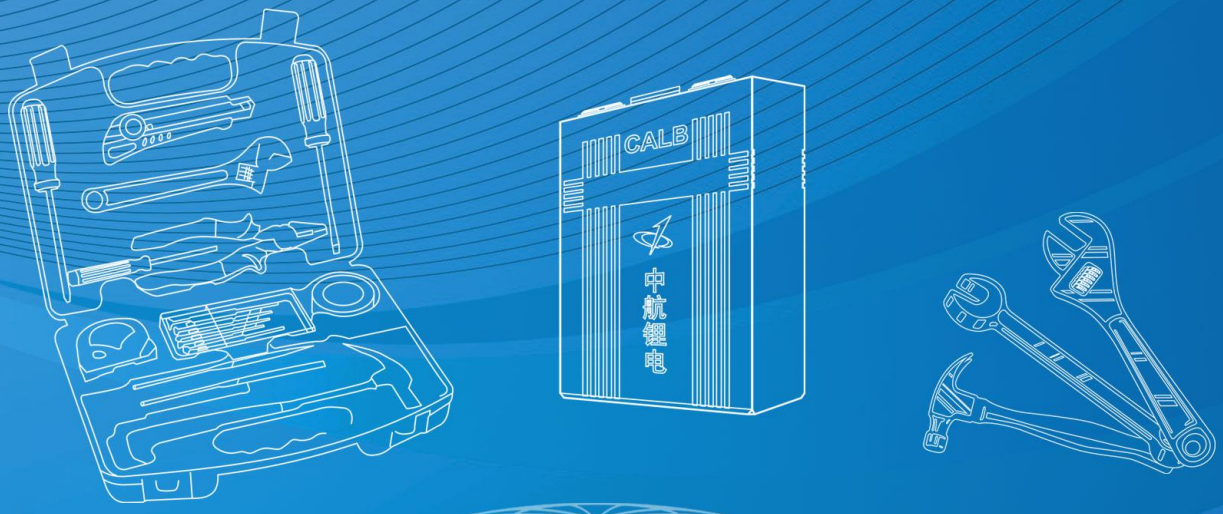
PRODUCT USER MANUAL



CALB

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Company Profile

CALB is a leading company in designing and manufacturing batteries and po wer system with advanced technology for various applications, enabling utilit y and industry customers to improve performance while lowering environment al impact around the world.

As a large national-owned enterprise, CALB is headquartered in Luoyang, Chi na as well as going globally, with 800 million registered capitals and 3.6 billio n gross investments in the new industry park, and has more than 1,700 emplo yees worldwide.

Being the “Global Golden Lithium Battery Manufacturer”, CALB is implementin g its strategy in renewable energy storage, transportation, wind & photovoltai c energy storage,telecommunication markets, mining equipment and rail tran sportation,with high technology oflithium-ion battery’slarge capacity, long life-c ycle, high power density, excellent safety performance, low self-discharge an d excellent low temperature performance.

With global vision, CALB steps into rapid development, ranking top in the fiel d of EV Model, energy storage and lithium battery exporter of China, and ente rs the USA, EU,Japan, Korea, Taiwan and other markets worldwide. CALB i s an ISO9001 certified manufacturer of lithium ion cells and energy storage s ystem, aiming at providing thebest battery solutions available today and in th e future, to promote low carbon economy and sustainable development globa lly.

I. Outline

1.1 Introduction

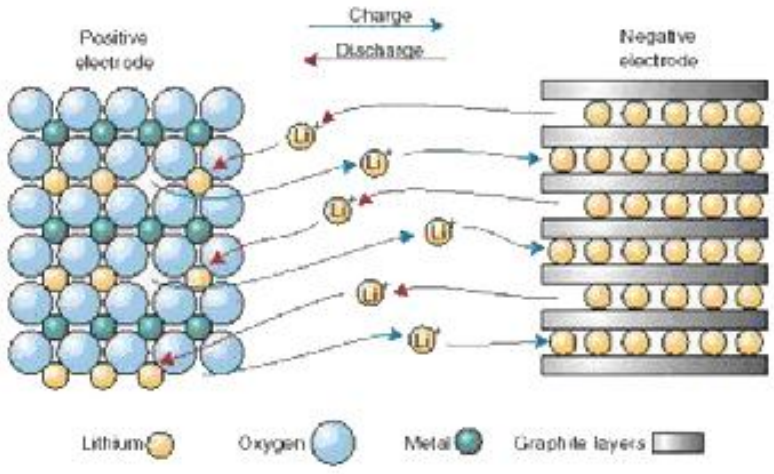
With the increasing degree of integration of electronics industry, the demand of portable power has been rapidly increased. Meanwhile, lithium battery has been put forward with higher requirements, particularly in high energy density, long life-cycle, high discharge rate, high security, low temperature performance, and so on. To meet customers' requirements of lithium batteries, CALB has proceed a variety of innovations on the basis of lithium-ion power battery technology, and has launched with cell large capacity lithium-ion power battery using $LiFePO_4$ as the cathode material to meet the requirements of battery' life cycle, rate, safety and low temperature performance. At current, CALB's batteries have already successfully applied in electric vehicle, large power station system, small- distributed energy storage system, mineral power supply, communication power, military power, rail transportation and other areas. CALB attaches great importance to the building of scientific research capacity with the philosophy of "advanced technology, reliable quality, customer satisfaction". Our research and development team continues to innovate and has made a number of achievements, has been committed to developing stronger security, higher energy density, and better consistency of next-generation lithium-ion batteries.

1.2 Product Features

1) High capacity: cells contain various models from 40Ah to 500Ah.
2) High rate performance: cell can maintain high capacity retention and voltage platform at the rate of 10C.
3) Low temperature performance: cell's discharging capacity retention keeps above 70% at -20℃.
4) Long life-cycle：Cell's capacity keeps above 80% after being cycled for 2000times.
5) High voltage：Cell's nominal voltage can reach to 3.2V.
6) High energy density：Specific mass energy is large than 110Wh/kg.
7) Green environmental protection.

1.3 Working Principle

The anode and cathode materials of lithium-ion batteries are all the reversible lithium intercalation – delithiation compound material, with the anode material using the lithium intercalation of transition metal oxides having high oxidation reduction potential and be stable in the air, while, the cathode material using lithium intercalation material, the potential of which are close to lithium's. Commonly used are graphite, mesocarbon microbeads and carbon materials. The principle of lithium battery is illustrated in Drawing1. Lithium-ion battery are also named as "rocking chair", the reason of that is lithium-ion have back and forth movement between positive and negative through electrolyte. During charging, lithium-ion embedded remove from anode active material (usually oxides of cobalt, nickel, manganese, vanadium or iron phosphate, etc), and embed into cathode (mostly carbon material) through conductive electrolyte and membrane; however, it is different during the discharging process. Lithium-ion embedded remove from cathode and embed into anode. In order to keep charge balance, the outside circuit compensates electron with the same amount of lithium-ion. Under normal charging-discharging condition, lithium-ion are embedded between carbon material in layered structure and oxide, which generally only causes the changes in interlayer spacing without causing destruction of the crystal structure, but does not change the basic chemical structure of anode material.



Drawing1 Lithium-ion power battery charge/discharge schematic diagram

1.4 Charge/ Discharge Mechanism

Lithium-ion, as electric charge carrier, embed and prolapse between the positive and negative through electrolyte. Thus, forming battery's charging and discharging process. During charging, lithium-ion reach to cathode surface prolapsed from anode, forming Li_XC_6 along the negative layered gap embedded interlamination. During discharging, lithium-ion prolapse from the negative layered and embedded into positive structure. During charging, lithium-ion prolapsed form the positive $LiFePO_4$, which charges and forms $FePO_4$, during discharging, $FePO_4$ changes into $LiFePO_4$. The charging/discharging mechanism can be represented as the following chemical formula.

$(-)Li_xC_6 \mid 1mol/L\ LiPF_6 - EC+DEC(1:1) \mid Li_{1-x}FePO_4\ (+)$

Positive: $LiFePO_4 \Leftrightarrow Li_{1-x}FePO_4 + xLi^+ + x\,e^-$

Negative: $6C + x\,Li^+ + xe^- \Leftrightarrow Li_xC_6$

Overall reaction: $6C + Li\,FePO_4 \Leftrightarrow Li_{1-x}FePO4 + Li_xC_6$

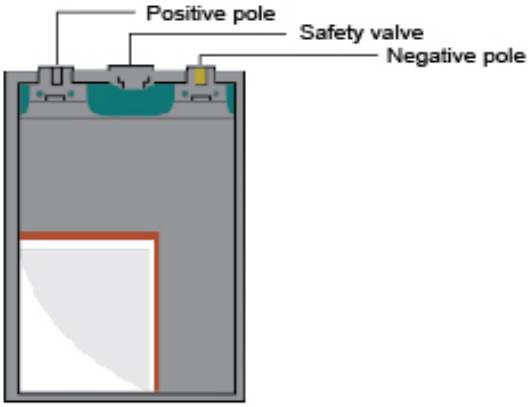
1.5 Cathode

CALB's lithium-ion battery, the positive material of which is lithium iron phosphate, named as $LiFePO_4$ power battery. Compared with other positive materials (lithium cobalt oxide, lithium manganate, ternary material), it possesses high security performance, long life-cycle, low-cost characteristics. Lithium-ion power battery's positive material $LiFePO_4$ is polyanion oxide, possessing olivine-type crystal structure. The polyanion contains P-O key structure, making its structure stability well, and $LiFePO_4$'s thermal decomposition temperature's high（＞350℃），there is no oxygen produced during the decomposable process, so it's thermal stability is well, which guarantees batteries have higher security performance. $FePO_4$,, prolapsed from Lithium-ion of $LiFePO_4$, has the same structure as olivine, volume change is only 7% when material has phase change, increasing the life-cycle to a large extent.

1.6 Anode

The negative material of CALB's lithium battery adopts artificial graphite. As a two-dimensional layered structure of graphite, lithium ions embed into layers through two-dimensional channel, providing lithium storage space for lithium-ion's embedding, playing higher gram capacity. Graphite material's price is relatively cheap, being helpful for power batteries' scale use. Besides, after classification and surface treatment, materials protect battery with higher consistency and longer cycle-life.

1.7 Battery Chart



Drawing2 Lithium-ion power battery structure drawing

Cell, as showed in the figure above, is Zigzag structure design of positive and negative pole-piece stacks, the positive and negative are blocked with diaphragm, inside of battery shell are filled with electrolyte. Between cell and shell, O-type seal ring is used for seal. In order to ensure its safety performance, safety valve is fixed on the shell to release the battery, which has explosion-proof effect.

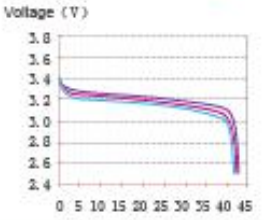
1.8 Model Specification

Specification：CA40

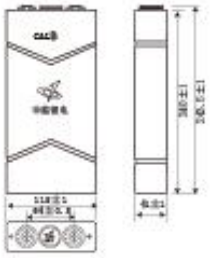
discharging curve @ room temperature

0.3C
0.5C
1C

Capacity (Ah) Voltage (V)



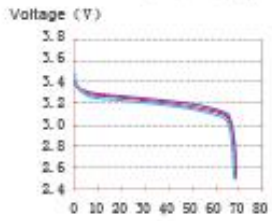
Specification：CA60FI



discharging curve @ room temperature

0.3C
0.5C
1C

Capacity (Ah) Voltage (V)

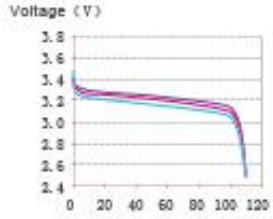


Specification：CA100

discharging curve @ room temperature

0.3C
0.5C
1C

Capacity (Ah) Voltage (V)

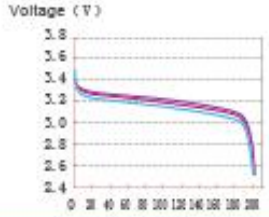


Specification：CA180FI

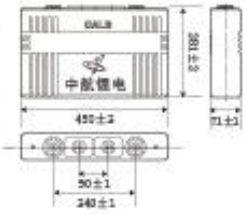
discharging curve @ room temperature

0.3C
0.5C
1C

Capacity (Ah) Voltage (V)



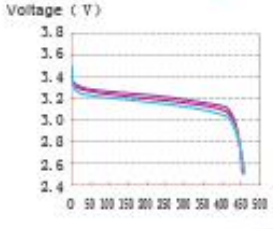
Specification：CA400



discharging curve @ room temperature

0.3C
0.5C
1C

Capacity (Ah) Voltage (V)



1.9 Environmental Protection

CALB is specialized in green environment protection system construction of lithium-ion power battery production industrial chain and it conducts strict control of the raw materials, production equipment, manufacturing process and other aspects. Battery product, do not include Cd, Pb, Cr, Hg, and other heavy metals and in line with the requirements of environmental protection, passed RoHS certification and EU battery directive certification of Germany Rheinland certification institute (TUV).

As an important member of the electric vehicle industry association of Central enterprises, CALB set up power lithium-ion battery recycling project, and it conducted systems studies, currently has initially build a better recycling system.

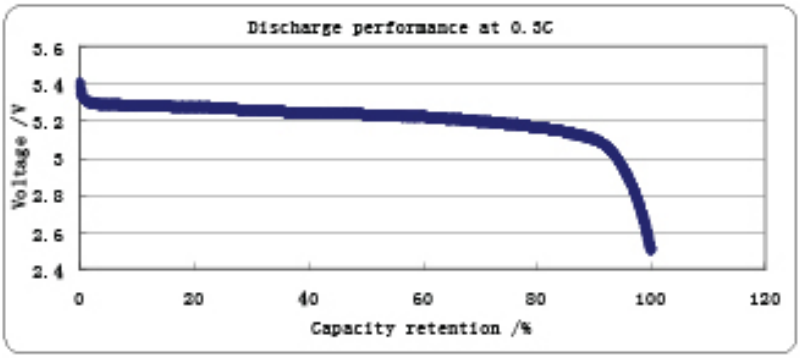
II. Technical Characteristic of Product

2.1 Technical Data

		CA40	CA60FI	CA100	CA180FI	CA400
Nominal Capacity(Ah)		40Ah@0.3C	60Ah@0.3C	100Ah@0.3C	180Ah@0.3C	400Ah@0.3C
Minimum capacity		40Ah@0.3C	60Ah@0.3C	100Ah@0.3C	180Ah@0.3C	400Ah@0.3C
Nominal Voltage (V)		3.2V				
Internal Resistance (mΩ)		≤1mΩ		≤0.9mΩ	≤0.6mΩ	≤0.4mΩ
Charging (constant current-constant voltage)	Maximal charging Current	1C				
	Upper Limit ChargingVoltage	3.65V				
Discharging	Maximum Discharging Current	2C				
	Cut-off Discharging Voltage	2.5V				
Charging Time	Standard ChargingTime	4h				
	Fast Charging Time	1h				
Recommended SOC Using Window		10%~90%				
Operating Temperature Range	Charging	0°C~45°C				
	Discharging	-20°C~55°C				
Storage Temperature	ShortTerm (within a month)	-20°C~45°C				
	LongTerm (within a year)	-20°C~20°C				
Storage Temperature Range		<70%				
Weight (kg)		About1.5kg	About2kg	About3.4kg	About5.7kg	About14.5kg±1kg
Shell Material		Plastic				

2.2 Discharging Characteristic

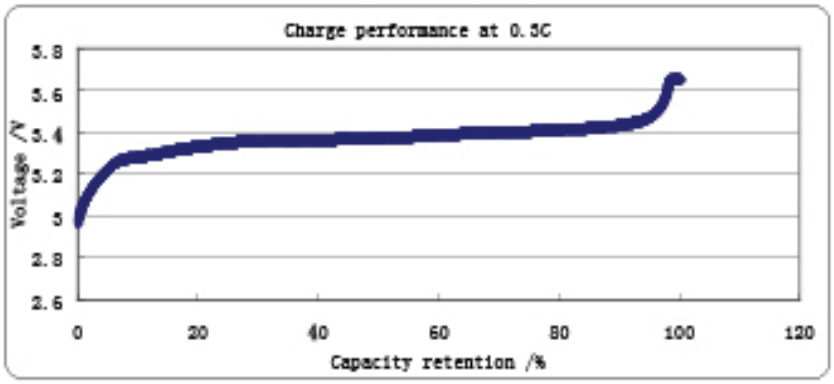
As illustrated in Drawing3 , it is fully charged lithium-ion power battery's discharging characteristics curve, with discharging rate of 0.3C, discharging cut-off voltage of 2.5V, environmental temperature of 25℃.



Drawing3 Lithium-ion power battery discharge curve

2.3 Charging Characteristic

Drawing 4 is lithium-ion power battery's charging characteristics curve, which describes the relation among charging voltage, charging current and battery capacity retention rate under CC-CV condition. Voltage upper limit: 3.65V, charging rate:0.3C, environmental temperature :25℃.



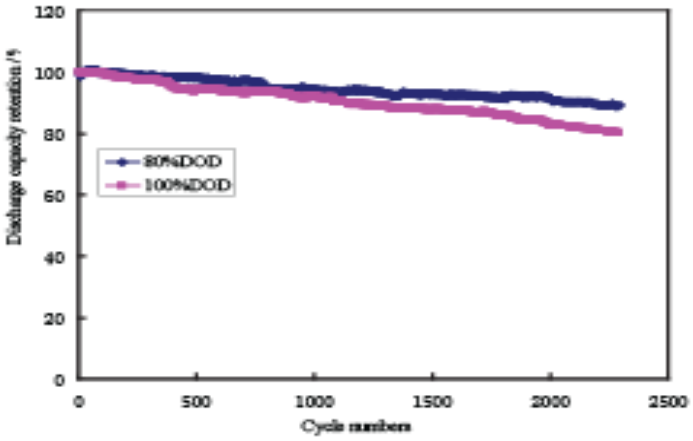
Drawing3 Lithium-ion power battery charge curve

2.4 Storage Characteristics

Battery's storage performance refers to SOC battery being open circuit, under certain conditions of storage, battery's charging retention capacity.

2.5 Cycle Data

Under room temperature （25℃）, lithium-ion power battery's cycle performance curve is illustrated in Drawing5. Charging/discharging rate all are 1C, charging cut-off voltage is 3.65V, discharging cut-off voltage is 2.5V, DOD are 100% and 80% separately.



Drawing5 Lithium-ion power battery's different DOD cycle performance curve

III. Product Safety Features

3.1 Battery Materials

Lithium-ion power battery is a rechargeable battery, working primarily relays on the moving of lithium-ion between the anode and cathode. Generally, its material adopts lithium elementary as the cathode. It is the representative of modern high-performance batteries. Lithium-ion power battery is developed from lithium metal battery. The cathode material of lithium metal battery is manganese dioxide or thionyl chloride, and the anode material of it is lithium metal. Lithium metal battery is easy to form lithium crystals during charging and discharging cycles, resulting in internal short circuit. Lithium metal is very lively, being easy to cause violent reaction with air, water, appearing security problem. However, during lithium-ion power battery's operation, lithium-ion exists in ion form, enhancing security compared with lithium metal battery. At present, from mobile phones, portable computer to electric bicycle, electric

vehicle, energy, communication base station, lithium-ion power battery have been widely used in many applications, with its security effectively guaranteed. Internationally renowned Underwriters Laboratories （ UL ） formulated lithium-ion cell security testing standard UL1642. Domestic industries have also developed a relevant mandatory testing standards， like QC/T743-2006< Lithium-ion batteries for electric vehicles > to guarantee lithium-ion battery's security. CALB has passed relevant inspection standards, fundamentally guarantees batteries' security.

3.2 Principle of Operation

With the development of cathode materials for lithium-ion power batteries, lithium-ion power battery's security has been improved. Especially after the lithium-iron phosphate material has appeared, large-capacity lithium-ion power battery's security can be effectively guaranteed. Structure of lithium-iron phosphate battery plays a vital role on battery's security:

1) In the olivine structure of lithium iron phosphate, material contains "PO4" polyanion, all oxygen ions and P5+ through the strong covalent bond , combines and forms (PO4)3-, even in the fully charged state, o is difficult to extract, improving the stability and security of materials;

2) Due to its redox couple is Fe3+/Fe2+, when the battery is fully charged, the reactivity with organic electrolyte is low, therefore, safety performance is good;

3) Fully charged cathode materials' volume shrinks 7%, when composed of battery with carbon, just compensating for carbon anode's volume expansion, improving battery's safety and stability.

3.3 Product Certification

At present, CALB has received more than 60 patents, becoming standard drafting units in the power industry (power lithium-ion battery system). Products have passed the test of national 863 project power batteries testing center, quality system certification GB/T19001, qualification of confidentiality of weapon equipment research and production unit and the CE, RoHS, MSDS

transport certification for the entering international market.

CALB undertook National 863 Plan Project Issue

SGS certification

CE certification

PONY certificaiton

EU RoHS environmental protection

CNAS system certificaiton: GB/T19001-2008/ ISO9001：2008 standard

3.4 Security Testing

1	Dropping test	After charging, at 20℃±5℃, drop it from the height of 1.5m to hardwood flooring with the thickness of 20mm, each face of the cell is dropped one time. Cell has no explosion, no fire, no leakage.	Cell has no explosion, no fire, no leakage
2	Heating test	After charging, place cell in constant temperature box of 85℃±2℃ for 120mins, Cell has no explosion, no fire, no leakage.	Cell has no explosion, no fire
3	Extrusion test	Testing in accordance with the following conditions, cell has no explosion, no fire, no leakage:1)Extrusion direction: press perpendicularly to plate;2)Extrusion area: less than 20C ㎡;3)Extrusion degree: until shell is cracked or short-circuit (cell's voltage turns to 0V)	Cell has no explosion, no fire
4	Nail puncture test	After charging, use high temperature steel nail of Φ3mm~Φ8mm, with the speed of 10mm/s~40mm/s, puncture it perpendicularly to plate (steel nail remains inside of the cell). Cell	Cell has no explosion, no fire

		has no explosion, no fire.	
5	Impact test	After fully charged, place it at horizontal level, place the stick with the diameter of 15.8mm on the center of battery, let the goods with the weight of 9.1kg drop to the battery with the height of 610±25mm. Cylindrical or square battery suffers impaction, the long axis shall be parallel with horizontal level, vertical to direct-axis of steel column. Square battery's longest axis shall vertical to steel column, the bedding face shall vertical to impaction direction. Each sample only suffers one-direction impaction.	Cell has no explosion, no fire
6	Acceleration test	After fully charged, place it at stationary fixture with each face shall be fastened. Accelerate along with 3 directions vertical with each other, except cell's shape only has 2 directions. Each direction of vibration acceleration shall vertical to the surface of battery. Acceleration requirement: minimum average acceleration within initial 3ms shall reach to 75g(g-local acceleration of gravity)。Peak acceleration shall be 125-175g. Testing temperature: 20±5℃。	Cell has no explosion, no fire, sample's quality lose shall less than 0.1%.
7	Vibration endurance test	Fasten battery module on vibration test-bed. Testing in accordance with the following conditions:1) discharging current: 1I3 (A);2) vibration direction: up and down single vibration;3) vibration frequency: 10Hz～55Hz;4) Maximum accelerated speed: 30m/s2;5) sweep cycle: 10 times6) vibration time: 2h.During vibration test, phenomena of discharging current transmutation, abnormal voltage, shell transformation, electrolyte leakage are not allowed, and reliable connection, flawless structure should be retained, installation looseness is not allowed.	Cell has no explosion, no fire, sample's quality lose shall less than 0.1%.
8	Temperature impaction test	After fully charged, place it in temperature cabinet to proceed cycling listed as bellow: Warming to 70±3℃ within 30mins, then keep warm for 4h. Warming to 20±3℃ within 30mins, then keep warm for 2h. Warming to-40±3℃ within 30mins, then keep warm for 4h. Warming to20±3℃ within 30mins. Repeat cycling listed above for 9 times. After 10times of cycling, check it after placing it under normal temperature for 24h	Cell has no explosion, no fire, sample's quality lose shall less than 0.1%.
9	Low-pressure test	After fully charged, store it under the conditions of 11.6Kpa、20±3℃ for 6h.	Cell has no explosion, no fire, sample's quality lose shall less than 0.1%.

Ⅳ. Product operation

4.1 Precautions prior to use, technical requirements for charging and discharging

1) The battery user shall carefully read the battery using guide and other explanatory materials, familiar with the charging and discharging characteristics, understand the usage of BMS and charging generator before using our products.

2) Except for special stated, parameters of charging/discharging are:

• Cell's charging cut-off voltage: 3.65V(cell's charging limited voltage: 3.8V. Cut off current as soon as cell's voltage raises to 3.8V)

• N batteries in series charging voltage: N×3.65V(when cell's voltage raises to 3.65V, charger can automatically enter into charging mode);

• cell's discharging alarming voltage: 3.1V(quiescent value), (when cell's quiescent voltage reduces to 3.1V, battery cluster's DOD is over 85% DOD; when cell's quiescent voltage reduces to 3.0V, battery cluster's DOD is over 90% DOD. Low charging and low discharging usage are strongly recommended.)

•cell's discharging cut-off voltage: 2.5V （under -20℃ condition, cell discharging cut-off voltage is 2.0V, if cell is severely over-discharged, the loss resulting from that can't recovered.）

3) To ensure the safe and effective use of batteries, it is necessary to equip special power lithium battery management system and lithium battery charger possessing constant-current limited voltage charging model for CALB's lithium-ion power battery. When small amount of small-capacity batteries are connected in series, performance reliable lithium battery protective plate is also be useful.

4) Under no circumstances, testing or using batteries, it is necessary to detect batteries' voltage. Shall never be allowed to conduct charging/discharging test to batteries after connected in series without no management system or

protective plate, in order to avoid over-charging/over-discharging of batteries, over-charging poses a security risk, over-discharging would seriously affect battery life;

5) The BMS used shall possess insulated resistance testing function, after battery and BMS installed. Set all the protective parameters of BMS firstly. Confirm battery's real delivery charged quantity when setting SOC initial value;

6) It is a must to confirm the communication standard between BMS and charger, the good signal connection between BMS and charger(using CAN protocol communications or general switch signal communication), guaranteeing charger is dominated by BMS during batteries' charging process, avoiding over-charging incurs;

7) It is a must to confirm the communication standard between BMS and electric machine controller, the good signal connection between BMS and electric machine controller (using CAN protocol communications or general switch signal communication), guaranteeing batteries do not over-charged during usage.

8) Except for special statement, new ex-factory cell usually have 60% of SOC. Do not use the battery for a long time before the adjustment of BMS and charger completed in case of over discharge the battery.

9) In the course of using the battery, it is highly recommended to stick to the low-charging and low-discharging principle of charging capacity90%（90%SOC）, discharging capacity 80%（80%DOD）. It is time to charge battery clusters when cell's quiescent voltage reduces to 3.1V and real capacity is less than 20%;

10) Avoid dragging the vehicle to charge only after the exhaustion of power. While during the towing process, drive motor has stopped working, but the car DC/DC (to the lights, wipers, power supply), auxiliary systems such as steering, braking assistance are still using power, that would similarly lead to battery

over-discharging.

11) It is strictly prohibited to twist the bolt for fixing pole without permission, as illustrated in Drawing6.

12) Battery safety valve is explosion-free designed for avoiding longtime overcharging, damageable extrusion and accidental short circuit. Screw action is not allowed under any circumstance, as illustrated in Drawing 7.

Drawing6 Private mobility is forbidden

Drawing7 Twisting safety valve is forbidden

13) Battery cluster’s high-voltage safety protection work must be done completely, main circuit of high-voltage and low-voltage electrical circuit for electric vehicles (including the body) shall be properly isolated, and select the reliable performance of DC air breaker and quick-acting DC fuses.

14) Should never be allowed to separately lead power cable of signal battery from cluster to the carload low-voltage apparatus for power supply, if long time using these batteries in that way, them will over-discharge because of its low power.

15) How to recognize the laser encoding of battery

Bar codes of the battery are 16 digits, including 3 digits of area code, 3 digits of capacity code, 6 digits of production date and 4 digits of serial number.

Specific Instructions are as follows.

a. Area Code

America	NSA
Europe	Space+EU
Asia, Africa and Australia	Space+AP

b. Capacity Code

Capacity code is the number of capacity of the battery. For example, the capacity code of 100AH is 100.

c. Production Date

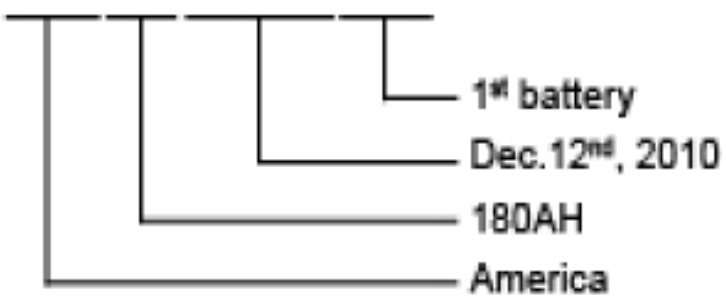
Manufacturing Department mainly confirmed the date. Same date with a batch of batteries is suggested. Date format: year/mouth/day

For example, Dec.2nd, 2010, that is 101202 which generally for the date of production.

d. Serial Number

Based on the amount of batteries，4 digits in all. Such as the serial number of the 20th battery is 0020.

For example, code: NSA1801012120001, as illustrated in Drawing 1.8.



Drawing8 Battery code chart

4.2 The Battery Layout Basic Requirements：

1) It should be cautious for battery layout, not only take the ventilation inside of battery cabinet into consideration, but also should take dust-proof and rain-proofed measures;

2) Take full account of water flooded, shock-resistance for battery cabinet's layout;

3) When considering battery cabinet's layout design, fully taking the later repair and maintenance into consideration for assembling and disassembling batteries and battery cabinet simply;

4) When considering battery cabinet's layout design, conduct modularized group selection of batteries according to the maximum amount of batteries single BMS sub-module can manage as far as possible;

5) The layout of battery and battery cabinet shall make high-voltage cable lines short and smooth;

6)when considering battery cabinet's layout, make sure it is as far as possible away from sources of heat, if it has to be allocated near the heat source, then the proper insulation measures should be taken;

7) When considering the battery layout, make sure batteries' external environment, especially ambient temperature conditions, are consistent as far as possible, temperature differentials must not exceed 5 ° c.

4.3 The Battery Is Installed The Basic Requirements

Power supply modules or batteries' installation must be operated by trained professionals, installations must be operated strictly in accordance with the relevant work instruction book;

1) Each group of batteries must be properly fastened to the battery cabinet

after clamping. Make sure batteries are placed with the poles up. Placing the batteries with lay flat or on its side is not recommended. It is forbidden to install the batteries upside down.

2) Using CALB' battery modularized group-selection fixture, make sure the flat washer, spring washer, nut on the tension rod are fully assembled and tightened, to ensure that the battery clusters are clamped during car's bump condition;

3) When clamped battery modules are installed inside of the battery cabinet, the bottom and all around of batteries shall be lay with a layer of elastic items such as rubber for shock absorption, the installation of battery cabinet on the frame shall take appropriate vibration reduction measures;

4) Inside of battery boxes, sufficient space should be allowed above the battery module, to facilitate the connection between battery management system harness and repairing lines, meanwhile, better heat dissipation can be achieved;

5) Consider cooling measures for designing the layout and installation of batteries and battery cabinets. Battery cooling methods can be varied, with the most basic one of adopting fan cooling. Consider air-flow problems of vehicle at run time when designing, you can also drum the cold air of train carriage or air conditioning system into the battery compartment, in order to achieve the purpose of cooling batteries;

6) The positive and negative power wires of e ach battery module are connected with a proper quick-acting connector separately, connector shall be fastened on the battery cabinet.

7) After batteries' group-selection, battery pole shall be taken insulated protection measures

4.4 The Battery Connection To The Basic Requirements

Electrical connection operation shall abide by national related electric installation operation specification:

1) Be careful during the battery connection operation, keep in mind of the high voltage safety, and be sure to avoid battery short circuit

2) Fix quick-acting connector between the battery cabinets, adopt power cord connector and charging plug and socket with higher protection level

3) Before connecting the battery and management systems, battery aluminum pole on the surface need sanding to remove the oxide layer to reduce contact resistance, as illustrated in pictures below. If the copper bus bar used has no surface treatment, bus bar and its conductive connectors from the contact surfaces are polished

4) Bolts on battery poles must be tightened to avoid osculate resistance increase. Loose connections can cause battery cluster’s severe fever in pole position during large-current discharging, thus affecting batteries’ life-cycle, even make battery early retired.

5) BMS voltage acquisition line terminal’s soldering or crimping and wiring harness’ connections must be reliable, in order to avoid voltage signal sampling accuracy caused by bad contact. Insulated casing covers on terminals can’t be too long to avoid parcel lug;

6) Do not connect BMS voltage acquisition across battery cabinet, generally, BMS voltage acquisition modules are installed inside the battery cabinet, the length of voltage acquisition cable should be appropriate. If voltage acquisition line is too long, then it leads to excessive voltage drop on the cable, which will bring very large error for battery voltage measurement;

7) Connection between batteries and the connection between batteries and management system should be considered carefully.

8) Battery pole metal is aluminum material, do not use excessive force when tighten the bolts, so as not to strip the screw thread.

9) Be sure to install the appropriate quick-acting fuse or DC air breaker in the main circuit, in order to ensure the safety of battery system.

4.5 Operation Procedure

1) Dividing batteries according to the design requirements, and using clamp and other accessories to fasten each battery cluster. It is important to note battery's polarity;

2) According to the design requirements, hoisting batteries into in various battery cabinet. Pay attention to battery cluster' orientation when allocating them, to facilitate wiring and battery maintenance;

3) According to the design of battery connection, connect batteries of battery cluster with bus bar. Using the flat washer and spring washer when install pole bolt, BMS voltage acquisition lug should cover pole bolt. Pole bolts must be tightened, but it should be moderate force when you tighten the pole bolt, after spring washer is fastened, slightly hard twist it, be sure to avoid too much force, so as not to damage the battery pole screw;

4) Securely install battery cabinet on the frame, and deal with all the protection of the battery cabinet;

5) In accordance with the design requirements, install BMS master controllers, sub-control module and a variety of sensors, connect communication lines and signal acquisition lines;

6) The positive and negative leads must be clearly identified, properly conduct wiring job, high and low voltage isolation, high voltage safety protection;

7) After whole car batteries are connected, it is a must to use a multimeter to confirm the total voltage of the main positive and negative terminals is correct before you can connect to the switch box;

8) It is a must to do the isolation between high-voltage main circuit and the body of vehicle well. It is forbidden to connect the negative of battery high-voltage main circuit to the body of vehicle;

9) After BMS turns to normal work, set the battery protection parameters

10) Do the signal connection between BMS and charger well, to make sure charger is dominated by BMS in real time during charging procedure;

11) Do the signal connection between BMS and breaker well, to make sure the batteries are not over-discharged during usage.

12)Debugging the charger. Fully charge the battery before normal use.

4.6 Operating Tool

1) It is necessary to put on insulating gloves in the process of battery connection. As illustrated in Drawing9.

2) Socket wrench, fixed wrench, screwdriver and other tools have to be make strict insulated treatments, as illustrated in Drawing10. Pay attention for the metal items carrying-on, such as keychains, watches, necklaces etc.

3) Before connecting the battery and management systems, battery aluminum pole on the surface need sanding to remove the oxide layer to reduce contact resistance, as illustrated in Drawing11/12.

4) Bolts on battery poles must be tightened to avoid osculate resistance increase.

5) Battery pole metal is aluminum material, do not use excessive force when tighten the bolts, so as not to strip the screw thread.

Drawing 9 insulated gloves

Drawing 10 tools are insulated handled

Drawing 11 sanding paper

Drawing 12 polish poles' surfaces and bus bars

6) Please use the torque spanner of 5—30NM during tightening bolts. The specific types of torque spanners match to the specific type of batteries.

Serial Number	Battery Type	Pole Bolts	Tightened Torque (N·m)	Notes
1	40AH	M6×16	14	
2	60AH	M6×16		
3	100AH	M8×16	16	Use the pneumatic wrench of 0.5KG, torque of 8NM
4	130AH	M8×16		
5	160AH	M8×16		
6	180AH	M8×16		
7	200AH	M8×16		
8	210AH	M8×16		
9	240AH	M8×16		
10	400AH	M14×16	24	(suggested)
11	500AH	M14×16		
Note: All the data is artificially measured. The material of bolts is A2-70.				

V. Emergency processing

The electrolyte of lithium-ion power battery is lithium salts organic solvents, which is corrosive, being damage if disclosure incurs, if it is inadvertently leaked, the following first-aid measures shall be taken:

1) Release measures:

Method 1: Electrolyte leaks on the shell surface, you need to wear corrosion protective gloves, wipe with a cloth impregnated with alcohol, and to dry.

Method 2: If electrolyte reliefs from safety valve in the form of gaseous, immediately evacuate the people present, wear gas masks and insulated gloves, turn the battery upside down (with the side having valve down) in a dry

plastic buckets, then immediately transfer the barrel to ventilation environment

2) Eye contact: quickly rinse eyes with plenty of water for more than 15 minutes, during which lift the upper and lower eyelids. Turn to medical treatment if it is serious.

3)Skin contact: remove clothing, wash with plenty of water for 15 minutes. Turn to medical treatment if it is serious.

4)Inhalation: move to ventilated place. Oxygen as needed. Turn to medical treatment if it is serious.

5) Ingestion: take orally 2 cups milk or water. Vomitoria is forbidden under unconscious. Turn to medical treatment if it is serious.

VI. Transport Requirement

1) In the course of transport, make sure the capacity of battery is not more than 60% of the total one;

2) During batteries' loading and unloading process, lightly move and handle with care, preventing batteries from falling, rolling and heavy load;

3) During batteries' transshipment and usage, avoid strong impact and excessive squeeze of external force to them, so as to avoid causing damage to the shell or internal structure .

VII. Battery Storage and Maintenance

Drawing13 Battery storage site map

1) If not for temporarily use, the battery should be stored at temperature of 5-40 ℃, dry, clean and well-ventilated warehouse. When not use batteries for a long time, store them well, let the state of charge in half, neither full charging nor discharging.

2) Batteries, which in use or inventory, should be excluded from direct sunlight, also should be away from heat sources at a distance of no less than 2m.

3) Batteries shall be stored in boxes, or flat laid with insulated material and marked by obviously.

4) Battery inventory shall not be placed upside down or lying. Mechanical shock or stress, and cells exposed to heat and rain is strictly prohibited.

5) Formulate the tracking table of stock battery voltage, and check inventory battery voltage, inter resistance every 3 months and record the results.

6) Fully charge and discharge the cells per 6 months @0.3C, and record the results.

VIII. After-sales Service

1) During the warranty period, batteries can't be used because of quality problems, firstly, contact your nearest agent Office technician for consultation

2) After technicians confirm, customer first send exceptions to the agency; technicians of representative office give battery feedback to CALB's customer service department;

3) After representative offices receive exceptions, arrange technicians to test the batteries, after confirmation, fill in the application form for battery replacement, send it back to customer service department in the form of e-mail, after customer service department confirm, head the requirement to leaders of marketing company, then replace batteries after agreement.
4) Representatives make identification, registration of exceptions which have already been replaced, and store that in the specific location for recycling;

5) After the replacement, battery's warranty will be based on the original one;

6) Warranty customers must first fill out the battery quality information feedback, and provide photos or data that can explain battery problems during warranty period.

IX. Quality and Commitment

1) The ways and conditions of quality assurance: battery sales are identified that based on its laser barcode, our company will not be responsible for after sales service if there is no laser barcode. According to the area code, the representative office, which in charge of this area will solve the problem. Head office of CALB will not be responsible for after sales service directly.

2) Before setting up the overseas representative office, head office of CALB is in charge of the after sales service directly.

3) Battery warranty period is 36 months (from the date of Shipping out of factory).If there are warranty terms in the contract, please follow the contract.

4) In the first 18 months, if batteries cannot be used because of the quality, and is in accord with the exchanging requirement of our company, we will exchange them for free (including the round-trip freight).

5) In the last 18 months, if batteries cannot be used because of the quality, and is in accord with the exchanging requirement of our company, we will exchange them timely and afford 50% cost.

6) Identification method: the identification must be proceeded by CALB's Customer Service Department or the third party authority admitted by CALB. The fare will be paid by customers in advance. The result of the identification shows that if batteries do have quality problems, CALB will pay the fare and send money back to customers in cash or some other ways, if not, customers will pay instead.

To be Global golden lithium battery supplier with principle of “Advanced techn ology, reliable quality, customer satisfaction", CALB carries out business mod el of "Brand marketing, cooperative R&D, closed manufacturing, alliance purc hasing" aiming at providing prefect battery with high efficicency and low cost, and makes CALB internally well-know brand.

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