



ELECTRIC VEHICLE ENERGY STORAGE COMPANY



ES-60EU SERIES Power: 60kW Energy: 128kWh +

All-in-One Battery Energy Storage System
LiFePO4 Battery Technology

FEATURES

- All-in-one system complete with battery, hybrid inverter,, 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
- Outstanding performance and long lifespan with over 5000 cycles
- Bi-directional hybrid inverter with multiple modes for flexible charging and discharging of batteries
- Delivered 95% pre-assembled
- Optimized for both on-grid and off-grid applications
- Integrated local controller for operation status control, DC grid-connection control, protection and data exchange
- Designed for easy installation and maintenance

APPROVALS

- UL 9540 certified
- UL 9540A thermal runaway tested
- UN 38.3 certified
- IEC62619/62477 certified
- UL 1741 hybrid inverter
- UL 1973 battery

SYSTEM SPECIFICATIONS

MPPT DATA

PV Voltage Range	520 - 900V (MPPT 520 - 800 V)
Max. PV DC Current	192 A

SYSTEM SPECIFICATIONS

AC DATA

Rated AC Power	60 kW
Maximum Power	65 kW
Input/ Output Voltage AC	400 Vac
Input/output Frequency	50 Hz
Out THDI	<3%
AC Current	72 A
Grid	3Phase 4Wires isolated line transformer

GENERAL DATA

Communication	RS485, Ethernet, GPRS
Operating Temperature Range	-4°F (-20°C) to 104°F (40°C)
Cell Chemistry	Lithium Iron Phosphate (LiFePO4)
Dimensions (W x D x H)	(ES-60128) 2250 x 1300 x 2591 mm (All other ES-60) 2991 x 2438 x 2591 mm
Weight (Approx.)	TBC
Enclosure Protection	IP54
Containerized System Includes	Battery, BMS, hybrid inverter, HVAC, FSS, Local Controller

SYSTEM LAYOUT



The graphics shown may differ from the actual structure.



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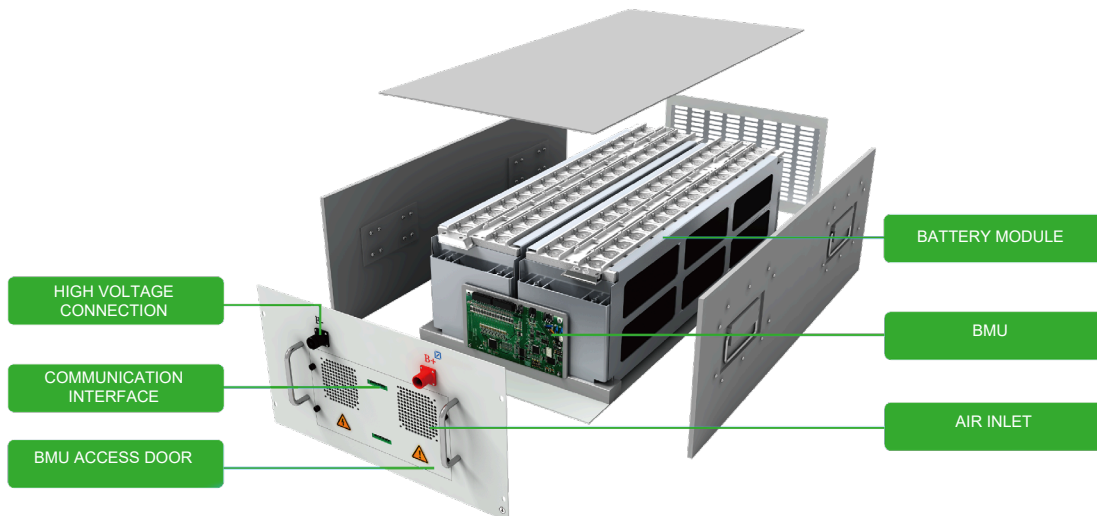
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BATTERY SPECIFICATIONS

	ES-60128EU	ES-60192 EU	ES-60256EU	ES-60320EU	ES-60384EU
Cell Type	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4
Assembled Module Configuration	16s2p	16s2p	16s2p	16s2p	16s2p
Assembled Rack Configuration	112s2p	112s2p	112s2p	112s2p	112s2p
Number of Racks	2	3	4	5	6
Nominal Energy	128kWh	192kWh	256kWh	320kWh	384kWh
Nominal Capacity	360 Ah	540 Ah	720 Ah	900 Ah	1080 Ah
Nominal Voltage	358 V	358 V	358 V	358 V	358 V
Voltage Range	314 - 398 Vdc	314 - 398 Vdc	314 - 398 Vdc	314 - 398 Vdc	314 - 398 Vdc
System Voltage Balance	<100ms	<100ms	<100ms	<100ms	<100ms
BMS	3 level framework	3 level framework	3 level framework	3 level framework	3 level framework
Life-span	5000 cycles @ 80% EoL 1C				



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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
Over current 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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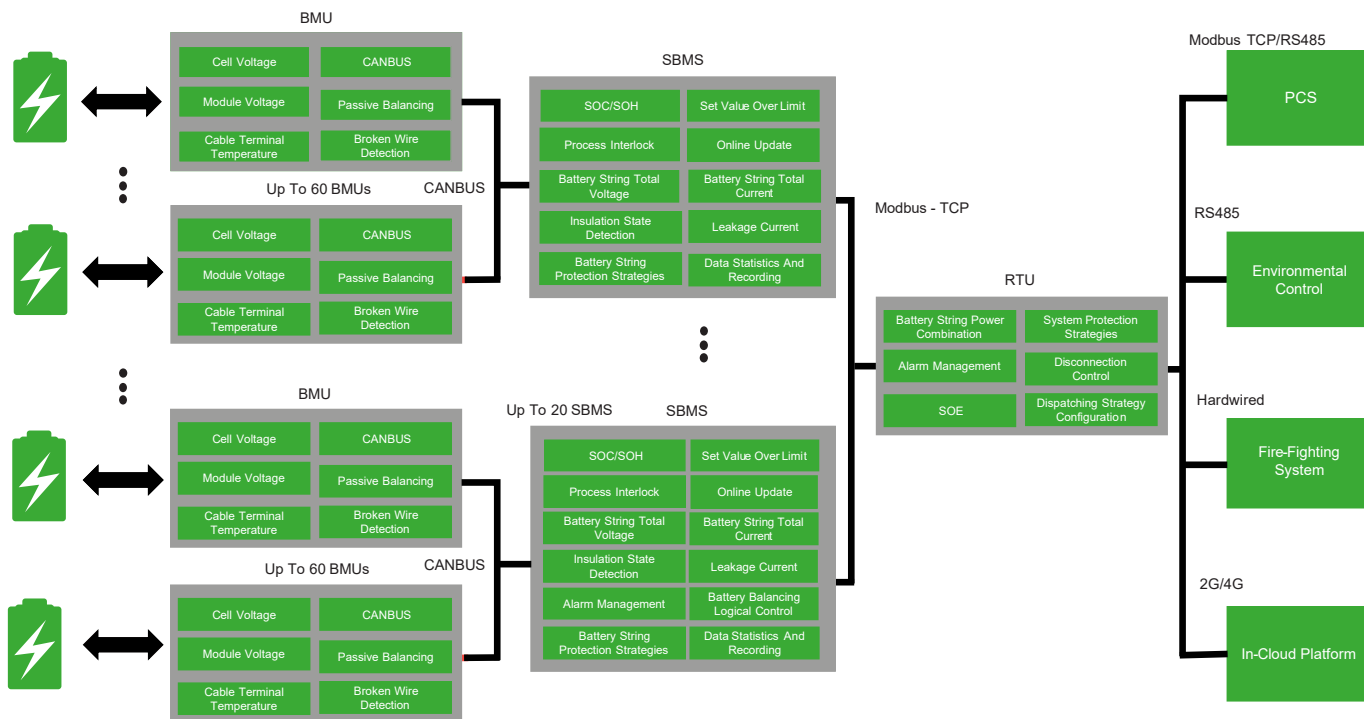
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BATTERY MANAGEMENT SYSTEM

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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HYBRID INVERTER

EVESCO's all-in-one energy storage systems utilize a hybrid inverter with an advanced bi-directional conversion system 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 conversion with multiple modes for flexible charging and discharging of batteries
- Modes for charging include constant current charging, equalized charging and float charging
- Grid-support functions
- Integrates with solar PV
- Off-grid independent operation
- Modular design and wide power range in single cabinet
- Fast and accurate power response
- Integrated transformer optional

Hybrid Inverter specifications subject to change based on application.

GENERAL SPECIFICATIONS	
Peak Efficiency	95.5%
IP Level	IP20
Operating Temperature	-4°F (-20°C) to 122°F (50°C)
Relative Humidity	0 ~ 95% (no condensation)
Cooling	Forced air cooling
Dimensions (W x H x D)	800 x 2160 x 800 mm
Weight	520 Kg
Altitude	3000 m (>2000 m derating)
Display	Touch screen LCD



GENERAL SPECIFICATIONS (CONT..)

Noise	70dB
Communication	RS485, CAN, Ethernet
AC Connection	3Phase, 4Wire
Communication Interface	RS485

DC INPUT SPECIFICATIONS

Battery Voltage Range	250- 520 Vdc
Max. DC Current	150 A

UTILITY INTERACTIVE MODE SPECIFICATIONS

PV Voltage Range	520 - 900 V (MPPT 520 - 800 V)
PV DC Max. Current	192 A
AC Voltage Range	400 Vac (340 - 460 V)
AC Current	72 A
Nominal Power	60 kVA
AC Frequency	50 Hz
AC Power Factor	0.8 - 1 leading or lagging (controllable)
THDi	<3%

STAND-ALONE MODE SPECIFICATIONS

AC output Voltage	400 VAC (+/- 10% configurable)
AC Output Current	72 A (79 A Max)
Nominal AC Output	60 kVA
AC Max Power	65 kVA)
Output THDu	<2%
AC Frequency	50 Hz
AC Power Factor	0.8 - 1 leading or lagging (controllable)
Overload Capability	105%-115% (10min), 115%-125% (1min), 125%-150% (200ms)



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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 enclosure size. Each system is equipped with a nickel plated brass valve, a pressure gauge to monitor cylinder pressure, and a quarter turn ball valve that interfaces with the detection tubing. A piston in the valve bore is equipped with a static seal that keeps the agent under pressure within the cylinder, while allowing the pressure to equalize on both sides of the piston.

When the pressure from the top assembly is released by means of automatic or manual activation, the internal piston slides to its fully open position and allows the HFC-227ea agent to discharge through the two outlets.



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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 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, hybrid inverter, 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 hybrid inverter, 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
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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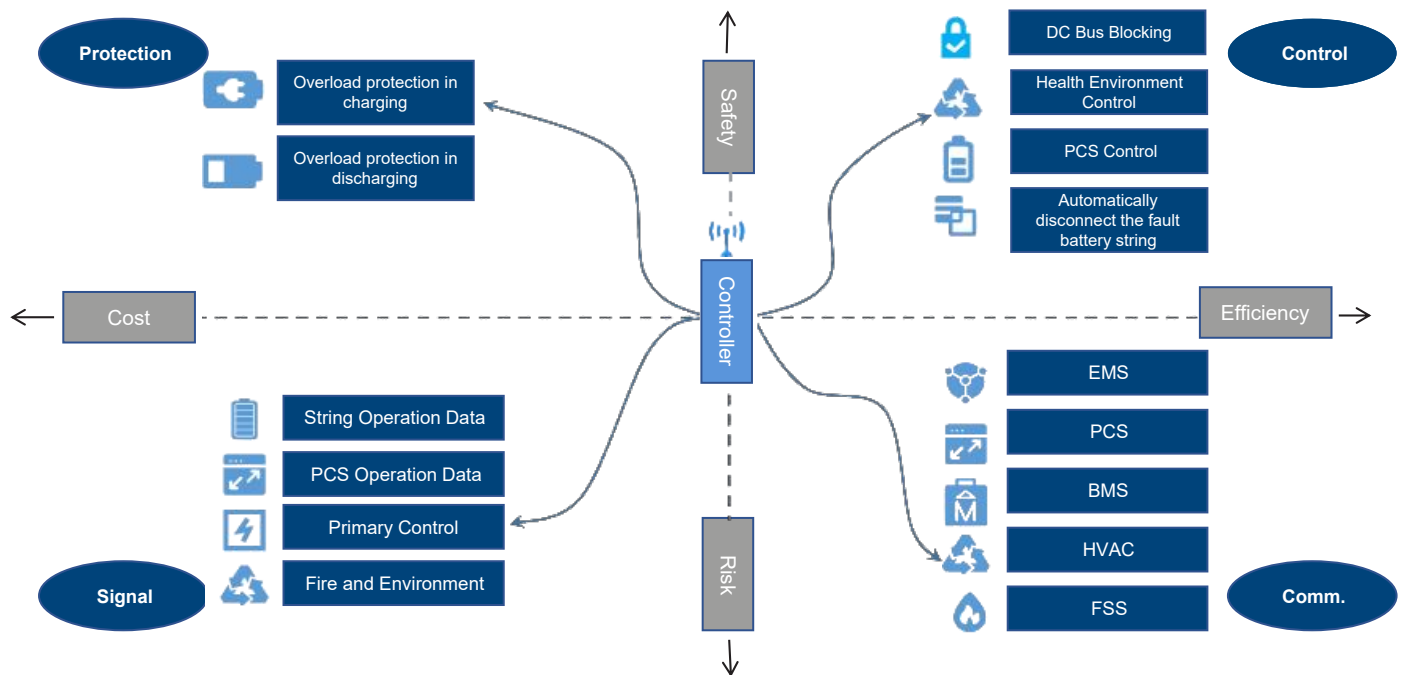


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LOCAL CONTROLLER

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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