



## ES-10002000EU Power: 1000kW Energy: 2212kWh

### Containerized Battery Energy Storage System LiFePO4 Battery Technology

#### FEATURES

- 40' containerized design complete with battery, PCS, HVAC, fire suppression, lighting and local controller
- Maximum safety utilizing the safest type of lithium battery chemistry (LiFePO4) combined with an intelligent 3-level Battery Management System
- Outstanding performance and long lifespan with over 6000 cycles at 0.5C
- Bi-directional PCS with multiple modes for flexible charging and discharging of batteries
- Prefabricated containerized design makes for quick and easily onsite assembly
- Optimized for both on-grid and off-grid applications
- Integrated local controller for operation status control, DC grid-connection control, protection and data exchange

#### APPROVALS

- Cells: UL 1642, Modules: UL 1973, System: UL 9540A
- UN 38.3 certified
- ISO9001:2015 – Quality management systems

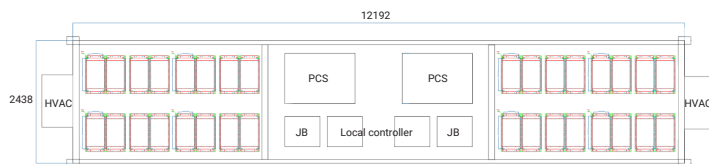


The graphics shown may differ from the actual structure.

#### SYSTEM SPECIFICATIONS

<b>Nominal Energy</b>	2212 kWh
<b>Usable Energy (@95% DoD)</b>	2056 kWh
<b>Rated AC Power (via PCS)</b>	1000 kW
<b>Nominal Capacity</b>	2880 Ah
<b>Nominal DC Voltage</b>	768 Volts
<b>DC Voltage Range</b>	672 ~ 852 Volts
<b>Max. Continuous Charge</b>	2880A @ 1C
<b>Max. Continuous Discharge</b>	2880A @ 1C
<b>Grid-tied AC Connection</b>	AC Bus 400 Vac (360 ~ 440 Vac settable)
<b>Operating Temperature Range</b> Charge Discharge	32°F (0°C) to 113°F (45°C) -4°F (-20°C) to 131°F (55°C)
<b>Cell Chemistry</b>	Lithium Iron Phosphate (LiFePO4)
<b>Dimensions (L x W x H)</b>	12192 x 2438 x 2591mm
<b>Weight (Approx.)</b>	TBC
<b>Enclosure</b>	40' GP container IP54
<b>Containerized System Includes</b>	Battery, PCS, HVAC, FSS, Local Controller, Lighting & DC Power Meter

#### SYSTEM LAYOUT



**EVESCO**  
(PART OF POWER SONIC CORP.)  
**NA, LATAM & APAC**  
365 Cabela Dr Suite 300,  
Reno, Nevada 89439  
USA  
T: +1 775 824 6500  
E: [evesco@power-sonic.com](mailto:evesco@power-sonic.com)

**EMEA**  
Smitspol 4, 3861 RS,  
Nijkerk  
The Netherlands  
T: +31 33 7410 700  
E: [evesco@power-sonic.com](mailto:evesco@power-sonic.com)

[evesco.com](http://evesco.com)



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BATTERY RACK SPECIFICATIONS		BATTERY MODULE SPECIFICATIONS	
Cell Configuration	240s2p	Cell Configuration	16s2p
Assembled Module Configuration	16s2p	Nominal Energy	9.22 kWh
Number of Modules per Rack	15	Nominal Capacity	180 Ah
Nominal Energy	138.24 kWh	Nominal Voltage	51.2 Volts
Nominal Capacity	180 Ah	Voltage Range	44.8 ~ 56.8 Volts
Nominal Voltage	768 Volts	Cycles @ 25 °C	6000 @ 0.5C
Voltage Range	672 ~ 852 Volts	BMU	Included
Max. Continuous Charge	180A @ 1C	Cell Max. Continuous Charge	1C
Max. Continuous Discharge	180A @ 1C	Cell Max. Continuous Discharge	1C
HVU	Included/ 160-250A	Cell Peak Discharge @ 25 °C	3C, 10s
Communication	CAN, RS485	Communication	CAN, RS485
Air Cooled	Included	Air Cooled	Included
IP Level	IP20	IP Level	IP20
Dimensions (W x D x H)	1000 x 750 x 2050 mm	Weight	80 Kg
Weight	1500 Kg	Approvals	UL 1973, IEC62619, CE
Number of Racks in ES-10002000EU	16		



**EVESCO**  
(PART OF POWER SONIC CORP.)  
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USA  
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E: [evesco@power-sonic.com](mailto:evesco@power-sonic.com)

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Nijkerk  
The Netherlands  
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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
- Passive cell balancing to maximize battery life
- Modular design with high scalability

#### BMU SPECIFICATIONS

Cell Volt. Measurement Accuracy	±3 mV
Cell Volt. Monitoring Interval	10 ms
Cell Temp. Measurement Accuracy	±3°C
Cell Temp. Measurement Interval	100 ms
Cell Balancing Current	≥120 mA
Cell Voltage Measurement Range	1 ~ 4.95 Volts

#### BMU SPECIFICATIONS (CONT..)

Balancing Method	Passive balancing
Over Temperature Protection	Automatic
Low Temp. Protection in Charging	Automatic
Overcurrent Protection	250 A/1 s
Short Circuit Protection	500 A/10 ms
Input Insulation Resistance	≥10MΩ, 1000 VDC
BMS Insulation Voltage	All internal cables to shell: 2.2kVac/5mA, 1 minute, no arcing

#### SBMS SPECIFICATIONS

String Voltage Measurement Range	0~1000 Volts
String Volt. Measurement Accuracy	±0.5%
String Volt. Monitoring Interval	100 ms
String Current Measurement Range	±400 A
String Curt. Measurement Accuracy	1%
String Current Monitoring Interval	20 ms
String Temp. Measure. Accuracy	±2°C
String Temp. Monitoring Interval	100 ms
SOC Calculation Accuracy	8%
Insulation Monitoring Resolution	1kΩ
Input Insulation Resistance	≥10 MΩ, 1000 VDC

#### MBMS SPECIFICATIONS

Operating Voltage Range	220 VAC ±15%
Operating Temperature	-40°F (-40°C) to 122°F (50°C)
Relative Humidity	20% ~ 90% RH
Thermal Management Method	Air cooling
Insulation State Detection	Yes
Temperature Measurement Range	-40°F (-40°C) to 122°F (50°C)
Maximum Power Supply	10 W
Input Insulation Resistance	≥10 MΩ, 1000 VDC



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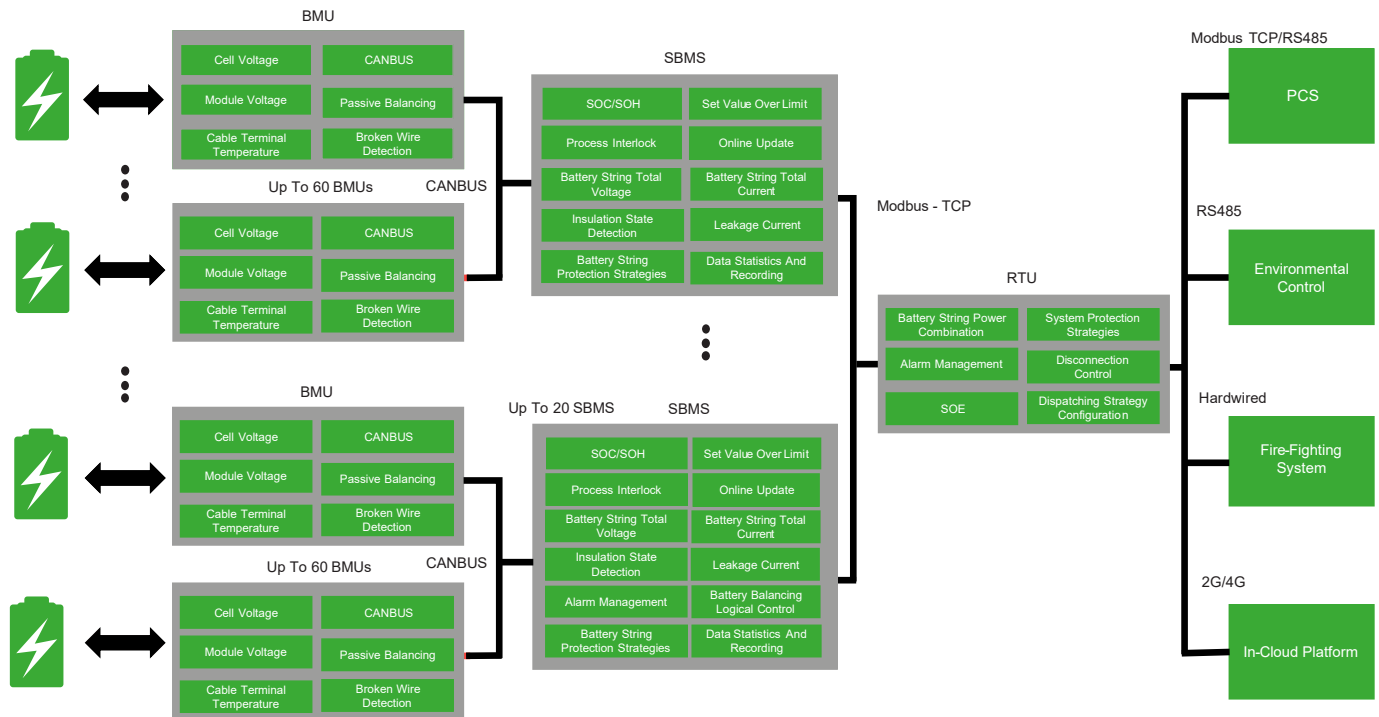
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### BATTERY MANAGEMENT SYSTEM

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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365 Cabela Dr Suite 300,  
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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.

### 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
- Integrated isolation and step-up transformers optional

**PCS specifications subject to change based on application.**

#### GENERAL SPECIFICATIONS

Isolation Transformer	Optional
IP Level	IP20
Operating Temperature	-22°F (-30°C) to 149°F (65°C) (>113°F (40°C) derating)
Relative Humidity	0 ~ 95% (no condensation)
Cooling	Intelligent forced air cooling
Dimensions (W x H x D)	2438 x 2591 x 1990 mm
Weight	3400 Kg



#### GENERAL SPECIFICATIONS (CONT..)

Altitude	5000 m (>3000 m derating)
Display	Touch screen LCD
Communication Protocol	Modbus-RTU / Modbus-TCP
Communication Interface	RS485

#### DC INPUT SPECIFICATIONS

Max. DC Voltage	1000 VDC
DC Voltage Range	500 VDC ~ 900 VDC
Max. DC Current	962 A*2
Auto Buffering Function	Yes

#### GRID-TIED AC OUTPUT SPECIFICATIONS

Rated AC Output Power	1000 kW
Max. AC Output Power	1100 kVA
Rated Output Voltage	400 VAC
Output Voltage Range	-15% ~ 10% (settable)
Rated Grid Frequency	50 Hz (45 Hz ~ 55 Hz settable)
Max Output Current	794 A *2
Adjustable Power Factor	>0.99 (at rated power) 1 (leading) ~ 1 (lagging)
THDi	<3% (at rated power)

#### OFF-GRID AC OUTPUT SPECIFICATIONS

Rated AC Output Voltage	400 VAC
Output Voltage Precision	1%
Max. Output Current	794 A*2
THDu	<1% (linear load)
Rated Output Frequency	60 Hz
Overload Capability	110% Overload



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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 European 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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LiFePO<sub>4</sub> Battery Technology

### 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 ACQUISITION

- State-of-charge and fault signal of each battery string; PCS fault signal; system emergency stop signal; AC & DC circuit breaker position signal; DC contactor position signal; air conditioning operation signal; gas fire extinguishing system alarming signal;
- Total DC and voltage, DC and voltage of each battery string, grid access point active power, demand power, and container ambient temperature signal;
- Communication Control: In-cloud EMS, PCS, BMS, air conditioning, fire protection, third-party platform;

### LOGIC CONTROLLER

- Monitor the DC voltage level difference between battery strings, and block the DC busbar connection to avoid circulating current due to the massive voltage difference;
- Monitor battery temperature and container ambient temperature, automatically start the fan and air conditioner in the battery cabinet to meet the battery working environment requirements;

### 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.



### MULTIPLE PROTECTION

- Overload protection in charging: monitor the transformer load status at the grid access point busbar in charging, and adjust the charging power or stop charging when overloading;
- Reverse power protection in discharging: monitor the transformer load status at the grid access point busbar in discharging, and adjust the discharging power or stop discharging when there's reverse power;
- Unlike the conventional integrated system's three- or four-level architecture, the Local Controller is designed according to the relay protection control logic derived from the transformer substation integrated automation system. It De-couples' interactions between PCS, BMS, EMS, and auxiliary system, which becomes a central control unit to avoid crossing controls.

#### 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	4 dry contacts inputs/outputs
Dimensions (W x H x D)	600 x 2050 x 750 mm
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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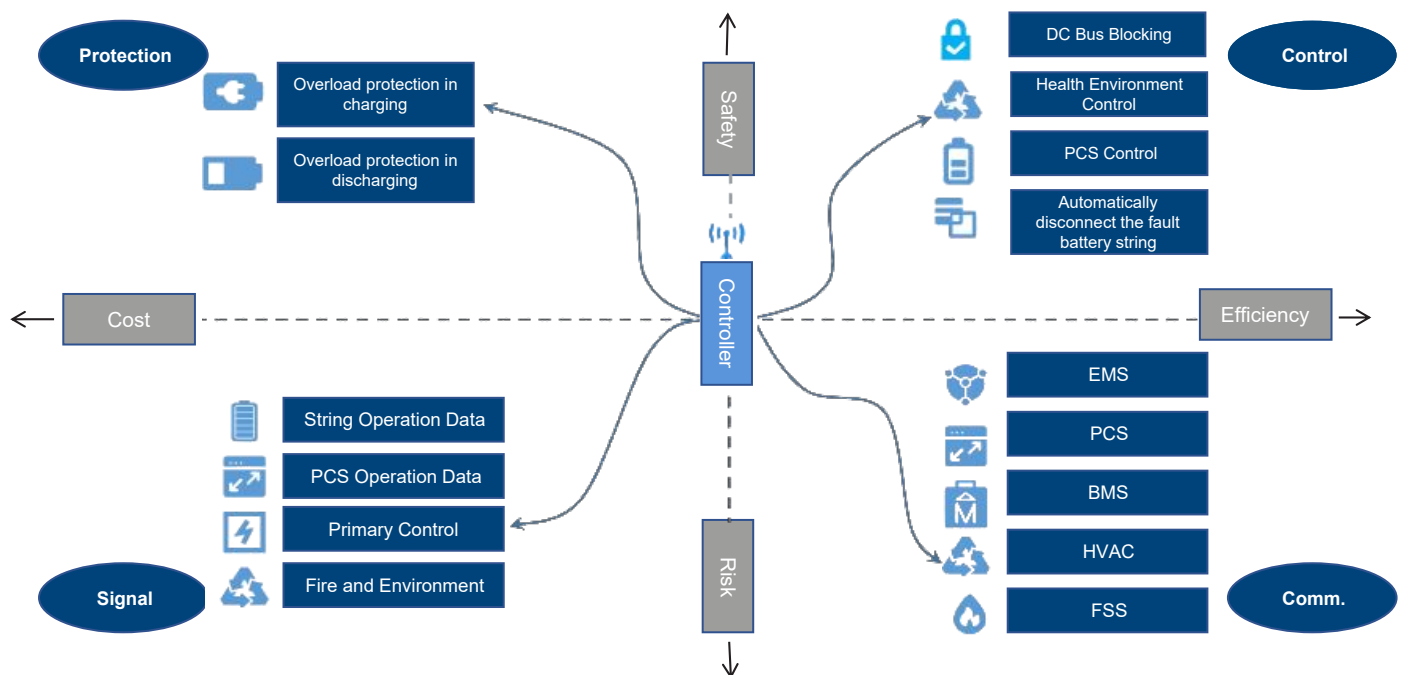


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### LOCAL CONTROLLER

The local controller is a device that realizes system operation, status control, DC grid connection control, system protection and data exchange. It is at the core of the ESS operation.



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