80KWH Energy Storage System
Product Specification

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Table of contents

1. Overview

1.1 General

The technical specification applies to the technical and service requirements of the 80 kWH Energy Storage System in terms of functional design, structure, installation and commissioning, supply and after-sales service.

1. 1.1 After confirmation by the buyer and the seller, the technical specification of this project will serve as the technical appendix of the commercial contract and have the same legal effect as the text of the contract.

1. 1.2 Contact method: design liaison meeting, email. Daily contact can be made via telephone, WeChat, QQ and other instant messaging methods. (However, the legally effective contact methods are design liaison meeting and email).

1. 1.3 Matters not covered in this technical specification shall be determined by both parties through negotiation.

1. 1.4 If the commercial clauses in the technical specification are inconsistent with the commercial contract, the commercial contract shall prevail.

1. 2 Technical Standard

The equipment provided by the seller shall be designed, manufactured, inspected and installed with reference to the following standards and regulations.

The main reference standards are as follows:

GB 4208 enclosure protection level (IP code)

GB 7251 Low-voltage complete switchgear

GB/T 191 Packaging, storage and transportation icon marks

GB 51048 Code for Design of Electrochemical Energy Storage Power Stations

GB 7947 Basic and safety rules for human-machine interface sign identification Conductor color or number identification

GB/T 2423.1 Basic environmental test procedures for electrical and electronic products Test A: Low temperature test method

GB/T 2423.2 Basic environmental test procedures for electrical and electronic products Test B: High temperature test method

GB/T 36547 Technical regulations for connecting electrochemical energy storage systems to power grids

GB/T 36548 Test specification for electrochemical energy storage system connected to power grid

GB/T 36549 Operation Index and Evaluation of Electrochemical Energy Storage Power Station

GB/T 4026 Identification of electrical terminals and principles for marking terminals with alphanumeric symbols

GB/T 4942.2 Protection class of low-voltage electrical appliances

GB/T 36547　　Technical regulations for connecting electrochemical energy storage systems to power grids

DL/T 5429 Power System Design Technical Regulations

DL/T 620 Overvoltage Protection and Insulation Coordination of AC Electrical Installations

DL/T 5222 Conductor and Electrical Appliance Selection Design Technical Regulations

Q/GDW 696 Operation control specification for energy storage system connected to power grid

T/CEC 174 Technical Specifications for Remote Centralized Monitoring of Distributed Energy Storage Systems

IEC 60439 Low-voltage switchgear and controlgear assemblies

1. 3 Terms, Definitions, Abbreviations Description

Please refer to the table below for the specific meanings of the relevant terms, definitions, and abbreviations involved in this document:

EMS	Energy Management System
SCADA	Supervisory Control And Data Acquisition
DI	Digital Input
DO	Digital Output
UPS	Uninterrupted Power Supply
PCS	Power Control System
BMS	Battery Management System
BMU	Battery Management Unit

BCMU	Battery Control Management Unit
BAMS	Battery Array Management System

1.4 Overview of Energy Storage System

Energy storage system: the energy storage system is equipped with a 60kWH lithium iron phosphate battery energy storage system and a 30KW MPS; The Lithium iron phosphate battery module, Battery management system, fire protection system, environmental control system, energy management system, MPS and other subsystems are arranged in a standard energy storage cabinet to achieve peak and valley power consumption, demand control, power distribution expansion, standby power supply, photovoltaic consumption and other functions.
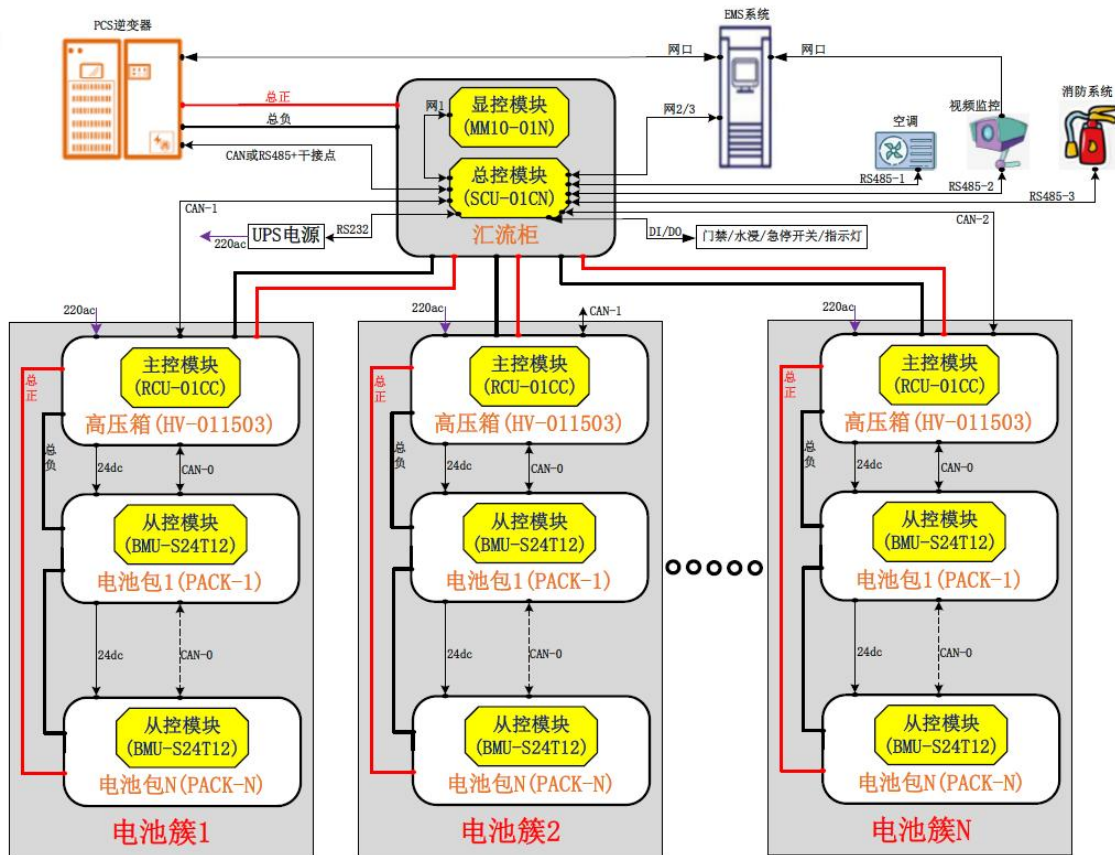
Energy Storage System Topology

2、MPS Hybrid Inverter

2.1 Safe & Reliable

• Built-in isolation transformer for high load adaptability;
• Perfect protection function for inverter and battery;
• Redundancy design for important functions;

2.2 Abundant Configuration

• Integrated design, easy to integrate;
• Support simultaneous access of load, battery, power grid , diesel and PV;
• Built-in maintenance bypass switch, improve system availability;

2.3 Intelligent & Efficient

• Support battery capacity and discharge time prediction;
• Smooth switching between on and off grid, uninterrupted supply of load;
• Operate with EMS to monitor system status in real time;

2.4 Friendly & Flexible

• Various working modes can be set flexibly;
• PV controller modular design, easy to expand;

Model	EMGS30-TM	EMGS50-TM	EMGS100-TM	EMGS250-TM	EMGS500-TM
			Input(MPPT)		
Max. Input Power(kW)	30	50	100	250	500
Max. Input voltage(V)			950		
Voltage range(V)			180 ~ 800		
Full-load voltage range(V)	300V ~ 800V	500V ~ 800V	500V ~ 800V	500V ~ 800V	500V ~ 800V
Max. Current each MPPT(A)			100A		
MPPT String	1	1	2	5	10
			Input(Battery)		
Battery type			lithium /Lead-acid		
Max. Power(kW)	30	50	100	250	500
Voltage range(V)			250 ~ 800		
Full-load voltage range(V)	300 ~ 800		500-800		
Max. Current(A)	100	100	200	500	1000
			Output(On-grid)		
AC output topology			3W+N/3W		
Max. Output power(kVA)	33	55	110	275	550
Rated power(kVA)	30	50	100	250	500
Max. Grid input power(kVA)	60	100	200	500	1000
Rated output voltage(V)			220/380, 230/400, 3W/N+PE		
Rated power frequency(Hz)			50/60		
Rated output current(A)	43	72	144	360	721
PF			1.0lagging-1.0leading		
THDi			<3%		
Transformer			Optional		
			Output(Off-grid)		
Max. Power(kVA)	33	55	110	275	550
Rated power(kVA)	30	50	100	250	500
Rated output voltage(V)			220/380, 230/400, 3W/N+PE		
Frequency(Hz)			50/60		
Rated output current(A)	43	72	144	360	721
PF			1.0lagging-1.0leading		
THDU			<2% linear		
Overload capacity			110% Long-term		
			General data		
Protection		Anti-island protection, DC backconnection protection, insulation detection, direct surge protection, DC short-circuit protection, AC surge protection, etc.			
Operation Temperature(℃)			-25 ~ +55(45℃ derating)		
Relative humidity(RH)			5~95%		
Altitude(m)			4000(2000 derating)		
Cooling mode			Air cooling		
Display			7 inch screen		
Communication			Ethernet/4G/RS485/CAN		
Weight(kg)		350	580	1360	1500
		520*	910*	2080*	2800*
Dimensions W*D*H(mm)		900*1000*1960	1100*1000*1960	2900*1000*2160	4400*1000*2160
Protection class			IP20		
			Standard		
Certificates			TUV CE		
On-grid standard		EN 50549-1, VDE-AR-N 4105, VDE V0124-100, NRS 097-2-1			

3. Energy management system (EMS) (optional)

3.1 EMS Introduction to system functions

The energy management system is an important part of the energy storage system. It provides data management, monitoring, control and optimization for the microgrid dispatch and control center to ensure the stability of the energy storage system. run efficiently. The energy management system

can receive instructions from the superior dispatching system, and can also monitor the operation of each device in the container system.

3.2 EMS Network Architecture

In energy storage system, the EMS communication topology is divided into two layers, the top layer is the general centralized monitoring system system, underlying equipment: PCS, battery management system (BMS), environmental monitoring equipment, The fire protection system and air conditioner are all connected to the monitoring system.

EMS System diagram (for reference only)

The monitoring host completes the network connection, conversion, data collection, local data processing ,protocol conversion and command exchange between on-site measurement and control systems, local user screen monitoring operations ,and control strategies to achieve large capacity The high-speed collection and transmission of real-time data ensures that the main station system can quickly and accurately obtain all monitoring and monitoring information, and timely feedback system abnormalities and faults detected by the network , to ensure fast positioning and recovery.

3.3 EMS Function

(1) Real-time monitoring of power station operation The system can collect real-time and regular data of all monitored operating parameters and states, process important historical data and store them in the database. Includes: BMSThe total voltage ,current ,average temperature, SOC, SOH, charge and discharge current and power limits of each group of batteries in the system , the maximum value battery voltage of a single cell, the maximum value battery voltage of a single cell Common information such as battery temperature ,fault and alarm information ,historical charging and discharging power, and historical charging and discharging power. PCSrelated parameters, including: voltage/current/power of each branch on the DC side, active power, reactive power, voltage, current, power factor, frequency and temperature of each phase on the AC side Temperature ,cabinet temperature ,operating status ,alarm and fault information and other common information ,as well as daily charging

capacity ,daily discharging capacity, cumulative charging capacity ,cumulative discharging capacity, etc. Each phase voltage, current, active power, reactive power and frequency of the load

(2) The power station operation data display system can customize the relevant data required by the user to the designated interface, view real time data and historical data, and export reports;

(3) Real-time scheduling and remote scheduling of power stations According to the difference between the on-site monitoring layer and the general control center for the system demand data, on - site equipment layer of the microgrid power station can freely configure the data to be uploaded to the on-site monitoring layer and the central control center respectively It can be processed and screened by the on-site monitoring layer and uploaded to the master control center. protocol supportMODBUS.

(4) Fault alarm

The system provides recording and query functions for events at all levels, and uses colors to distinguish and manage event types and degrees of importance.

(5) Reports, real-time curves, and energy flow display The system provides real-time curve recording, analysis and query functions, freely select the data to be recorded and analyzed, and present real-time data ,historical data and historical data statistics with curves and bar graphs. Calculated value ,statistical data interval is5minutes ,1 5minutes, 1hours and1 day. The system can customize various reports and analysis charts according to user requirements, and export them

4. System cooling

The main equipment in the electrical room isPCS, EMSsystem, the PCS adopts direct exhaust air cooling for heat dissipation. The temperature of the battery compartment is controlled by an industrial air conditioner.

5. Fire system

S-type aerosol automatic fire extinguishing device

Fire extinguishing principle

The four elements of combustion: combustibles, oxidants, temperature, and uninhibited chain reactions. The extinguishing mechanism of extinguishing gases is to eliminate one or several of the four elements of combustion.

The solid fire extinguishing agent in the S-type aerosol fire extinguishing device is activated by electricity, and undergoes an oxidation-reduction reaction to form a large amount of condensed fire extinguishing aerosols. Its main components are N2, a small amount of CO2, and metal salt solid particles.

The extinguishing mechanism of S-type fire extinguishing aerosol is as follows:

Heat absorption cooling and fire extinguishing mechanism

Metal salt particles absorb a lot of heat under high temperature, and physical endothermic process such as hot melting and gasification occur. The flame temperature is reduced, and then the heat radiated to the combustion surface of combustible materials for gasification of combustible molecules and pyrolysis of vaporized combustible molecules into free radicals will be reduced, and the combustion reaction speed will be inhibited to a certain extent.

Folding fire extinguishing mechanism

a. Gas phase chemical inhibition: Under thermal action, vaporized metal ions or cations that have lost electrons that decompose in extinguishing aerosols can undergo affinity reactions with active groups during combustion, repeatedly consuming a large amount of active groups and reducing combustion free radicals.

b. Solid phase chemical inhibition: The particle size in fire extinguishing aerosols is very small (10-9-10-6m), with a large surface area and surface energy. They can adsorb active groups during combustion and undergo chemical reactions, consuming a large amount of active groups and reducing combustion free radicals.

c. Reducing oxygen concentration: N_2 and CO_2 in extinguishing aerosols can reduce the oxygen concentration in combustion, but their speed is slow, and their extinguishing effect is far less than that of heat absorption, cooling, and chemical suppression.

6. Access control system and lighting

Which cooperate with the access control system. When the door is opened, the conventional lighting is turned on. After the door is closed, the conventional lighting is tuned off. The time guarantee is not less than 30minutes.

7. Lithium battery system

Lithium-ion batteries have high energy density, high conversion efficiency, long cycle life, Memory effect, no charge and discharge delay, low self-discharge rate, wide operating temperature range and environmental friendliness And other advantages, thus becoming an ideal carrier of electric energy, widely used in various fields Wide application. With the intensification of environmental protection problems in recent years, as the best substitute for lead-acid batteries as substitutes, the application trend of lithium batteries is becoming more and more extensive. Compared with the low energy density of lithium titanate and the danger of ternary lithium, the application of lithium iron phosphate has become the preferred configuration for power applications. in addition, compared with the application of traditional lead-acid

batteries, lithium batteries have a safer application solution. The lithium battery pack is equipped with a lithium battery management system with multiple protections (hereinafter referred to asBMS).

7. 1. The main parameters of the cell
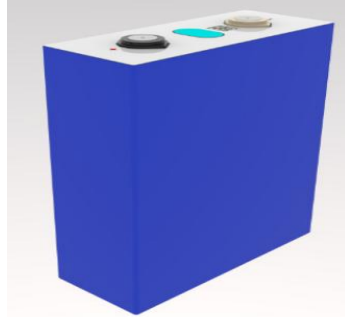
(3.2V100AH lithium iron phosphate battery, pictures are for reference only)

Item	Technical Parameters	Remark
Cell model	200A h	
Nominal voltage (V)	3.2V	
Nominal capacity (Ah)	100 Ah	
Nominal energy (WH)	640 WH	
Standard charging current (A)	40A (1/5C)	
Maximum continuous charging current (A)	100A (1/2C)	
Standard discharge current (A)	100A (1/2C)	
Maximum continuous discharge current (A)	200A (1C)	
Nominal charging voltage (V)	3.65V	
Nominal discharge cut-off voltage (V)	2.5V (temperature > 0°C);	
Internal resistance (mΩ)	≤0.7mΩ	
Weight (kg)	3.8±0.05kg	
Cycles	6000 times (capacity retention ≥ 80%)	
Cell size	Thickness 54±0.5mm; Width 173±0.5mm; Height 204±0.5mm (including pole)	
Storage Humidity Range (RH)	≤85% RH	

7.2 Battery Module

The batteries are assembled into a battery module using a design scheme of 1 parallel 16 series. The technical parameters of the battery module are shown in the table:
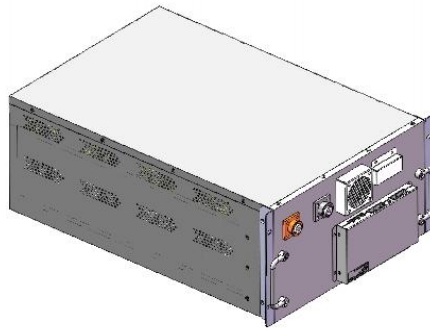
(51.2V200AH battery module, the picture is for reference only)

1 parallel 16 series battery module technical parameters

Item	Technical Parameters	
Composition of battery box	Battery subrack shell; 16S1P battery module; laser welding aluminum row; BMU (including collection harness); output terminal; cooling fan	
Rated voltage (V)	51.2V	
Rated capacity (Ah)	200Ah	
Rated energy (KWH)	10.24KWh	
Cell combination	16 strings and 1 parallel	
Standard charging current (A)	40A (1/5C)	
Maximum continuous charging current (A)	100A (1/2C)	
Standard discharge current (A)	100A (1/2C)	
Maximum continuous discharge current (A)	200A (1.0C)	
Working voltage range (V)	43.2V~58.4V	
Weight (kg)	about 80kg	
Storage temperature range (°C)	-20℃~55℃	
Working temperature range (°C)	0℃~60℃	
Size	Width 442mm (482mm including mounting ears) 500mm deep 280mm high	

7.3 Battery Cluster

Every 8pcs 51.2V200Ah battery modules and a set of high-voltage boxes constitute a battery cluster. The parameters of the battery cluster are as follows:

(409.6V200AH battery cluster, pictures are for reference only)

Battery cluster technical parameters

project	Technical Parameters	Remark
Battery Cluster Composition	8 battery sub-boxes ; 1 main control high-voltage box (including BCMU, relay, power supply); connecting wire	
Rated voltage (V)	409.6V	
Rated capacity (Ah)	200Ah	
Rated energy (KWH)	82.92KWh	
Standard charging current (A)	40A (1/5C)	
Maximum continuous charging current (A)	100A (1/2C)	
Standard discharge current (A)	100A (1/2C)	
Maximum continuous discharge current (A)	200A (1C)	
Working voltage range (V)	352V~467.2V	
Storage temperature range (℃)	-20℃~55℃	
Working temperature range (℃)	0℃~60℃	

7.4 Battery system

1 cluster of 409.6V200AH battery clusters and one set of BAMS master control modules form a 81.92 KWH energy storage battery system. Each battery cluster controls the input and output of battery power through a high-voltage box (including BCMU), and then performs parallel cluster control through the master control.

7.5 Battery Management System (BMS)

The battery management system (BMS) is a three-level network architecture,

BMU (Battery Module Monitoring Unit) battery pack monitoring unit, which integrates the functions of battery operation information monitoring and collection, charge/discharge balance management, fault diagnosis, etc.

BCMU (Battery Control Management Unit) branch control unit, BCMU collects the information of all battery modules through the BMU, and at the same time collects the total voltage and current of the whole cluster of batteries, and through the cooperation with the electrical protection components in the high-voltage box of the cluster, the battery cluster is charged and discharged Alarm and protection for the abnormality of the battery pack during the process;

BAMS (Battery Array Management System) battery stack control unit, the management unit performs numerical calculation, performance analysis, alarm processing and record storage for the real-time battery data uploaded by BCU, and alarms and protects the abnormality of multi-cluster parallel battery stacks.

BMS system function

Analog measurement function: It can measure the voltage and temperature of the single unit in real time, and measure the terminal voltage and current of the battery pack and other parameters. Ensure the safe, reliable and stable operation of batteries, ensure the service life requirements of single batteries, and meet the requirements for optimal control of the operation of single batteries and battery packs.

Online SOC diagnosis: On the basis of real-time data collection, it adopts multiple modes and segmented processing methods to establish an expert mathematical analysis and diagnosis model, and online measures the remaining power SOC of each battery.

Battery system operation alarm function: When the battery system is in overvoltage, undervoltage, overcurrent, high temperature, low temperature, communication abnormality, BMS abnormality and other states, it can display and report alarm information.

Battery system protection function: In case of serious battery overvoltage, undervoltage, overcurrent (short circuit) and other abnormal fault conditions that may occur during operation, the high voltage control unit can quickly cut off the battery circuit, isolate the fault point, and output alarm information in time.

Ensure safe and reliable operation of the system.

Communication function: The system needs to have the communication function (RS485) with the DC converter and the communication function (LAN) with the energy management system.

Thermal management function: Strictly monitor the operating temperature of the battery pack. If the temperature is higher or lower than the protection value, the thermal management start signal will be output. If the temperature reaches the set dangerous value, the battery management system will automatically link with the system protection mechanism, and timely Cut off the battery circuit to ensure the safety of the system.

BMS has a self-diagnosis function, which can self-diagnose failures such as communication interruption between BMS and the outside world, abnormal internal communication of BMS, abnormal collection of analog quantities, etc., and can report to the local monitoring system.

Balance function: battery passive balance technology

Operation parameter setting function: BMS operation parameters should be able to be modified remotely or locally in the BMS or energy storage station monitoring system, and some parameter modifications require password confirmation.

Local operating status display function: BMS can display various operating statuses of the battery system locally, such as system status, analog information, alarm and protection information, etc.
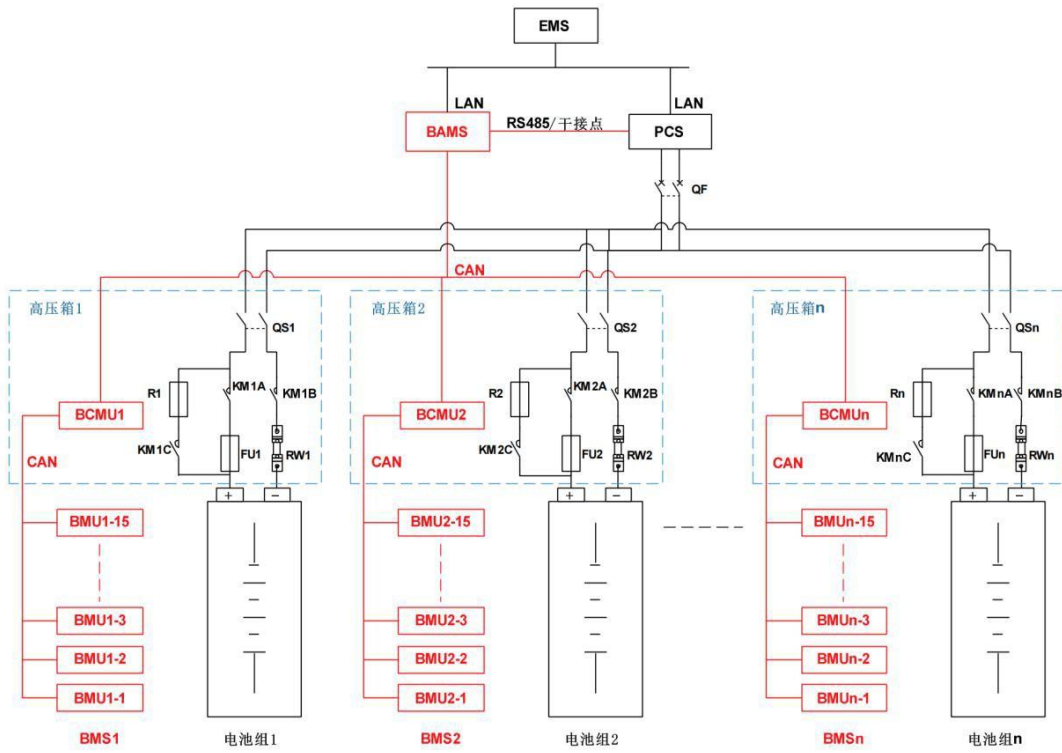
Event and log data recording function: BMS can store a certain amount of various events and log data of the battery system locally.

BMS technical parameters

project	describe	Technical Parameters	Remark
Operating Voltage	Normal working voltage and power consumption	Rated voltage: 9-36VDC (with reverse polarity protection) Rated power: 600mW (without load)	
Working environment		Working temperature: -20℃~65℃ Storage temperature: -40℃~125℃ Relative humidity: 5~95%RH Atmospheric pressure: 80~110KPa Altitude: 0~4000m	
Total voltage acquisition		Acquisition range: 0~1500V Acquisition resolution: 0.1V Acquisition accuracy: total pressure ≤1000V	

		(≤±1%FS); total pressure ≥1000V (≤±0.5%FS) Acquisition speed: Refresh 100ms Electrical isolation: 4149VDC/2934VDC (8mm)	
Total current collection		Acquisition range: ±1200A (determined according to the range of Hall sensor) Acquisition resolution: 0.1A Acquisition accuracy: ±1%FS Acquisition speed: Refresh 200ms Electrical isolation: 4149VDC/2934VDC (8mm)	
Insulation collection		Acquisition range: 0~10MΩ Acquisition accuracy: 500V~1500V, above 600KΩ, accuracy ≤10% Acquisition speed: 60S (adjusted according to the Y capacitor value of PCS equipment) Electrical isolation: 4149VDC/2934VDC (8mm)	
Temperature acquisition		Acquisition range: -40°C~125°C Acquisition resolution: 1°C Acquisition accuracy: -20°C~65°C, accuracy ≤1°C -40°C~125°C, accuracy ≤2°C Acquisition speed: Refresh 2s	
Active output Maximum continuous discharge current (A)	Support 4 high-side drive outputs (total positive, negative, pre-charge, etc. relay control)	High-side output current: 4- channel total current 7.2A , single-channel maximum 3.3A High side output voltage range: 9~32Vdc High side output power rating: 43.8W High side output instantaneous power: 72W	
	Support 4 low-side drive outputs (total positive, negative, pre-charge, etc. relay control)	Low-side output current: single-channel current up to 1.2A , continuous 0.55A Low-side output voltage range: 9~32Vdc Low-side output power rating: 84W Low-side output instantaneous power: 120W	
Dry contact	Reserve 2 dry contacts	Dry contact specification: 24VDC/1A	
Digital signal input detection	Support 8 digital input detection: 4 high-level DI detection;	High voltage range: 9~32VDC	
SOC estimation	Realize SOC calculation and SOC fault alarm	Accuracy: ≤5%	
Data record	History data record/fault data record	Storage space 128MB	
Internal parameter storage		Memory 512KB	
CAN communication	1 way non-isolated CAN 1 way isolated CAN	Baud rate: 250k	
RS485 communicatio	2-way isolated RS485	Baud rate: 9600kb	

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BMS topology map

8. List of energy storage system equipment

Serial number	Name	Model	Unit	Qty	Remark
1	Energy storage cabinet	(length*width*height) 1800mm*1100mm*2500mm	PCS	1	Including air duct, emergency lighting , smoke detector; protection level of outer box IP54
2	Battery cluster	409.6V200AH (81.92kWH)	PCS	1	Each set contains 12 battery modules and 1 set of high voltage box
3	Battery module	51.2 V200 Ah (10.24 kWh)	PCS	8	3.2V100AH battery cell 16S1P, slave control BMU
4	Battery cluster rack	Floor + side wall fixed, IP20, 2 columns and 5 floors	PCS	1	
5	High voltage box	DC1000V200A contactor, DC fuse, shunt, power supply module etc.	PCS	1	matchingBCMU
6	BMU slave	16 String × 3.2V Lithium iron phosphate battery, collection, monitoring and management, Passive balance with temperature acquisition module	PCS	8	In the matching battery module
7	BCMU master	Real-time monitoring and summary of the data of the battery acquisition management module, group voltage, insulation detection, contactor control, etc.	PCS	1	Supporting high pressure box
8	BAMS master control	Information collection, analysis, storage functions, and PCS communication, contain 1 display panel	PCS	1	Supporting battery control cabinet
9	Display module	10.1-inch display screen, 3-point capacitive touch, 1 network port, 4 USB ports, 1 TF card;	PCS	1	Supporting battery control cabinet
10	PCS	30KW	PCS	1	
11	Industrial Air Conditioning	220VAC 1KW	PCS	1	With 485 communication
12	Fire warning equipment	Smoke	PCS	1	
13	Fire Fighting System	Smoke sensor, temperature sensor, fire alarm control host,	PCS	1	

		heptafluoropropane gas, alarm bell, gas release indicator, manual module, input module etc.			
15	Energy management system EMS	EMS host, touch screen, switch, monitoring software, etc.	PCS	1	Optional
16	Illumination	General lighting and emergency lighting	PCS	1	

9. Paint and corrosion protection

Carry out proper paint or other effective anti-rust and anti-corrosion treatment on the equipment. The paint should meet the requirements of JB/T6886 to meet the long-distance transportation conditions and the needs of a large number of hoisting, unloading and long-term open-air stacking to prevent rain and snow from damp, Rust, corrosion, vibration, and mechanical and chemically induced damage.

10.   Packaging

10.1 All equipment and accessories have fixed nameplates. The nameplate is not easily damaged. The logo is eye-catching, neat and beautiful.

10.2 According to the drawings, the important parts are marked with the assembly number, the material used and the mark of qualified inspection at a certain position.

11.   Transportation

11.1 The seller transports the complete set of products to the project installation site.

11.2 The equipment transportation and packing dimensions of this project, the shape, weight and volume of the goods to be transported shall comply with the relevant international transportation regulations, and the delivery location shall be referred to in the business terms.

11.3 Product packaging, transportation, and storage should comply with the relevant provisions of the business terms.

12.   Service Commitment

12.1 Emergency response time: response within 8 hours, rush to the customer site if needed.

12.2 Out-of-warranty maintenance: only the cost of replacement spare parts is charged, and the response time is the same as 12.1.