

Specification of 5MWh Battery Container System

Battery Cell



Fig 1. Lithium Iron Phosphate (LFP) Cell

The battery cell adopts the lithium iron phosphate battery for energy storage. At an ambient temperature of 25°C, the charge-discharge rate is 0.5P/0.5P, and the cycle life of the cell (number of cycles) ≥ 8000 times.

Parameters for 314Ah Cell

No.	Project	Parameter	Remark
1	Product Model	LFP314Ah	
2	Battery Type	LFP	
3	Nominal voltage (V)	3.2	
4	Nominal capacity (Ah)	314	
5	Operation Voltage range (V)	2.5-3.65	Limit range $T > 0^{\circ}\text{C}$
6	Rated charge and discharge rate	0.5P	
7	Energy density	$\geq 170\text{Wh/kg}$	
8	Storage temperature range ($^{\circ}\text{C}$)	$-40\sim 60^{\circ}\text{C}$	Optimum storage temperature: $10\sim 30^{\circ}\text{C}$
9	Working temperature range ($^{\circ}\text{C}$)	Charging: $0\sim 55^{\circ}\text{C}$ Discharging: $-30\sim 60^{\circ}\text{C}$	

Battery Pack

Battery Pack adopts a hierarchical modular design allows for customized configurations, ease of maintenance, and future expansion capacity. The battery Pack consists of 104 single cells, the specification is 1P104S, the power is 104.499kWh, and the nominal voltage is 332.8V.



Fig2. Battery Pack

Parameters for Battery Pack

NO.	Project	Parameter	Remark
1	Cell type	LFP314Ah	
2	Configuration	1P104S	
3	Rated capacity (Ah)	314	
4	Rated energy (kWh)	104.499	100%DOD
5	Rated Voltage (V)	332.8	
6	Rated charge and discharge rate	0.5P	
7	Operating Voltage Range (V)	291.2-374.4V	Cell 2.8-3.6
8	Cooling method	Liquid cooling	

Battery Rack

Each rack of batteries consists of 4 modules.



Fig3. Battery Rack (Two battery clusters)

Parameters for Battery Rack

NO.	Project	Parameter	Remark
1	Combination	1P416S	
2	Battery rack nominal voltage (V)	1331.2	
3	Battery Rack Voltage Range (V)	1164.8—1497.6	2.8-3.6V
4	Rated capacity (Ah)	314	
5	Battery rack nominal capacity (kWh)	417.9	
6	Rated charge and discharge rate	0.5P	
7	Operating temperature range (°C)	Charging: 0~55°C Discharge: -30°C~60 °C	
8	Humidity (%)	0-95%	
9	Cooling method	Liquid cooling	

Battery Container



Fig4. Outside View of 5MWh Battery Container

Standard 20 -foot battery container has two stacks, one side O&M, every container has two out for one PCS.

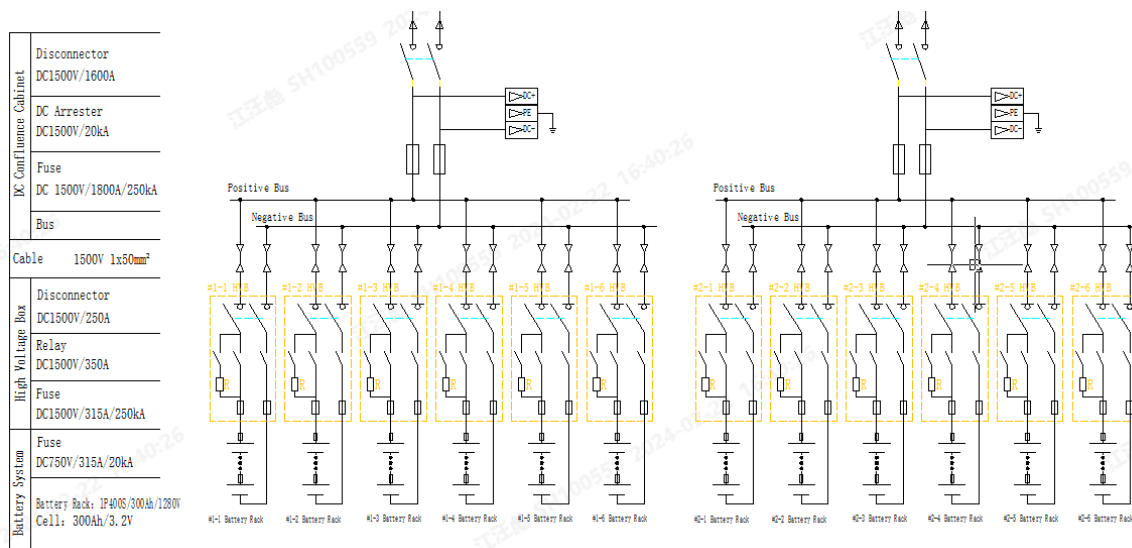


Fig5. Electric Wiring Diagram of Battery Container (for reference)

Parameters for Battery Container

NO.	Project	Parameter	Remark
1	Model	ESD1331-05P5015	
2	Nominal energy(kWh)	5015	
3	Rated voltage(V)	1331.2	
4	Operating Voltage(V)	1040—1497.6	2.5-3.6V
5	Max charge/discharge Power(kW)	2507.5kW	0.5P,25±2℃
6	Operating temperature range	15~45℃	≤0.5P
7	Operating humidity	0-95%	
8	Protection Level	IP54	
9	Cooling method	Liquid Cooling	
10	FSS system	NOVEC1230/Aerosol	
11	Weight(Kg)	≈44000	
12	Altitude	<2000m	
13	Balance Strategy	Passive	
14	Size	6058*2438*2896mm	

Battery Management System Solution

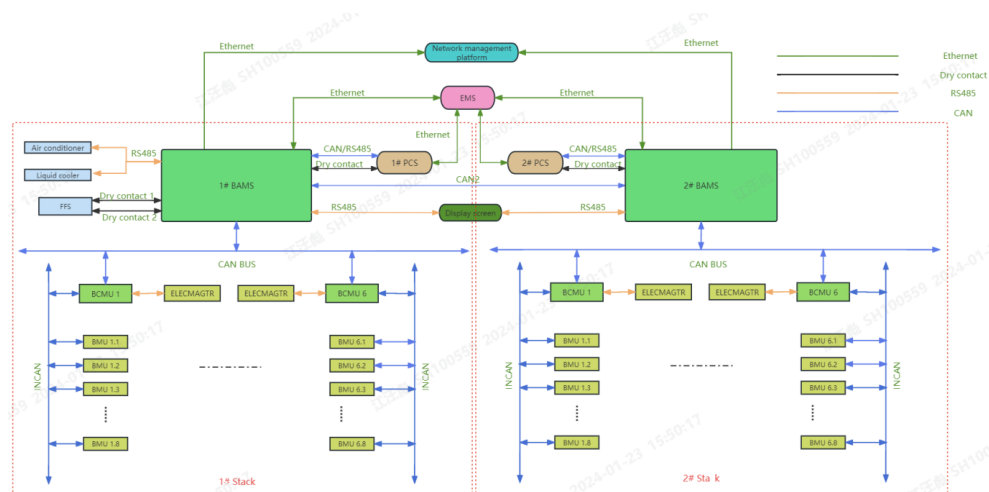


Fig5. BMS Architecture Diagram

The protection and monitoring functions of the battery system are realized by the BMS battery management system. The BMS system of the battery system is managed in three levels, namely L1 BMS, L2 BMS, and L3 BMS. The main functions of each level of BMS are as follows:

L1 BMS (pack level, built into the pack): Monitor the voltage, temperature of a single cell and the total voltage of a single tray, And the above information is transmitted to the upper-level BMS in real time through the CAN protocol, which can control the voltage balance of the single cell.

L2 BMS (rack level, built in the high-voltage box): Detect the total voltage and total current of the entire battery pack, and transmit the above information to the upper-level BMS in real time through the CAN protocol. It can detection the capacity and health status of the battery during charging and discharging, the prediction of power, etc.

L3 BMS (system level, provided when multi-rack batteries are connected in parallel): Collects lower-level MBMS information, and can estimate the remaining capacity and health status of the battery in real time. Communicate with host and external systems through RS-485, CAN, Modbus-TCP/IP. Depending on the complexity of the system, the system BMS can be integrated into the switch box or separately.