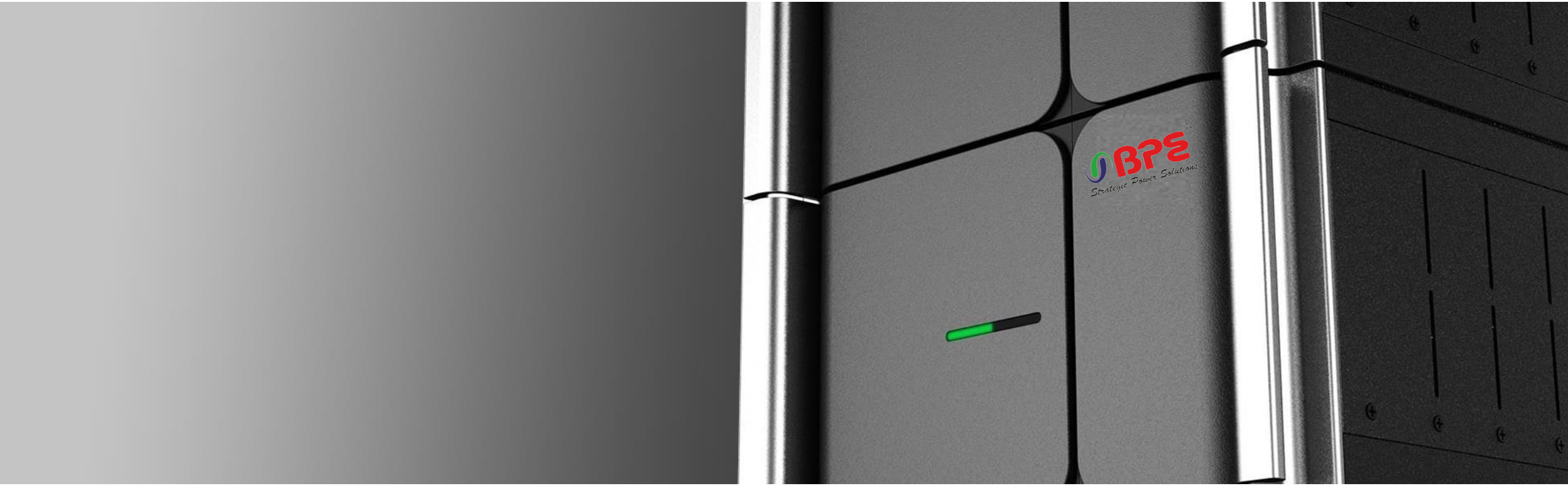

500kW/1.075MWh BESS
20ft Container Energy Storage System

Best Power Equipments India Pvt. Ltd.

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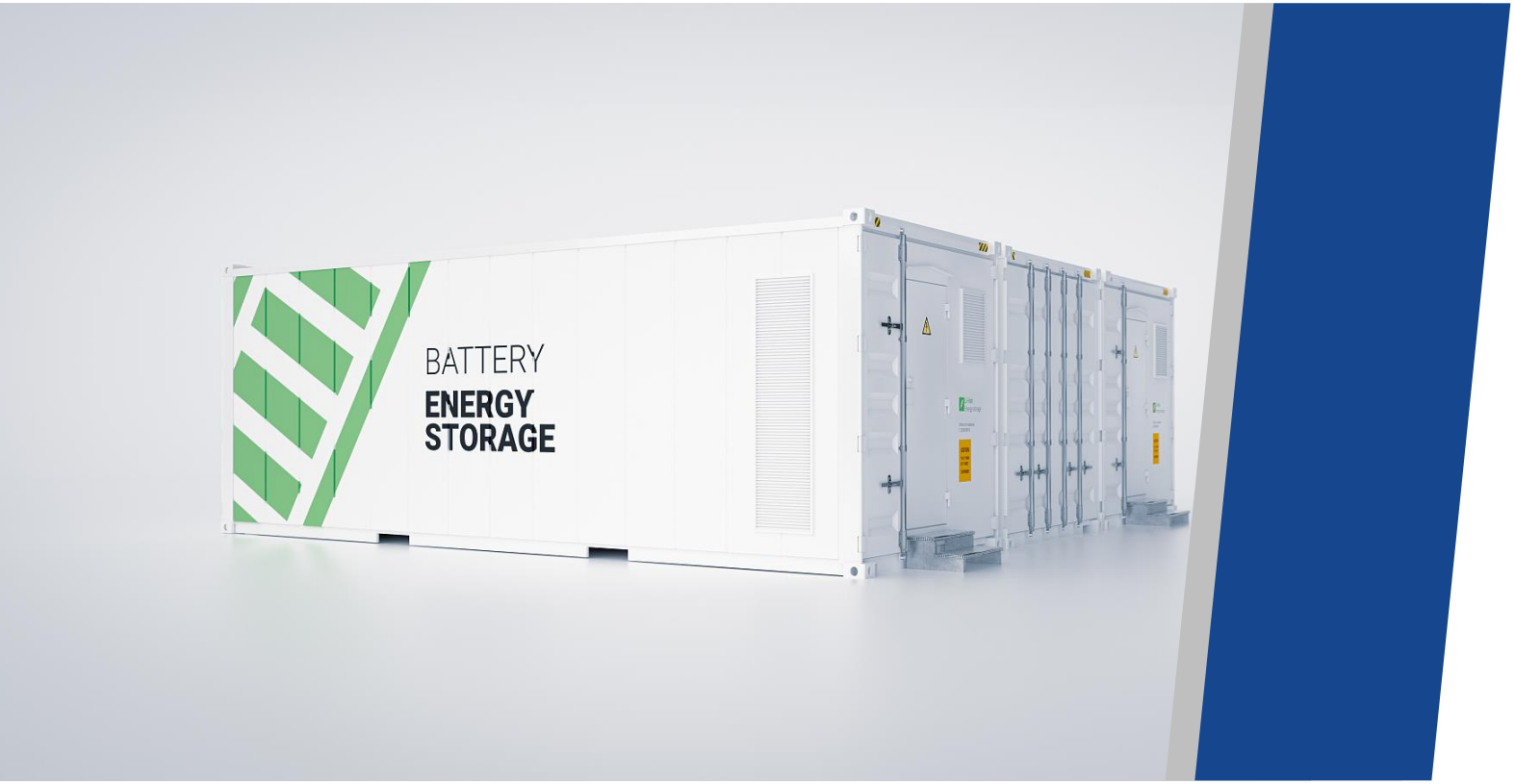
POWER IS ON

About US



Best Power Equipments India Pvt. Ltd. is industry leading electrical and power electronic product designer and manufacturer since 2000. located in Noida .

BPE provides complete solutions for data center infrastructure, Power solutions and green energy storage sectors.

The ESS products cover four main application: Industrial and commercial energy storage system, renewable integration, uninterrupted power lithium battery system and residential energy storage system.

Excellent developer and supplier of innovative smart energy storage system

BESS Container

Overview

BPE uses standard battery modules, PCS modules, BMS, EMS and other systems to form standard containers to build large-scale grid-side energy storage projects. The standardized 20feet container system can be configured with 1075kWh500kW energy storage system. The standardized and prefabricated design reduces user customization time and construction costs, and reduces safety hazards caused by local installation differences and management risks. It meets the application needs of regional power grid peak shaving, frequency regulation, voltage regulation, emergency response, new energy consumption, etc., and ensures the normal operation of the power system.

Configuration

PCS
Bidirectional AC / DC converter can realize the bidirectional conversion from DC to AC and AC to DC. It can not only convert AC to DC to charge battery, but also convert DC to AC to supply power to load or feed back to power grid.

Battery System
The system mainly consists of safe, efficient and long-life lithium iron phosphate cells, which are connected in series to form battery modules, and multiple modules are connected in series to form battery clusters.

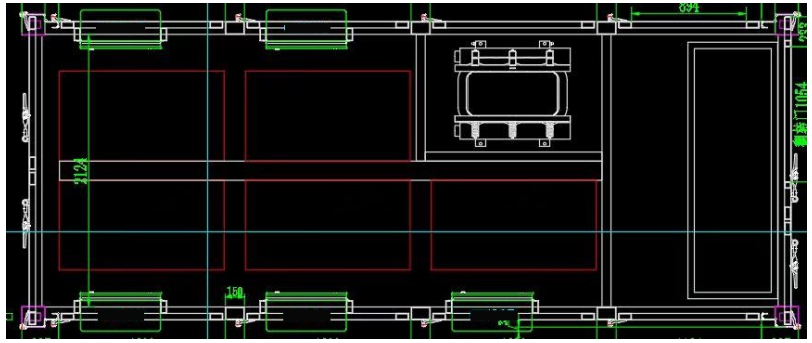
Air Conditioning
Air Conditioning (HVAC) system is configured to maintained an optimal temperature to maximize energy system operational life and efficiency.

Battery management system
The core components of the system can effectively protect the battery from overcharge, overdischarge and over-current. At the same time, the balanced management of the cells can ensure the safe, reliable and efficient operation of the whole system.

Power Management System
System operation data monitoring, operation strategy management, historical data record, system status record, etc.

Enclosure
Protection degree IP54.

Container Layout



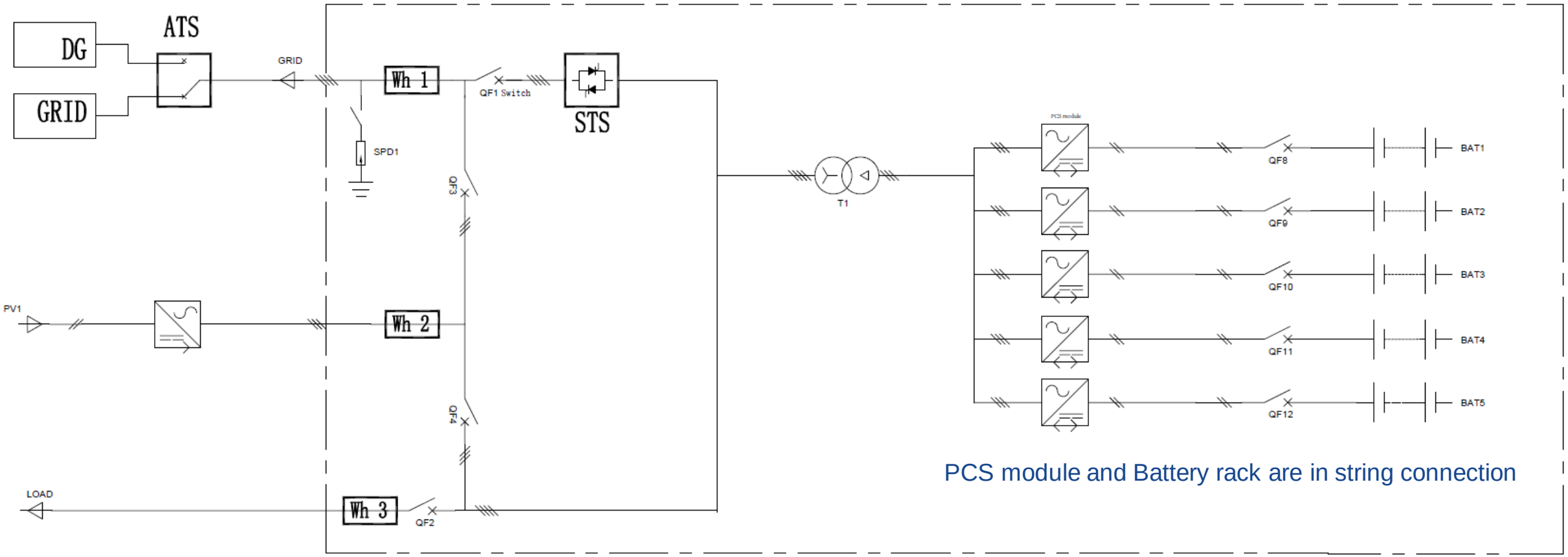
Configuration:

Lithium Battery System: 1MWh Battery storage, composed by 5 sets Lithium battery system of 768V280AH.

Power Conversion System: 1 set 500KW PCS (includes STS,isolation transformer) ;

Container: 5 set 5KW air conditioner, Fire fighting system, Explosion-proof fan, Pressure relief valve, Distribution box ,Lighting;

Container Single Line Diagram



PCS module and Battery rack are in string connection

Container Specification

| Safe and reliable |

- High quality LFP batteries for mobile use.
- Intelligent air conditioning design, small temperature fluctuation.
- Automatic induction of fire source; automatic fire extinguishing; sound and light alarm function.
- Container-mounted network camera with video surveillance function; (optional)
- IP54, safe and reliable operation in outdoor environment.
- Serially designed PCS and battery pack eliminates circulating current and improve system reliability.
- Integrated BMS,DC, AC multi-layer protection, maximum safety performance design.

| Efficient and Convenient |

- Container installation, high modularity, simple structure, easy installation and maintenance.
- All-in-one equipment, which can be fixed, vehicle-mounted, and easy to move.
- Enables remote monitoring, device management, remote troubleshooting and data analysis.

| Cost optimization |

- One investment, multiple benefits:Peak shaving, backup power supply, microgrid building, power quality improving and energy storage,etc.
- Long cycle life, low failure rate, reduce operation and maintenance investment.
- Maximize green energy utilization.

System application

Industrial and commercial demand management, peak shaving

User side backup power

Peak and frequency regulation, smoothing new energy generation

Building microgrid system

Model		BESS 1075K-500
Parameter		
	Rated power	1075KWh
	Configuration	5 Sets 768V280AH battery racks, Each racked composed by15nos 51.2V280Ah battery packs.
	System voltage	768V
	Working voltage range	DC672V~DC876V (2.8V~3.65V)
	Battery type	LFP
PCS parameters		
AC grid-connected parameters	Output line	3W+N+PE/3W+PE
	Rated power	500KW
	Rated voltage	AC 380V/400V
	Rated Current	758A
	Voltage range	-15%~+10%
	Rated frequency	50Hz/60Hz
	Frequency range	±2Hz
	Power factor	1
	Output harmonics	≤3%
AC off-grid parameters	Output line	3W+N+PE/3W+PE
	Rated power	500KW
	Rated voltage	AC 380V/400V
	Rated frequency	50Hz/60Hz
	Rated Current	758A
	Voltage accuracy	1%
	Frequency accuracy	±0.2Hz
	Output voltage harmonics	3% liner full load
	Unbalanced load capacity	100%
	Overload capacity	105%]: continuous operation;; (105%~120%]: 10min; 120%): stop operation;
Basic Patameters		
Environment	Working temperature	-20℃~55℃ (>45℃derating)
	Storage temperature	-20℃~60℃
	Relative humidity	0%RH~95%RH, No condensation
	Working altitude	45℃时, 2000m; 2000m~4000m Derating
	Noise	<75dB
Other	Comminication	CAN/RS485
	Isolation	Isolation Tranformer
	Protection	IP54
	Cooling	Air cooling, intelligent fan regulation
	Maximum efficiency	container round-trip efficiency 95% (without transformer) container round-trip efficiency 93% (with transformer)
	Fire control	Perfluoro
	Demension W*D*H	6096*2438*2591

Components

1. Battery system

Overview

The lithium battery system consists of rack, battery modules, battery management system (BMS), display control system and protection system. 2 level BMS design, hierarchical linkage and multiple monitoring of system status. Relay, fuse, circuit breaker and BMS constitute a comprehensive protection system integrating electrical safety and functional safety.

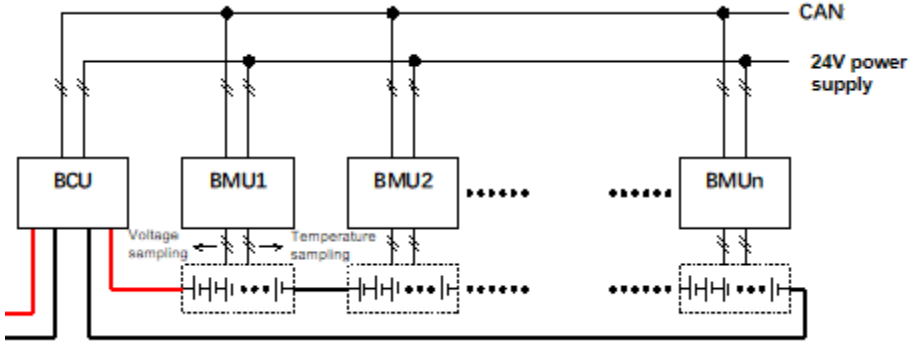
Configuration

Battery System
The system mainly consists of safe, efficient and long-life lithium iron phosphate cells, which are connected in series to form battery modules, and multiple modules are connected in series to form battery clusters.

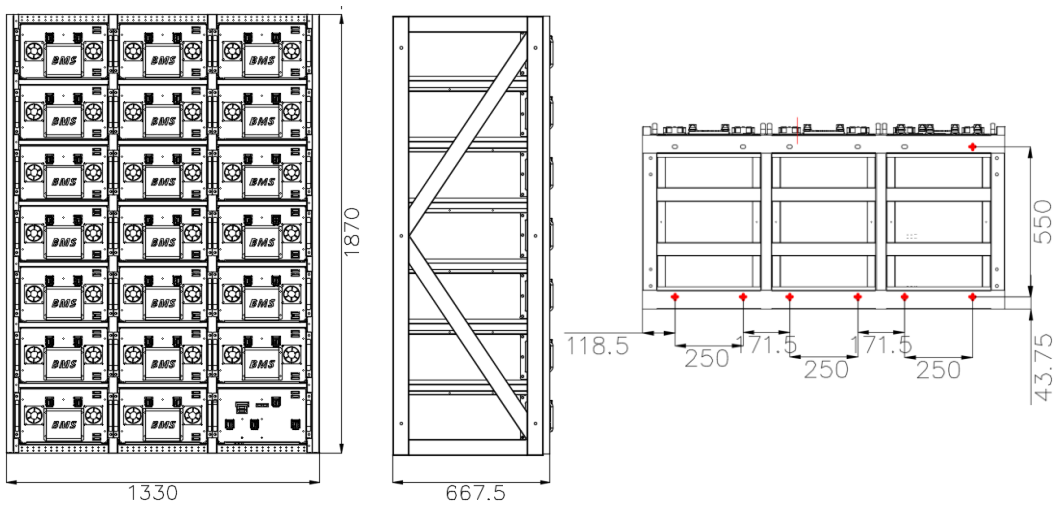
Battery management system
The core components of the system can effectively protect the battery from overcharge, overdischarge and over-current. At the same time, the balanced management of the cells can ensure the safe, reliable and efficient operation of the whole system.

Power Management System
System operation data monitoring, operation strategy management, historical data record, system status record, etc.

System topology



Dimension



Key product features and benefits

| Safe and reliable |

- Top manufacturer of iron phosphate lithium battery
- Intelligent air cooling design, long service life life, stable operation
- Three level BMS design of module, cabinet and system, multiple state monitoring, hierarchical linkage, comprehensive guarantee of battery system safety

| Efficient and Convenient |

- Energy system, high energy density, high integration
- Outstanding high rate performance, maximum 1C charging and 2C discharging
- Modular design, convenient for maintenance, management and expansion

| Active equalization |

- Three level BMS design, energy transfering active equalization, to overcome the impact of single cell capacity on system capacity
- The equalization accuracy is less than 2%, and the equalization capacity can reaches 10% of the rated output

| Cost optimization |

- Small size, light weight, less space and installation cost
- Long cycle life, low failure rate, reduce operation and maintenance investment

Application

Industrial and commercial demand management, peak shaving

User side backup power

Peak and frequency regulation, smoothing new energy generation

Building microgrid system

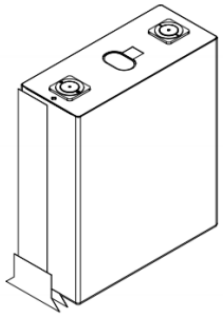
Parameters

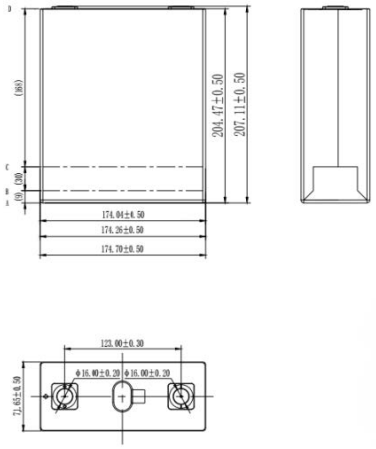
Model	LFP15S1P - 280	
Battery capacity	280Ah	
Rated voltage	768V	
Rated capacity	215.04kWh	
Working voltage range	672V～876V	Cell 2.8～3.65
Max. continous charging current	140A (0.5C)	
Max. continous discharging current	140A (0.5C)	
Working Temperature	Charge：0℃～50℃ Discharge：-20℃～55℃	
Best Working Temperature	15℃～35℃	
Storage temperature	-40℃～60℃	System SOC：20%~40%
Working environment	Altitude: ＜2500m Relative humidity: <95% (no condensation)	
System cooling	Controlled air cooling	
Insulation resistance	＞500MΩ@1500VDC	
Isolation and withstand voltage	2500VDC/1min	
Internal power supply mode	24VDC	Built-in DC/DC
Static power consumption	35W	
IP rating	IP21	
Dimension (W*D*H)	1330mm*667.5mm*1870mm	
Weight	2000	
Life cycle	6000~10000s	0.5C@25℃charge/discharge@80%DOD, EOL70%
Battery Management System (BMS)		
Cell voltage acquisition range	1-5V	
Cell voltage acquisition accuracy	≤10mV	
Total voltage acquisition accuracy	±1V or ±1%	
Current acquisition range	0～±200ADC	
Current acquisition accuracy	≤1%	
Temperature acquisition range	-20～125℃	
Temperature acquisition accuracy	≤±1℃	
Charging over current protection	＞1C，10S；	
Discharging over current protection	＞1.2C，10S；	
Over temperature protection	Discharge＞55℃ (20S) Charge＞50℃ (20S)	The default value is 15 ° C (optional)
Low temperature protection	Discharge＜-20℃ (1S) Charge＜0℃ (1S)	The default value is 15 ° C (optional)
Communication	CAN,RS485,Dry contact	

Cell

The lithium battery system uses 3.2V 280Ah LFP prismatic cell, which reduces the possibility of cell damage caused by mechanical damage on the cell surface and improves the safety performance of the product. The explosion-proof valve on the top ensure that in any extreme case (such as internal short circuit, battery overcharge and overdischarge), a large amount of gas quickly accumulated in the cell can be discharged through the riot valve,which highly improves the safety.

Parameters		
Battery type	LFP	
Rated capacity ☆	280Ah	0.5C@25℃
Rated voltage ☆	3.20V	
Average working voltage	2.5～3.65V	
AC-impedamce☆	0.18±0.05mΩ	
Weight	5430±20g	
Max charge current	0.5C	Continuous
Max discharge current	0.5C	Continuous
Max operating temperature range	-20℃/+60℃	
Charge	0℃～45℃	
Discharge	-20℃～60℃	
Optimal operating temperature range	15℃～35℃	
Storage temperature	-40℃/+60℃	<1 month -40℃～45℃<6 month -20℃～35℃
Cycle life	≥10000 times	25℃ 0.5C/0.5C





Module

The battery module, consists of cells of 3.2V, 280Ah. The module has a built-in BMU system, which can collect the voltage and temperature of each cell, and manage the cell balance, so as to ensure the normal operation of the whole module safely and efficiently.

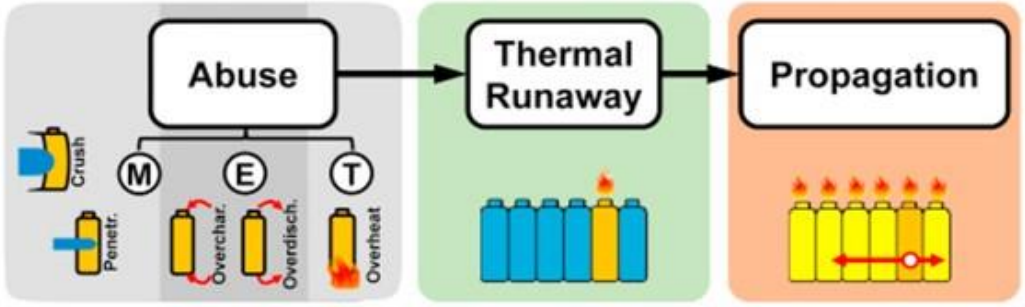
Parameter	BMS16S1P
Rated capacity	280Ah
Configuration	1P16S
Rated voltage	51.2 V
Rated energy	14.336kWh
Max continuous charge current	140A (0.5C)
Max continuous discharge current	140A (0.5C)
Working voltage range	40～58.4V
Operating temperature range	-20℃～55℃
Weight	90kg
DImension （W*D*H)	420mm*677.7mm*230mm （reference)
Communication	CAN
Cooling	Cooling fan

Battery Safety Design

Comparision Between Market Design & BPE Design of Battery Module

Market modules Design Feature

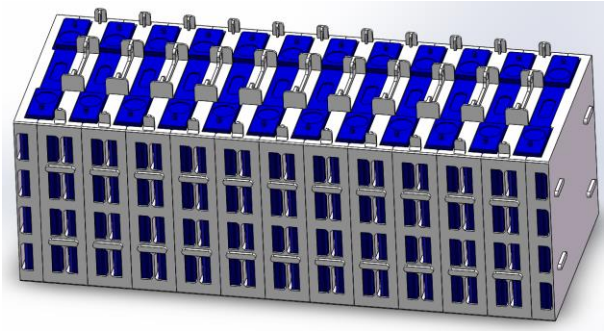
- There is no gap between the battery cells, which can only ensure the regular operation of the battery with low magnification. And heat dissipation is difficult to accelerate battery aging
- Under abnormal circumstances, when a cell is out of control, the heat generated is directly transferred to the adjacent cell, and the thermal control is easy to spread rapidly, resulting in the accumulation of greater heat, and eventually lead to the control of the whole system.
- Lack of physical isolation between cells, when the insulation of the cell itself is damaged due to internal short circuit, bulge, mechanical impact or other reasons, it is easy to cause the electrical insulation of adjacent cells to be destroyed, resulting in a larger scale of failure.

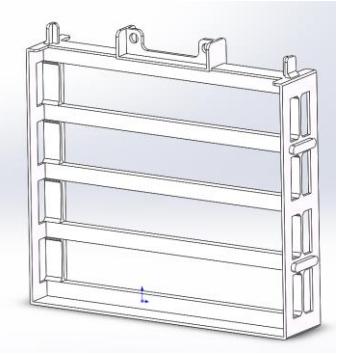


BPE modules Design Feature

Compared with the PACK design of conventional cells bundled directly into groups, the use of thermal isolation bracket can significantly improve the safety of the lithium battery system.

- **Heat dissipation design:** there is a gap between the batteries. Through hydrodynamics analysis, the installation position of the fan is optimized, the air duct is optimized, the thermal management ability is improved, the operating environment of the battery is improved, and the Ageing rate of the battery is slowed down.
- **Insulation design:** in addition to the core itself has PE blue insulation film, the core is insulated and fixed by the plastic insulation bracket with high melting point and resistance to 2000V. The plastic top cover of the project is fully covered, and it is anti-touch and anti-short circuit.Even if the abnormal situation still can maximize the insulation between the cell, improve the safety of the whole system.
- **Thermal isolation design:** cell spacing ≥7mm. When thermal runaway occurs in a single cell, thermal isolation can be realized to reduce the temperature rise of adjacent cells that trigger thermal runaway.
- **Safety design:**the electric core pressure relief valve above the reserved space, to prevent abnormal pressure caused by the explosion.





Battery Safety Design

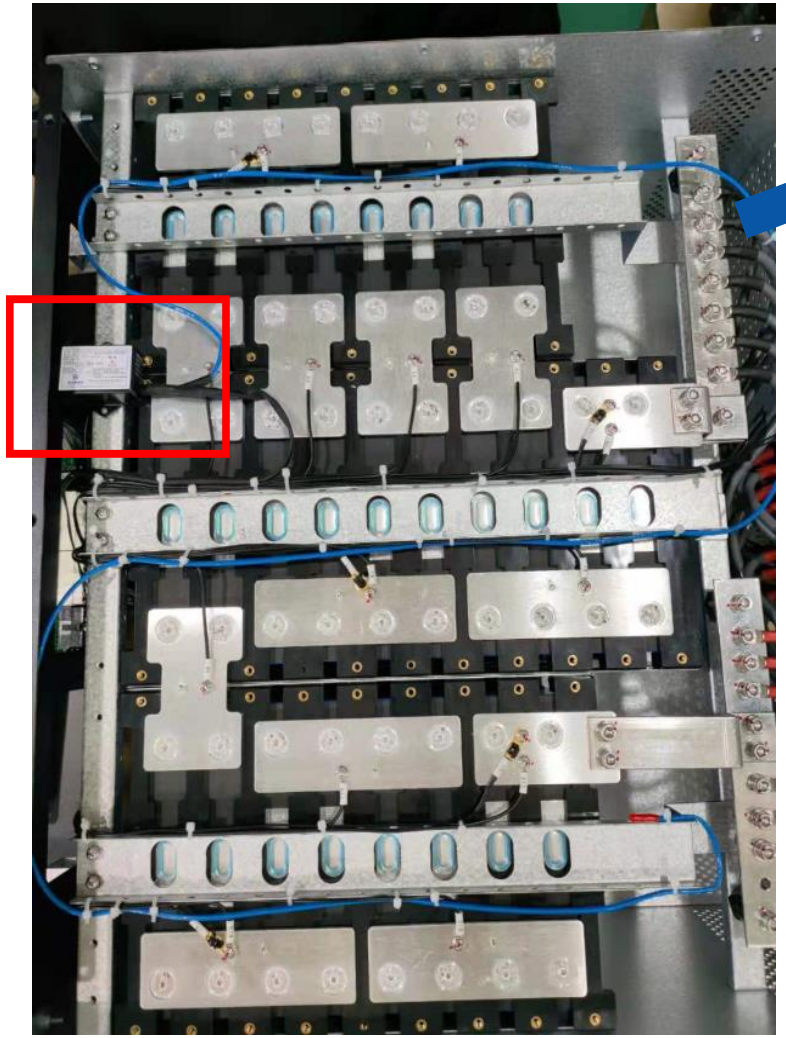
QRR0.4 GW/S - MC pulse type heat sol fire extinguishing system is a new kind of sol fire extinguishing installation, is a kind of high extinguishing efficiency and reliability of the fire field breakthrough products, the product has small volume, no pressure storage, without laying pipe network and maintenance, fire fighting and efficient, rapid, non-toxic harmless, safe and reliable, the characteristics of green environmental protection, Especially suitable for battery modules.

Extinguishing mechanism of thermal aerosol is mainly reflected in:

- Cooling and extinguishing effect of endothermic decomposition-- endothermic effect of metal oxides and carbonate.
- Gas phase chemical inhibition -- multiple chain reactions occur between the gasified metal ions decomposed by the fire extinguishing agent and the active group in the combustion, thus the combustion is inhibited.
- Solid phase chemical inhibition -- solid particles in thermal sol fire extinguishers can adsorb the chain reaction intermediates OH, H and O, and catalyze them to reconstitute stable molecules.

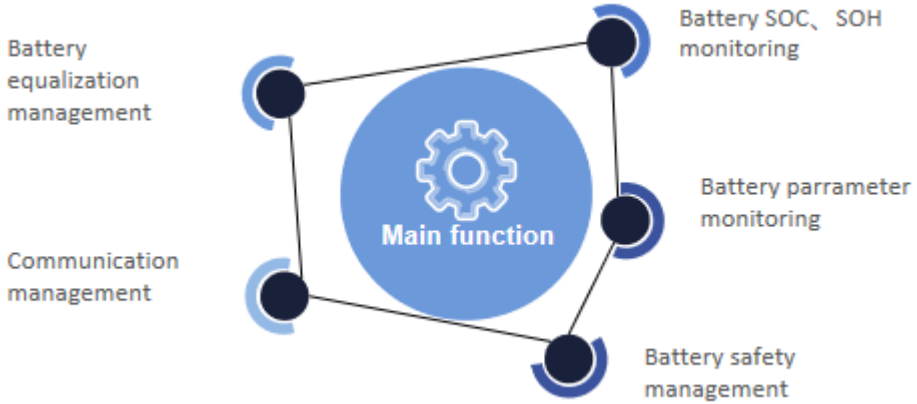
The aerosol trigger temperature is 170℃. Compared with the fire-fighting measures outside the traditional system, the built-in aerosol in the module can intervene earlier and effectively reduce the spread degree of thermal runaway.

At the same time, when the aerosol action occurs, the BMS system will synchronously conduct linkage operation to forcibly disconnect the battery charge and discharge circuit, which can ensure that the battery fault is controlled within the minimum range.



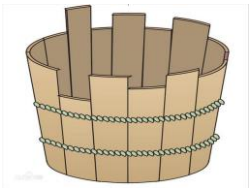
Active Battery Management System

Battery management system is one of the core components of the energy storage system. Excellent BMS can ensure the safety, performance, life and other aspects of the single cell, effectively protect the battery overcharge, over discharge, over-current, etc., and avoid the unbalanced single cell and uneven temperature distribution caused by the long-term and high-power charging and discharging of the battery, so as to ensure the safety, reliability and reliability of the whole system Efficient operation.

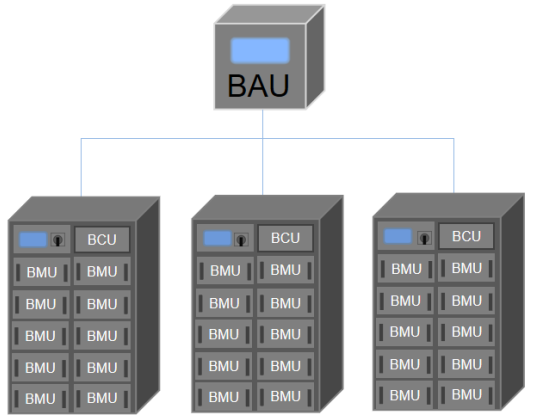


Bidirectional active equilibrium

- Energy transfering active equalization;
- The equalizing accuracy is less than 2%, and the equalizing capacity can reaches 10% of the rated output;
- The change of single cell capacity does not affect the system capacity



BMS Three Level Management



Type		Function
BMU	Battery module management unit	Manage energy storage battery modules and support voltage acquisition of 16 circuits at most
BCU	Battery cabinet management unit	Control BMU and manage battery clusters
BAU	Battery array management unit	Control BCU and manage the entire battery array
Others	Heavy current control system	Supervise main connector at the battery string, collect current at the battery string and detect insulation leakage status
	Display	Display battery information and alarm; set and change partial critical parameters
	Current sensor	Detect battery pack charge/discharge loop current
	Connecting cable	Detection/communication/power/control/other cables

2. Power Conversion System

Overview

The multi-functional bi-directional converter can realize the b
directional conversion from DC to AC and from AC to DC. It c
not only convert AC into DC to charge the battery, but also
convert DC into AC to supply power to the load or feed back
the grid. The system adopts advanced digital control
technology, which optimizes the control performance and
improves the reliability of the system. It can realize seamless
switching between grid-connected discharge, grid -connecte
charging and off grid operation modes.

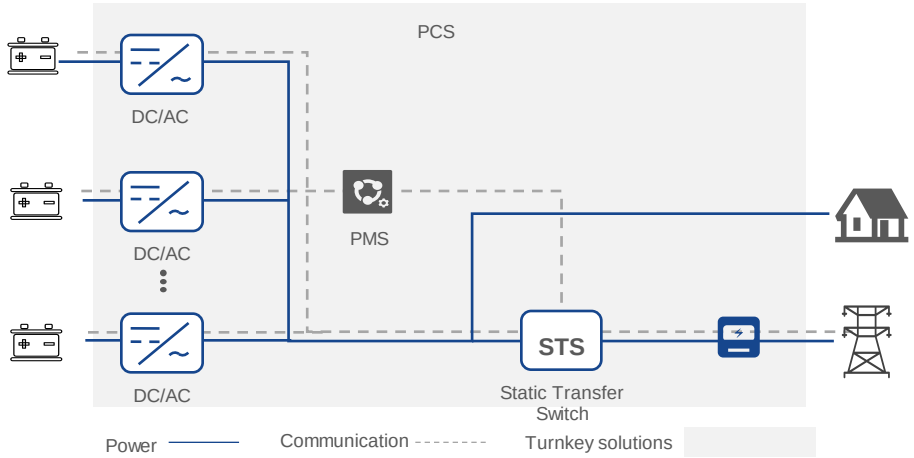
System configuration

AC/DC Module
Bidirectional AC / DC converter can realize the bidirectional conversion from DC to AC and AC to DC. It can not only convert AC to DC to charge battery, but also convert DC to AC to supply power to load or feed back to power grid.

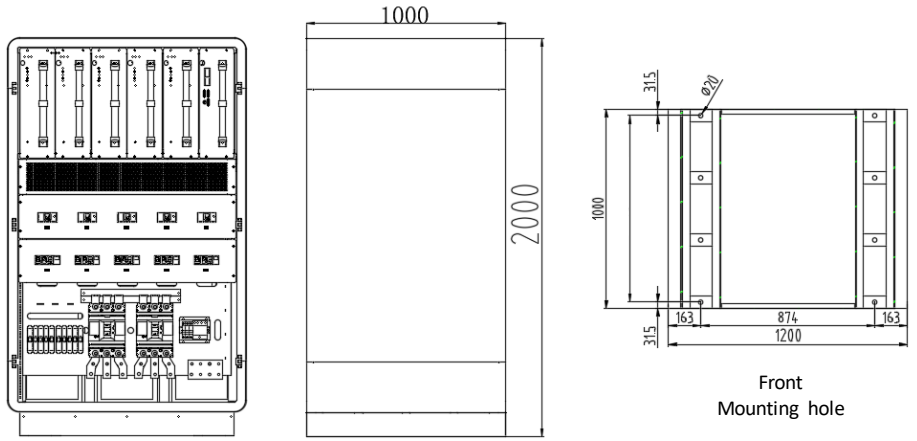
Static Transfer Switch (optional)
Under normal working condition, the static switch is closed. When the power supply is interrupted, the static switch is immediately disconnected. The system turns to off grid power supply, and the battery is discharged for the load.

Power Management System
System operation data monitoring, operation strategy management, historical data record, system status record, etc.

System topology



Dimension



Key product features and benefits

- Multiple working modes.
- Seamless switching between on-grid and off grid modes, <10ms.
- 3P3W and 3P4W optional.
- RS485, CAN, Ethernet communication modes.
- Functions of low voltage ride through and reactive power compensation.
- 100% unbalanced load capacity in off grid operation.
- Continuous 105% rated output power.
- AC and DC dual input redundant power supply.
- Modular design and flexible product.

System application

Industrial and commercial demand management, peak shaving

User side backup power

Peak and frequency regulation, smoothing new energy generation

Building microgrid system

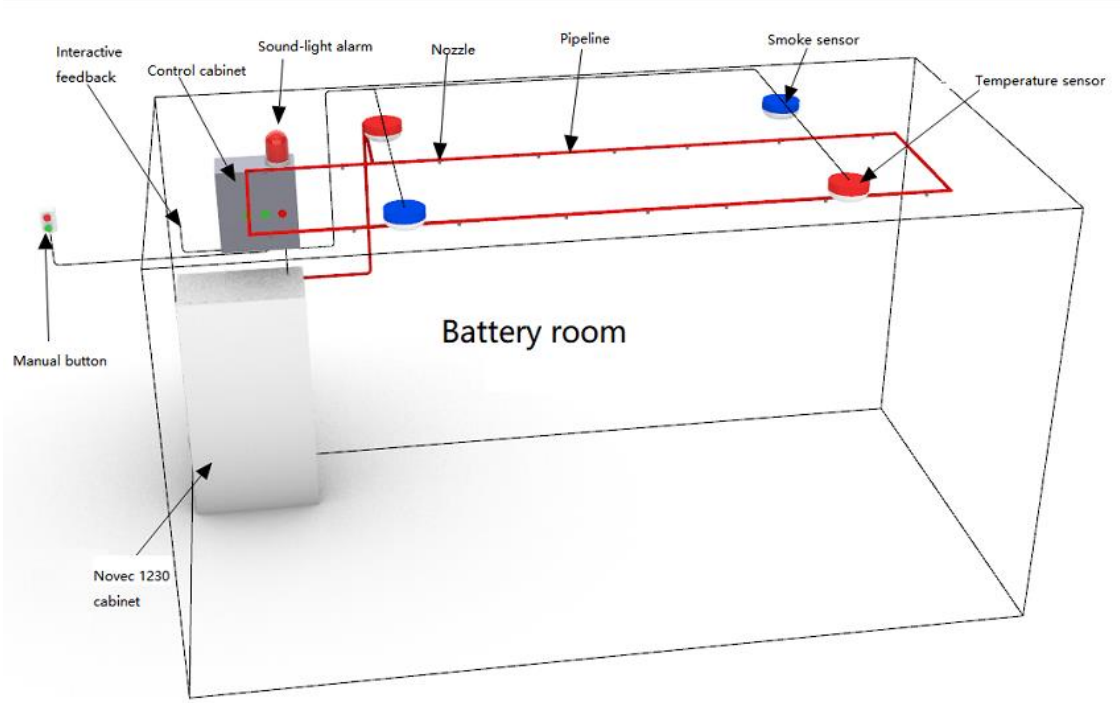
Spec

	Model	EPCS-300	EPCS-400	EPCS-500	EPCS-600
DC side parameters	Voltage range	DC650V~DC900V			
	Max DC channel Qty	3	4	5	6
	Single channel maximum current	170A			
AC grid-connected parameters	Output	3W+N+PE/3W+PE			
	Rated power	300KW	400KW	500KW	600KW
	Rated voltage	AC 380V/400V			
	Rated Current	454A	606A	758A	909A
	Voltage range	-15%~+10%			
	Rated frequency	50Hz/60Hz			
	Frequency range	±2Hz			
	Power factor	1			
	Output harmonics	≤3%			
AC off-grid parameters	Output	3W+N+PE/3W+PE			
	Rated power	300 KW	400KW	500KW	600KW
	Rated voltage	AC 380V/400V/415V			
	Rated frequency	50Hz/60Hz			
	Rated Current	454A	606A	758A	909A
	Voltage accuracy	1%			
	Frequency accuracy	±0.2Hz			
	Output voltage harmonics	3% linear full load			
	Unbalanced load capacity	100%			
	Overload capacity	105%]: continuous operation; (105%~120%]: 10min; 120%): stop operation			
Environment	Working temperature	-20℃~55℃ (>45℃ derating)			
	Storage temperature	-40℃~70℃ (No batteries)			
	Relative humidity	0%RH~95%RH, No condensation			
	Working altitude	45℃时, 2000m; 2000m~4000m Derating			
Others	Noise	<75dB			
	Communication	CAN/RS485			
	Isolation	Isolation Tranformer Optional			
	Protection	IP20			
	Cooling	Air cooling, intelligent fan regulation			
	Maximum efficiency	98.5%			
	Dimension W*D*H	1400*1000*2000			
	Weight	600kg	650kg	700kg	750kg

3.Fire Fighting System

According to the different properties of protective products, the battery room adopts automatic Perfluoro fire extinguishing system for full submersion fire protection. The whole solution is scientific fire extinguishing, more safety.

The detectors are installed on the top of the energy storage battery room inside the container. All detectors are logically controlled, if one detector detects a fire inside the container, the fire extinguisher is automatically activated.



Product Features

- automatic induction of fire source, automatic fire extinguishing.
- mechanical action start, the failure rate is small.
- the fire source near-range detection and rapid reaction time to minimize the loss.
- Fire extinguishing agent is released inside the equipment, close to the fire source and high fire extinguishing efficiency.
- Small size, not limited by the internal structure of the protected object.
- Fire extinguishing gas is released inside the equipment, the retention time is long and the reburning resistance is strong.

4. Air Conditioner

Monoblock air conditioner is designed as the climate control solution for energy storage system. Considering about the thermal control request for the battery and the structure of the energy storage container, the air conditioner is designed as the reliable and efficient climate control solution with monoblock structure, large air flow and top air supply.

Feature

◆ **Energy Efficiency**
– Branded high efficient fans and compressor with long life and minimal power consumption for energy saving;
– Top air supply and large air flow, dissipate the heat of the battery;

◆ **Easy installation and Operation**
– Monoblock, plug and play unit to ensure easy installation;
– Closed loop cooling protects equipment against dust and water;
– Constructed of sheet metal, powder coated with RAL7035, excellent anti-corrosion and anti-rust properties, endure hash environment.

◆ **Intelligent Controller**
– LCD display, multifunction alarm output, real-time system monitoring and convenient human-computer interface;
– RS485 & dry contactor
– Self-recovery, with multi protection function;
– Open communication protocol, Air conditioner can be running based on battery temperature

5.Container

The container is mainly composed of double-layer insulation system, monitoring system, fire protection system, access control system, construction wiring of lighting system,equipment frame and other load-bearing frame and bridge;Can be added to the ceiling, reserved ceiling and box link fixed installation location, bulk design, on-site assembly;The equipment is installed on the load bearing frame, which is installed (welded) on the steel bottom plate, and the fixed installation position of the monitoring camera can be reserved.

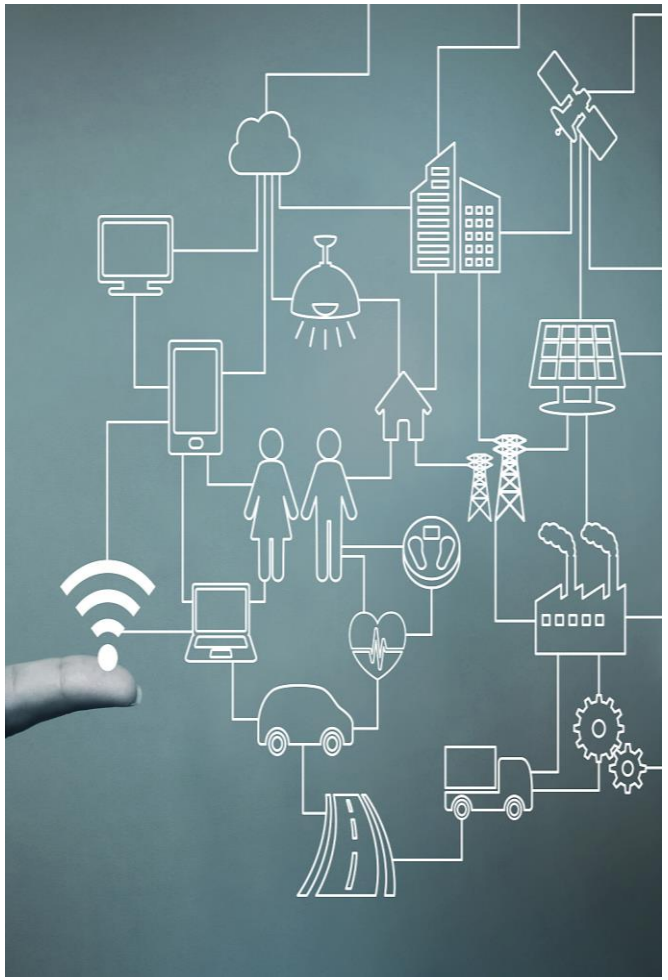
- Shape size :20feet container (mm L*W*H). The whole is frame structure, the bottom is 5mm steel plate, the side plate adopts high strength container special plate, the wave height 36 mm; roof adopts tensile reinforcement roof, and the top side plate needs to be invisible strengthened, that is, the steel support is C in the concave wave, the spacing is 1 meter.
- The box is 2.0 mm corrugated plate and the roof is 2 mm corrugated plate.
- The ground decoration uses 5 mm flame retardant ABS+2 mm anti-static rubber.
- Insulation system using container room special board (insulation materials: ceramic cotton + high strength rock wool composite board).
- Door frame dimensions and technical parameters: see drawings for details
- Container outer packing: naked (sea container regulation).
- Appearance: white, paint using "Hep" container special polyurethane paint, primer + middle paint + top paint ≥160 bottom: asphalt anticorrosion; integral sandblasting grinding.
- The installation equipment inside the box is used as load-bearing frame to ensure no deformation, and vibration absorber should be added.
- Use clean room special floor drain or self-closing floor drain, water seal device should be installed under floor drain, and measures should be taken to prevent water seal damage and overflow.
- Box door :2 sets, door frame is made of SUS304 stainless steel material, inner layer of door frame is filled with rock wool for heat preservation, safety grade is A class watertight +A class fire proof + Class A security lock, with external opening handle, and handle must not exceed container size.

6. Integrated PMS

Intelligent Power Manegement System—PMS

PMS power management system provides integrated control and monitoring functions for the whole system, collects and analyzes the real-time data of each equipment (including diesel generator) in the whole project, and monitors the key data parameters in real time.

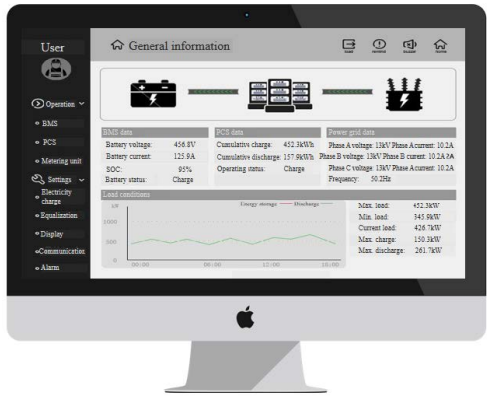
It can realize the functions of equipment information collection, control, data summary, chart analysis and so on, and forms a set of 24-hours scientific and energy-saving energy distribution scheme according to battery BMS data, load rate, energy availability, power demand curver etc.



PMS Display

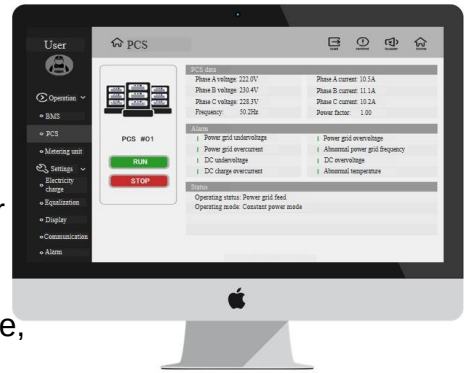
General information

Real-time acquisition of all parameters and statuses of all monitored equipment and collection of major parameters of MESS, including BMS information, PCS information, power grid information, load conditions, etc.



PCS information monitoring

Information is collected from PCS, including three-phase voltage, three-phase current, power factor, frequency, fault and alarm information (power grid undervoltage, power grid overvoltage, power grid overcurrent, abnormal frequency, DC undervoltage, DC overvoltage, abnormal temperature), etc.

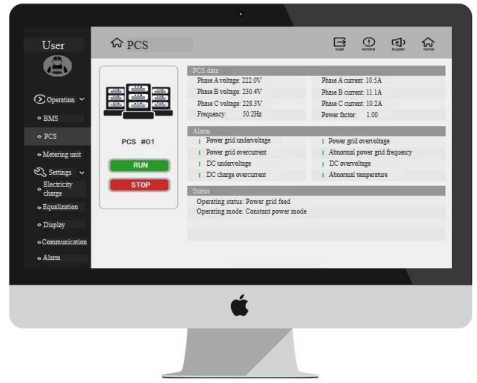


BMS information monitoring

Including total voltage, total current, SOC (state of charge), SOH (state of health), average cell voltage, maximum voltage, minimum voltage, maximum temperature, minimum temperature, etc.

Metering information

Real-time display of daily electricity charge, expected electricity charge, actual electricity charge, daily battery capacity, expected capacity, actual capacity and other data; relevant data report and historical curve can be generated accordingly.



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