

**Jilipow Co., Ltd.**

## Specification of Liquid Cooling Energy Storage System

Prepared by	Checked by	Approved by

Model:JL-ESS-3440-2H-L

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## History of Specification

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### Acronyms and abbreviations

BMS	Battery Management System
BMU	Battery Management Unit
BCMU	Battery Cluster Management Unit
BAMS	Battery Array Management System
BOL	Begin of Life
SOC	State of Charge
SOE	State of Energy
SOP	State of Power
SOH	State of Health
MSD	Manual Service Disconnect
EOL	End of Life
CC	Constant Current
CCCV	Constant Current Constant Voltage
CP	Constant Power
CPCV	Constant Power Constant Voltage

**Definitions of symbols**



**Danger**

This indicates that there are dangers during operation, and failure to comply with such warnings will directly lead to serious personal injury or accidents.



**Warning**

This indicates that there are potential risks during operation, and failure to comply with such warnings may lead to personal injury or accident.

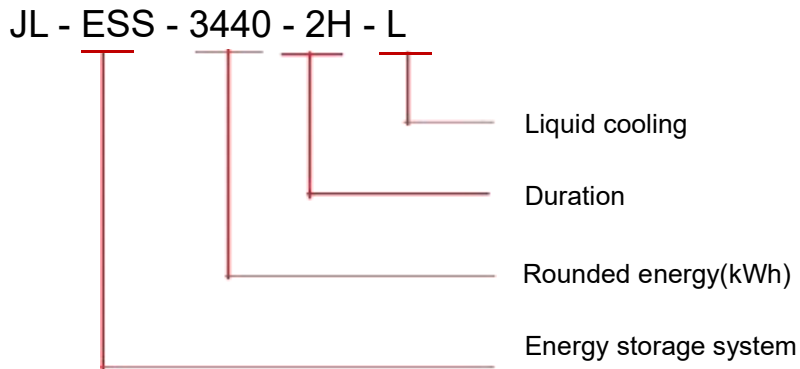


**Caution**

This indicates that there are potential risks during operation, and failure to comply with such warnings may lead to personal injury or accidents.

## 1. Product Model

The definition of product model is shown as follows.



## 2. Scope of Application

The purpose of this document is to specify the specifications of liquid cooling energy storage system: ESS-3440-2H-L, and also provide customers with information on the usage of the specified product. The supply scope of this product is: 20HC battery container; customer's accessories: container external positive and negative output wires, container external output communication wires, low-voltage power cables. The details are as following.

**Table 1 Components of energy storage system**

No.	Sub-parts	Components	Quantity	Remark
1	Battery container	20HC	1	Including distribution and lighting system
2	Battery cluster	Battery pack	80	BP-48-153.6/280-L
		Battery cluster switch gear unit	10	Including BCMU, breaker, fuse contactor, current sensor, etc
3	DC combiner cabinet	DC combiner cabinet	1	
4	Liquid cooling system	Liquid cooling machine	1	Cooling capacity: 45kW Refrigerant: R134a Liquid coolant: 50% ethylene glycol + 50% water
		Liquid cooling pipes	1	Including three-stage pipes
5	Fire suppression System	Fire suppression	1	Including fire suppression machine, external fire extinguishing interface flammable gas sensor, CO sensor, smoke sensor, explosion vent plate in the cabin and ventilation system, etc

**Note:** The specific model, specification and quantity are subject to confirmation before delivery

### 3. Product Specification

**Table 2 Parameters of energy storage system**

No.	Items		Specification	Remark
1	Configuration		1P384S×10	8 battery packs in series per cluster
2	Rated energy		3440kWh	0.5P @25±3℃
3	Rated voltage		1228.8V	
4	Voltage range		1075.2V~1382.4V	Cell voltage 2.8V~3.6V
5	Charge/discharge mode		CC/CCCV/CP/CPCV	
6	Standard charge power/current		1720kW/1400A	
7	Operating temperature	Charge	0℃~55℃	
8		Discharge	-20℃~55℃	
9	Recommended operating environment temperature		20℃~30℃	
10	Charge/discharge efficiency		93%	0.5P@25±3℃,BOL
11	Thermal management		Liquid cooling	
12	Communication		RS485,Ethernet,CAN	
13	Auxiliary power supply		480Vac,50/60Hz	
14	Dimension		L6058×W2438×H2896mm	
15	Weight		About 35T	Subject to actual situation
16	IP rating		IP55	
17	Storage temperature	6 months	0℃-35℃	
18		1 month	-20℃-45℃	
19	Storage/operating humidity		<75%RH,no condensation	
20	Application altitude		≤4000m(Pollution level II)	Derating use above 3000m



## 4. Product Description

### 4.1. System Architecture

This energy storage system adopts the design of 20ft container, including 10 battery clusters system, 1 DC combiner cabinet, 1 set of liquid cooling unit, 1 set of fire suppression and lighting system, etc. The container meets the basic requirements of crane installation, and provides users with bolt fixing method and 2 grounding points that meet the electricity standard requirements.

This container system is characterized by good environmental adaptability, such as anti-corrosion, fireproof, waterproof, dust proof (windswept sand), shockproof, ultraviolet-proof, anti-theft and other functions. The related diagram of this container is shown below:

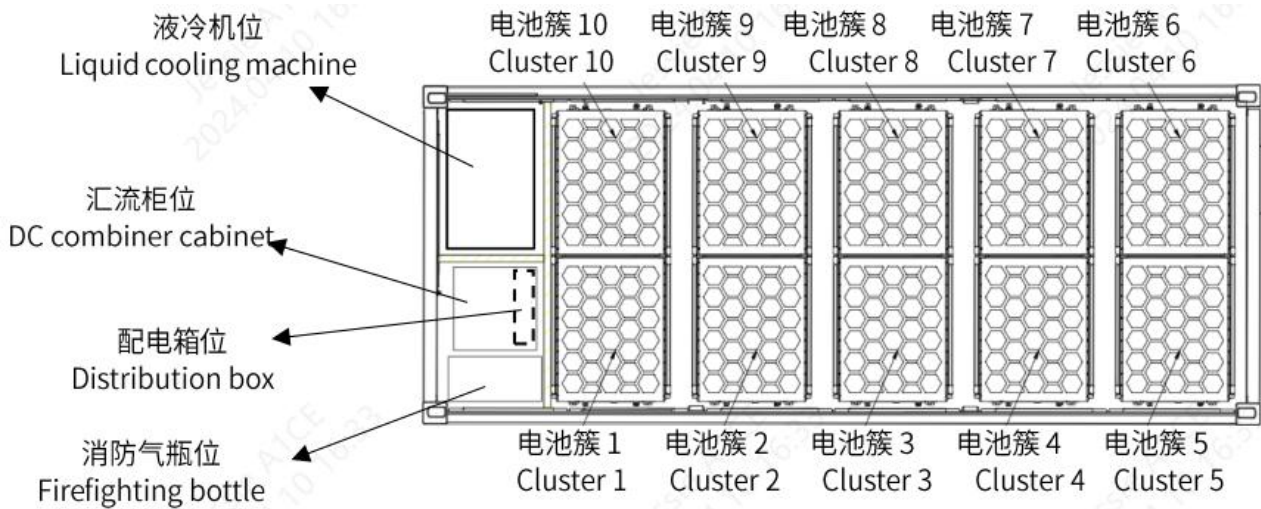


图 1 集装箱设备布局图 (仅供参考, 以实际为准)

Figure 1 The layout of the container (for reference, subject to actual conditions)



Figure 2 The appearance of container (for reference, subject to actual conditions)

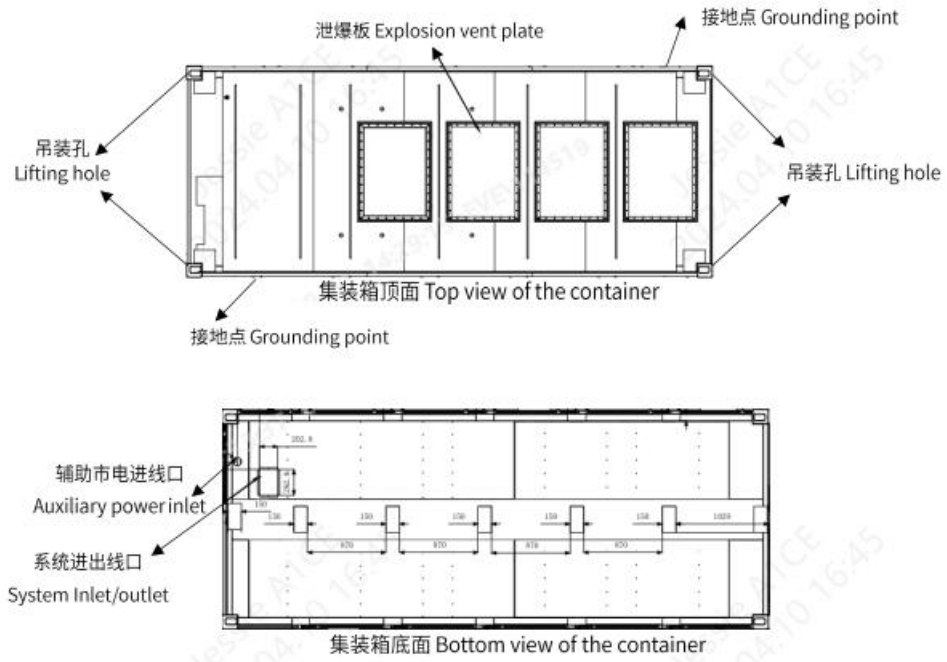


图3 集装箱吊装和接地示意图 (仅供参考, 以实际为准)

Figure 3 The diagram of container lifting and grounding (for reference, subject to actual condition)

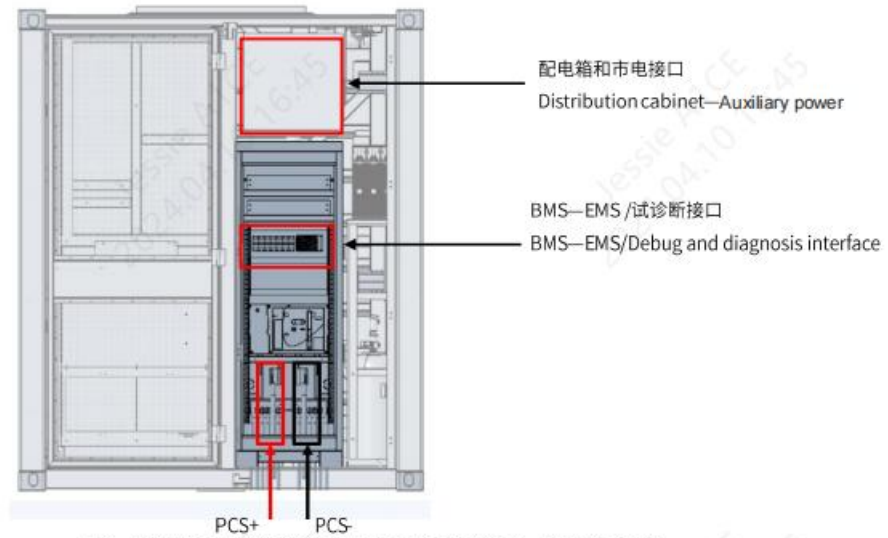


图4 集装箱对外接口位置图示意图 (仅供参考, 以实际为准)

Figure 4 The diagram of container interface (for reference, subject to actual condition)

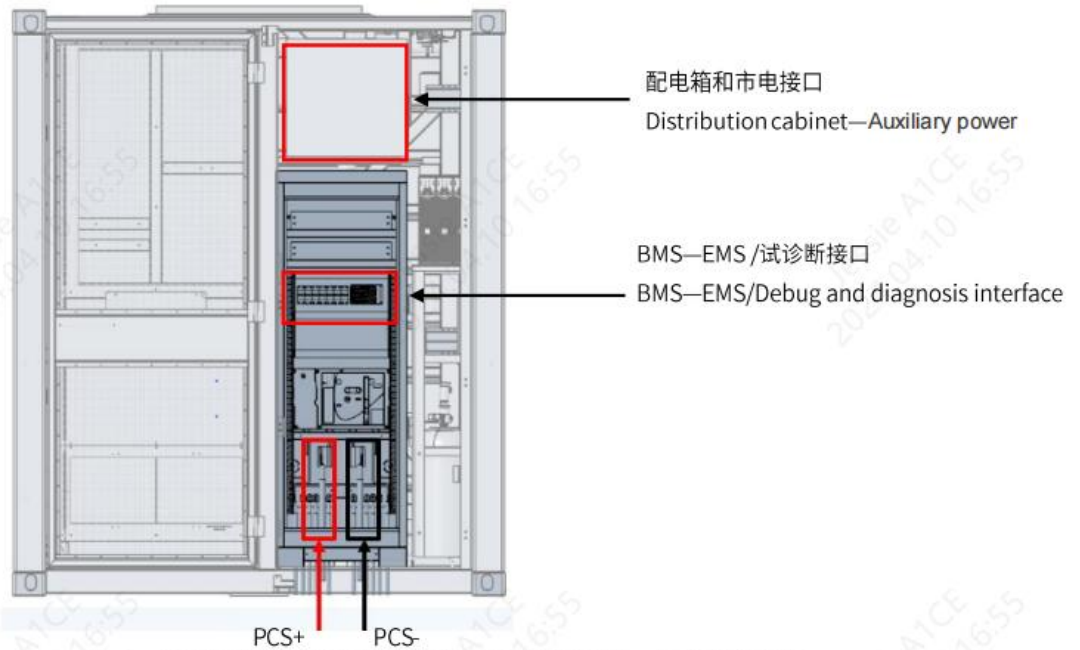


图 4 集装箱对外接口位置图示意图（仅供参考，以实际为准）

Figure 4 The diagram of container interface (for reference, subject to actual condition)

## 4.2. Liquid Cooling System

The thermal management system of this product applies liquid cooling method to control the temperature of the battery system. The integrated liquid cooling unit in the container and reasonable pipeline design are used to realize the effective temperature control of the internal cells of the battery system, so that the working environment of the energy storage system is controlled within the best range, and the service life of the entire system is extended and the operation is safe and reliable.

The liquid cooling unit should have the following four working modes: cooling, heating, self-circulation, and standby.

**Cooling mode:** The compressor is turned on, and the high temperature and high-pressure coolant is released from the compressor to the condenser to cool down and reduce pressure by throttling. Then the refrigerant enters the battery cooler to evaporate and exchange heat with the coolant, and the refrigerant is refluxed to the compressor after endothermic evaporation in the plate heat exchanger. The above processes form a cooling cycle. The water pump is turned on and PTC is turned off; The coolant enters the liquid cooling plate of battery pack to cool down batteries after it's cooled down in the plate evaporator.

**Heating mode:** The compressor is turned off, The water pump and PTC heater are turned on; The coolant is heated by the PTC and then enters the liquid cooling plate of battery pack to heat batteries.

**Self-circulation mode:** The compressor, draught fan, PTC are turned off and the water pump is turned on. The coolant will circulate in the liquid cooling plate of battery pack and unit to bring out heat. This mode is suitable for low load condition during battery charge/discharge process.

**Standby mode:** All the devices are turned off and start to work according to the BMS signal.

**Table 3 Parameters of the liquid cooling system**

No.	Items	Specification	Remark
1	Cooling capacity	45kW	
2	Heating capacity	16kW	
3	Liquid coolant	50%ethylene glycol+50%water	
4	Refrigerant	R134a	
5	Outlet water temperature	20°C	
5	Rated operating voltage	480V,50/60Hz	
6	Maximum consumption power	28kW	
7	Operating temperature	-30°C~60°C	

### 4.3. Fire Suppression System

The container fire suppression system includes fire suppression device, flammable gas sensor, CO sensor, smoke sensor, manual switch, sound and light alarm, sprinkler, pipeline and plugs, etc., such equipped sensor devices will be applied for early fire warning. Once there is a fire, the corresponding sensors will alarm and fire suppression device starts, then the corresponding pipeline partition valve and smoke exhaust system will be turned on, and the sound and light alarm system will feedback signals to the corresponding control system to cut off the external circuit, such series of procedures will start to work at the same time. Then the fire extinguishing agent will quickly be sprayed to the fire area to achieve early fire suppression and continuous cooling, and to inhibit fire re-ignition and battery thermal runaway expansion.

The fire-resistant copper core wires and cables shall be applied for power supply and fire linkage control of the automatic fire extinguishing system. Meanwhile, the automatic fire extinguishing system should introduce a special backup power supply for fire protection to ensure that the normal operation of the fire protection system can be maintained in the absence of AC mains power.

On the side of the container, a DN65 standard water fire protection quick interface shall be reserved and equipped with a water joint cover for fire trucks.

**Table 4 Parameters of fire suppression system**

Product name	The fire suppression system of lithium battery energy storage container
Major component	Including fire suppression machine and sensor(CO sensor flammable gas sensor,smoke sensor)
Inhibition medium	PERFLUORO/aerosol
Operating voltage	220V
Operating environment temperature	-20~55℃
Fire detection method	(CO,combustible gas,smoke)multiple fire detection devices
Other functions	Water /PERFLUORO:when the gas medium in the firefighting bottle is used up,the external water source is available to be employed to spray and extinguish fire

**4.4. The External Interface of Distribution Cabinet**

**Table 5 The External Interface of Distribution Cabinet**

No.	Item	Cable model	Definition	Quantity
1	L1	35 mm <sup>2</sup>	M8	1
2	L2	35 mm <sup>2</sup>	M8	1
3	L3	35 mm <sup>2</sup>	M8	1
4	PE	16 mm <sup>2</sup>	M8	1
5	N	16 mm <sup>2</sup>	M8	1

#### 4.5. The external interface of DC Combiner Cabinet

No.	Item	Cable model	Definition	Quantity
1	PCS+	185mm <sup>2</sup>	M12 hex flange	4
2	PCS-	185 mm <sup>2</sup>	M12 hex flange	4
3	CAN_H	AWG20	Adopt to AWG20 terminal	1
4	CAN_L	AWG20	Adopt to AWG20 terminal	1
5	Closed dry contact 1	AWG20	Adopt to AWG20 terminal	1
6	Closed dry contact 2	AWG20	Adopt to AWG20 terminal	1

### 5. Product Instructions

- 1) The battery system must be operated within the specified charging rate or power. The upper charging voltage shall not exceed the technical requirements of the product to prevent overcharging of the battery, in case that the charge/discharge performance, mechanical performance and safety performance of the battery is influenced.
- 2) The battery system must be operated within the specified discharging rate or power. The lower limit discharging voltage shall not exceed the technical requirements of the product to prevent over discharging of the battery, in case that the charge/discharge performance, mechanical performance and safety performance of the battery is influenced.
- 3) The battery system must be operated within the specified environment, since temperatures being too high or too low would affect battery performance and safety.
- 4) The battery system shall be used or stored in clean and ventilated environment, avoid contact with corrosive substances and be kept away from fire and heat sources.
- 5) The battery system shall not be used or stored in places with strong static electricity and strong magnetic fields to avoid potential safety hazards.
- 6) The product shall not be disassembled or modified without the permission of EVE. otherwise the warranty will be terminated, and our company will not be responsible for any safety accidents.
- 7) Do not mix the battery with metal objects to avoid short circuits and safety risks
- 8) The usage of 3.44MWh battery energy storage system must strictly comply with the above requirements, otherwise the warranty will be terminated, and EVE will not be responsible for any product performance damages or safety accidents.

## 6. Product Maintenance

- 1) If the energy storage system would be stored for a long time, it is recommended to maintain the SOC at 30%~50%
- 2) For a long time, in order to prevent the occurrence of over-discharge, the battery system should be charged every 3 months regularly and be proceeded a charge-discharge cycle every 6 months.

### **Disclaimer:**

These mentioned products shall be used within the scope specified in product specifications. The manufacturer shall be free from liability for any damages to people, animals or property caused by the improper operations in the process of installation, commissioning, maintenance, use, etc., or uses not in accordance with the terms and conditions specified in product specifications.