Address: Economic Development Zone of Hangbu town, Shucheng County, Lu'an, China		
Tel:+86-0564-8030526	Post Code:231300	Web: www.lvwo-energy.com

110KW/215KWh Liquid-Cooling Energy Storage Integrated Device Procurement Project

Technical Specifications

Anhui Lvwo Energy Technology Co., Ltd.

April 28th,2024

CONTENT

1 General Principles

1.1 This technical agreement applies to the technical requirements of Anhui Lvwo Energy Technology Co., Ltd. for the 125KW/233KWh liquid-cooling energy storage integrated device system, including:
(1) Technical requirements for device selection, functional design, etc. for battery system, PCS, liquid cooler, BMS and high-voltage box.
(2) Technical requirements for device material technical parameters, structure, performance and testing.
1.2 The measurement unit is the national legal measurement unit.
1.3 The supplier shall provide the purchaser with complete technical information, system control strategy and operating instructions, as well as factory reports and compulsory inspection reports of battery cells and important components.
1.4 Any matters not covered in this agreement shall be handled by negotiation between the two parties.

2 Environmental Conditions

The supply address of this project is located at Economic Development Zone of Hangbu town, Shucheng County, Lu'an, China. If the purchaser requires the supplier to provide installation and commissioning services, the purchaser must provide an installation site and ensure that there are no dangerous sources such as flammable and explosive materials in the installation area. For projects that require the construction of installation foundations, the purchaser must ensure that there are no underground water, gas, and electricity pipelines at the location or that the existing conditions do not affect the foundation construction.

3 Device Specifications

3.1 Device, including all device and accessories purchased by the supplier, shall comply with the requirements of relevant standards, specifications or regulations.

3.2 Unless otherwise specified in the agreement, the latest national standards (GB) and International Engineering Committee (IEC) standards and International System of Units (SI) standards shall be complied with. If joint venture or cooperative products are used, the national standards of the partner shall also be complied with. When the above standards are inconsistent, the higher standards shall be implemented.

3.3 All bolts, studs, threads, pipe threads, bolt clamps and nuts shall comply with the standards of the International Organization for Standardization (ISO) and the International System of Units (SI)3.

3.4 The main current standards to be followed are:

GB/T36276-2018	Lithium-ion batteries for power storage
GB/T36547-2018	Technical regulations for access to the grid for electrochemical energy storage systems
GB/T36548-2018	Test specifications for access to the grid for electrochemical energy storage systems
GB/T34131-2017	Technical specifications for lithium-ion battery

	management systems for electrochemical energy storage power stations
GB/T34120-2017	Technical specifications for energy storage converters for electrochemical energy storage systems
GB21966-2008	Safety requirements for lithium primary cells and batteries in transportation
GB4208-2008	Enclosure protection grade (IP code)
DL/T621-1997	Grounding of AC electrical devices
GB50217-2007	Design specifications for power engineering cables
GB14048.1	Low-voltage switchgear and control device
Q/GDW 1564-2014	Technical regulations for energy storage system access to distribution network
GB/T 17626	Electromagnetic compatibility test and measurement technology
GB/T 14549	Power quality Public power grid harmonics
GB/T 15543	Power quality Three-phase imbalance
GB/T 15945	Power quality Power system frequency deviation
GB 7251	Low-voltage complete switchgear and control device

4 Delivery Scope

Figure 1 110KW/215KWh Liquid-Cooling Energy Storage System

Device introduction:

Cell: lithium iron phosphate, 3.2V/280Ah;

Battery pack: 1P48S, 153.6V/280Ah; 24 temperature points;

Battery cluster: 5 battery boxes, 1P240S, 768V/280Ah, capacity is 215.04kWh;

Single cluster is connected to 1 PCS with a power of 110kW;

Charge and discharge rate is 0.5C, rated current is 140A.

The configuration list of a single 110KW/215KWh liquid-cooling energy storage device is as follows:

No.	Component Name	Specifications	Unit	Quantity	Remark
1	Energy storage integrated machine	110kW/215KWh	set	1	Included
1.1	PCS Converter	110kW	set	1	3P+N+PE Non-isolated
1.2	Energy storage battery system	215KWh	set	1	1P260S
1.3	Liquid-cooling device	3.2kW	pcs	1	
1.4	BMS	/	set	1	
1.5	EMS	/	set	1	
1.6	Cabinet fire fighting system	Perfluorohexanone	set	1	
1.7	STS		set	1	Not included, need to be purchased separately
1.8	Grid-connected box/cabinet				Not included, need to be purchased separately
1.9	Project cable				Not included, need to be purchased separately

System single set parts list:

No.	Name	Specifications	Brand
1	Slave control	QT-SBMU-52T52M0	Lvwo
2	Cluster control	QT-SBCU-3131	Lvwo
3	EMU	QT-EMU-3905B	Lvwo
4	High voltage box	QT-HBOX-1000V250A	Lvwo
5	Energy storage inverter	125kW Energy storage converter	YUNT, SINEXCEL
6	Thermal Management System	3.2KW Liquid-cooling device	DunAn,Envicool
7	Backup power system	R-1K Standard device UPS	DELTA
8	Cabinet level firefighting system	Energy storage power station fire fighting	Chuangwei-Fire fighting
9	Battery box	1P52S	Lvwo

5 Device Technical Requirements

5.1 Cell Technical Parameters

The battery cell of the 110KW/215KWh liquid-cooled energy storage integrated solution uses the LFP71173207/280Ah battery cell specially used by Xiamen Lithium Energy Storage Co., Ltd. The cycle life reaches 10000cls (25°C, 100%DOD, 0.5P @70%SOH).

No.	Basic Index	Parameters/Specifications	Remark
1	Cell model	LFP71173207/280Ah	Square aluminum shell
2	Cell type	Lithium iron phosphate	
3	Cell capacity	280Ah	25±2°C,0.5P standard charge-discharge as new battery status
4	Cell rated voltage	3.2V	
5	Maximum charging voltage	3.65V	
6	Discharge cut-off voltage	2.5V@T＞0°C；2.0@T≤0°C	
7	Standard charging current	0.5C	25±2°C
8	Standard discharge current	0.5C	25±2°C
9	Maximum continuous charge and discharge power	1P	25±2°C
10	Charge and discharge times	≥10000 Times(@70%)	Initial clamping force 300±20 Kg, Standard charge-discharge test
11	Monthly self-discharge rate	≤3%	25°C,50%SOC, New batteries after 3 months of storage
12	Internal resistance (Max at 1000Hz)	0.18mΩ±0.05mΩ	New battery status 27%SOC,1kHz
13	Weight	≤5.43±0.20 kg	
14	Operating temperature	Charge：0~60°C	
15		Discharge:-30~60°C	
16		Storage:-20~45°C	
17	Dimension	Thickness:71.65±0.8mm	
18		Width:174.7±0.8mm	
19		Height: 207.11±0.8mm	

5.2 Battery Module Technical Parameters

The liquid-cooling battery pack consists of 48 cells connected in series, with a specification of 1P48S, a power of 43kWh, and a nominal voltage of 153.6V. The BMS configured in the battery pack has a passively balanced BMU module, which is used to collect parameters such as the voltage and temperature of the module.

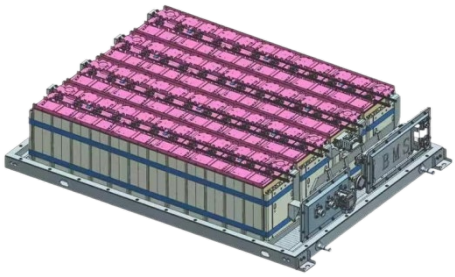


Figure 2 Battery Module Schematic

No.	Basic Index	Parameters/Specifications	Remark
1	Battery pack dimension	1148mm(L)*810mm(D)*250mm(H)	
2	Nominal capacity	280Ah@0.5C,25℃	
3	Nominal voltage	153.6V (48cells)	
4	Operating voltage range	120~175.2V	
5	Rated continuous charge-discharge rate	0.25C@25℃	
6	Maximum continuous charge-discharge rate	1P@25℃	
7	Weight	266KG	±3kg
8	Rated energy	43kWh	
9	Insulation standard	Battery box insulation resistance≥1GΩ (1000VDC)	
10	Pressure resistance standard	2830VDC, No breakdown phenomenon, Current leakage<10mA	Start at 50% rated voltage
11	Cell maximum charging voltage	3.65V	Protection voltage setting: 3.65V
12	Cell minimum discharge voltage	2.5V	Protection voltage setting: 2.5V
13	Discharge overcurrent protection current	280A@5S	
14	Charge high temperature protection	55℃	Battery pack temperature
15	Discharge high temperature protection	55℃	Battery pack temperature
16	Charge low temperature protection	0℃	Battery pack temperature
17	Discharge low temperature protection	-20℃	Battery pack temperature
18	Cycle times	≥8000 Times (70%SOC)	25℃@0.5C Charge-discharge

5.3 Battery System Technical Parameters

The battery system consists of 5 standard battery modules with specification 1P240S.

No.	Basic Index	Parameters/Specifications	Remark

1	Dimension	965mm(W)*1300mm(D)*2290mm(H)	
2	Nominal capacity	280Ah@0.5C,25℃	
3	Nominal voltage	768V (240cells)	
4	Operating voltage range	600V-876V	
5	Continuous charging rate	0.5C@25℃	
6	Continuous discharge rate	0.5C@25℃	
7	Cycle life	≥8000 Times(0.5C@25℃,70%SOC)	
8	Weight	2430Kg	
9	Energy	215kWh	
10	Insulation standards	Battery box insulation resistance ≥200MΩ(1000VDC)	
11	Pressure resistance standard	2830V DC, No breakdown phenomenon, Current leakage<20mA	Start at 50% rated voltage

5.4 BMS System Technical Indicators

The battery box integrates 48 series and 1 parallel batteries. QT-SBMU-52T52M0 is used to collect 48 series voltages and 48 battery temperatures. The SBMU is placed inside the battery box.

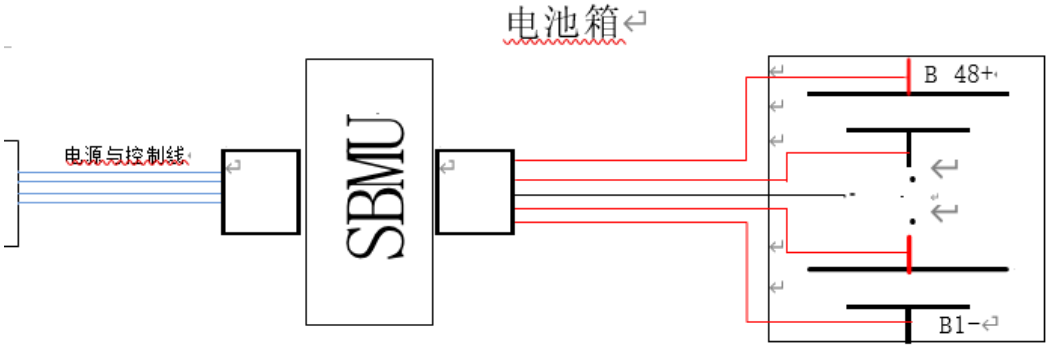


Figure 3 Battery Box Collection Design

5.4.1 BMS Function

(1) Analog measurement function: It can measure the single cell voltage, temperature, battery pack terminal voltage, current and other parameters in real time. It ensures the safe, reliable and stable operation of the battery, guarantees the service life requirements of the single cell, and meets the requirements for the operation optimization control of the single cell and battery pack.

(2) Online SOC diagnosis: Based on real-time data acquisition, it adopts a multi-mode segmented processing method to establish an expert mathematical analysis and diagnosis model to measure the remaining power SOC of each battery online. At the same time, it intelligently corrects the SOC prediction according to the battery discharge current and ambient temperature, and gives a battery remaining capacity and reliable use time that is more in line with the changing load.

(3) 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.

(4) Battery system protection function: For abnormal faults such as severe overvoltage, undervoltage, overcurrent (short circuit) of the battery that may occur during operation, the high-voltage control unit can quickly cut off the battery circuit, isolate the fault point, and output sound and light alarm information in time to ensure safe and reliable operation of the system.

(5) Communication function: The system has the function of communicating with the energy storage PCS (can/RS485) and the integrated monitoring and management system (LAN).

(6) Thermal management function: The operating temperature of the battery pack is strictly monitored. If the temperature is higher or lower than the protection value, a thermal management start signal will be output. The system can be equipped with a fan or a heat preservation and heat storage device to adjust the temperature; if the temperature reaches the set dangerous value, the battery management system automatically links with the system protection mechanism to cut off the battery circuit in time to ensure system safety.

(7) Self-diagnosis and fault-tolerant function: The battery management system adopts advanced self-fault diagnosis and fault-tolerant technology, and has self-checking function for the module's own software and hardware. Even if there is an internal fault or even device damage, it will not affect the safety of battery operation. The energy storage system will not fail due to a battery management system failure, and even cause battery damage or a serious accident.

(8) BMS has a self-diagnosis function, which can self-diagnose faults such as interruption of BMS communication with the outside world, abnormal internal communication of BMS, abnormal analog acquisition, etc., and can report to the local monitoring system.

(9) Balancing function: Supports 24-way passive balancing, and can charge or discharge any two batteries in the battery pack at the same time, thereby effectively improving battery consistency and extending battery life. 1.8A≤balancing current≤2.2A, balancing efficiency 85%.

(10) 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.

(11) Local operation status display function: BMS can display various operating states of the battery system locally, such as system status, analog information, alarm and protection information, etc.

(12) Event and log data recording function: BMS can store a certain amount of 10,000 events and log data of the battery system locally.

(13) The BMS system operation interface is divided into two categories of personnel, operators and installers, each with their own permissions and password settings.

5.4.2 BMS Product Features

(1) Real-time monitoring of the voltage and temperature of the single cell;

(2) Real-time calculation of the SOC and SOH of the single cell;

(3) The module has active balancing, which improves the consistency of the battery pack and effectively extends the battery life;

(4) The module has dry contact output, which can be used for on-site alarm or control;

(5) The module has a CAN communication interface, which can upload data and alarm information in real time to achieve remote monitoring of the battery pack;

(6) Modular design, easy installation, use and maintenance, and the modules are isolated from each other and have high reliability.

5.4.3 BMS Technical Parameters

No.	Index	Technical Parameters	Remark
1	Working power supply	DC 24V±15%	
2	Cluster terminal voltage acquisition range	0~1000V	
3	Cluster terminal voltage acquisition accuracy	≤±0.2%FSR	
4	Current acquisition range	0～±200A	
5	Current acquisition accuracy	≤±5‰	
6	Temperature acquisition accuracy	±1℃	
7	Balance current	1.8A≤Balanced current≤2.2A	
8	SOC estimation	8%	
9	Protection	Short circuit, overcharge, over discharge, over temperature	
10	Communication	CAN、RS485	

5.5 PCS Technical Parameters

5.5.1 PCS Design Logic

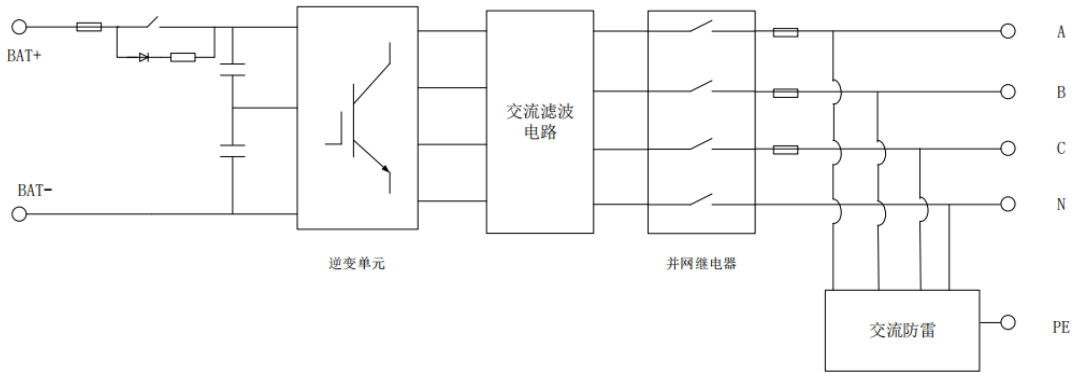


Figure 4　PCS-110 Main Circuit Diagram

(1) PCS converter can realize AC/DC conversion between power grid and battery, complete the bidirectional energy flow between the two, and is the main actuator and core component of energy storage system.

(2) It adopts three-phase four-bridge arm topology structure, has the ability of single-phase and three-phase active and reactive power control, and can accurately solve the three-phase imbalance problem.

(3) It supports multi-machine parallel connection and has good scalability. This system uses 1 110kW module in parallel operation. Considering the high reliability requirements of military use, it can be used in both mutual backup mode (output 110kW) and parallel mode (single system 110kW high power output).

(4) It supports active and reactive power regulation function.

5.5.2 PCS Technical Parameters

Marks-110KT inverter parameters:

Basic indicators	**PCS-110**
Battery parameters	
Battery operating voltage range	580V-1000V
Battery maximum charging current	190A
Battery maximum charging power	110kW
Battery maximum discharge power	132kW
Maximum conversion efficiency	≥98%
Voltage regulation accuracy	±2%
Current regulation accuracy	±5%
Ripple factor	<1% V_0
AC part parameters	
Rated voltage	400V(-20%~+15%)
Rated current	160A
Rated power	110kW
Voltage format	Three-phase four-wire(3P+N+PE)
Frequency range	45-55Hz/55-65Hz
Rated frequency	50/60Hz
Maximum AC	110kVA

input/output power	
Power factor	0.99 Lagging -0.99 Leading
Current harmonic THDi	< 3% (Fully loaded)
Voltage harmonic THDu	≤2%
Current DC component	≤0.5%
Overload capacity	110%——Long term，120%——1 minute
Charge and discharge conversion time	<100ms
Unbalanced load capacity	100%
Other parameters	
Protection level	IP20 (Indoor)
Noise	≤75 dB(A)@1m
Heat dissipation method	Intelligent air cooling
Humidity	0%-95% No condensation
Maximum altitude	6000m (Derating when above 2000m)
Built-in isolation transformer	None
Operating temperature range	-30℃-+55℃
Weight	90kg
Communication	
Communication interface	RS485/CAN

5.5.3 Function Requirements

(1) Active power control function: the PCS energy storage device can control its active power output according to the instructions of the microgrid operation control system. To achieve the active power regulation function, the battery energy storage system can receive and track the active power control signal sent by the microgrid operation control system in real time, and automatically adjust the active output according to the control instructions of the microgrid operation control system and other signals. The output active power deviates from the set value by no more than 3%.

(2) Voltage/reactive power regulation function: the PCS energy storage device can track and adjust the reactive output in real time according to the control instructions of the microgrid operation control system and other signals. Its parameters such as reactive power and power factor can be remotely set by the microgrid operation control system.

(3) Off-grid V/F control function: the PCS energy storage device has the voltage and frequency regulation function in the off-grid mode, and can automatically set the rated voltage and rated frequency to start and run. It can also receive external voltage setting instructions and frequency setting instructions to adjust the voltage and frequency.

(4) Off-grid soft start function. In off-grid mode, the PCS energy storage device can start smoothly, reduce the impact

current, and reduce the impact on the microgrid. The system can operate stably from standby to rated voltage in less than 2s.

(5) The PCS energy storage device has an active island detection function. In the island state, it can detect the island state within 500ms and report the fault information through the monitoring system.

(6) The PCS energy storage device has a certain ability to withstand voltage abnormalities. The allowable deviation of the three-phase voltage at the AC output end is +15% and -15% of the rated voltage (adjustable)

(7) The PCS energy storage device has a certain ability to withstand system frequency abnormalities in the grid-connected mode and can operate under the grid frequency deviation shown in Table 6-2 (adjustable).

Operating time requirements of battery energy storage systems when grid frequency is abnormal

Frequency range	Operation requirements
Below 47.5Hz	Determined by the minimum frequency allowed for the PCS energy storage device to operate
47.5 Hz～49.5Hz	Each time it is lower than 49.5Hz, it is required to be able to operate for at least 10 minutes
49.5 Hz～50.2Hz	Continuous operation
50.2 Hz～51.5Hz	Each time the frequency is higher than 50.2Hz, the battery energy storage system should be able to operate continuously for 2 minutes
Above 51.5Hz	Stop power supply within 0.2s

(1) The cooling method of the PCS energy storage device is air cooling.

(2) The PCS energy storage device has two operating modes, grid-connected and off-grid, and can realize the grid-connected and off-grid switching function according to conditions (it needs to cooperate with STS to realize automatic grid-connected and off-grid switching (power-off time <15ms)). In the off-grid operation mode, it meets the relevant requirements of power quality. Note: The off-grid load capacity is determined by the load characteristics.

(3) The PCS energy storage device meets the battery's power quality requirements when charging the battery. During constant current charging, the steady current accuracy is ≤1% (at 20%~100% of the rated output current), and the current ripple is ≤5%.

(4) After the PCS energy storage device is connected to the power grid, the three-phase voltage imbalance at the public connection point shall not exceed the limit value specified in GB/T 15543-2008 "Three-phase Voltage Unbalance of Power Quality", and the negative sequence voltage imbalance at the public connection point shall not exceed 2%, and shall not exceed 4% for a short time; the negative sequence voltage imbalance caused by the PCS energy storage device shall not exceed 1.3%, and shall not exceed 2.6% for a short time.

(5) The PCS energy storage device has a human-machine interface and communication functions, and the staff can operate it locally and remotely.

(6) The PCS energy storage device has a certain overcurrent tolerance capability. 1.1 times for 10 minutes, 1.2 times for 1 minute. When the output current of the PCS energy storage device is 1.1 times the rated current, it will run continuously for 10 minutes; when the output current of the PCS energy storage device is 1.2 times the rated current, it will run continuously for 1 minute.

(7) The PCS energy storage device has an overheating protection function. In any case where the main heating components inside the PCS energy storage device: such as IGBT temperature, transformer temperature, and reactor temperature exceed the allowable value, the PCS energy storage device stops supplying power to the grid. After returning

to normal, the PCS energy storage device can work normally.

(8) The PCS energy storage device has three-phase imbalance and phase protection functions. When the three-phase on the AC output side of the PCS energy storage device is unbalanced or the phase detected after connecting to the grid is wrong, the PCS energy storage device stops working.

(9) The PCS energy storage device can form a microgrid system. The PCS energy storage device works off-grid and can form a microgrid with photovoltaic inverters, wind power generation equipment, loads, etc. The PCS energy storage device can output stable voltage and frequency. When the three-phase load imbalance of the PCS is less than 15%, the output voltage and frequency can remain stable. When the photovoltaic inverter, wind power generation equipment, other power sources and loads are arbitrarily put into (cut off), the change and recovery of the output voltage and frequency meet the relevant power quality requirements.

(10) When the power grid loses power, the energy storage system can automatically switch to the off-grid state, and the switching time is less than 20ms. When the power grid changes from power failure to normal power supply, the energy storage system can automatically switch to the grid-connected state and execute the grid connection.

5.5.4 Protection Performance Requirements

The energy storage device is equipped with both hardware fault protection and software protection. The protection function is well configured, the protection range overlaps, and there is no dead zone, which can ensure the safety of the system under various fault conditions.

(1) AC side protection: mainly includes: AC overvoltage protection, AC undervoltage protection, AC side overcurrent protection, AC frequency overlimit protection, surge overvoltage protection, phase sequence error protection, etc.

(2) DC side protection: mainly includes overcurrent, DC overvoltage protection, DC undervoltage protection, DC reverse connection protection, etc.

(3) Other protections: overtemperature protection, fan fault protection, emergency shutdown protection, communication fault protection, etc.

When the above faults occur, the energy storage device will shut down for protection, and the human-machine unit will display the fault information. When the fault is restored, it is divided into automatic reset, manual reset (fault clearing command), and power-off reset according to the fault type.

5.5.5 Monitoring Requirements

The device has the following monitoring functions:

(1) Telemetry: device output current, grid voltage/current, grid voltage frequency, power factor, etc.;

(2) Telesignaling: device working status (running/stopping/fault), input over-voltage, under-voltage, over-temperature, over-current, etc.;

(3) Remote control: power on/off.

(4) Remote adjustment: power and current setting, operation mode setting, etc.

Upload: the energy storage device uploads alarm information, simulation information, etc. to the background monitoring system.

Download: the background monitoring system sends remote control information to the energy storage device.

(5) Human-computer interaction: in local mode, the monitoring interface includes the main wiring diagram, system information, event record, system settings, power on/off, local remote, control strategy, login and logout, and each submenu has a corresponding function.

(6) in remote control mode, the main wiring diagram, system information, event record, login and logout,

(7) The energy storage device can save at least 200 action reports and operation records, which will not be lost during power outages.

5.5.6 Communication Requirements

(1) The PCS energy storage device has communication interfaces such as RS485/CAN and LAN, and supports MODBUS protocol and CAN2.0 protocol.

(2) When the system only has PCS and BMS, it is recommended that BMS be connected to PCS.

(3) When the system is configured with EMS, PCS and BMS, it is recommended that BMS and PCS communicate with EMS independently to prevent the communication framework between PCS and BMS from being messy and the logic from being unclear;

(4) The RS485 of PCS can be connected to EMS or BMS (not at the same time); the CAN port can only be connected to BMS; the LAN port can only be connected to EMS.

(5) When EMS queries PCS data, the execution interval needs to be greater than 500ms; when EMS sets PCS general parameters or control commands, the execution interval needs to be greater than 1s; when EMS sets PCS scheduling parameters (active power, reactive power, DC current setting, DC power setting), the execution interval cannot be greater than 500ms.

5.6 EMS Technical Parameters

This equipment uses QT-SCU-5819B model equipment from Qualtech as the energy storage management system. The display screen of the equipment communicates with SBCU via ModbusTCP to achieve high-flow data transmission. The screen runs local EMS and BMS, which can display charging and discharging information, scheduling strategy control, total voltage, total current, SOC, maximum and minimum single cell voltage, temperature information, alarm information, etc. In addition, the above main information can be saved, SD card can be connected, data can be exported, and the capacity of the hard disk can be expanded externally.

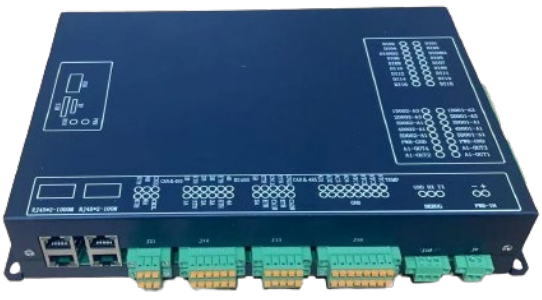


Figure 5 QT-SCU-5819B Panel

The energy management system and monitoring system are the core of the coordinated control of the entire system, an important part of the coordinated operation, and an important tool and guarantee for achieving efficient, stable, safe and reliable operation of the system and maximizing the use of renewable energy.

5.6.1 Energy Management System Hardware Parameters

The EMS hardware management parameters are as follows:

Motherboard Resources	CPU	NXP IMX8MP Cortex-A53@1.6GHz
	Running memory	2GB DDR4
	FLASH storage	16GB eMMC
	Network Interface	2-way 10/100/1000 Gigabit Ethernet, RJ45 interface with ACK, LINK indicator
		2-way 10/100M Ethernet, RJ45 interface with ACK, LINK indicator light
	Communication interface	1-way RS232 serial port, baud rate 115200bps; 3Pin-3.81 spacing Phoenix terminal
		2-way CAN, 3Pin-2.0 pitch PHB socket; 3Pin-3.81 pitch Phoenix terminal; configurable terminal matching resistor
		6-channel RS485, baud rate 9600~115200bps; 3Pin-3.81 spacing Phoenix terminal; with isolation protection; configurable terminal matching resistor
		1-way TTL-A53 debug serial port, baud rate 115200bps; 1-way TTL-M7 debug serial port, baud rate 115200bps;
		4G mobile network-mini-pcie interface
	USB/SD/SSD	1-way USB2.0, TYPE-A
		1-way USB-OTG, TYPE-C
		1-way SD card, 128GB capacity Recognizable
		SSD mobile storage hard disk
	Extension interface	Plug-in SIM card slot (standard SIM card)
		16-way DI
		6-way DO
		4-way NTC temperature sensor (±1℃)
		ADC
		4-way analog inputs (12bit, 1%)
	Video	10.1-inch screen (1280*800@350cd), LVSD signal, with touch function
	Other circuits	RTC clock, hardware watchdog, indicator light, reset circuit
Structure parameters	PCBA single board size	230mm x 145mm
Electric	Rated input voltage	DC 24V (supports 9-32V input)
	Working humidity	10%~65% non-condensing

Characteristics	Working temperature	-20℃~70℃
	Storage temperature	-40℃~85℃

5.6.2 Software Features

(1) It can configure remote charging and discharging strategies, and has functions such as anti-reverse flow, anti-overcapacity, and demand control.

(2) It has a remote emergency cut-off function.

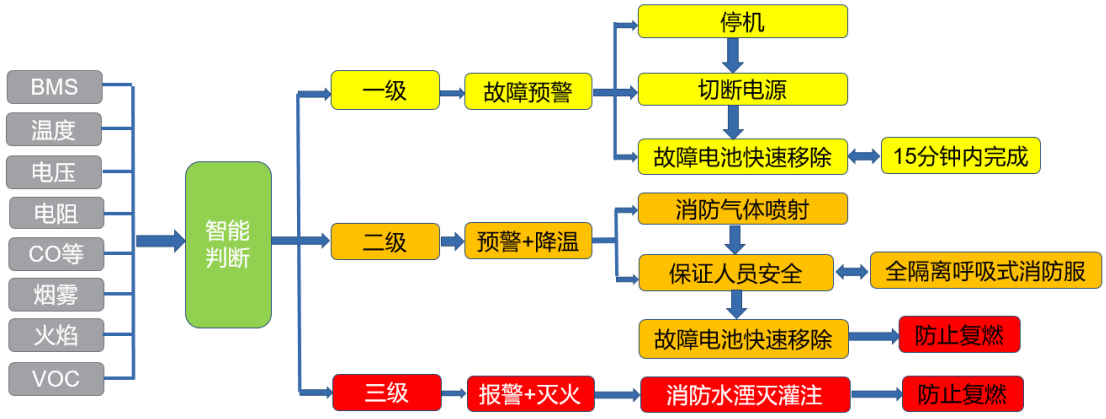
(3) It has a large-screen display on the cloud platform, which can display all statistical information of the battery system, such as total voltage, total current, total SOC, maximum cell voltage, temperature, minimum cell voltage, temperature, insulation, alarm, etc. It can display system charging and discharging capacity, power curve and other information.

(4) It has permission management. When there is sufficient permission, the system alarm parameters can be set.

(5) It has historical data storage, and can be configured with a 32G SD card to store data at a fixed time. The saved historical data can be opened and viewed through EXCEL.

5.7 Fire Fighting System Technical Parameters

In order to ensure the safety of energy storage power stations, the selection and design of energy storage system equipment should follow the principles of "prevention first, prevention and control combined" and ensuring key points, taking into account general issues, easy management, and economical and practical.



Fiture 6　Fire Protection System Logic Diagram

The overall design of this power station mainly considers the following aspects:

(1) The battery container adopts an energy cube structure, and each energy cube is equipped with a water cooler, inverter, and fire control system; the battery module meets the 15-minute quick removal requirement; and meets the water immersion fire protection requirements and hardware matching.

(2) An automatic fire alarm system is configured, and the automatic alarm system is connected to the centralized control room.

(3) Non-combustible or flame-retardant electrical equipment is used, and power cables and control cables (including communication cables) are laid in layers. Fire walls are set at certain parts of the cables, and non-combustible materials are used to seal the holes in the wall.

(4) A fire truck lane is set up so that fire trucks can reach the accident site in an emergency.

(5) Inflammable and explosive items, oxidants, strong reducing agents, acids, alkalis, etc. that are not related to the energy storage system are not stored in the equipment room.

The design scope of this project is to configure one set of pump-type perfluorohexanone fire extinguishing device for each battery cabinet.

(1) A 3KG pump-type perfluorohexanone fire extinguishing device is installed on the top of each battery cabinet to collect thermal runaway data of each PACK in the battery cabinet and spray the agent.

(2) A 07A composite detector (CO, temperature, VOC, smoke) is installed inside each PACK to detect thermal runaway data inside the battery and upload the data to the perfluorohexanone fire extinguishing device.

(3) A 07A composite detector (CO, temperature, VOC, smoke) is installed on the top of each battery cabinet to detect thermal runaway data inside the battery cabinet and upload the data to the perfluorohexanone fire extinguishing device system.

(4) A single-row box valve, space nozzles and pipelines are installed on the top of each battery cabinet to spray the fire extinguishing agent into the battery cabinet space for fire extinguishing.

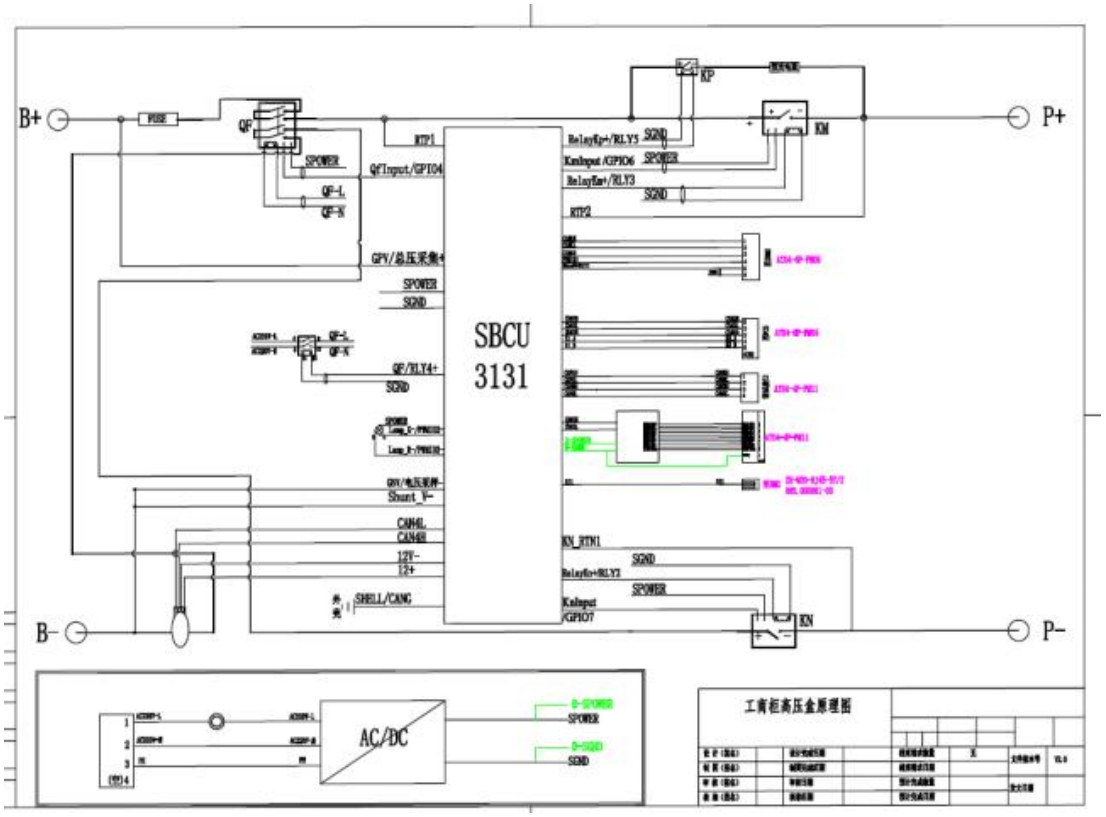
(5) A perfluorohexanone integrated nozzle and pipelines are installed on each PACK to spray the fire extinguishing agent into a single pack for fire extinguishing after thermal runaway occurs in a single pack.

(6) The 3KG pump-type perfluorohexanone fire extinguishing device reserves 1 24V power supply (input), 3 passive normally open dry contact signals, and 1 485 communication for power supply and communication with BMS and other equipment.

5.8 High voltage box technical parameters

The high-voltage box integrates the battery management system main control, circuit breaker switch, protection relay, voltage and current acquisition module, fuse and other devices. As the secondary main control module of the energy storage system, it is mainly used to connect the battery input. There are 2 DC relays inside and 1 disconnectable DC circuit breaker is configured. The two-stage switch is configured to ensure the safe switching of the system. In the case of no current or low current, the battery cluster is controlled by closing and opening the DC relay; in the case of high current, the safety of the relay is guaranteed by controlling the opening of the DC circuit breaker; the high-voltage box has a built-in isolating switch, which can manually disconnect the DC circuit during maintenance.

The system is powered by AC 220V. Each main control box and high-voltage box have built-in AC/DC power conversion, with each cluster as a unit. The SBMU is powered by the high-voltage box.



Fiture 7 High Voltage Box Schematic Diagram

6 Technical Services

6.1 The supplier shall dispatch skilled and competent technical personnel to the construction site to provide technical services to the buyer. The supplier's technical services shall comply with the provisions of the contract.

6.2 The buyer shall provide working conditions and conveniences for the supplier's technical personnel free of charge, including but not limited to necessary office space, technical information and access permits.

6.3 The supplier's technical personnel shall accept on-site supervision and management when providing technical services on site. No contract equipment shall be dismantled, painted or damaged without permission at the construction site; if the supplier needs to debug the contract equipment, it shall be operated under the supervision of the on-site supervision representative, and if necessary, it shall be approved by the on-site supervision representative or the person in charge of the owner's project department.

6.4 The supplier must ensure that the configuration of the same model of equipment is completely consistent, and must ensure that the various plug-ins configured for the same model of equipment are completely universal.

6.5 The purchaser may choose to mark the purchaser's LOGO on the supplier's products and use the purchaser's appearance design scheme (limited to LOGO and LOGO element spraying), and the supplier shall cooperate.

7 Quality Assurance Period

7.1 The quality assurance period of the contract equipment is 5 years from the delivery of the contract equipment or the number of cycles is greater than or equal to 6,000 times.

7.2 If the contract equipment fails during the quality assurance period, the supplier shall provide warranty service at its own expense and repair or replace the relevant contract equipment to eliminate the fault.

7.3 If the failure of the contract equipment is caused by the buyer, the cost of repairing and replacing the contract equipment shall be borne by the buyer.

7.4 If defects are found in the parts of the contract equipment during the quality assurance period but do not affect the normal operation of the contract equipment, the quality assurance period of the repaired or replaced parts shall be extended to offset the equipment downtime.

7.5 During the quality assurance period, if the contract equipment is shut down due to the supplier's responsibility, the quality assurance period of the contract equipment shall be extended from the supplier's elimination of the defect to the warranty period, and the extension period shall be the equipment downtime.

7.6 The supplier may provide extended warranty service for a fee, with the maximum extension period being 5 years. The annual extended warranty fee for each device is 1.8% of the total contract value. The cost of replacing the core components of PCS, EMS, high-voltage box, BMS and liquid cooler is calculated separately.

7.7 The situation that the quality assurance period is not fulfilled in this agreement shall be determined by negotiation between the two parties.

8 Quality Assurance Period Service

8.1 The supplier shall provide sufficient technicians, tools and spare parts for the warranty period service and ensure that the contact information provided is unobstructed. The supplier shall respond within 24 hours after receiving the buyer's notice. If the supplier fails to respond within the above time, the buyer has the right to solve the relevant problems or find and solve the faults of the contract equipment by itself or entrust others.

8.2 If the supplier's technicians need to go to the contract equipment site for warranty period service, the buyer shall provide the supplier's technicians with working conditions and convenience free of charge, including but not limited to necessary office space, technical information and entry and exit permits. The transportation, food and accommodation expenses of the supplier's technicians shall be borne by the supplier. The supplier's technicians shall abide by the various rules and regulations and safety operating procedures of the buyer's construction site and obey the buyer's on-site management.

8.3 If any technician violates the on-site safety system, the buyer has the right to require the supplier to replace him, and the expenses incurred by the replacement shall be borne by the supplier. The supplier may also replace its technicians at its own expense without affecting the warranty period service and with the buyer's consent.

8.4 The supplier shall keep records of the warranty service at the construction site, record the time, cause and solution of the contract equipment failure, etc., and the record shall be signed and confirmed by the buyer and submitted to the buyer after the end of the quality assurance period.

8.5 For the contract equipment, the supplier shall use the correct and mature technology and materials that have been proven by operating experience; if the supplier uses new technologies and new materials that have not been used in the past, the buyer's prior consent shall be obtained. If the new technology, new material, new process, etc. have not been tested and verified and evaluated, the buyer has the right to request the supplier to return or replace it. The buyer's consent does not reduce or exempt the supplier from the responsibilities it should bear under this contract. The supplier shall be responsible for all quality problems of the equipment and components purchased by the supplier from the subcontractor.

8.6 If the contract equipment provided by the supplier is defective, or the contract equipment is scrapped or the project is reworked due to errors in the technical data or incorrect guidance of the supplier's technical personnel, the supplier shall immediately replace it free of charge or compensate the buyer for the losses suffered thereby. If the contract equipment

needs to be replaced, the supplier shall bear all the costs incurred in replacing the goods at the installation site, including but not limited to the cost of new goods, the cost of transporting the new goods to the installation site and the cost of handling the replaced goods. The supplier shall replace or repair the contract equipment within the time limit required by the buyer. If the replacement or repair work is not completed within the time limit, it shall be treated as delayed delivery.

8.7 If the contract equipment is damaged due to the buyer's failure to install, operate or maintain in accordance with the technical data, drawings, and instructions provided by the supplier, or due to reasons other than the supplier's technical personnel, the buyer shall be responsible for repair and replacement, but the supplier shall be obliged to provide the required replacement parts as soon as possible. For the urgent parts required by the buyer, the supplier shall arrange the fastest way of transportation, and all costs shall be borne by the buyer.

8.8 The painting of the contract equipment should be able to prevent corrosion and damage for a long time. If any damage that affects the appearance of the contract equipment, such as paint peeling and rust, occurs within five years after the acceptance and commissioning of the contract equipment, the supplier shall handle it free of charge.

8.9 Other agreements:

(1) When the buyer purchases supporting equipment related to the contract equipment, the supplier guarantees to provide the technical specifications and information of the interface-related equipment to ensure the normal operation of the supporting equipment after it is connected to the system.

(2) The software system provided by the supplier must have a wide range of applicability to the hardware. If the hardware equipment matched by the current system is discontinued, the supplier guarantees that the latest hardware equipment can ensure the normal operation of the original software.

(3) After the warranty period, the supplier is responsible for the lifelong maintenance of the equipment at a fee. Depending on the needs of the buyer, the system software upgrade and replacement will be provided free of charge. For product principle failures, the supplier shall be responsible for making improvements free of charge.

8.10 If the contracted equipment has family defects, the supplier should take the initiative to recall it.