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ELECTRIC VEHICLE ENERGY STORAGE COMPANY

ES-10002000S

Power: 1000kW
Energy: 2064kWh

Containerized Battery Energy Storage System
LiFePO4 Battery Technology

FEATURES

- 20' containerized design complete with battery, PCS, HVAC, fire suppression, and local controller
- Maximum safety utilizing the safest type of lithium battery chemistry (LiFePO4) combined with an intelligent 3-level Battery Management System
- Tested to UL9540A and certified to UL9540
- Outstanding performance and long lifespan with over 5000 cycles
- Bi-directional PCS with multiple modes for flexible charging and discharging of batteries
- 100% prefabricated containerized design makes for quick and easily onsite installation
- Optimized for both on-grid and off-grid applications
- Integrated local controller for operation status control, grid-connection control, protection and data exchange

APPROVALS

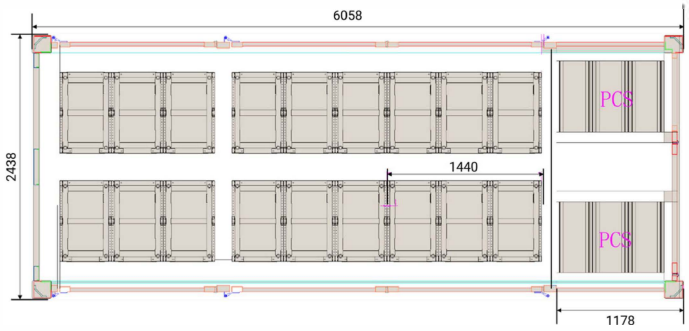
- UL 9540 certified
- UL 9540A thermal runaway tested
- UN 38.3 certified
- IEC62619/62477 certified
- Complies with CEPA and NFPA safety codes

The graphics shown may differ from the actual structure.

SYSTEM SPECIFICATIONS

Nominal Energy	2064 kWh
Rated AC Power (via PCS)	1000 kW
Nominal Capacity	1680 Ah
Nominal DC Voltage	1228.8 Volts
DC Voltage Range	1075.2 ~ 1363.2 Volts
Max. Continuous Charge	836.8 A
Max. Continuous Discharge	836.8 A
Grid-tied AC Connection	690 VAC 50 / 60 Hz
Optional Transformer	Step down to loads: 690:400 or 690:480 V etc.. Step up to grid: 0.690:20, 25, 35 kV etc..
Operating Temperature Range Charge Discharge	 32°F (0°C) to 113°F (45°C) -4°F (-20°C) to 131°F (55°C)
Cell Chemistry	Lithium Iron Phosphate (LiFePO4)
Dimensions (L x W x H)	6058 x 2438 x 2591mm
Weight (Approx.)	~24,000kg
Enclosure	20' GP container IP65
Containerized System Includes	Battery, BMS PCS, HVAC, FSS, Local Controller and Optional Gas Detection & Release System,

SYSTEM LAYOUT



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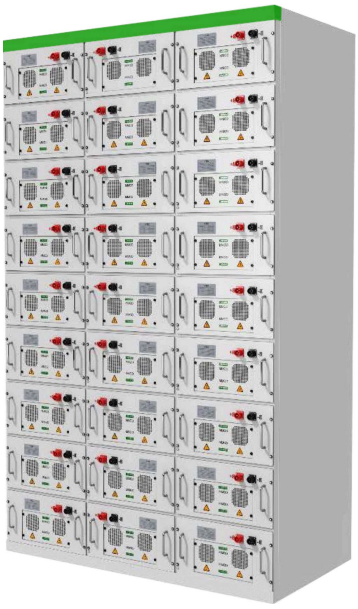

BATTERY RACK SPECIFICATIONS	
Cell Configuration	384s1p
Assembled Module Configuration	16s1p
Number of Modules per Rack	24
Nominal Energy	344.064 kWh
Nominal Capacity	280 Ah
Nominal Voltage	1228.8 Volts
Voltage Range	1075.2 ~ 1363.2 Volts
Max. Continuous Charge	280A @ 1C
Max. Continuous Discharge	280A @ 1C
HVU	Included
Communication	RS485, Modbus RTU/TCP
Air Cooled	Included
IP Level	IP20
Dimensions (W x D x H)	1440 x 650 x 2150 mm
Weight	2910 Kg
Number of Racks in ES-10002000S	6

BATTERY MODULE SPECIFICATIONS	
Cell Configuration	16s1p
Nominal Energy	14.336 kWh
Nominal Capacity	280 Ah
Nominal Voltage	51.2 Volts
Voltage Range	44.8 ~ 56.8 Volts
Cycles @ 25 °C	5000
BMU	Included
Cell Max. Continuous Charge	1C
Cell Max. Continuous Discharge	1C
Cell Peak Discharge @ 25 °C	3C, 10s
Communication	RS485, Modbus RTU/TCP
Air Cooled	Included
IP Level	IP20
Approvals	UL 1973, IEC62619, CE Racks tested to UL9540A for thermal runaway

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BATTERY MANAGEMENT SYSTEM

EVESCO's containerized energy storage systems come complete with an intelligent 3-level framework Battery Management System (BMS), which includes a BMU, SBMS and MBMS.

The BMS provides all round, real- time monitoring and protection of the lithium batteries within the ESS. It provides data on cell voltage, cell temperature, cable terminal temperature, battery string voltage, current, SOC and SOH.

The BMS has been configured with a set value over limit logic, which is integrated with the main control terminal to deliver complete protection and maximum battery life.

FEATURES

- 3-level BMS offering complete battery protection
- Comprehensive monitoring of battery operating status, including voltage, current and temperature
- High voltage detection accuracy on battery cells, ensuring exceptional system data analysis reliability
- Multi point temperature monitoring to avoid battery thermal runaway and ensure system safety
- Active cell balancing to maximize battery life
- Modular design with high scalability

BMU SPECIFICATIONS	
Cell Volt. Measurement Accuracy	±5 mV
Cell Volt. Monitoring Interval	≤ 500 ms
Cell Temp. Measurement Accuracy	±2°C
Cell Temp. Measurement Interval	≤ 3s
Cell Balancing Current	5A max.
Cell Voltage Measurement Range	1 ~ 4.95 Volts
Balancing Method	Active balancing
Over Temperature Protection	Automatic
Overcurrent Protection	250 A / 1s
Short Circuit Protection	500 A/ 10ms

CMU SPECIFICATIONS	
String Voltage Measurement Range	50~1500 Volts
String Volt. Measurement Accuracy	±1%
String Volt. Monitoring Interval	≤ 200 ms
String Current Measurement Range	±400 A
String Curt. Measurement Accuracy	≤ 1%
String Current Monitoring Interval	≤ 50 ms
SOC Calculation Accuracy	≤ 8%
Input Insulation Resistance	≥10 MΩ, 1000 VDC

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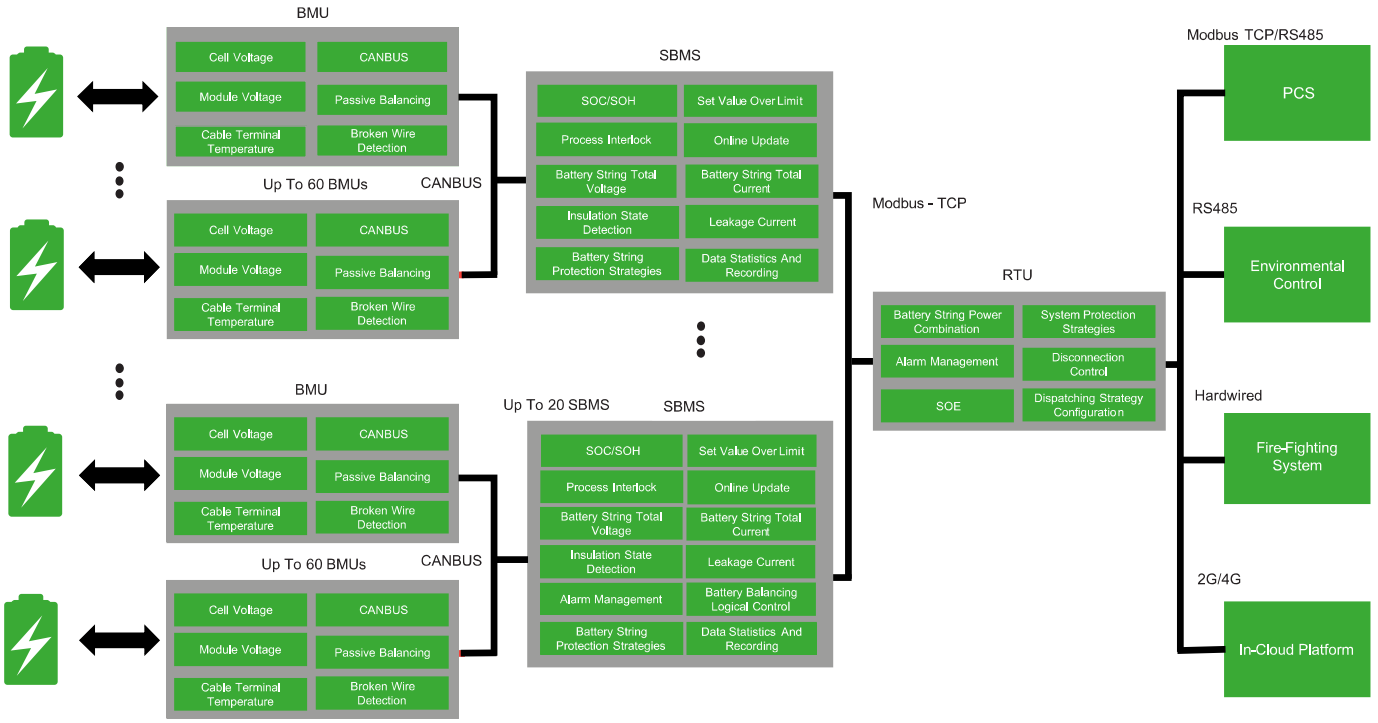
BATTERY MANAGEMENT SYSTEM

The BMS includes a first level system main controller MBMS, a second level battery string management module SBMS, and a third level battery monitoring unit BMU, wherein the SBMS can mount up to 60 BMUs.

3-LEVEL FRAMEWORK



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POWER CONVERSION SYSTEM (PCS)

EVESCO's containerized energy storage systems utilize a Power Conversion System (PCS) with an advanced bi-directional converter which can charge and discharge the batteries with various modes. These modes offer flexibility for different charging/discharging strategies based on the specific goals of your application. The ES-10002000S utilizes 6 x 200kW PCS in parallel.

FEATURES

- Bi-directional converter with multiple modes for flexible charging and discharging of batteries
- Modes for charging include constant current charging, equalized charging and float charging
- Meets smart grid design specifications allowing for grid ancillary services and demand response programs
- Advanced islanding detection technology
- Off-grid independent operation
- Reactive power compensation and other functions
- Fast and accurate power response
- Optional transformer to step-up to grid and step-down to loads

GENERAL SPECIFICATIONS (1X 200KW)	
Transformer	Not included
IP Level	IP66
Operating Temperature	-22°F (-30°C) to 149°F (65°C)
Relative Humidity	0 ~ 100% (no condensation)
Cooling	Intelligent forced air cooling
Dimensions (W x H x D)	800 x 275 x 865 mm
Weight	100 Kg

GENERAL SPECIFICATIONS (CONT..)	
Altitude	4000 m
Display	Touch screen LCD
Communication Protocol	Modbus-RTU / Modbus-TCP
Communication Interface	RS485, CAN

DC INPUT SPECIFICATIONS	
Max. DC Voltage	1500 VDC
DC Voltage Range	1000 VDC ~ 1500 VDC
Max. DC Current	224.5 A (x6 for complete system)

GRID-TIED AC OUTPUT SPECIFICATIONS	
Rated AC Output Power	200 kW (1000 kW for complete system)
Max. AC Output Power	220 kW (1320 kW for complete system)
Rated Grid Voltage	690 VAC 3W +PE
Output Voltage Range	586.5 ~ 759 V (settable)
Rated Grid Frequency	50 Hz / 60 Hz
Max Output Current	184.1 A (x6 for complete system)
Adjustable Power Factor	>0.99 (at rated power) 1 (leading) ~ 1 (lagging)

PCS specifications subject to change based on application.

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HVAC

The environmental control system inside the ESS adopts precision heating, ventilation and air conditioning designed to ensure ideal internal temperature whether discharging, charging or on standby.

The operation of the HVAC is fully automatic and responds to the internal temperature of the container. It is a highly reliable system and has a number of easy to use functions.

- **Cooling -** cooling starts when the containers internal temperature exceeds the cooling set point, and it stops when the temperature drops below the cooling set point.
- **Heating -** heating starts when the containers internal temperature is lower than the heating set point, and it stops when the temperature rises above the heating set point.
- **Dehumidification -** dehumidification starts when the containers internal humidity exceeds the dehumidification set point, and it stops when the humidity drops below the dehumidification set point.

HVAC SPECIFICATIONS

PARAMETER	DEFAULT	SETTING RANGE
Cooling Set Point	77°F (25°C)	59 ~ 122°F (15 ~ 50°C)
Return Difference	50°F (10°C)	34 ~ 50°F (1 ~ 10°C)
Heating Set Point	59°F (15°C)	5 ~ 59°F (-15 ~ 15°C)
Return Difference	50°F (10°C)	34 ~ 50°F (1 ~ 10°C)
Dehumidification Set Point	60%	40 ~ 90 %
Return Difference	50%	34 ~ 86%

FIRE SUPPRESSION SYSTEM

The fire suppression system is designed according to the container size, and the fire extinguishing gas is discharged from the extinguishing gas cylinders to the main pipeline and then to branch pipelines and sprayed from nozzles. The system includes fire detectors, audible and visual alarm, emergency start/stop button, gas release indicator, gas extinguishing controller, etc., and follows global standards. Main features include.

- Extinguishes electrical, liquid and solid substance fires
- Auto start, manual start and mechanical emergency start
- Effectively prevents accidental discharge caused by chronic leakage
- Configured to prevent accidental start
- Event logging function

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LOCAL CONTROLLER

The local controller is a dedicated controller which has been developed specifically for energy storage systems. It has been designed for the control, protection, communication and scheduling of the ESS subsystems (BMS, HMI, HVAC, fire suppression, electricity meter etc.)

DATA EXCHANGE

The controller summarizes information of the subsystems through communication protocols, it is then forwarded to the master BESS. At the same time, it processes the control commands issued by the main station and then forwards them to each subsystem.

DATA STORAGE

The controller has a storage function, which stores up to 8G of historical data. Historical data can be analyzed by the user if a fault occurs w to quickly locate and solve the problem. The standard data (1-minute intervals) can be stored for at least 3 months.

DESIGNED TO WORK WITH THIRD PARTY SCADA & EMS

The local controller's operating system is designed to work with third party SCADA or EMS using register map as a communication protocol.

The key function for the local controller is the charge or discharge of the Battery Energy Storage System. Depending on the application of the BESS an EMS may be required. EVESCO are happy to work with you in choosing a suitable EMS based on the location and application.

REMOTE MONITORING & MANAGEMENT

The controller can access 4G Internet, enabling communication with remote servers to facilitate remote monitoring and management. The control delay time is <500 ms. Internet infrastructure and additional hardware will be required.

FLEXIBLE EXPANSION OF INTERFACE FUNCTIONS

The controller includes various interface expansion modules: communication module, digital input/ output module, analog input/output module. Through expansion, the controller can quickly expand the sampling and control functions

LOCAL CONTROLLER SPECIFICATIONS	
PCS Communication	TCP, RS485
HVU Communication	TCP, IP
HVAC Communication	RS485
Supported Communication Protocols	Ethernet, Analog and digital I/O, MODBUS, DNP, IEC 102, IEC61850
Relay	24 stem node input / outputts
Grid Control Application	Time shifting, peak shaving, renewable moving average
Off-Grid Control Application	Backup power, PV/DG/EV/ ESS integrated micro-grid control
Battery Management System	DC busbar incoming control

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LOCAL CONTROLLER

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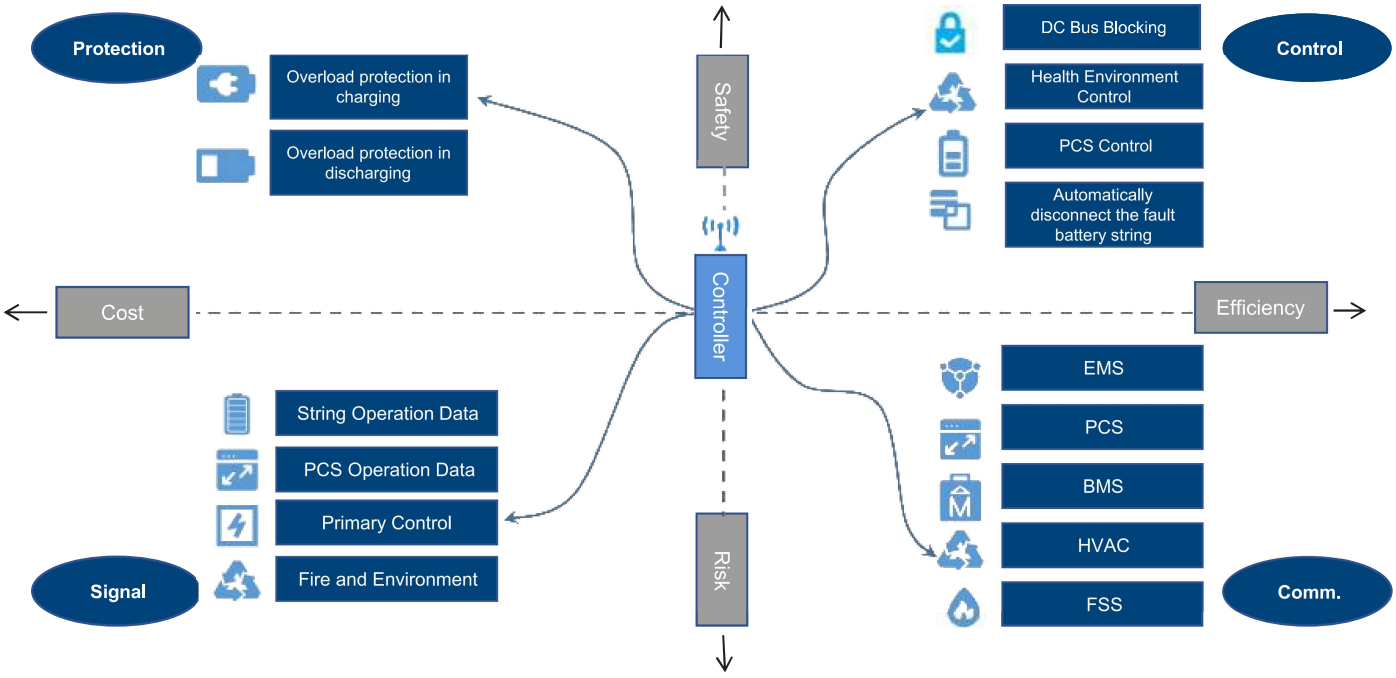

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