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Ultra light weight Li-NCM battery pack

Model: BUPNE51144U, 51.8V, 144Ah

Overview

Bestgo Battery Co., Ltd. dedicated to offer advanced lithium-ion batteries which feature both high power and energy densities with a long lifespan and ultra safe performance. The cells made with unique manufacturing technology can help to build high quality li-ion batteries with high effective environmental friendly. Bestgo's unique technologies make sure cells will have amazing consistency, with high precision quality control and auto selecting & matching system, Bestgo dedicated to help customer to build the excellent energy storage systems as customer required.



Scope

This specification describes the performance and detail technical requirements of the Li-ion Batteries that are supplied by BESTGO BATTERY COMPANY LIMITED, the products mentioned in the specification accord with GB/T18333.1-2001 Standard.

Parameters

Item	Rating	Note
Battery Model	BKPNE51144U	ALSO WN14S144M1
Battery pack description	51.8V 144Ah Li-NCM battery pack	Metal case, capacity indicator, IP67
Cell Type and config	BCPNE48M, 14S3P config	3 cells in parallel to build 144Ah unit, 14 units in series to build battery pack.
BMS and components	PCB type BMS, capacity indicator	Indicator can also show pack volt
Battery Pack Dimension (L*W*H) and connector type	450*355*255 ± 1mm (metal case)	Output connector is Anderson Gray SB120
Battery Pack Weight	49 ± 0.5 kg	The whole pack weight with power cables
Rated Capacity	≥ 144 Ah @ C/3 Discharge, 23°C	Less capacity with big current discharging
Operating Voltage	51.8 V @ C/3, 23°C/73°F (3.0 V cut off)	Average working voltage
Charging Voltage	≤ 58.8 V @ CC/CV charge	Can reduce to ≤ 58.1V for longer battery life
Discharge cut off Voltage	42 ~ 43 V	3.0 V for cell level
Charge Current	≤ 48 A (C/3, 23°C)	The smaller the better
Discharge Current	≤ 185 A (23°C) @ continuous	Peak current of ≤ 250A @10sec (23°C)
Internal Resistance	≤ 15 mΩ	AC internal resistance
Operating Temperature	Charge: 0°C ~ 45°C Discharge: -20°C ~ 45°C	Suggested charging temp: 10°C ~ 40°C Suggested discharging temp: 0°C ~ 40°C
Storage Temperature (≥ 3 months)	15°C ~ 30°C	Keep SOC at 40~60% for long term storage



Structure

The battery pack has metal case for protection and BMS built inside. The whole pack has handle(s) for the lifting and carrying. For inside structure here are cassette sheet battery modules connected in series config with screws and bus-bars. Here are necessary foams among modules and BMS for isolation and vibration resistance.

Test Performance and Conditions

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of $23\pm 2^{\circ}\text{C}$ and relative humidity of 45~85%. The test results are not affected evidently by such conditions of temperature $23\pm 2^{\circ}\text{C}$ or humidity 40~85%RH.

Item	Measuring Procedure	Requirements
Vibration test	After standard charge, the battery / battery pack is to be tested as following conditions: Amplitude: 0.8mm Frequency: 10~55Hz(sweep:1Hz/min) Direction: X/Y/Z axis for 9~30min. The battery / battery pack is to be tested in three mutually perpendicular to each axis.	No fire, no explosion, no smoking is obtained.
Short-Circuit Test	After standard charge, the battery / battery pack is to be Short-circuited by connecting the positive and negative Terminals of the battery / battery pack with copper wire having a Maximum resistance load of 0.2Ω	No explosion, no fire. The temperature of the exterior cell casing shall not exceed 120°C .
Heating Test	The battery / battery pack is to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of $5\pm 2^{\circ}\text{C}/\text{min}$ to a temperature of $75\pm 2^{\circ}\text{C}$ at which temperature the oven's to remain for 10 minutes before the test is discontinued.	No explosion, no fire.
Over Charging Test	After standard charge, the battery / battery pack is subjected to a charging current by connecting it to a DC-power supply. The beginning current is 3C, which is to be obtained by connecting a resistor of specified size and rating in series with the battery / battery pack. The test time is 2.5 hours. This does not require that the initial current be maintained for 2.5 hours.	No explosion, no fire.

Transportation & Storage of Li-ion Battery Pack

Here is the Notice in transportation and Storage of our Li-ion battery packs, please make sure they have been well executed.

- Can be transported via Truck, train, airplane and vessel, but to keep out of the sun & raining during transportation.
- To handle the battery pack with care during assembling or dis-assembling, do not arbitrarily throw to avoid collision.
- Do not place any heavy objects on the battery pack during transportation, to avoid crushing or damage caused.
- Do not mix Battery with flammable, explosive, and sharp metal objects in transportation.
- Make sure that the Packaging marked with moisture-proof & waterproof sticker, anti-fire stickers, to avoid dangerous in transportation.



Battery care and maintenance

- When battery pack is fully discharged and turned off automatically, please do not use it any more until it is recharged. Over discharge the battery pack means battery life will be shortened and the battery may become permanently damaged.
- When battery pack is fully discharged and turned off automatically, please recharge it in time (Within 12 hours), even charge 2~5% electricity to the pack will protect the cycle life well.
- We suggest charge up to 90% SOC and discharge no less than 20% SOC when using to prolong the cycle life. When the voltage of single cell drop down to 3.3V or the actual capacity is lower than 20%, please recharge the battery promptly.
- If the battery pack will not be used for a long time (several days or weeks), please disconnect the Anderson connector from the load. (When battery pack connected to the load, the pack is always "waiting for" running, which will consume the electricity and make battery fully discharged and damaged.)
- Please discharge and recharge the battery timely after kept for more than 3~6 months so that the battery cycle life would be longer. The cycle life of li-ion battery would be shorted if the battery always be kept as fully charged state. For long time storage, keep the battery as 40 ~ 60% state of charge (SOC) and discharge and charge every 3~6 months if possible.
- The battery pack can be used at -15~45°C for discharge, 0~45°C for charge, while the best working temperature for this battery pack is 15~40°C. Please take some necessary procedures, like heating & cooling system, or use heat insulation materials to stop cold effect battery pack in winter.
- When the temperature is more than 75°C (Internal temperature of the battery), the battery cycle life would be shorted. So do not exposure the battery under the sun during summer.
- When the temperature is under -15°C or lower, the battery performance would be effect and the cycle life might be shorted.
- Battery should be kept under dry and ventilation condition. Do not put the battery close to fire and explosive products. When charging the battery, cut of the load.
- Do not wash the battery shell with organic solvent. If there's fire accident, please do not use CO2 to extinguish the fire but use CCl4 or sand soil.
- Please handle the pack with care and gently to avoid severe vibration, throw or drop.

Requirements in operation of Li-ion battery pack (General purpose)

Before operation, please carefully read the data sheet provided by the manufacturer. This is benefit to understand better of the charge and discharge characteristics of lithium ion battery, and the battery management system (or the lithium battery protection board) and the use of lithium battery charger.

To make sure our customer can use our battery effectively, we suggest to choose the specified Li-ion charger in CC/CV mode. Please do not charge and discharge the battery without BMS in case the battery pack be over-charged and over-discharged.

Unless otherwise specified, our Li-NCM batteries charge and discharge parameters are:

Charging state:

When single cell reaches 4.2 V, BMS would cut-off the charging circuit;

Or when battery pack reaches the volt of 4.2*N, charging state is finished.

(PS: N is the number of 3.7 V parallel units in series config of battery pack)

Discharge state:



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When single cell reaches 3.3V, BMS should alarm (if BMS support this function), it is not suitable for use now;

When Single cell reaches 3.0V, BMS should cut-off the discharging circuit.

Battery Pack Installation & Maintenance (For Technical Reference only)

- Please study the related data-sheet and user manual before the installation of battery pack, BMS and Charger.
- Fix the battery installation location and install the battery pack under ventilation cooling environment.
- Please be careful and prevent the battery from short circuit.
- All the cables should be the standard match that can resist the related temperature and voltage.
- Please install/change the BMS under the instructions of operation manuals and make sure every part is rightly and tightly connected. BMS install requires the right sequence of parts, please be aware.
- If the battery pack is separated, please pay attention to the connecting steps and composition way.

Failure	Cause Analysis	Cause Analysis	Corrective Action
The Battery pack can not work properly		1. Incorrect Wire connection	Make Sure the connection is right
		2. Energy has exhausted	Please use the charger for charging
		3. BMS is not working	Replace the BMS
		4. Some single cell is damaged.	Replace the damaged cell
Battery pack is overheated while working		1. The continuous discharging current is too large.	Do some cooling method, make sure battery pack is not over-discharged.
BMS (Only for Advanced BMS type)	Cannot working	1. No power supply	Make sure the DC power supply for BMS is 12V or 24V
		2. Incorrect connection	Make sure the wire connection is right.
	Buzzing Alarm	1. Battery pack is in overcharge or over discharge state.	Please check the volt too low (≤ 3.0 V) or too high (≥ 4.2 V)
		2. CAN communication is stopped	Check the communication port.
	No display on Screen	No power supply.	Please check the line of power is connected to screen or is loosed?
	The volt is 0 V on CCM	CAN communication is stopped	Please check the communication port is loosed or not?
When discharge, it shows as "charge"	The direction of current sensor is opposite.	Please refer to the current sensor installation manual	



After-sale Service

For the warranty and after-service we will follow the following principle.

Warranty year(s) for this model of battery pack is specified by supplier. In the period of warranty, there is any problem as the following description, we will take responsible for the replacement and repair.

- The whole battery pack can not be charged or discharged.
- Under the standard condition for testing, capacity is not same as nominal Ah. It is less than 80% in the first year, or 70% in last warranty year (if the last warranty year is provided as warranty period).
- There is liquid leakage.
- There is some damage on battery pack's case and accessory because it is caused by the battery.
- The charger is not working properly.

There is any situation like the following description, we will not take responsible for the warranty and after-sale service.

Expired warranty period.

- Customer didn't follow the manual instruction, which is resulted in battery damage.
- Customer dismantles and convert the battery pack, which is not guided by the professional people.
- There is some apparent scratches and trace on the case of BMS and charger.
- Customer has right to choose the charger, while customer should get confirmation from supplier about technical details of Charger, to avoid mis-operation.