

DOCAN POWER

12V230Ah

BATTERY

PACK



4S1P-12.8V-230AH

1.Scope

This specification applied to the lithium-ion battery pack, it's the basis of production and test, and it can make customer to learn about the parameter and how to use this battery in a right way.

2.Test Condition

2.1 Test Environmental Condition

All the tests mentioned as above should be under the standard Test Conditions unless the other regulation.

Temperature: 15°C~35°C

Relative Humidity: 45%~75%

Air Pressure: 86kPa~106kPa

2.2 Requirement of Facility and Equipment

The precision of the voltage meter should be no less than 0.5 grades. And the inner-resistance should be no less 10KΩ/V

The precision of the current voltage meter should be no less than 0.5 grades.

The relative tolerance of the time meter should be $\pm 0.1\%$.

The relative tolerance of the temperature meter should be $\pm 0.5\%$.

3.Pack

3.1 Specification

Item	Paramete	Remarks
Nominal Capacity	230Ah	0.2C
Min. Capacity	230Ah	
Nominal Voltage	12.8V	
Internal Impedance	$\leq 150\text{m}\Omega$	
Combination Mode	4S1P	AC 1kHz
Charging Mode	CC/CV	
Standard Charging Current	0.2C	
Maximum sustainable chargingcurrent	$\leq 200\text{A}$	
Standard Discharging Current	0.2C	
Maximum sustainable discharge current	$\leq 200\text{A}$	
Limited Charging Voltage	14.6V	
Discharging Cut-off Voltage	10.8V	
Shipping Voltage	12~14V	
Weight	19.8kg	
Charging Temperature	0°C~45°C	
Discharging Temperature	-20°C~60°C	
Storage Temperature	1 Month : -20~60°C 3 Months : -10~40°C 1 Year : -5~20°C	
Relative Humidity	45%~85% RH	

3.2 Nominal Characteristics

Item	Test Methods	Criteria
Standard Charge	When the ambient temperature is $(25 \pm 2)^{\circ}\text{C}$, the battery is charged with 0.2C current. When the voltage reaches the charging limit voltage, the battery is charged with the constant voltage of the charging limit voltage, until the charging current is less than 0.02C to stop charging.	Charging time is less than 8 hours
Rated Capacity	Under the ambient temperature of $(25 \pm 2)^{\circ}\text{C}$, after being fully charged in the standard charging mode, it was set aside for 0.5h, discharged at 0.2C to the discharge cut off voltage, and the discharge capacity was recorded.	More than the min. capacity
Internal Impedance	Uses AC the 1kHz examination method	Refer to 3.1
Power holding	After standard charged, battery shall be stored in a temperature-controlled environment at $25 \pm 2^{\circ}\text{C}$ for 28 days. After storage, battery shall be discharged with 0.2C to cut-off voltage. Measure the remain capacity and record the discharge time.	More than 85% of standard
Cycle life	Temperature condition $25 \pm 2^{\circ}\text{C}$, charge it till full and stand for 0.5h, then discharge at 0.2C constant current till cut-off voltage. After 0.5h, do it again till the capacity is less than 80% origin twice in a row.	Cycle times ≥ 5000

3.3 Nominal Characteristics

Item	Test Methods	Criteria
External normal temperature shortage	After the battery is fully charged, place it at the temperature of $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$. When the temperature of the battery reaches $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$, connect the positive and negative extremes of the battery with a wire and ensure that all external resistances are 80 ± 20 milliohms (the temperature coefficient of the resistivity of the wire is less than $5 \times 10^{-3}/^{\circ}\text{C}$) for 30min. When the following two situations occur, The experiment was terminated: a) the battery temperature dropped to 20% lower than the peak, and b) the short-connection time reached 24H.	Non-explosive, non-fire, and the maximum temperature should not exceed 150°C
High Temperature external shortage	After the battery is fully charged, place it at the temperature of $55^{\circ}\text{C} \pm 5^{\circ}\text{C}$. When the temperature of the battery reaches $55^{\circ}\text{C} \pm 5^{\circ}\text{C}$, connect the positive and negative extremes of the battery with a wire and ensure that all external resistances are 80 ± 20 milliohms (the temperature coefficient of the resistivity of the wire is less than $5 \times 10^{-3}/^{\circ}\text{C}$) for 30min. When the following two situations occur, The experiment was terminated: a) the battery temperature dropped to 20% lower than the peak, and b) the short-connection time reached 24H.	Non-explosive, non-fire, and the maximum temperature should not exceed 150°C

Over charge	After the battery is fully charged, the battery is placed on the wire mesh of the experimental tooling. a single metal wire is required to fix the sample battery on the wire mesh, and the battery is heated with a flame. The heating can be stopped when the following three conditions occur: a) The battery explodes; b) complete combustion of the battery; c) After continuous heating for 30min, the battery does not catch fire or explode	Components of the battery (other than dust products) or battery products shall not penetrate the aluminum mesh
Combustion injection	Single cell (excluding protection board circuit), under the ambient temperature of $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ at 0.2C constant current to the termination voltage, then set the constant current of 3C, the voltage of 3.65V, until the voltage reaches the maximum value, the battery charging time reaches 7 hours, the battery temperature drops to 20% lower than the peak.	Non explosive and non-fire
Acceleration impact	After the battery was fully charged, the battery was fixed on the impact platform, and the half-sinusoidal impulse impact experiment was carried out. In the first 3ms, the minimum average acceleration was 75gm, the peak acceleration was $150 \pm 25\text{gm}$, and the pulse duration was $6\text{ms} \pm 1\text{ms}$. Three times of acceleration impact were carried out successively in three perpendicular directions of the battery	The battery should not explode, not fire, not crack, not smoke, not leakage and not deflated
Heat abuse	After the battery is fully charged, it is placed in a hot box, where the temperature rises to $130 \pm 2^{\circ}\text{C}$ at the rate of $(5^{\circ}\text{C} \pm 2^{\circ}\text{C}) / \text{min}$ and is kept warm for 30min.	Battery should not leak, not deflated, not explosion, not fire
Temperature cycle	After the battery is fully charged according to the standard charge, the battery is placed in a temperature control chamber with a temperature of $(25 \pm 2)^{\circ}\text{C}$ for the following steps: (1) The sample is placed in an experimental chamber with a temperature of $75^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 6H; (2) Reduce the temperature of the test chamber to $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and keep it for 6H; (3) The conversion time of the above temperatures does not exceed 30min; (4) Repeat steps 1-2 for a total of 10 cycles.	The battery should not explode or catch
Forced Discharge	When the ambient temperature is $(25 \pm 2)^{\circ}\text{C}$, discharge the battery at 0.2C to the termination voltage, and then reverse charge the battery at 1C. The charging time is required to be no less than 90 minutes.	Battery should not leak, do not deflate, do not explode, do not fire
Over-Voltage charge	After the battery is fully charged, continue to charge with the maximum charging current constant current to $n * 6.0\text{V}$ or the highest voltage that can be borne (whichever is higher), and maintain the voltage for constant voltage charging. Charge the battery with the protection circuit removed or without the protection circuit for 1H, and charge the battery with the protection circuit to the protection board circuit.	Battery does not leak, do not deflate do not explode, do not fire and do not crack
Over-Current charge	After the battery discharge, then with 1.5 times the overcurrent charging protection current (1.5C) for constant current charging, for the battery with removed protection circuit or no protection circuit to charge to the upper voltage, for the battery with protection circuit to charge to the protection board circuit action.	The battery shall not catch fire or explode
Under-Voltage discharge	After the battery is fully charged, and then with 1.5 times the overdischarge electric protection current (1.5C) for constant current discharge, and remove the protection circuit or no protection circuit of the battery discharge to discharge cut off voltage, and with the protection circuit of the battery charging to the protection board circuit action.	Battery should not leak, do not deflate, do not explode, do not fire

3.4 Environment accommodation

Item	Test Methods	Criteria
High Temperature Usage	Put full charge battery in high temperature box with a temperature which is the maximum of charge upper temperature, discharge upper temperature and 80°C, after temperature stabilized, keep 7H.	No explosion、fire、fume and leakage.
Vibration	A cell is charged and then installed onto the vibration desk with clamps. Vibrated by sine wave, equipment parameters of frequency and amplitude are as follows (the frequency is to be varied from 7Hz to 200 Hz in 15min. The cell is to be tested in three mutually perpendicular directions, each direction repeats 12 times, vibrate 3H). In the method of:7Hz to 18Hz keep 9.8 mm/s ² peak accelerated speed, amplitude is 0.8mm to peak accelerated speed is 78.4mm/s ² (frequency is about 50Hz), keep the speed until frequency is 200Hz	No explosion、fire、fume and leakage.
Free Fall	After rapid charged, a cell is dropped from a height of 1000mm to a wooden board which is placed on the concrete ground. Cells shall be dropped in each of three mutually perpendicular directions. Total drop Times are 6. (More than 1000mAh, height is 1000mm, lower than 1000mAh, height is 1500mm) .p the speed until frequency is 200Hz	No leakage, explosion and fire
Low Air pressure	After rapid battery charging or standard charging, the sample was placed in an empty chamber at (25±2) °C. After the empty chamber was closed, the internal pressure was gradually reduced to no more than 11.6kPa(simulated altitude 15240m) and maintained for 6H.	No explosion、fire、fume and leakage.

4.Components

4.1 Cell

Manufacturer	Depends on	Type	LF230 3.2V LiFePO4
Rated Capacity	230Ah	Rated Voltage	3.2V
Internal Impedance	≤0.5mΩ	Upper charge voltage	3.65V
Weight	4.11±0.10kg	Discharge Cut-off Voltage	2.5V

4.2 BMS Specification

121020114-JBD-DP04S007-L4S-200A-200A-B-U-S-H/4

Cell specifications	3~4 strings of LiFePO4 battery cell
Interface type	Charge and discharge are both at the same port
Charging voltage	3.6V*Number of strings
Cell voltage range	2.20~3.75V
Continuous charging current	60~200A
Continuous discharging current	60~200A
Consumption of running	≤10mA

Consumption of sleep	≤800uA	
Sleep conditions	Delay 1min+30s under no current \ communication \ protection state	
Circuit resistance	≤10mA	
Operating temperature	-20°C~75°C	
Structure size of PCB		
Size	60~120A	160±2mm *105±1mm *10±1mm(Length*Wdth*Height)
	150~200A	160±2mm *105±1mm*17±1mm(L ength*Width*Height)

Note: Test should be at temperature 25±2°C, and relative humidity 65±20% of surroundings.

	Project	Specification			(Unit)
		MIN	TYP	MAX	
Over-voltage and Under-voltage protection	Over-voltage	3700	3750	3800	V
	Over-voltage delay	1000	2000	3000	mS
	Over-voltage release	3550	3600	3650	V
	Under-voltage	2100	2200	2300	V
	Under-voltage delay	1000	2000	3000	mS
	Under-voltage release	2500	2600	2700	V
	Over-current Charge protection value	Self-recovery by increasing voltage or charging			
	Under-voltage release conditions	Refer to configuration table of over-current protection value below			
	Over-current Charge delay	7	10	13	S
	Over-current Charge release conditions	Automatic recover after a delay of 32S			
	1th Over-current Discharge value	Refer to configuration table of over-current protection value below			
	1th Over-current Discharge delay	7	10	13	S
	2th Over-current Discharge value	Refer to configuration table of over-current protection value below			
	2th Over-current Discharge delay	100	300	500	mS
Over-current Discharge release	Automatic recover after a delay of 32S				
Over-voltage and Under-voltage protection	Short circuit protection current value	Refer to configuration table of over-current protection value below			
	Short circuit protection delay time	-	560	900	uS
	(Short circuit protection recovery)	Recover by releasing load after approximately 5s			
Short Circuit Discharge	(Short- dircuit description: The short-circuit current is less than the minimum value or higher than the maximum value, which may cause the short-circuit protection to fail, and the short-circuit current exceeds 2000A,short- circuit protection is not guaranteed, and short-circuit protection testing is not recommended.)				
	Temperature protection value	62	65	68	°C
	Temperature protection release value	52	55	58	°C

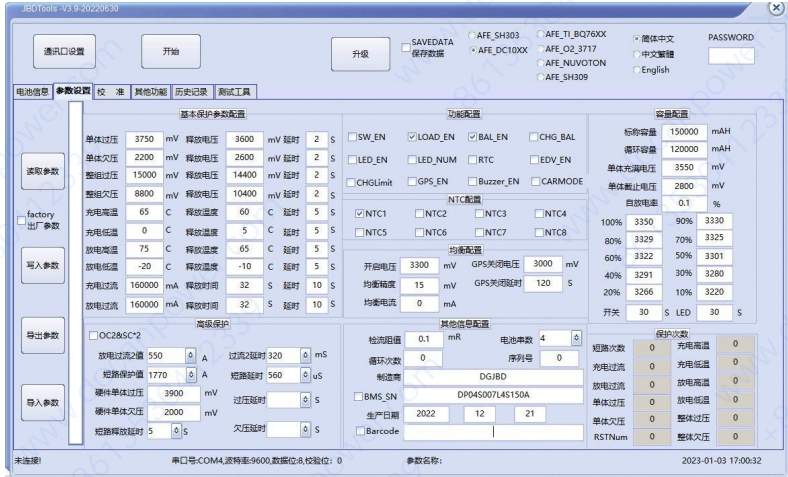
Short Circuit Discharge	CHG	Without eating	Temperature protection value	-13	-10	-7	°C
			Temperature protection release value	-8	-5	-2	°C
		With heating	Temperature protection value	-3	0	3	°C
			Temperature protection release value	2	5	8	°C
DSG		Temperature protection value		72	75	78	°C
Short Circuit Discharge	DSG	Temperature protection release value		62	65	68	°C
		Temperature protection value		-23	-20	-17	°C
		Temperature protection release value		-13	-10	-7	°C
		Temperature protection value		100	105	110	°C
		Temperature protection release value		60	75	90	°C
	FET	Balance function turn-on voltage		3.27	3.30	3.33	V
(Diference opening voltage value)			15		mV		
Balance Function		(Balance current)		150	200	250	mA
		(Balance model)		(Idle equalization)			
		(Balance type)		(Pulsed model)			

Note: Test should be at temperature 25±2°C, and relative humidity 65±20% of surroundings.

Over-current protection value configuration table

(Continuous current)		Charge Over-current value	1st discharge Over-current value	The second discharge Over-current value	Short circuit protection value
Charge	Discharge				
60A	60A	70±5A	70±5A	210±50A	750±150A
80A	80A	90±5A	90±5A	280±60A	1000±200A
100A	100A	110±5A	110±5A	330±80A	1350±300A
120A	120A	130±5A	130±5A	440±120A	1550±400A
150A	150A	160±5A	160±5A	550±120A	1800±400A
200A	200A	210±5A	210±5A	760±120A	2400±400A

4.3 Parameter settings



5. Package, Storage, Shipping

5.1 Package

- 1) The packaging box containing battery products should be placed in a dry, dustproof and moistureproof packing box.
- 2) Packing diagram



5.3 Shipping

- 1) In the transportation process, the product should not be subjected to severe mechanical impact, exposure to the sun, rain, should not be inverted.
- 2) In the process of loading and unloading, the product should be handled lightly to prevent throwing, rolling and heavy pressure

6. Dimensions and Connector Description

Dimension: 345*190*245mm Units: mm

Connector: M8 screw, red positive, black negative.

7. Description of Usage and Notes

7.1 Description of Usage

- 1) Before using the battery, please read the instruction manual and the battery surface label carefully.
- 2) Please use batteries in a normal indoor environment. Temperature: -20 ~ +35°C, relative humidity: 55 ± 20%.
- 3) During use keep away from heat source and high pressure to avoid children playing with the battery. Do not break the battery. This battery can only be charged using the accompanying charger. Don't leave the battery in the charger for more than 24 hours.
- 4) Do not short circuit the positive and negative terminals of the battery, do not disassemble the battery, and do not let the battery damp, so as to avoid danger
- 5) If not used for a long time, please store the battery in good condition. Leave the battery half charged. Wrap batteries with nonconductive materials to avoid direct metal contact, which may cause battery damage. Store the battery in a cool, dry place.
- 6) Dispose of waste batteries safely and properly. Do not put them into fire or liquid.

7.2 Notes

- 1) Please do not use the battery in the environment of strong sunlight, so as to avoid heat, deformation and smoke. At least avoid battery performance degradation and reduced life
- 2) The battery is equipped with a protective circuit to avoid all kinds of accidents. Do not use batteries in places where static electricity is generated.
- 3) High voltage static electricity may damage the protection board and cause the battery to work improperly, heat, deformation, smoke, or fire.
- 4) The recommended charging temperature range is 0-45°C. Charging in an environment beyond this range may degrade battery performance and reduce battery life.

- 7) When using the battery for the first time, if the battery is found to be untidy, smelly and other abnormal phenomena, do not continue to use the battery, the battery should be returned to the seller.
- 8) Children should be guided by their parents before using batteries, and supervised to see if they are correct in use
- 9) Batteries should be placed where children cannot get to them. Avoid children taking the battery out of the charger and playing with it.
- 10) If your skin or clothing comes into contact with the battery leakage, rinse with clean water to avoid skin discomfort.
- 11) When purchasing batteries, please pay attention to the seller's contact method. In order to timely contact with the seller when needed, get consultation.
- 12) If the battery is used for other devices, please discuss with the supplier about the completeness of the protection function. At the very least, you should consult the battery's high current, fast charging, special use problems.

7.3 Warnings

- 1) Do not mix with other types of primary or secondary batteries, otherwise it will cause heat, smoke, deformation or combustion of the battery due to abnormal charging and discharging.
- 2) Keep batteries out of reach of children to prevent them from biting or swallowing them. If you swallow a battery, get it to the hospital quickly
- 3) If the charger is still charging for a long time after the normal charging time, it should stop charging. Improper charging may cause the battery to heat, smoke, distort, or burn
- 4) Do not place in the microwave oven or other pressure vessels, instant heating or structural damage will make the battery heat, smoke, deformation or combustion.
- 5) If battery leakage (or odor) is found, keep the battery away from the fire. Otherwise, the leaking electrolyte will catch fire and even cause other dangers.
- 6) If the battery is found to be smelly, deformed, discolored or distorted, leave the battery away from the phone or charger and discard it. Using an abnormal battery can heat, smoke, distort, or burn.
- 7) Not for use as a starting battery.
- 8) Not suitable for golf carts.
- 9) If M8 terminals are attached directly with screws less than 2mm thick, use gaskets to secure the connection and prevent loosening or overheating.
- 10) For any series-parallel connections, ensure all battery packs are identical (same brand, model, voltage, capacity, internal resistance, and BMS) and from the same batch (manufactured within one month). Also, verify that connection wires can handle the required current load.

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