
4	Warning signs	8	Liquid cooling outlet

1.7.3.3. Technical Parameters

ECO-P1P52LSP	
Cell Type	LFP
Rated Capacity	314Ah
Grouping	1P48S
Rated Energy	48.23kWh (rated condition)
Rated Voltage	153.6Vdc
Operating Voltage	120-175.2Vdc
Rated Charge/Discharge Rate	0.5P
Cycle Life	≥8000 times@75%
Operating Temperature	-10~50°C (Discharging)/5~55°C (Charging)
Ingress Rating	IP65
Dimensions(W*D*H)	804*1063*247.5 mm
Weight	326 kg

1.7.4. Liquid-cooling Chiller Unit

1.7.4.1. Introduction

ECO-E20FT2170LP-2 adopts 40kW air-cooled liquid chiller.

During cooling, the air-cooled liquid chiller uses antifreeze liquid to transfer heat through convection, removing the heat generated by the battery and thus reducing the battery temperature.

During heating, the compressor and fan are turned off, the water pump is activated, and the heater is switched on. The antifreeze fluid flows through the heater to be heated, then returns to the battery pack's cooling plate to achieve heating and insulation for the battery pack.

1.7.4.2. Appearance

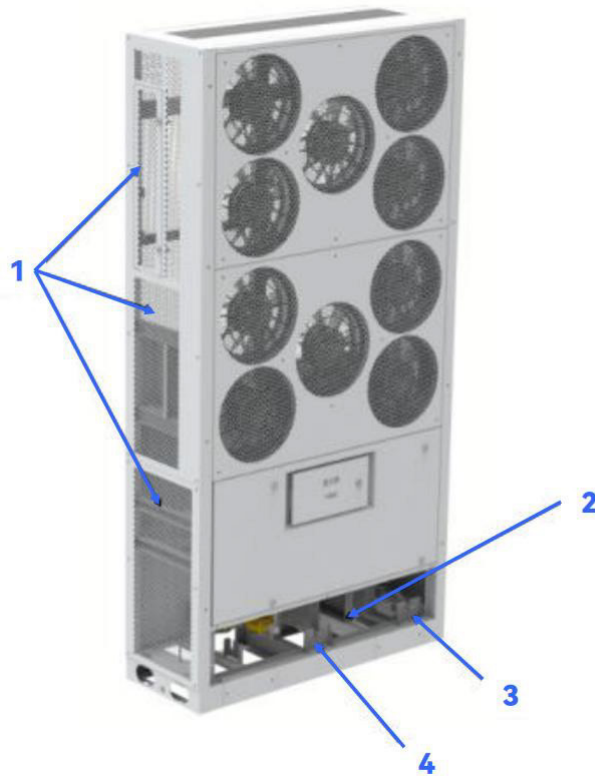


Figure 1-12 40kW Air-cooled liquid chiller

No.	Item
1	Side air intake
2	Front air intake
3	Refill port
4	Infusion port

1.7.4.3. Work Mode

The chiller communicates with the BMS via 485 or CAN communication methods, and there are currently 2 control modes:

Active mode: The BMS sends the cooling target water temperature, heating target water temperature, and control deviation. The liquid cooling unit automatically executes cooling, heating, or self-circulation mode based on the actual water temperature.

Passive mode: The BMS sends the cooling target water temperature, heating target water temperature, and specific operation modes such as cooling, heating, and self-circulation, and the

liquid cooling unit executes the operation mode requested by the BMS.

Mode	Sub-mode	Execution Action
Active Mode	Automatic Mode	The BMS sends the cooling target water temperature, heating target water temperature, and control deviation. The liquid cooling unit automatically executes cooling, heating, or self-circulation mode based on the actual water temperature.
Passive Mode	Cooling Mode	After receiving the cooling mode request and cooling target temperature from the BMS, the TMS activates the cooling mode, and components start in the order of water pump, fan, compressor, etc.
	Heating Mode	After receiving the heating mode request and heating target temperature from the BMS, the TMS activates the heating mode, and components start in the order of water pump, PTC liquid heater, etc.
	Self-circulation Mode	After receiving the self-circulation mode request from the BMS, the TMS activates the self-circulation mode and starts the water pump.
	Shutdown Mode	After receiving the shutdown mode request from the BMS, the TMS activates the standby mode.

1.7.4.4. Technical Parameters

Environment Temperature	
Operating Temperature Range	-30~55°C
Storage Temperature Range	-40~70°C
Humidity	0~95%RH
Altitude	0~4000m (Functional cooling capacity drop ≤3%/km)
Corrosion Resistance Grade	C3
Noise	80dB

IP Protection Level	IPX5
Refrigerant	R410A
Coolant	50% Ethylene Glycol Water Solution
Product Parameter	
Diameter(W*D*H)	1200*440*2200 mm
Weight(without coolant)	540kg
Air Inlet and Outlet Method	Front outlet, side inlet
Water Inlet and Outlet Method	Bottom water inlet and outlet, flange connection
Performance parameter	
Cooling Capacity	40kW (Ambient Temperature 45°C; Outlet Water 18°C)
Heating Capacity	15kW
Water Temperature Range	15~35°C
Circulating Water Flow Rate	350L/min@100kP
Power Consumption	
Cooling Input Power	22kW (Ambient Temperature 45°C; Outlet Water 18°C)
Heating Input Power	16.6kW
Water Pump Self-circulation Input Power	1.6kW
Maximum Power Consumption	27.9kW
Power Supply & Control	
Rated Voltage	380VAC, 50Hz
Voltage Range	323-437VAC, 50Hz
Maximum Operating Current	49.8A@323V
Control Method	RS485, CAN

1.7.5. POC Cabinet



The POC cabinet is mainly divided into three parts: AC collection, auxiliary distribution, and energy management system (EMS).

AC Collection: The AC output side of the PCS cabinet within the system is connected externally through the AC framework circuit breaker in the distribution cabinet. The AC collection system is equipped with a main switch and a surge protector. The container connects to the power grid through the distribution cabinet, with an output mode of AC400V/50(60)Hz, supporting three-phase four-wire connection to the low-voltage power supply network.

Auxiliary Distribution: The auxiliary power supply within the system is divided into two parts: grid power supply and UPS power supply.

Grid power supply is mainly used for the liquid cooling unit, maintenance sockets, lighting, heat dissipation fans, and AC/DC24V switch power supply.

UPS power supply is mainly used to provide energy for equipment that needs to maintain working status during grid disconnection and system power outages. It mainly supplies power to

the BMS system, EMS system, environmental monitoring system, fire protection ventilation system, electricity meters, video surveillance, and other equipment, including the opening and closing of system switching equipment, serving control and protection functions.

EMS is integrated in the container, responsible for the collection and monitoring of the entire container's data, uploading of information and receiving of commands, as well as communication with third-party systems.

2. Transportation & Storage

2.1. Product Transportation

- Transportation Status

The SOC of this product at the time of shipment is 30%~50%. Before shipping, all power circuit disconnection devices are disconnected, and the positive and negative power cables between the battery packs (PACKs) as well as the power cables of the high-voltage box and control box are removed to ensure safety during transportation. This cabinet product is transported as a whole.

- Transportation Requirements

- 1) The dedicated lifting points of the liquid-cooled integrated container assembly are located at the bottom and top corner pieces, and the lifting equipment has the required load capacity;
- 2) The container should be protected from overturning, severe vibration, external impact, and compression during transportation;
- 3) The container can be transported using trucks, trains, ships, and other means of transportation;

2.2. Product Storage

The storage SOC of the ECO-E20FT2170LP-2 container should be maintained within the range of 30%~50%. If customers expect to store it for more than 1 month but not exceeding 3 months, they should perform a charge-discharge cycle in advance to adjust the SOC to 30%~50%. If customers fail to store according to the manufacturer's recommendations, causing capacity loss or other losses, Sunpal will not assume responsibility.

3. Installation

3.1. Main Tools

					
Striping Plier	Torque Wrench	Wire Crimper	Hydraulic Plier	Multi-meter	Electric Screwdriver
					
Insulating Gloves	Anti-arc Flash Suit	Safety Shoes	Ear Protector	Safety Goggles	

3.2. Space Requirement

The external dimensions of the storage system are 6058mm (W)*2438mm (D)*2591mm (H).

The installation site must have enough space to place the container.

1) Single container installation(recommend space)

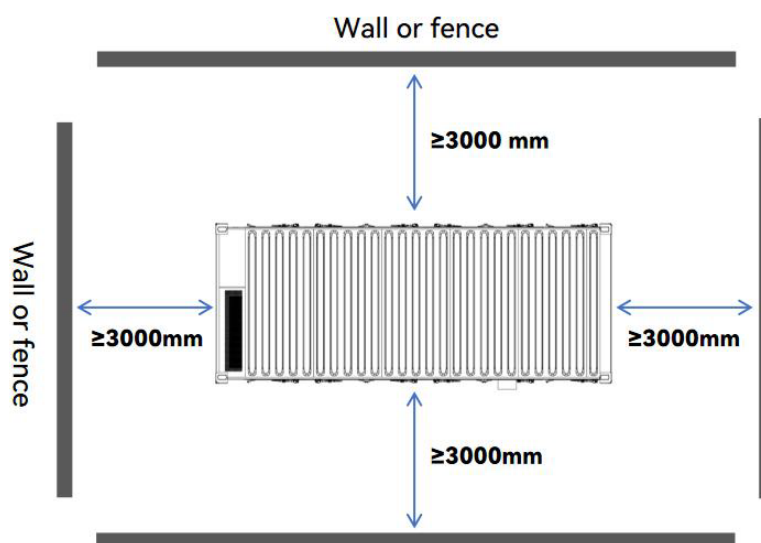


Figure 3-1 Space requirement of single container

2) Multiple containers installation(recommend space)

The container must have a clearance of at least 3 meters in all four directions.

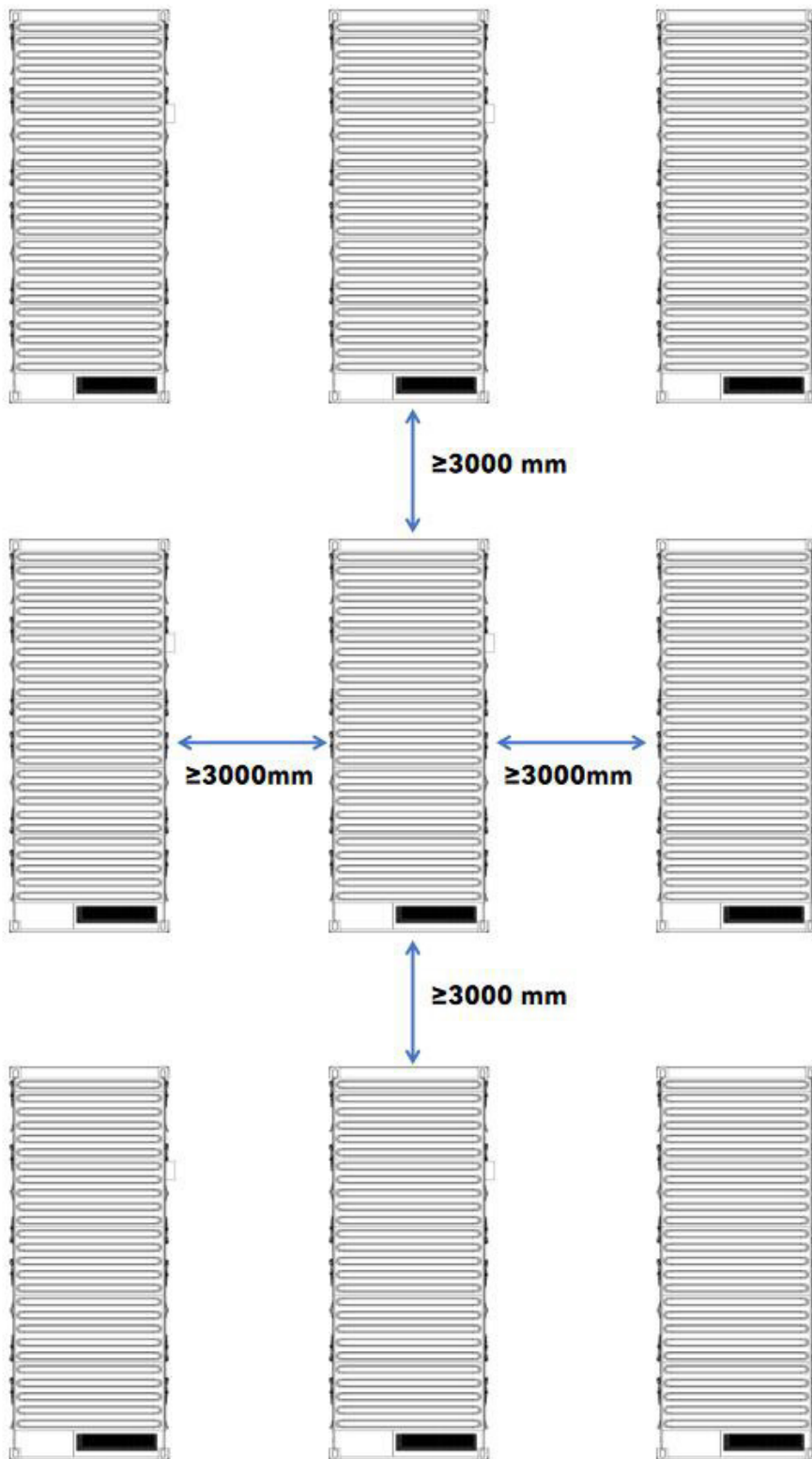


Figure 3-2 Space requirement of multiple containers

3.3. Cable Inlet Size & Position

The cable inlet is located at the bottom of the POC cabinet, with dimensions of 290*490mm. By default, there are 8 holes opened, each with a diameter of 90mm. The specific location is shown in the figure below:

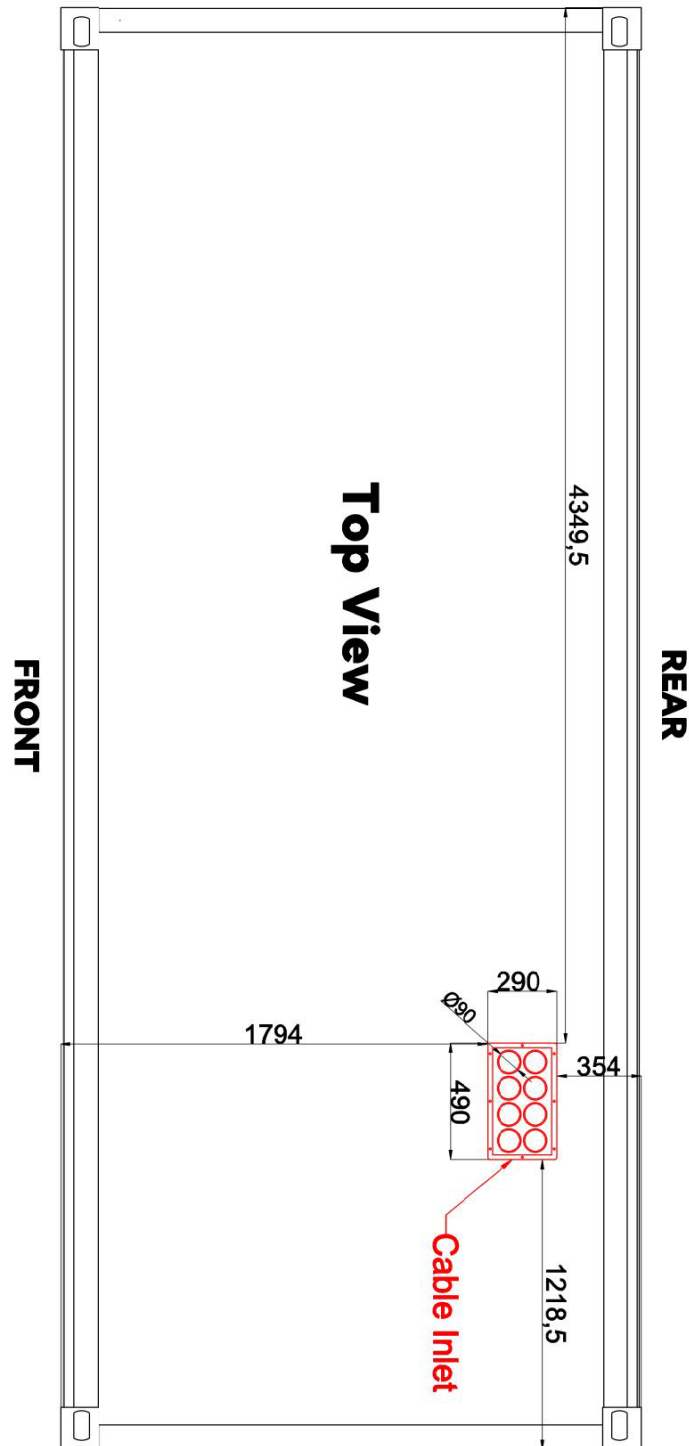


Figure 3-3 Cable Inlet Size & Position

3.4. Foundation Requirement

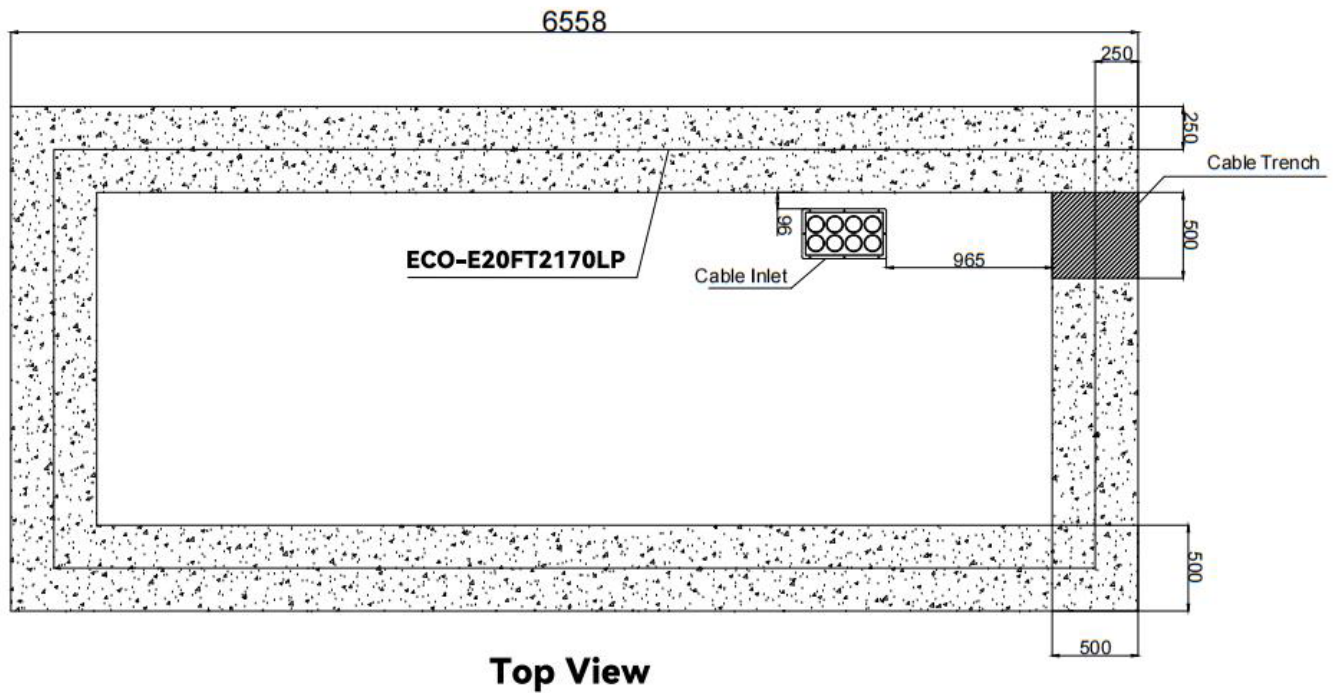
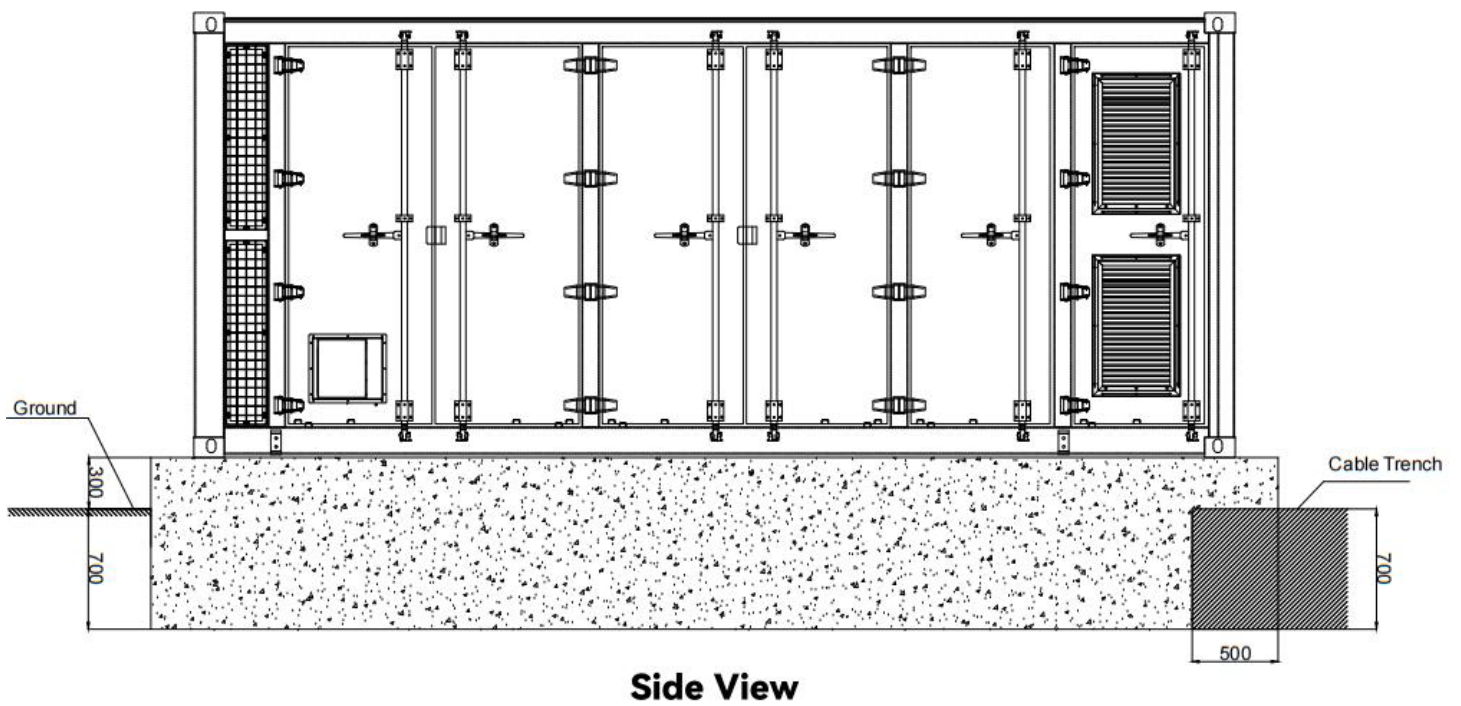


Figure 3-3 Foundation

- This drawing is for reference only; specific requirements should be designed and constructed in accordance with local regulations and building codes.
- For foundation of the container, it is recommended to use a layer of cobblestone compacted to prevent settlement.
- The foundation shall be reinforced concrete, with an embedment depth not less than 600 mm, and have a load-carrying capacity of more than 30T.
- After the container is set onto the foundation, mark, with a fastener, where holes are to be drilled and then drill holes by using an electric driller for embedding expansion bolts.

3.5. Lifting Method

A crane (recommended lifting capacity: 30 – 50 tons) will be used on-site to slowly lift the liquid cooling energy storage system as a whole onto the prepared foundation. The specific lifting method is shown as below.

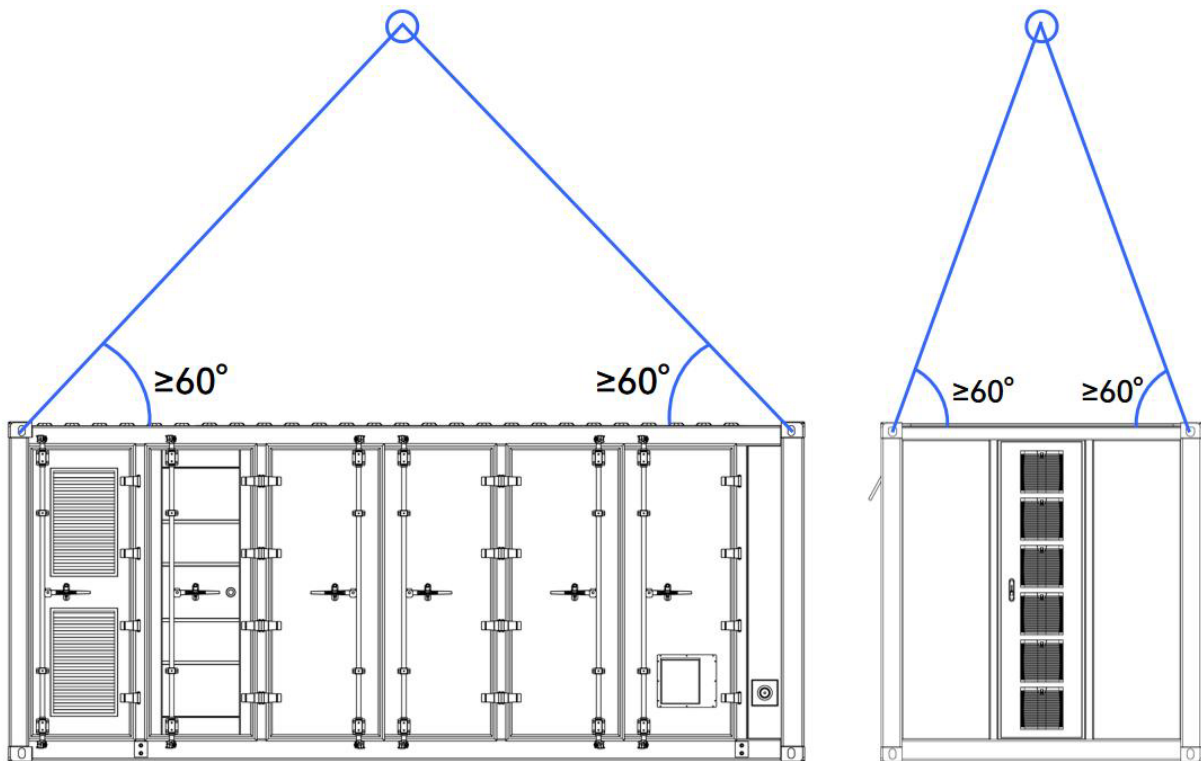


Figure3-4 Lifting angle requirement

It is recommended to use the special latch shown in the Figure3-4 below when lifting.

Please do not directly pass the steel wire rope through the holes to avoid scratching the paint

surface.

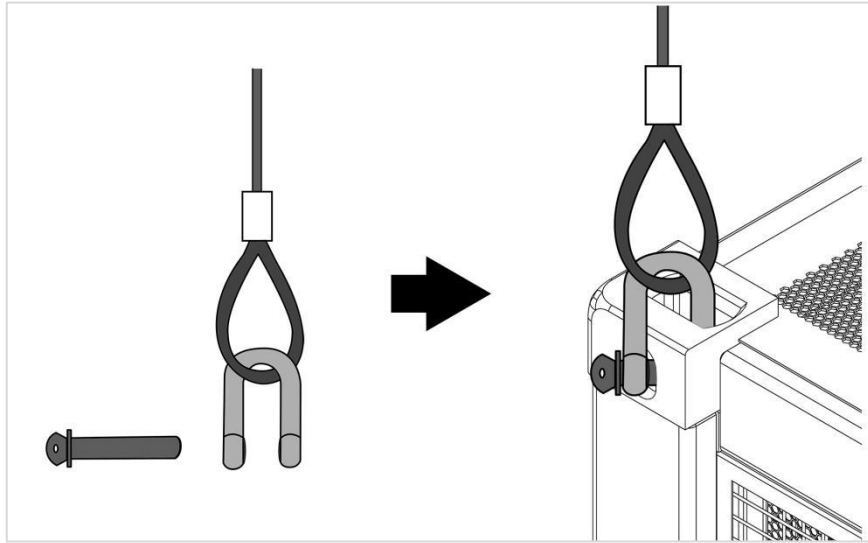


Figure 3-5 Special Latch

3.6. Cable Connection

The installation of ECO-E20FT2170LP-2 is mainly divided to 2 parts: 1. Pack side installation; 2. POC cabinet side.



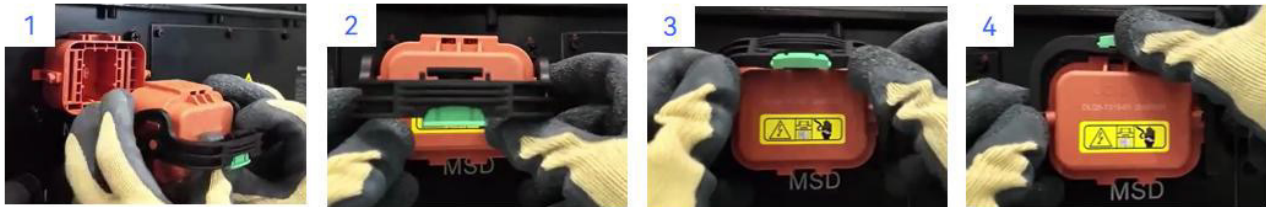
Figure 3-6 Configuration parts

3.6.1. Pack side installation

Before proceeding with the installation, please check if there is any detachment or loosening of the battery DC connection wires and water cooling connection wires between each pack. If such

a condition is found, please halt the installation and report to the Sunpal after-sales department.

If there are no issues mentioned above, please follow the steps below to install the MSD for each pack in sequence.



- 1) Open the handle, make sure at a 90° angle to the connection surface.
- 2) Insert the MSD horizontally.
- 3) After inserting, flip the handle upwards while continuing to push it further in.
- 4) After pushing the handle all the way in, press the central protruding part until you hear a click.

Please ensure that every pack has had the MSD installed (45 units in total) before proceeding to the next step of the installation.

3.6.2. POC cabinet side installation

- 1) AC power connection

At the bottom of the POC cabinet, there are four rows of connectors, as shown in the Figure 3-6 below.

The last two rows are the PCS distribution connectors, which will be pre-connected before shipment.

The container is configured with two output routes by default, so the first two rows are container output connectors for connecting external power cables.

Please connect according to the phase sequence of U-V-W-N from left to right.

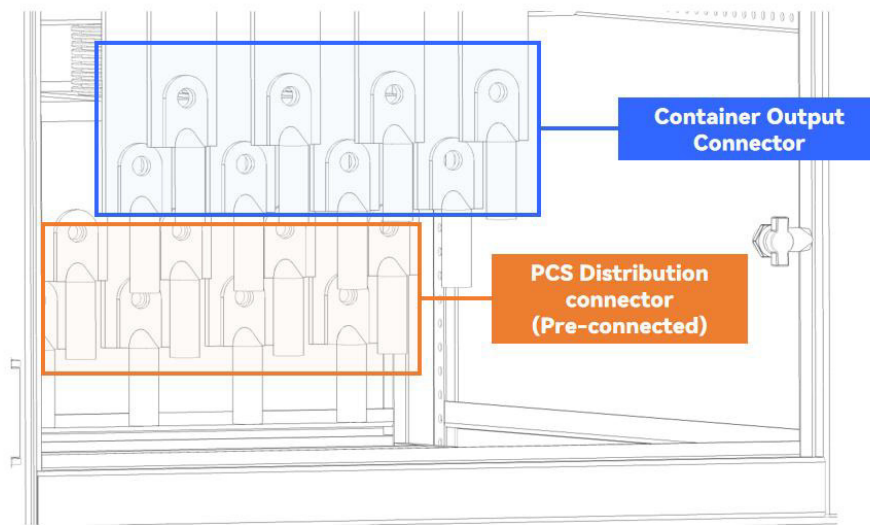


Figure 3-7 Power Connectors inside the POC Cabinet

The recommended specifications for connecting cables are detailed in the table below.

Phase	Bolt Spec.	Max. Voltage and Current	Cable Recommendation
U-phase terminal	M12	Voltage≤460V Current≤1950A	4* Flexible cooper cable 185mm ²
V-phase terminal	M12	Voltage≤460V Current≤1950A	4* Flexible cooper cable 185mm ²
W-phase terminal	M12	Voltage≤460V Current≤1950A	4* Flexible cooper cable 185mm ²
Neutral terminal	M12	Voltage≤460V Current≤1950A	4* Flexible cooper cable 185mm ²
Grounding	M10	/	2* Flexible cooper cable 185mm ²

2) Communication connection

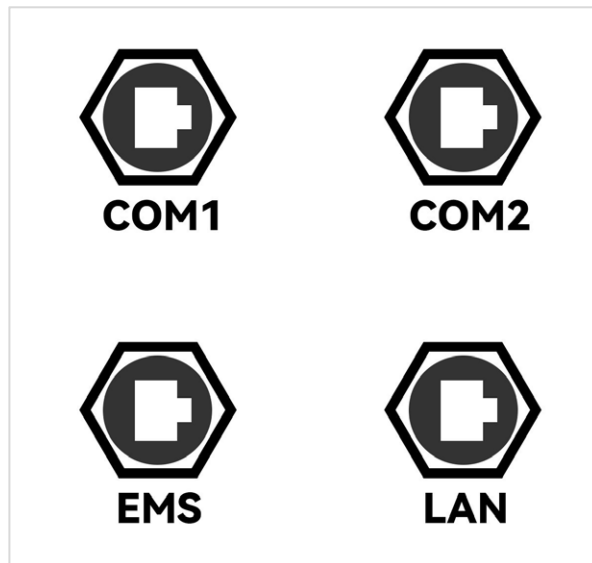


Figure 3-8 External communication terminals

ECO-E20FT2170LP-2 provides 4 external communication terminals inside the POC cabinet, the respective functions are:

COM1: Communication port for PCS cabinet#1

COM2: Communication port for PCS cabinet#2

EMS: Communication port for gateway or third-party EMS

LAN: Communication port for internal switch (pre-connected before shipment), support connection with data card.

3.6.3. Grounding Connection

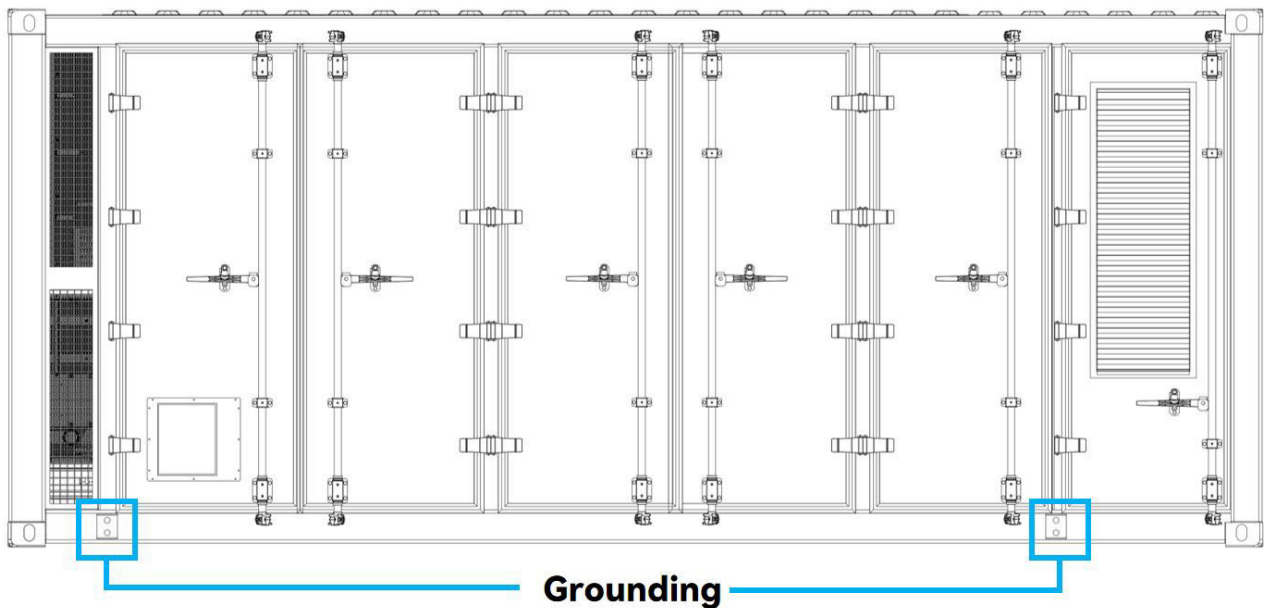


Figure 3-9 Grounding Plate

Each of the two long sides of the container is equipped with two grounding copper bars, complete with M10 bolts, allowing for cabinet grounding at these points. The grounding cables required are two copper core cables of 185 square millimeters each, or other cables of an equivalent current rating.

4. Warranty Precautions

Within warranty period, if there are various issues such as safety concerns, performance degradation, or abnormal attenuation caused by reasons other than the manufacturer's design, manufacturing process, and quality control, Sunpal will only provide technical consulting support and chargeable replacement or repair services, without commitment to free repair or replacement services.

Without permission from Sunpal, do not disassemble or assemble the ECO-E20FT2170LP-2 container and its accessories. If the customer does so without authorization, Sunpal will not assume any responsibility for related accidents and warranty services;

Sunpal assumes no responsibility for issues and accidents caused by unauthorized personnel operations or anomalies not inherent to the product itself:

1. Various issues and accidents resulting from violations of regulations, industry standards, technical agreements, safety usage guidelines, and usage limitations described herein;
2. Anomalies caused by actions of non- Sunpal personnel during the installation and usage process;
3. Problems arising from the use of improper electrical devices in conjunction with this product;
4. Issues resulting from the use beyond the battery performance specifications, i.e., using it outside of its intended range;
5. Direct electrical connection of this product with battery products of other types, models, or manufacturers;
6. Unauthorized modifications to this product without the manufacturer's consent.

More details please refer to Limited Warranty.

5. Safety Usage Guide

To prevent damage to equipment or personal injury caused by misuse of the container, please carefully read the following safety guidelines before using this product:

- Improper use and storage of batteries inside the product pose risks of fire, explosion, and burns. Do not disassemble, crush, incinerate, heat, or throw batteries into fire.
- If you need to replace the battery pack, use the same specification battery pack produced by Sunpal. Mixing batteries from different manufacturers may lead to performance degradation and even risks of fire and explosion.
- Do not immerse battery packs or this product in water or wet them.
- Do not short-circuit, overcharge, or over-discharge battery.
- Do not install, use, or store the product near heat sources (such as fire or heaters), and strictly prohibit the stacking of any flammable and combustible materials around the container.
- Do not puncture the battery pack casing, and prohibit actions such as hitting, throwing, striking, stepping on, pressing heavily, or rolling the batteries.
- Do not disassemble, repair, or modify this product in any way without authorization.
- If the equipment emits an unusual odor, heats up, deforms, changes color, or exhibits any other

abnormal phenomena, immediately cease use and transfer the abnormal battery components to an emergency disposal site.

- In case of a battery fire, immediately cut off the high and low voltage circuits, and use dry powder fire extinguishers, sand, etc., to extinguish it. If using water to extinguish the fire, ensure to use an absolute sufficient amount of water for a prolonged period of submersion, and prohibit using an insufficient amount of water to splash on the battery assembly.
- Without Sunpal's consent, do not arbitrarily disassemble the product itself, modify, or alter the design and structure of the container, to avoid affecting the battery's performance.