

Evacell Product Specification of 200Ah LiFePO4 Battery



EM MARİN BATARYA PİL ENERJİ SİSTEMLERİ SANAYİ İÇ
VE DIŞ TİÇ. LTD. ŞTİ.

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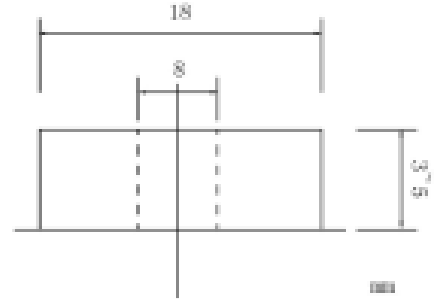
1. Scope

This specification applies to the rechargeable lithium iron phosphate battery pack supplied by Em Marin Batarya Pil Enerji Sistemleri Sanayi İç Ve Dış Tic. Ltd. Şti.

2. Product Configuration

No	Item Name	Specification	Qty
1	Cell	100Ah 3.2V	8
2	BMS	4 Strings lithium iron same port 200A	1
3	Connector	Red M8 / Black M8	1
4	Shell	ABS	1

3. Port Definitions



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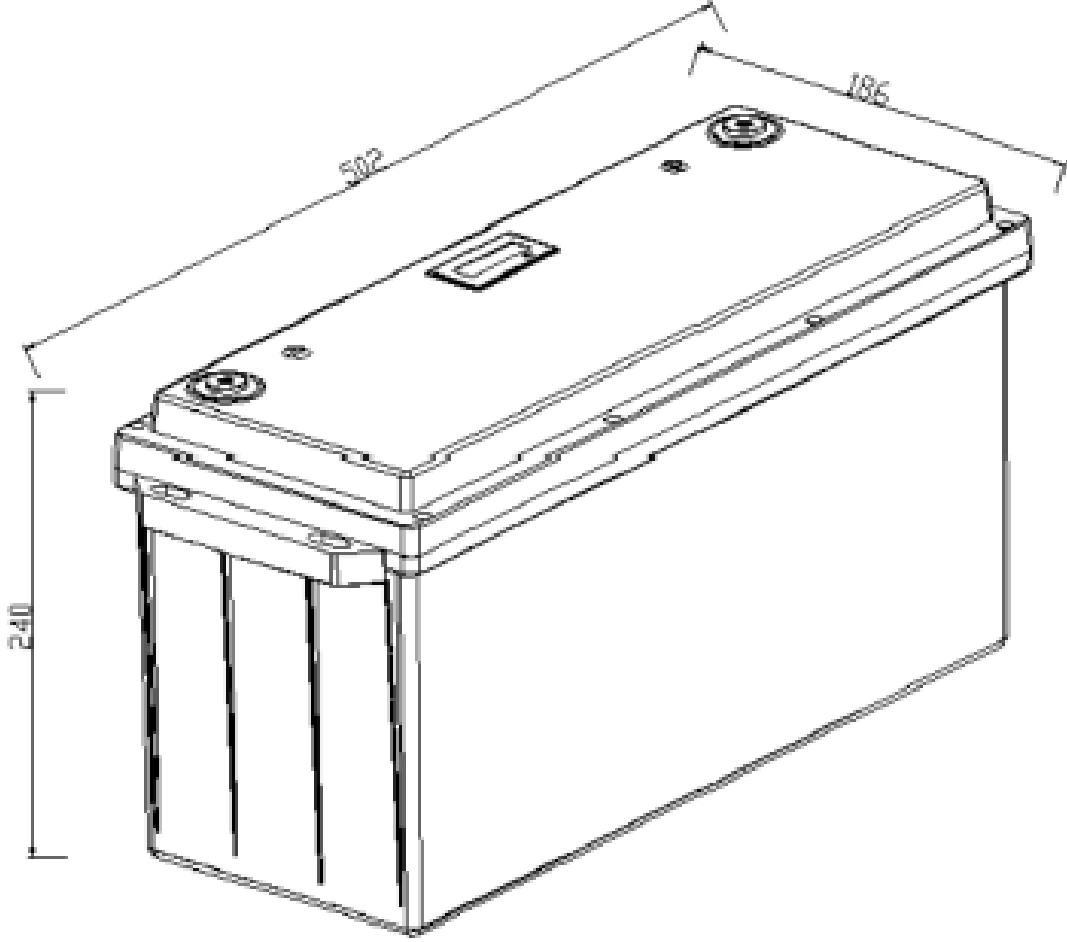
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4. Product Dimension



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5. Cell Specifications

No	Item	Rated Performance		Remark
1	Cell Model	100Ah 3.2V		
2	Rated Capacity	Typical	100Ah	Discharge at 0.5C ₅ after standard charge fully.
Minimum		98Ah		
3	Nominal Voltage	3.2V		
4	Shipment voltage	3.2~3.35V		
5	Discharge cut-off voltage	2.5V		
6	Charging Voltage	3.65±0.05V		
7	Internal resistance	≤0.5mΩ		AC Impedance, 1KHz
8	Standard Charge	Constant current 0.5C ₅ A charge to 3.65V, Then constant voltage 3.65V to current below 0.05C ₅ A cutoff.		Charge time: Approx 3.0h.
9	Standard Discharge	Constant Current 0.5C ₅ A end voltage 2.5V		
10	Fast Charge	Constant current 1.0C ₅ A charge to 3.65V, Then constant voltage 3.65V to current below 0.0C ₅ 5A cutoff.		Charge time : Appr. 1.5h
11	Fast Discharge	Constant Current 1.0C ₅ A end voltage 2.5V		
12	Maximum Continuous Charge Current	1.0C ₅ A		
13	Maximum Continuous Discharge Current	1.0C ₅ A		Only Single Cell
14	Discharge Pulse Current	200A		<30S ; Only single cell
15	Operation Temperature Range	Charge: 0~55°C		60±25% RH.
Discharge: -20~55°C				

6. Battery Pack Specifications

No	Item	Rated Performance		Remark
1	Cell Model	4S2P		
2	Communication Function	/		
3	Way to work	Use alone or in parallel		
4	Rated Capacity	Typical	200Ah	Discharge at $0.5C_5$ after standard charge fully.
5	Nominal Voltage	12.8V		
6	Discharge cut-off voltage	10V		
7	Charging Voltage	14.6V		
8	Internal resistance	$\leq 20m\Omega$		AC Impedance, 1KHz
9	Standard Charge	Constant current $0.5C_5A$ charge to 14.6V, Then constant voltage 14.6V to current below $0.05C_5A$ cutoff.		Charge time: Approx 3.0h.
10	Standard Discharge	Constant Current $0.5C_5A$ end voltage 10V		
11	Fast Charge	Constant current $1.0C_5A$ charge to 14.6V, Then constant voltage 14.6V to current below $0.0C_5A$ cutoff.		Charge time : Appr. 1.5h
12	Fast Discharge	Constant Current $1. C_50C_5A$ end voltage 10V		
13	Maximum Continuous Discharge Current	200A		
14	Maximum Continuous Discharge Current	200A		
15	Discharge Pulse	400A		<5S

	Current		
16	Operation Temperature Range	Charge: 0~55°C Discharge: -20~55°C	60±25% RH.
17	Weight	Approx 20Kg	
18	Product Dimensions	Height: 502±5mm Width: 186±5mm Thickness: 240±5mm	
19	Energy Extension	Max. 2 units in parallel Max.Support up to 4 units in series	The pressure difference of the battery should be less than 500mV when connected in parallel. When used in series, the voltage of each unit should be consistent, otherwise it will affect the overall capacity
20	Ingress Protection	IP65	

7. Product Performance Test

7.1 Standard Testing Conditions

The test should be conducted with fresh battery within one week after shipment and the battery shall not be cycled more than five times. Unless otherwise defined, the test and measurement shall be done under temperature of 23±2°C and relative humidity of 45~85%. Normally, the temperature and relative humidity will not affect the test results when they are at a range of temperature 15~30°C and humidity 25~85%RH.

7.2 Measuring Instrument or Apparatus

7.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

7.2.2 Volt meter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10kΩ/V

7.2.3 Ammeter meter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

7.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter).

7.3 Standard Charge\Discharge

7.3.1 Standard Charge

CC-CV

Test procedure and its criteria are referred as follows:

$0.5C_5A = 100A$

Charge with $0.5C_5A$ constant current until the battery reaches 14.6V, Then charge with voltage 14.6V until the charging current drops to 0.5A. The charge will be terminated and the battery shall be fully charged. Charge time is Approx 3h. The battery shall be with no permanent degradation when charged between 0°C and 60°C.

7.3.2 Standard Discharge

$0.2C_5A = 40A$

Battery shall be discharged at a constant current of $0.2C_5A$ to 10V @ $23\pm 2^\circ C$.

7.4 Appearance

There shall be no such defects as flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

7.5 Initial Performance Test

Item	Measuring Procedure	Requirements
Open-Circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	$\geq 13.6V$
AC Impedance Resistance	The Impedance shall be measured in an alternating current method (1kHz LCR meter) after standard charge at $23\pm 2^\circ C$.	$\leq 20m\Omega$
Nominal Capacity	The capacity measured after standard discharge at $0.2C_5A$ at $23\pm 2^\circ C$.	Discharge Capacity $\geq 200Ah$
Retention Capability	After charge fully, store the battery for 28 days at $23\pm 2^\circ C$, then store 1 hours more, then discharge the battery at current of $0.2C_5A$ till 10V cut-off voltage.	Capacity $\geq 90\%$

7.6 Discharge capacity at different temperatures

Battery shall be charged per 7.3.1. and discharged @ $0.2C_5A$ to 10V at different temperatures, the discharge capacities are as shown in below . The battery shall be stored for 3 hours at the test temperature before test. Each battery shall meet or exceed the discharge capacities as shown in below.

s

Discharge Temperature	-20°C	-10°C	0°C	10°C	23°C	60°C
Discharge Capacity (0.2C ₅ A)	70%	75%	80%	85%	100%	95%

7.7 Cycle Life and Leakage-Proof

No.	Item	Criteria	Test Conditions
1	Cycle Life	Higher than 80% of the Typical Capacities of the battery	Carry out 4000 cycles charging/discharging: <ul style="list-style-type: none">• Charge: Standard Charge, per 7.3.1• Discharge: 0.5C₅A to 10V• Rest Time between charge/discharge:30min.• Temperature:23±2°C
2	Leakage-Proof	No leakage (visual inspection)	After fully charged, store at 60±3°C, 60±10%RH for 1 month.

7.8 Mechanical Characteristics and Safety Test

Item	Battery Condition	Test Method	Requirements
Over charge test	Fresh battery, Fully charged %100	Discharge: 0.5C ₅ A to 10V Charge: 1.0C ₅ A charge to 14.6V, and maintain for 1 hours.	No explosion No fire
Over discharge test	Fresh battery, Fully charged %100	Discharge at constant current 0.5C ₅ A to 10V, then discharge at 0.2C ₅ A to 0V.	No explosion no fire, no smoke
Heat shock test	Fresh battery, Fully charged %100	Put the battery in hot box ,then heat up to 130°C in 5±2°C/min rate, remain for 10 minutes.	No explosion No fire
Heavy impact test	Fresh battery, Fully charged %100	Impact between bar (15.8mm diameter) and 9.1Kg falling material (at a height of 6.1cm). Bar is laid across the center of the test sample.	No explosion No fire
Crush Test	Fresh battery,	Crush between two flat plates. Applied	No explosion, No

	Fully charged %100	force is about 13kN(1.72Mpa) for 10min.	fire
Short Circuit test	Fresh battery, Fully charged %100	Make short-circuited by connecting the (+) and (-) terminals of the battery with a copper wire having a maximum resistance load of 0.1Ω. Tests are to be conducted at room temperature (23±2°C).	No explosion, No fire. The surface of the battery shouldn't exceed 150°C
Rate test	Fresh battery, Fully charged %100	0.2C/0.5C/1.0 charge & discharge.	
Low temperature discharge test	Fresh battery, Fully charged %100	Put the battery at -20°C for 1h, then discharge at 0.2C ₅ A to 10V.	Discharge capacity ≥70%
Store for 4 hours 85°C	Fresh battery, Fully charged %100	Charge the battery fully in standard charging way at ambient temperature (23 ±2°C) and store for 1 hour. Then put it into the constant temperature and humidity oven at 85±2°C for 4 hours. Take it out and cool it for 2 hours at (23± 2°C). And then test the thickness and capacity at 0.2C ₅ A when charge & discharge.	The rate of swelling ≤10% Remaining capacity ≥ 70% initial capacity. Recovery capacity ≥ 80% initial capacity
Vibration test	Fresh battery, Fully charged %100	Vibrate the battery for 30 minutes per each three mutually perpendicular axis (X,Y,Z) after standard charge.	No rupture, no fire. No critical damage.
Drop test	Fresh battery, Fully charged %100	Drop the battery from a height of 1m onto concrete board with 18~20mm thickness each one time from every direction after standard charge. Then discharge and charged at 1C 3 times, record the time of discharging.	No rupture, no fire No critical damage. Discharge time ≥51min

8. BMS Specifications

8.1 Electrical features :

Project	Parameter Value			
	Min.	Type	Max.	Unit
Over charge protection voltage	3.70	3.75	3.80	V
Over charge release voltage	3.50	3.55	3.60	V
Over discharge protection voltage	2.10	2.20	2.30	V
Over discharge release voltage	2.60	2.70	2.80	V
Charge over current protection current	/	/	/	A
Discharge over current protection current	300	330	360	A
Over charge protection delay time	500	1000	1500	ms
Over discharge protection delay time	500	1000	1500	ms
Over current protection delay time	50	100	150	ms
Short protection		YES		
Short protection delay time	100	300	600	us
Active Balance Current	30	40	50	A
Current consumption (Operation)		/	50	uA
Current consumption (Power down)	/	/	20	uA
Impedance	/	/	10	mΩ
Input voltage (B+ to B-)	-0.3	-	15	V
Operating temperature	-40	-	+85	°C
0V battery charge function	Available			
Communication Function	/			

9. Storage and Transportation

9.1 Storage

- 9.1.1 The Li-ion battery pack should be stored in a cool, dry and well-ventilated area and should be kept far away from the fire and high temperature.
- 9.1.2 The best capacity for storage is 30%-50%
- 9.1.3 The battery should be stored in the temperature range as stated in this specification sheet. The best storage temperature is 0 to 25°C. The best humidity is 60±25%.
- 9.1.4 If store the battery six months or longer, suggest carry on additional charge to the battery.

9.2 Transportation

- 9.2.1 Do not mix the battery products with other cargoes.
- 9.2.2 Do not immerse the battery products in water or get it wet.
- 9.2.3 Do not do over 4 layer- staking and upside-down.
- 9.2.4 The highest temperature in transportation is lower than 60°C.

10. Battery Precautions and Safety Instructions:

To ensure proper use of the battery please read the instructions carefully before using it.

10.1 Handling

- 10.1.1 Do not expose or dispose the battery in fire.
- 10.1.2 Do not put the battery in a charger or equipment with wrong terminals connected.
- 10.1.3 Avoid battery short circuit.
- 10.1.4 Avoid excessive physical shock or vibration.
- 10.1.5 Do not disassemble or deform the battery.
- 10.1.6 Do not immerse in water.
- 10.1.7 Do not use the battery mixed with other brand, type or model.
- 10.1.8 Keep out of the reach of children.

10.2 Charge

- 10.2.1 Battery must be charged in appropriate charger only.
- 10.2.2 Never use a modified or damaged charger.
- 10.2.3 Do not leave battery in charger over 24 hours.
- 10.2.4 Charging current : Don't surpass the highest charge current as stated in this specification sheet.
- 10.2.5 Charging voltage : Don't surpass the highest charge voltage as stated in this specification sheet.
- 10.2.6 Charge temperature : The battery must be charged in the ambient temperature range as stated in this specification sheet.
- 10.2.7 Charge the battery via constant current first and then via constant voltage, no reverse charge. If the positive electrode and the cathode mixed, the battery can be damaged
- 10.2.8 Store the battery after it's charged. The battery should be recharged/re-discharged every 3 months

10.3 Discharge

- 10.3.1 The discharge current shouldn't surpass the highest discharge current as stated in this specification sheet. If surpass, the battery may be damaged and it can result in hot battery which is risk.
- 10.3.2 Discharge temperature range: The discharge must be done in the ambient temperature range as stated in this specification sheet.
- 10.3.3 Over-discharge: A short-time over-discharge will not affect the use of the battery, but long-time will do. If the battery is not used for a long time, the performance will get poorer. It should be recharged and re-discharged fully several times before it's recovered.

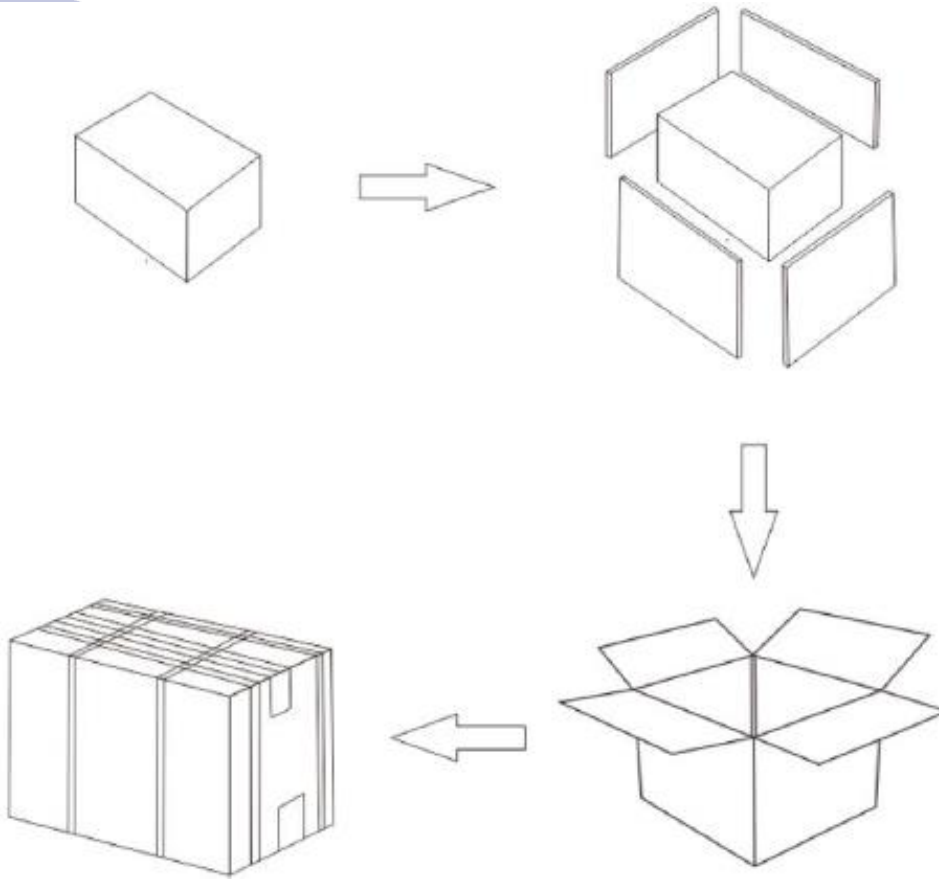
10.4 Disposal

Regulation is vary in different countries. Please dispose wasted battery according to local regulations.

11. Period of Warranty

There is a 24-month warranty of the batteries from the date of sale. If there is quality problem within, we are responsible to replace the defective ones according to the accurate analysis results. However, we won't take any responsibility if the problem is caused by the battery-related applications and related products.

12. Package



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13. Others

Battery is chemical product, the performance will be deteriorated when it's used for a long time or it's stored for a long time without being used. In addition, if it's not charged or discharged properly as stated in this specification sheet, the capacity and lifespan will be shortened, or the product which the battery applied to will be damaged by its leaking. If the battery is charged properly but can't be charged fully, please replace it in time.