



ELECTRIC VEHICLE ENERGY STORAGE COMPANY



## ES-90NA SERIES

Power: 90kW  
Energy: 128kWh+

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

### FEATURES

- Containerized, all-in-one system complete with battery, hybrid inverter, HVAC, fire suppression and controller
- Maximum safety utilizing the safest type of lithium battery chemistry (LiFePO4) combined with an intelligent 3-level Battery Management System
- Tested to UL 9540A and certified to UL 9540
- 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

### APPROVALS

- UL 9540 certified
- UL 9540A thermal runaway tested
- UN 38.3 certified
- IEC62619/62477 certified
- Complies with CEPA and NFPA safety codes
- UL 1741 hybrid inverter
- UL 1973 battery

### SYSTEM SPECIFICATIONS

#### MPPT DATA

<b>PV Voltage Range</b>	520 - 900 V (MPPT 520 - 800 V)
<b>Max. PV DC Current</b>	384 A

### SYSTEM SPECIFICATIONS

#### AC DATA

<b>Rated AC Power</b>	90 kW
<b>Maximum Power</b>	100 kW
<b>Input/ Output Voltage AC</b>	480 Vac
<b>Input/output Frequency</b>	60 Hz
<b>Out THDI</b>	<3%
<b>AC Current</b>	120 A
<b>Grid</b>	3Phase 4Wires isolated line transformer

#### GENERAL DATA

<b>Communication</b>	RS485, Ethernet, GPRS
<b>Operating Temperature Range</b>	-4°F (-20°C) to 104°F (40°C)
<b>Cell Chemistry</b>	Lithium Iron Phosphate (LiFePO4)
<b>Dimensions (W x D x H)</b>	(ES-90128NA) 2250 x 1300 x 2591 mm (all other ES-90) 2991 x 2438 x 2591 mm
<b>Weight (Approx.)</b>	TBC
<b>Enclosure Protection</b>	IP54
<b>Containerized System Includes</b>	Battery, BMS, hybrid inverter, HVAC, FSS, Local Controller

### SYSTEM LAYOUT



The graphics shown may differ from the actual structure.



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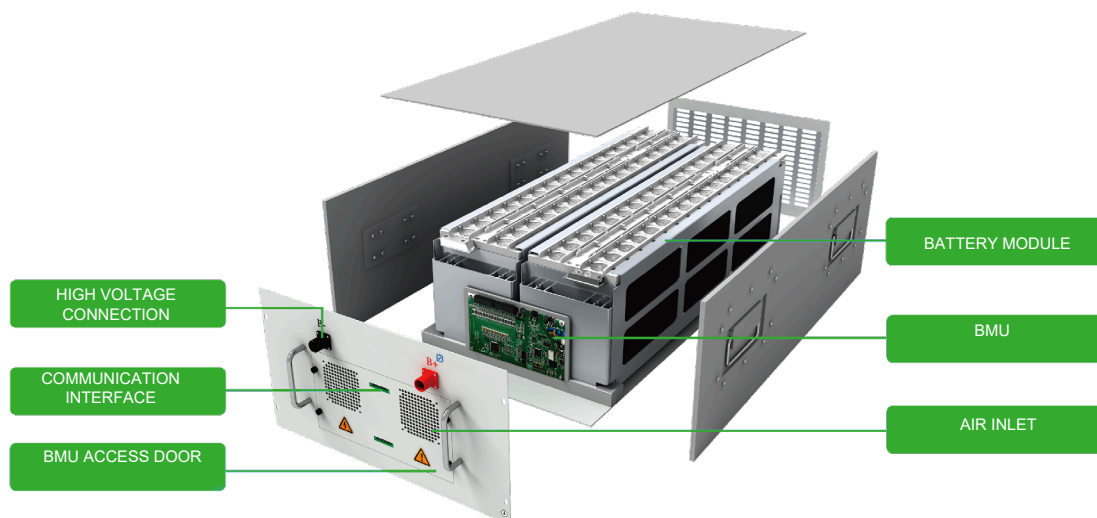
## ES-90NA SERIES

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### BATTERY SPECIFICATIONS

	ES-90128NA	ES-90192NA	ES-90256NA	ES-90320NA	ES-90384NA
<b>Cell Type</b>	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4	3.2V 90Ah LiFePO4
<b>Assembled Module Configuration</b>	16s2p	16s2p	16s2p	16s2p	16s2p
<b>Assembled Rack Configuration</b>	112s2p	112s2p	112s2p	112s2p	112s2p
<b>Number of Racks</b>	2	3	4	5	6
<b>Nominal Energy</b>	128kWh	192kWh	256kWh	320kWh	384kWh
<b>Nominal Capacity</b>	360 Ah	540 Ah	720 Ah	900 Ah	1080 Ah
<b>Nominal Voltage</b>	358 V	358 V	358 V	358 V	358 V
<b>Voltage Range</b>	314 - 398 Vdc	314 - 398 Vdc	314 - 398 Vdc	314 - 398 Vdc	314 - 398 Vdc
<b>System Voltage Balance</b>	<100ms	<100ms	<100ms	<100ms	<100ms
<b>BMS</b>	3 level framework	3 level framework	3 level framework	3 level framework	3 level framework
<b>Lifespan</b>	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
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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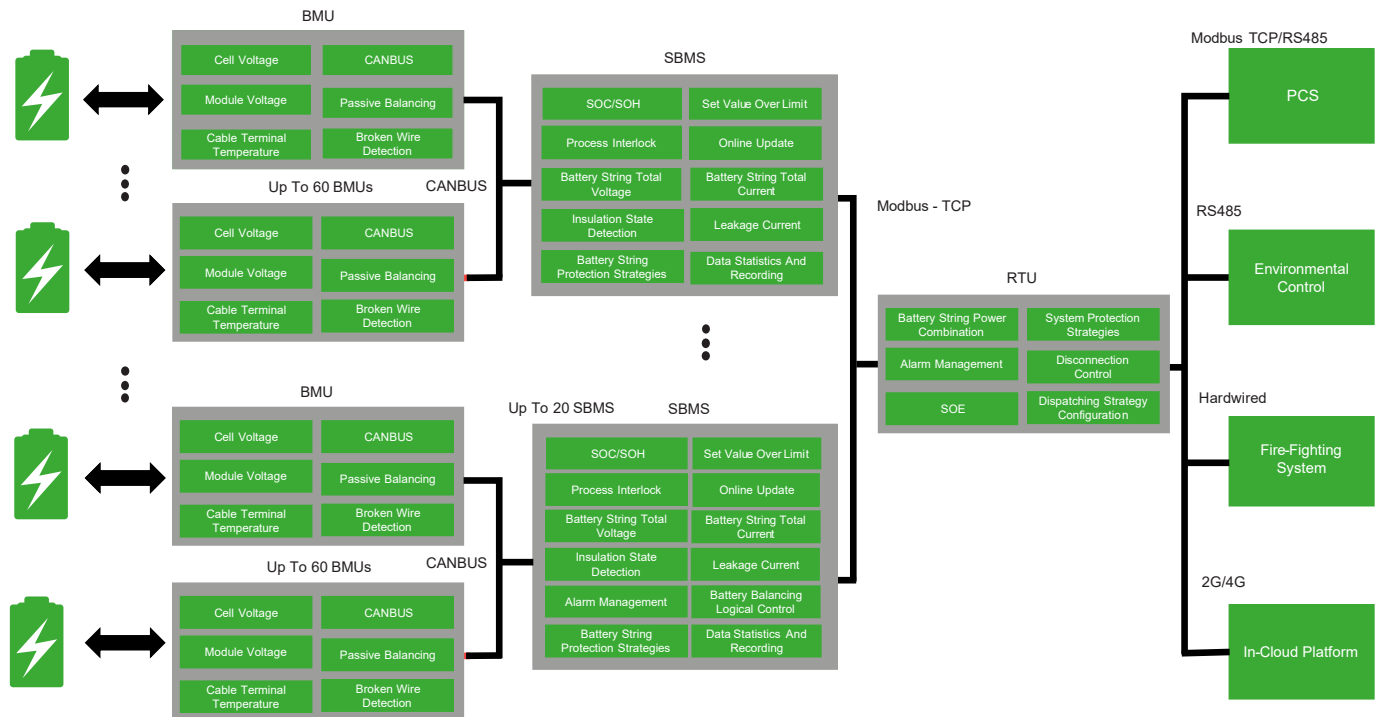
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### BATTERY MANAGEMENT SYSTEM

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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### 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	750 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	300 A

### UTILITY INTERACTIVE MODE SPECIFICATIONS

PV Voltage Range	520 - 900 V (MPPT 520 - 800 V)
PV DC Max. Current	384 A
AC Voltage Range	480 Vac (423 - 528 V)
AC Current	120 A
Nominal Power	90 kVA
AC Frequency	60 Hz
AC Power Factor	0.8 - 1 leading or lagging (controllable)
THDi	<3%

### STAND-ALONE MODE SPECIFICATIONS

AC output Voltage	480 VAC (+/- 10% configurable)
AC Output Current	120 A (132 A Max)
Nominal AC Output	90 kVA
AC Max Power	100 kVA
Output THDu	<2%
AC Frequency	60 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, 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
- *The fire suppression system is subject to change based on enclosure size and system configuration.*



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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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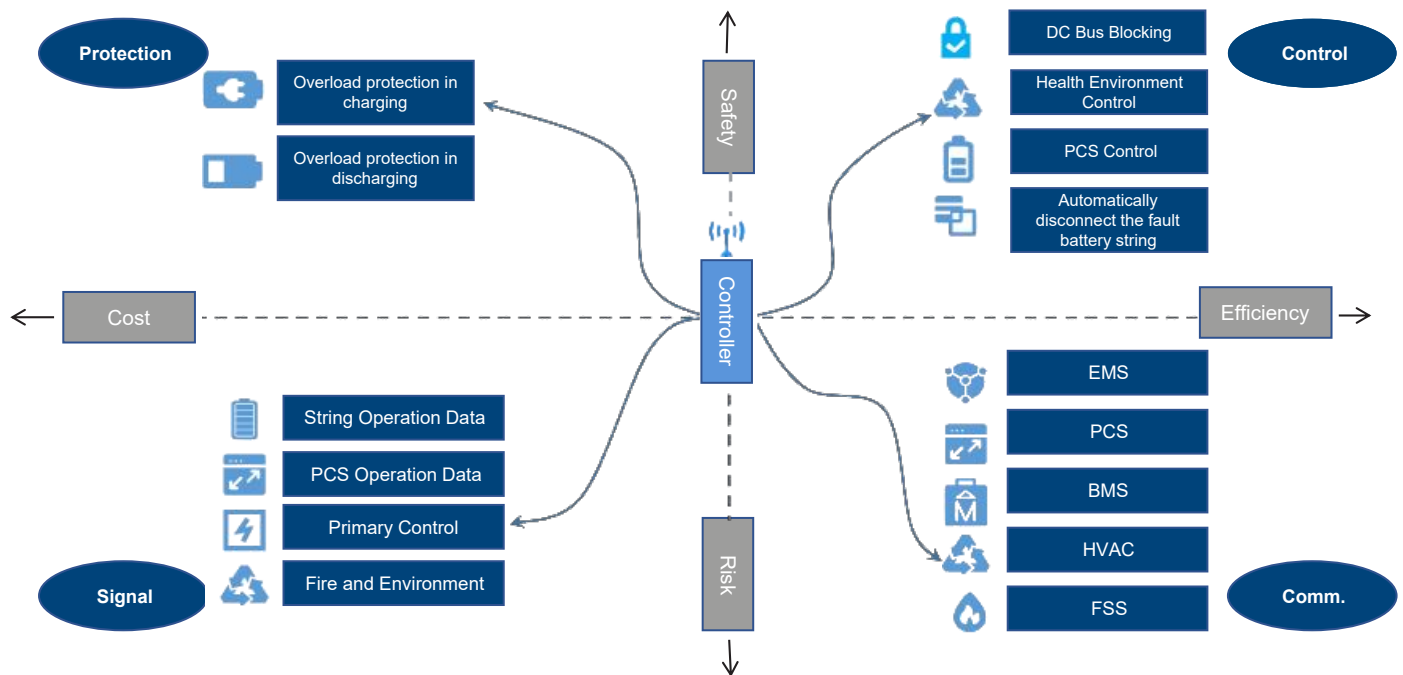


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### LOCAL CONTROLLER

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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