0.5MW (0.3MWh) - 2MW (1.2MWh) ESS BATTERY SPECIFICATION

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1. ESS BATTERY CONFIGURATION

◆ **Battery configuration**：

  ➢ **System capacity: 4 sets of 500KW/300KWh ESS**；

  ➢ Cell type：LiFePO4 3.2V100Ah (26650-3200mAh-3.2V, 1S32P, cell has IEC62133 and UL1642 certificates); Battery life 20 years, battery remains at least 80% of the rated capacity at the end of its life；

  ➢ Battery module：Each modules is consist of 12S1P-38.4V100Ah, approx. size 550*265*280mm；

  ➢ Battery cluster：20pcs battery modules and 1 high voltage box, 768V76.8kWh；

  ➢ Battery cabinet：16pcs cabinets in one container, approx. size of each cabinet 850*600*2350mm

  ➢ Battery capacity：4X (3.2V*100Ah*240S*4 clusters), 4X(307.2kWh)；

  ➢ Battery packing：Use tough-flame retardant and explode prove materials, resistant to shock and vibration, connect with Cu Busbar, flame retardant, design to prevent from bending, can print the information on each battery cell according to the customer's requirements. Metallic materials are rust and corrosion resistance. Hardware devices must be stainless steel, such as bolts, screws, rings and so on.

2. System structure（500KW/300kWH）
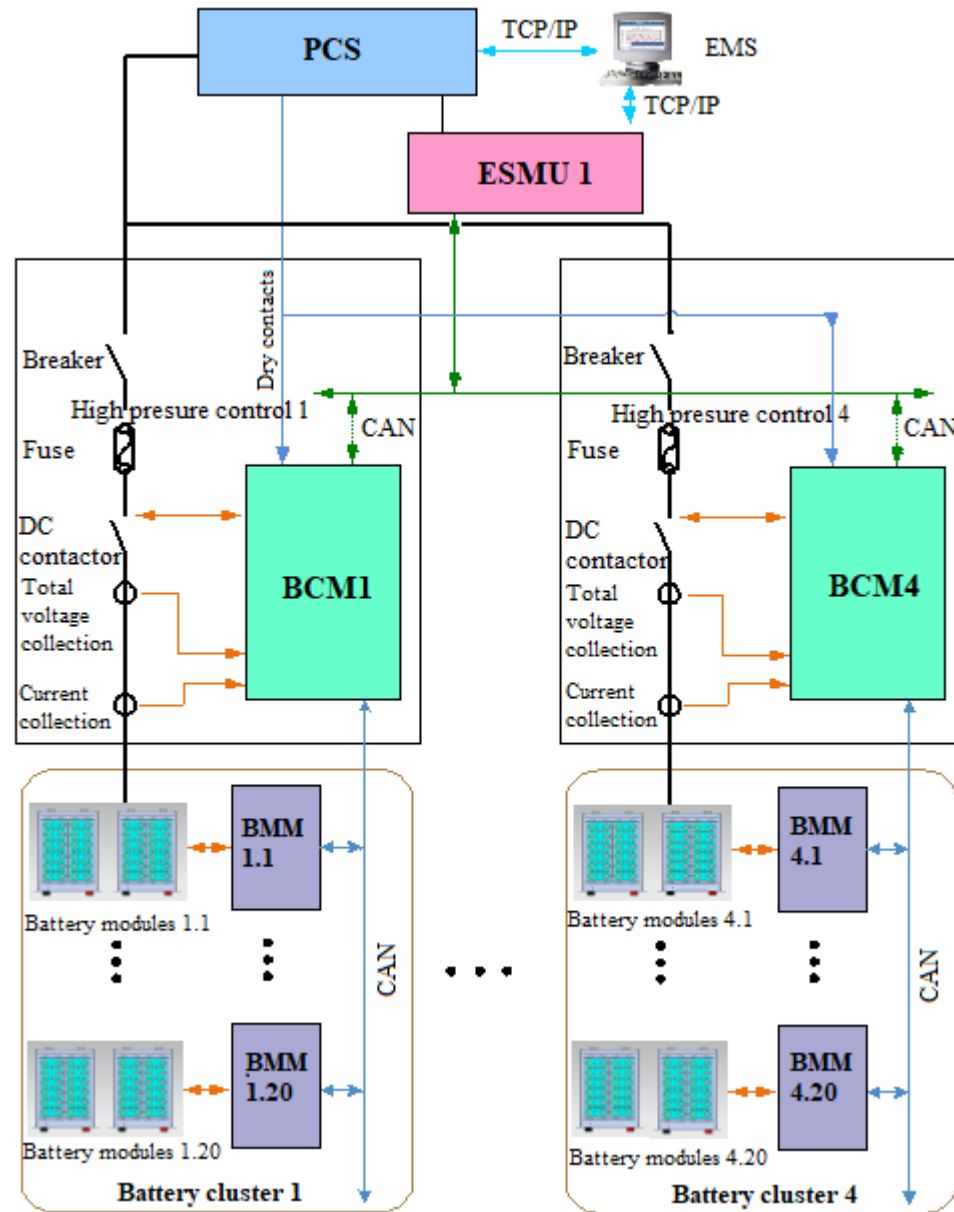
3. System parameter（500KW/300kWH）

| No.	Item	Parameter	Remark
1	Batter rated power	500kW	
2	Battery nominal voltage	768V	
3	Max. current	744A	
4	Energy	300KWh	25℃ 1C
5	DC voltage range	672V～864V	Cell voltage range：2.8V~3.6V
6	Efficiency	≥93%	
7	Working temperature	0~45℃	
9	Cell size	3.2V100Ah	125*77*245mm
10	Installation site	In the container	No fire, no explosion, no serious pollution, no chemical corrosion and no violent vibration

4. Battery system design

✳ Battery cluster parameter

Nominal voltage	768V
Capacity	1.2MWh (@25℃,1C)
Cell	3840pcs（3.2V100Ah）
High voltage box	16pcs
Working temperature	0℃~45℃
Size of high voltage box(W*H*D)	Approx. 500*400*300mm
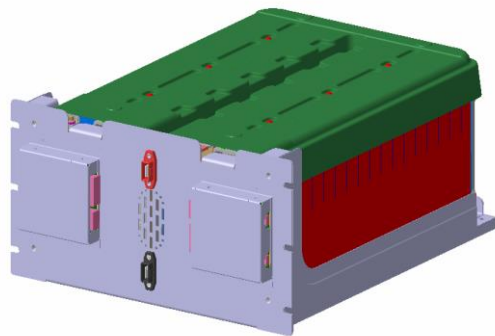
20pcs battery modules

+
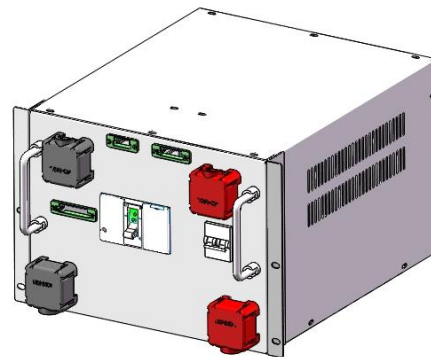
1pc high voltage box
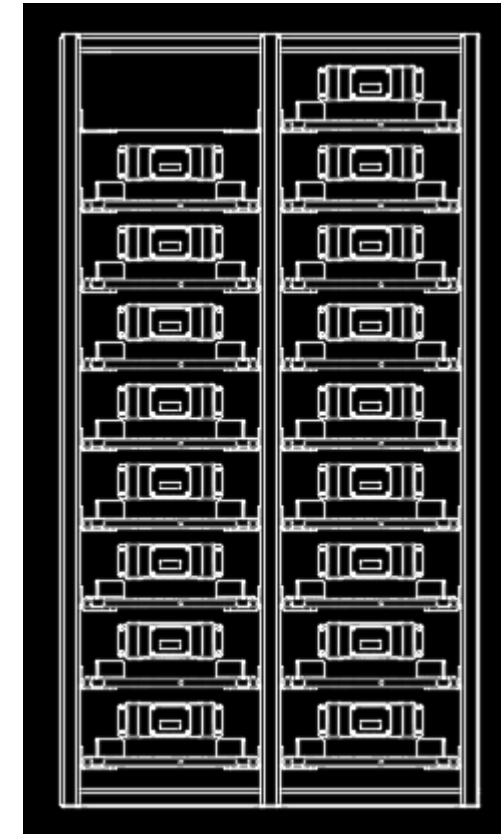
Pictures above for reference only

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Battery cluster-every 4 clusters connected into one PCS, total 4 PCS (16 clusters)

5. Battery Management System

　　The battery management system monitors the battery status and sends the battery status and alarm information to the background timely. The backstage controls the inverter to effectively charge and discharge the battery pack, ensuring the normal and stable operation of the whole energy storage system.

✓Cell voltage, temperature, pack voltage, temperature and current date collection function；
✓SOC and SOH diagnosis function ；
✓Balancing maintenance function；
✓Thermal management function；
✓Insulation monitoring, charge-discharge contactor control, etc. ；
✓Fault diagnosis function；
✓Alarm and protection function；
✓Battery status display, data query, parameter Settings, etc. ；
✓Information interaction with PCS or EMS。
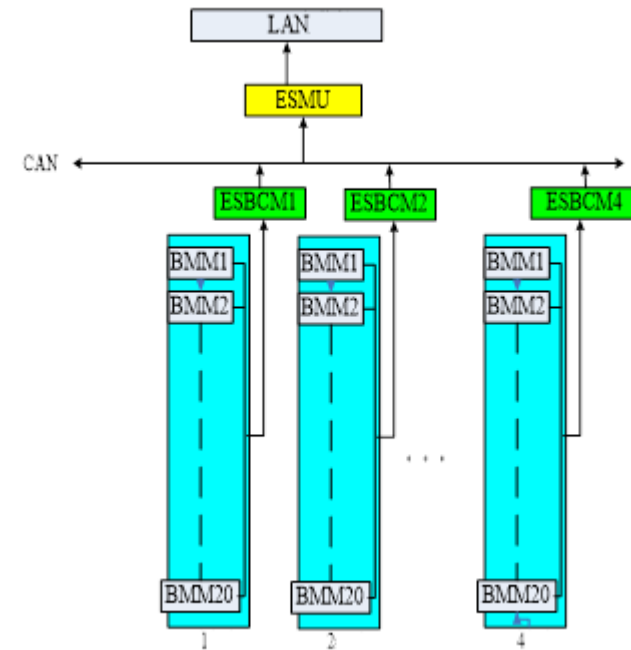
5. Battery Management System-slave control unit BMM

BMM technical parameter：

- Support 6~12 single cell voltage monitoring, and the total voltage of the battery pack should be greater than 12V；
- Support 12 channels NTC temperature monitoring；
- Support 1 channel digital signal output (output voltage following power supply) and 1 channel PWM signal output (for fan speed control)；
- Support passive equalization, and energy consumption equalization technology is adopted. Discharge equalization can be carried out for several single cells at the same time, the max. balancing current is 50mA, and the equalization energy of single cell can be calculated;
- Support thermal management, perform active cold and heat management on the battery based on the battery temperature status to fulfill the temperature control function of cooling or heating to extend the battery life；
- Support Bootloader upgrade, CAN bus online firmware upgrade；
- Support low power mode, and the sneak current in low power mode can be reduced to 10uA or even lower
- Support single cell SOC/SOH calculation；
- Cell voltage (over voltage, under voltage), temperature (over temperature), communication and other alarm functions
- Support balancing fault detection；
- Support the collection of wire harness (voltage, temperature) drop detection function.

Item	Technical parameter
Modular power supply	DC24V±15%
Working power	Operating consumption ＜2W (balancing function disable)
Battery balancing current	Passive balancing, 50mA
Manageable cells	Max. 12
Voltage balancing range	1.5～4.5V
Battery balancing method	Passive balancing
Communication	CAN 2.0
Communication baud rate	250Kbps (Default), optional
Input insulation resistance	≥5MΩ,1000VDC
Installation size	118.5*100*27mm （L×W×H）
Installation method	Screw fixation

5. Battery Management System-master control unit BCM

- Function of power on self-checking on the system, including the status of all sensor and system；
- Pack voltage, current and temperature detection function；
- Collect and forward the ESDBM data and at the same time;
- Main contactor control management and the main contactor feedback signal of detection function；
- Alarm for abnormality and hard contact protection control function；
- CAN/RS485 communication
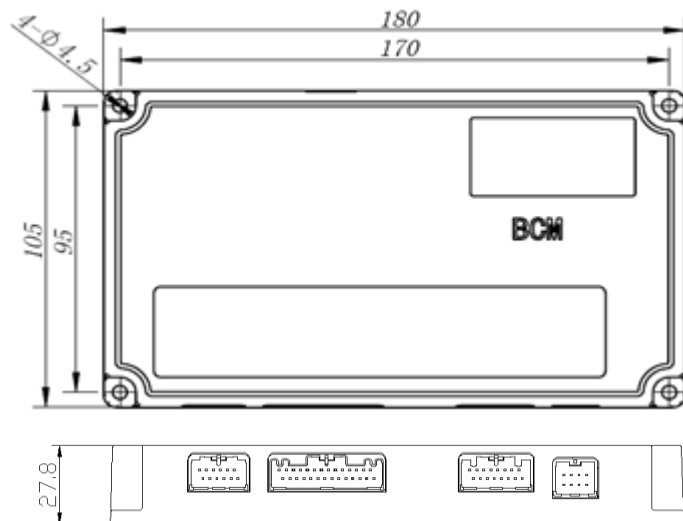
Control unit model		ESBCM-8133
Pack voltage detection	Voltage detection range	<1000V
	Voltage detection accuracy	±0.2%
	Voltage detection period	100ms
Pack current detection	Current detection range	±1000A（according to shunt model）
	Current detection accuracy	≤±0.5%（full range）
	Current detection period	100ms
Temperature detection	Temp. detection range	-20～85℃
	Temp. detection accuracy	±1℃
	Temp. detection period	100ms
Insulation resistance detection	Insulation resistance detection accuracy	±5%
	Insulation resistance detection period	2s
Working vol.		9～32Vdc
Working temp.		-20～65℃
Working consumption		<2.1W
Commu. port		RS485*2 ， CAN*3
Commu. baud rate		9600bps, 250Kbps（Default）
DO(Switch)		2*2A/Input power（9-30V）
DO(Active)		6*2A/Input power（9-30V）
DI		4*High level（9-30V），Current higher than 0.5mA
Input insulation resistance		≥5MΩ,1000VDC
Installation size		180*105*28mm（L*W*H）
Installation method		Rack mount

5. Battery Management System-Display control unit ESMU

1) Monitoring data
- Manage battery information and display cell data (V/SOC) ;
- Display pack voltage and current ;
- Display environmental temperature and cell temperature ;

2) Alarm function
- Communication alarm ;
- Cell overvoltage, under voltage alarm;
- Pack overvoltage, under voltage, overcurrent alarm ;
- Over temperature and under temperature alarm;

3) Protection
- Pack overvoltage, under voltage protection;
- Pack overvoltage, under voltage, short-circuit protection
- Over temperature and under temperature protection;

4) Parameter setting
- Pack installation and operating parameter setting;
- Network communication parameter setting ;
- Interface protocol parameter setting;
- ESBCM parameter setting。

ESS server ESMU	
Communication port	RS485*1，CAN*1，Ethernet10/100M，RS485/RS232*1
Event log database	10000 event log including abnormality, occur time, protective actions
User Interface	10.1" LCD touchscreen
ESMU power supply	Input: DC24V
ESMU	＜5W
Communication	9600bps，250Kbp、100Mbps
Size	275.85×188.85×41.90mm
Material	Metal case
Technology	Conformal coating
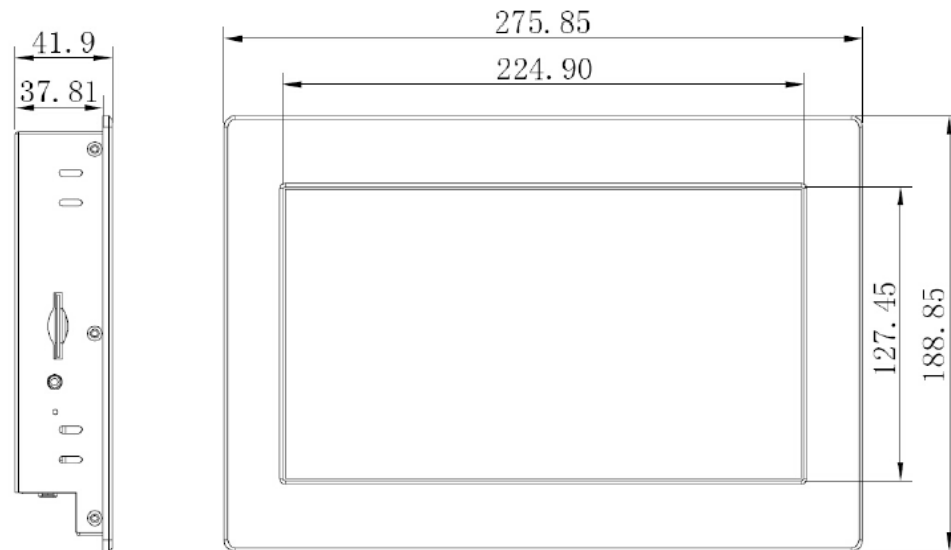
5. Protection control strategy and temperature management strategy

BMS protection function adopts a three-level strategy

- Level 1: when the battery status reaches the mild warning threshold, BMS sends alarm information to PCS and monitoring background to request EMS to adjust the battery operating power.

- Level 2: When the battery status reaches the moderate alarm threshold, BMS sends alarm information to PCS and monitoring background to request PCS to control the shutdown ;

- Level 3: When the battery status reaches the critical alarm threshold, BMS sends protection information to PCS and monitoring background. If PCS does not stop in time, BMS disconnects the contactor directly and prohibits output.

6. System configuration

No.	Item	Model	Unit	Quantity		Remark
				0.3MWh	1.2MWh	
1	BMM	ESBMM-1212, 12 cells*3.2V LiFePO4 battery management	Set	80	320	Passive balancing, calculate by managing 12 cells, 20 modules for each cluster
2	BCM	ESBCM-8133, pack voltage and current detection, insulation detection, communicate with PCS	Set	4	16	
3	Management server	10 inch ESMU, Battery information storage, analysis and display functions, communication with the background monitoring system EMS	Set	1	4	10 inch
4	Power module	Battery	Set	4	16	
5	Wiring harness	Sampling module wire harness (project customized) contains temperature module	Set	80	320	
6	Bus bar cabinet	Including bus bar circuit breaker, motor operator and switching power supply	Set	1	4	
7	DC circuit breaker	Bus bar circuit breaker with motor operator	Set	1	4	
8	High voltage box	High voltage control components and master control carrier	Set	4	16	
9	DC circuit breaker	Branch circuit breaker	Set	4	16	
10	DC contactor	Production function	Set	4	16	
11	Fuse	Pulse current protection	Set	4	16	
12	Shunt	Current sampling	Set	4	16	
13	System accessories	Connection wire, communication/power supply wire	Set	1	4	