





BUREAU  
VERITAS

Test Report No.: BAT200109N021-1



Certificate # 2951.01

<b>Test Report No.</b>	<b>BAT200109N021-1</b>
<b>Applicant's name:</b>	Shenzhen SOFAR SOLAR Co., Ltd.
<b>Address :</b>	401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong, P.R.China.
<b>Test Item description:</b>	Rechargeable Li-ion Battery
<b>Identification :</b>	GTX5000
<b>Testing laboratory</b>	
<b>Name :</b>	Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch
<b>Address :</b>	No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
<b>Test specification</b>	
<b>Standard :</b>	IEC 62619:2017, EN 62619:2017 Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications
<b>Test Result :</b>	<b>The sample satisfies to the clauses examined.</b>
<b>Prepared By :</b>	
	
<u>2020-06-08</u> Date	
_____ Jason Zhen / Engineer	
<b>Approved By:</b>	
	
<u>2020-06-08</u> Date	
_____ James Huang / Technical Manager	
<small>This report is governed by, and incorporates by reference, CPS Conditions of Service as posted at the date of issuance of this report at <a href="http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions">http://www.bureauveritas.com/home/about-us/our-business/cps/about-us/terms-conditions</a> and is intended for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. Measurement uncertainty is only provided upon request for accredited tests. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence or if you require measurement uncertainty; provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents.</small>	



**TEST REPORT  
IEC/EN 62619**

**Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for secondary lithium cells and batteries, for use in industrial applications**

Report Number .....: BAT200109N021-1

Date of issue .....: 2020-06-08

Total number of pages .....: 24

Name of Testing Laboratory preparing the Report .....: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch  
No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China

Applicant's name .....: Shenzhen SOFAR SOLAR Co., Ltd.

Address .....: 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong. P.R.China.

**Test specification:**

Standard .....: IEC 62619:2017, EN 62619:2017

Non-standard test method.....: N/A

Test Report Form No.....: TEST REPORT IEC/EN 62619 VER.0

Test Report Form(s) Originator.....: Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch

Master TRF .....: Dated 2018-07

Test item description .....: Rechargeable Li-ion Battery

Trade Mark .....: **AMASSTORE**

Manufacturer .....: Shenzhen SOFAR SOLAR Co., Ltd.  
401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, Guangdong. P.R.China.

Model/Type reference.....: GTX5000

Ratings .....: 51.2V, 100Ah, 5120Wh












<b>List of Attachments (including a total number of pages in each attachment): N/A</b>	
<b>Summary of testing:</b> Temperature: 25±5°C, Relative humidity: 60%, Air pressure: 950 mbar.	
<b>Tests performed (name of test and test clause):</b> <ul style="list-style-type: none"><li>- 5.3 Venting</li><li>- 5.8 Quality plan</li><li>- 7.2.3 Drop test (battery system)<ul style="list-style-type: none"><li>7.2.3.3 Edge and corner drop test (battery system)</li></ul></li><li>- 7.3.3 Propagation test (battery system)</li><li>- 8.2.2 Overcharge control of voltage (battery system)</li><li>- 8.2.3 Overcharge control of current (battery system)</li><li>- 8.2.4 Overheating control (battery system)</li></ul> <p>The load conditions used during testing: The unit is charging the empty battery, discharging the full charged battery according to its rating.</p>	<b>Testing location:</b> Bureau Veritas Shenzhen Co., Ltd. Dongguan Branch No. 96, Guantai Road (Houjie Section), Houjie Town, Dongguan City, Guangdong Province, 523942, People's Republic of China
<b>Summary of compliance with National Differences (List of countries addressed): N/A</b>	



**Copy of marking plate:**

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

<p><b>AMASS</b> STORE</p> <p>Rechargeable Li-ion Battery</p> <p>IFP/34/201/173/[1P16S]M-10+50/95</p> <p><b>Model:</b> GTX5000</p> <p>Ratings: 5120Wh/51.2V/100Ah</p> <p>Charge Voltage: 56.16V</p> <p>Max. Output Power: 3.5KW</p> <p>----- <b>AMASSSTORE</b> ----- Manufacturer: <b>Shenzhen SOFAR SOLAR Co., Ltd.</b> 401, Building 4, AnTongDa Industrial Park, District 68, XingDong Community, XinAn Street, BaoAn District, Shenzhen, GuangDong, P.R. China</p> <p><b>CAUTION !</b></p> <ul style="list-style-type: none"> <li>Do not disassemble</li> <li>Do not short-circuit</li> <li>Do not place in fire or near hot source</li> <li>Please read user manual carefully</li> </ul> <p>IEC 62040-1 IEC 62619 UN 38.3 SAAxxxxxx</p>	  <p><b>DANGER !</b> CHEMICAL HAZARD &amp; SHOCK HAZARD</p> <ul style="list-style-type: none"> <li>Do not disassemble or repair by yourself.</li> <li>Do not drop, deform, impact, cut or spearing with a sharp object.</li> <li>Do not place near open flame or incinerate.</li> <li>Do not put any objects onto the battery.</li> <li>Do not allow to contact with liquid.</li> <li>Keep out of reach of children, animals or insects.</li> <li>Contact the supplier within 24 hours if anything wrong.</li> </ul>      <p><b>WARNING !</b></p>   <p>Stop the battery operation immediately to secure the battery safety when environmental temperature is over working temperature (suitable operation temperature is 0~45°C). If battery is at high temperature usually, it will impact battery performance.</p>
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LFE051100EA019C01001

Explanation of date Code:

LFE051100EA019C01001

“19” indicate year;  
“C” indicate month(exp. A, October; B, November; C December);  
“01” indicate day;



<b>Test item particulars</b> ..... :	
<b>Classification of installation and use</b> ..... :	Use for the industrial applications
<b>Supply Connection</b> .....	DC Connection terminal
<b>Recommend charging method declared by the manufacturer</b> ..... :	Charge with constant current 50A to 56.16Vdc, then charge with constant voltage 56.16V to current decline to 0.05C
<b>Discharge current (0,2 I<sub>t</sub> A)</b> .....	20A
<b>Specified final voltage</b> ..... :	End of charge 56.16Vdc; End of discharge 45.6Vdc
<b>Possible test case verdicts:</b>	
- test case does not apply to the test object .....	N/A
- test object does meet the requirement.....	P (Pass)
- test object does not meet the requirement.....	F (Fail)
<b>Testing</b> ..... :	
<b>Date of receipt of test item</b> .....	2020-01-09
<b>Date (s) of performance of tests</b> .....	2020-01-09 to 2020-04-20
<b>General remarks:</b>	
<p>"(See Enclosure #)" refers to additional information appended to the report.          "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
<b>Manufacturer's Declaration per sub-clause 4.2.5 of IEC60904-2:</b>	
The application for obtaining a Test report includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	<input type="checkbox"/> <b>Yes</b> <input checked="" type="checkbox"/> <b>Not applicable</b>
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies)</b> .....	Dongguan SOFAR SOLAR Co., Ltd. 1F - 6F, Building E, No. 1 JinQi Road, Bihu Industrial Park, Wulian Village, Fenggang Town, Dongguan City. P.R.China.
<b>General product information and other remarks:</b>	
<p>(1) The equipment under test (EUT) contains 16pcs (16S1P) certified cells (Model: 001CB270) with CB Ref. Certif. No. JPTUV-096346 and Test report No. 50225835 001 issued by TÜV Rheinland (Shenzhen) Co., Ltd.</p> <p>(2) The Battery maximum Operating Temperature range is specified as 0~55°C for Charging and -20~60°C for Discharging.</p> <p>(3) Dimension of the Battery unit: (480mm x 211.5mm x 600mm) max.</p> <p>(4) Battery Weight: Approx.55kg.</p> <p>The test samples were pre-production samples without serial number.</p>	



IEC/EN 62619			
Clause	Requirement + Test	Result - Remark	Verdict
<b>4</b>	<b>PARAMETER MEASUREMENT TOLERANCES</b>		<b>P</b>
	Parameter measurement tolerances	Both normal and foreseeable misuses are evaluated in the report. All control and measure values were within the tolerances.	P
<b>5</b>	<b>GENERAL SAFETY CONSIDERATIONS</b>		<b>P</b>
<b>5.1</b>	<b>General</b>	<b>See below</b>	<b>P</b>
	Cells and batteries are safe under conditions of both intended use and reasonably foreseeable misuse ...:	The battery and cells is safe and continues to function in all respects under the condition of intended use.	P
<b>5.2</b>	<b>Insulation and wiring</b>		<b>P</b>
	Voltage, current, altitude, and humidity requirements	The cross section areas of wires were considered enough to carry the rating current of the battery.	P
	Adequate clearances and creepage distances between connectors	The terminals were connecting with end product which can provide good mechanical strength.	P
	The mechanical integrity of internal connections	The distance between the terminals is considered enough to minimize the possibility of short circuits.	P
<b>5.3</b>	<b>Venting</b>		<b>P</b>
	Pressure relief function	The Explosion-proof line safety valve which was at the surface of cell was considered as the pressure relief mechanism, which can release the pressure during the abnormal operation.	P
	Encapsulation used to support cells within an outer casing	The outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief.	P
<b>5.4</b>	<b>Temperature/voltage/current management</b>		<b>P</b>
	The design prevents abnormal temperature-rise	The EUT is cell. It should be evaluated during the final assembly.	P



Clause	Requirement + Test	Result - Remark	Verdict
	Voltage, current, and temperature limits of the cells	Have cell monitor & Balance Driver circuit.	P
	Specifications and charging instructions for equipment manufacturers	The battery vender had provided specifications including charge instruction for equipment manufacture reference.	P
<b>5.5</b>	<b>Terminal contacts of the battery pack and/or battery system</b>		<b>P</b>
	Polarity marking(s)	The "red output terminal +" and "black output terminal -" are marking on the output terminal.	P
	Capability to carry the maximum anticipated current	The cross section areas of wires were considered enough to carry the rating current of the battery.	P
	External terminal contact surfaces	The terminals were soldering which can provides good mechanical strength.	P
	Terminal contacts are arranged to minimize the risk of short circuits	The distance between the terminals is considered enough to minimize the possibility of short circuits.	P
<b>5.6</b>	<b>Assembly of cells, modules, or battery packs into battery systems</b>		<b>P</b>
5.6.1	General	See below.	P
	Independent control and protection method(s)	Battery management system.	P
	Recommendations of cell operating limits by the cell manufacturer	Provided cell specification including with cell operating limits instruction.	P
	Batteries designed for the selective discharge of a portion of their series connected cells	The battery pack has no design for selective discharge.	N/A
	Protective circuit component(s) and consideration to the end-device application	The battery pack's protective circuit was considered in line with end device application.	P
5.6.2	Battery system design	Battery management system.	P
	The voltage control function	Overcharge and over discharge voltage Warning and protection functions.	P



Clause	Requirement + Test	Result - Remark	Verdict
	The voltage control for series-connected batteries	Charge voltage balance function.	P
<b>5.7</b>	<b>Operating region of lithium cells and battery systems for safe use</b>		<b>P</b>
	The cell operating region .....	Provided cell specification including with cell operating region instruction.	P
	Designation of battery system to comply with the cell operating region	Battery system have cell balance function to meet the cell operation.	P
<b>5.8</b>	<b>Quality plan</b>		<b>P</b>
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented .....	Complied.	P
	The process capabilities and the process controls	Complied.	P
<b>6</b>	<b>TYPE TEST CONDITIONS</b>		<b>P</b>
<b>6.1</b>	<b>General</b>	<b>See below</b>	<b>P</b>
<b>6.2</b>	<b>Test items</b>		<b>P</b>
	Cells or batteries that are not more than six months old (See Table 1 of IEC62619)	The batteries under testing were less than six months old.	P
	Capacity confirmation of the cells or batteries	Confirmed.	P
	Default ambient temperature of test, 25 °C ± 5 °C	The testing was conducted at the ambient range of 20.0°C - 30°C.	P
<b>7</b>	<b>SPECIFIC REQUIREMENTS AND TESTS</b>		<b>P</b>
<b>7.1</b>	<b>Charging procedure for test purposes</b>		<b>P</b>
	The battery discharged to a specified final voltage prior to charging	The batteries are discharged in the ambient temp (25 °C ± 5 °C) and use a constant current of 0.2I <sub>n</sub> A, down to a specified final voltage.	P
	The cells or batteries charged using the method specified by the manufacturer .....	The cells are charged in the ambient temp (25 °C ± 5 °C) and use Recommend charging method declared by the manufacturer	P
<b>7.2</b>	<b>Reasonably foreseeable misuse</b>		<b>P</b>
7.2.1	External short-circuit test (cell or cell block)	Certified cell used. It has been evaluated in the cell report.	N/A
	Short circuit with total resistance of 30 mΩ ± 10 mΩ at 25 °C ± 5 °C		N/A





Clause	Requirement + Test	Result - Remark	Verdict
	Results: no fire, no explosion	See Table 7.3.2.	N/A
7.2.2	Impact test (cell or cell block)	Certified cell used.	N/A
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		N/A
	Results: no fire, no explosion.		N/A
7.2.3	Drop test (cell or cell block, and battery system)	Battery system.	P
7.2.3.1	General	See below.	P
7.2.3.2	Whole drop test (cell or cell block, and battery system)	The test unit is 20 kg or more.	N/A
	Description of the Test Unit .....		—
	Mass of the test unit (kg) .....		—
	Height of drop (m).....		—
	Results: no fire, no explosion		N/A
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)	Battery system Sample ID: GTX5000 / A04 (Edge); GTX5000 / A05 (Corner);	P
	Description of the Test Unit .....	The test unit is battery system.	—
	Mass of the test unit (kg) .....	50 kg or more – less than 100 kg.	—
	Height of drop (m).....	2.5cm	—
	Results: no fire, no explosion	After testing, no fire or explosion occurred.	P
7.2.4	Thermal abuse test (cell or cell block)	Certified cell used. It has been evaluated in the cell report.	N/A
	Results: no fire, no explosion		N/A
7.2.5	Overcharge test (cell or cell block)	Certified cell used. It has been evaluated in the cell report.	N/A
	For those battery systems that are provided with only a single protection for the charging voltage control		—
	Results: no fire, no explosion .....	See Table 7.2.5.	N/A
7.2.6	Forced discharge test (cell or cell block)	Certified cell used. It has been evaluated in the cell report.	N/A
	Upper limit charge voltage of the cell.....		N/A
	Cells connected in series in the battery system .....		N/A
	Redundant or single protection for discharge voltage control provided in battery system .....		N/A



Clause	Requirement + Test	Result - Remark	Verdict
	Target Voltage .....		N/A
	Maximum discharge current of the cell, $I_m$ .....		N/A
	Discharge current for forced discharge, 1.0 It .....		N/A
	Discharging time, $t = (1 It / I_m) \times 90$ (min.).....		N/A
	Results: no fire, no explosion .....	See Table 7.2.6.	N/A
<b>7.3</b>	<b>Considerations for internal short-circuit – Design evaluation</b>		<b>P</b>
7.3.1	General	See below.	N/A
7.3.2	Internal short-circuit test (cell)	Certified cell used. It has been evaluated in the cell report.	N/A
	Samples preparation procedure: a), in accordance with 8.3.9 of IEC62133:2012; or b), the nickel particle inserted before charging, or c), the nickel particle was inserted before electrolyte filling .....		N/A
	Tested according to Cl. 8.3.9 of IEC 62133:2012 test method, except all tests were carried out in an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$ .		N/A
	The appearance of the short-circuit location recorded by photograph or other means .....		—
	The pressing was stopped - When a voltage drop of 50 mV was detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached		N/A
	Results: no fire, no explosion .....	See Table 7.3.2.	N/A
<b>7.3.3</b>	<b>Propagation test (battery system)</b>	This test is according to battery manufacturer requirement.	<b>P</b>
	Method to create a thermal runaway in one cell .....	Heating by heater.	P
	Results: No external fire from the battery system or no battery case rupture.....	See Table 7.3.3.	P

<b>8</b>	<b>BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)</b>		<b>P</b>
<b>8.1</b>	<b>General requirements</b>	The BMS have been passed the IEC 60730 (function safety.)	<b>P</b>
	Functional safety analysis for critical controls	Evaluated in the IEC 60730 report.	P
	Conduct of a process hazard, risk assessment and mitigation of the battery system	Complied.	P
<b>8.2</b>	<b>Battery management system (or battery management unit)</b>		<b>P</b>



Clause	Requirement + Test	Result - Remark	Verdict
8.2.1	Requirements for the BMS		P
	The safety integrity level (SIL) target of the BMS	Complied.	P
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4	See below.	P
8.2.2	Overcharge control of voltage (battery system)	Complied.	P
	The exceeded charging voltage applied to the whole battery system	Complied.	P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s) .....	Complied.	P
	Results: no fire, no explosion .....	See Table 8.2.2.	P
	The BMS interrupted the overcharging before reaching 110% of the upper limit charging voltage	Complied.	P
8.2.3	Overcharge control of current (battery system)	Complied.	P
	Results: no fire, no explosion .....	See Table 8.2.3	P
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current	Complied.	P
8.2.4	Overheating control (battery system)	Complied.	P
	The cooling system, if provided, was disconnected	Complied.	P
	Elevated temperature for charging, 5 °C above maximum operating temperature .....	Complied.	P
	Results: no fire, no explosion .....	See Table 8.2.4	P
	The BMS detected the overheat temperature and terminated charging	Complied.	P
	The battery system operated as designed during test	Complied.	P

9	INFORMATION FOR SAFETY		P
	The cell manufacturer provides information about current, voltage and temperature limits of their products	Provided in the cell specification, which is given to the equipment manufacturer.	P
	The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users.	The EUT is cell. It should be evaluated during the final assembly.	N/A

10	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)		P
	The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual.	Complied. See the Copy of marking plate.	P



Clause	Requirement + Test	Result - Remark	Verdict
	Cell or battery system has clear and durable markings	Battery system complied.	P
	Cell designation	Certified cell used.	N/A
	Battery designation	IFpR/34/201/173/[1P16S]M-10+50/95.	P
	Battery structure formulation	Structure: 1P16S	P

<b>ANNEX A</b>	<b>OPERATING REGION OF CELLS FOR SAFE USE</b>		<b>P</b>
A.1	General	See below.	P
A.2	Charging conditions for safe use	The cell manufacturers stipulate the information on the operating region in the specification	P
A.3	Consideration on charging voltage	The cell manufacturers stipulate the charging voltage is 3.65V.	P
A.4	Consideration on temperature	Considered.	P
A.5	High temperature range	Not high temperature range	N/A
A.6	Low temperature range	Not Low temperature range	N/A
A.7	Discharging conditions for safe use	Considered.	P
A.8	Example of operating region	Operating region for charging and discharging illustrates in the specification.	P

<b>ANNEX B</b>	<b>PROCEDURE OF 7.3.3 PROPAGATION TEST</b>		<b>N/A</b>
B.1	General	Internal short-circuit test (cell) have evaluated.	N/A
B.2	Test conditions:		N/A
	– The battery fully charged according to the manufacturer recommended conditions .....		—
	– Target cell forced into thermal runaway.....		—
	– A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing.....		—
B.3	Method used for initiating the thermal runaway. 1) Heater (Heater, Burner, Laser, Inductive heating) 2) Overcharge 3) Nail penetration of the cell 4) Combination of above methods 5) Other methods.....		—



Clause	Requirement + Test	Result - Remark	Verdict
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<b>ANNEX C</b>	<b>PACKAGING</b>		<b>P</b>
	The materials and pack design chosen in such a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants	The material and packing which can prevent cell for short circuit, mechanical damage and possible ingress.	P



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5.1	TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity 1)	
Cells(1P16S)	CATL	001CB270	3.2V, 100Ah	IEC62619:2017	CB Ref. Certif. No. JPTUV- 096346 and Test report No. 50225835 001 issued by TÜV Rheinland (Shenzhen) Co., Ltd.	
Battery management system (BMS)	Shenzhen peicheng electronic technology co. LTD	P16S100A- SH9A55	Single cell overcharge protection: 3.500V; Single cell overdischarge protection: 2.800V; battery overcharge protection: 56.0V, 110A; battery overdischarge protection: 45.6V, 110A; MOS high temperature protection: 115°C; Cell high temperature protection: 55°C for charge, 60°C for discharge; Ambient temperature protection: 70°C; Tj=-20~75°C	IEC 60730- 1+AMD1	Test report No. 20PNS0300 91 01001	
Encapsulation	Shenzhen xinchengyuan technology co. LTD	5KWH	SECC/T=1.2mm	--	--	
Spacer/Holde	Dongguan yifeng plastic co. LTD	75 * 15	hole count: 75mm * 15mm	--	--	



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Clause	Requirement + Test		Result - Remark	Verdict
Wiring	DONGGUAN TENGDA WIRE CO LTD	Insulated Wire	200°C, 600Vac, Horizontal flame, Optional Oil Resistant 80°C, Optional Gasoline Resistant.	UL 758  UL E503909
Or	Interchangeable	Interchangeable	200°C, 600Vac, Horizontal flame, Optional Oil Resistant 80°C, Optional Gasoline Resistant.	UL 758  UL
- Description: The Interchangeable based on standardized dimensions and specified rating.				
<b>Supplementary information:</b>				
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.				



Clause	Requirement + Test	Result - Remark	Verdict
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<b>7.2.1</b>	<b>TABLE: External short-circuit test (cell)</b>	<b>N/A</b>	
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Sample No.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (mΩ)	Maximum Case Temperature Rise ΔT (°C)	Results
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--

**Supplementary information:**

- A - No fire or Explosion
- B - Fire
- C - Explosion
- D - The test was completed after 6 h
- E - The test was completed after the cell casing cooled to 20% of the maximum temperature rise
- F - Other (Please explain): \_\_\_\_

<b>7.2.5</b>	<b>TABLE: Overcharge test (cell)</b>	<b>N/A</b>				
--------------	--------------------------------------	------------	--	--	--	--

Sample No.	OCV at start of test (V dc)	OCV at end of test (V dc)	Measured Maximum Charging Current (A)	Measured Maximum Charging Voltage (V dc)	Max. Cell Case Temperature, (°C)	Results
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--

**Supplementary information:**

- Results:
- A - No fire or Explosion
  - B - Fire
  - C - Explosion
  - D - Test concluded when temperature reached a steady state condition
  - E - Test concluded when temperature returned to ambient
  - F - Other (Please explain): \_\_\_\_\_





Clause	Requirement + Test	Result - Remark	Verdict
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<b>7.2.6</b>	<b>TABLE: Forced discharge test (cell or cell block)</b>	<b>N/A</b>
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Sample No.	OCV before applying reverse charge, (V dc)	Target Voltage (V dc)	Measured Reverse Charge Current I <sub>t</sub> , (A)	Total Time for Reversed Charge Application (min)	Results
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**Supplementary information:**

Results:

A - No fire or Explosion

B - Fire

C - Explosion

D - Other (Please explain): \_\_\_\_

<b>7.3.2</b>	<b>TABLE: Internal short-circuit test (cell)</b>	<b>N/A</b>
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Sample No.	OCV at start of test, (V dc)	Particle location <sup>1)</sup>	Maximum applied pressure, (N)	Results
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Clause	Requirement + Test	Result - Remark	Verdict
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**Supplementary information:**

1) Identify one of the following:

- 1: Nickel particle inserted between positive and negative (active material) coated area.
- 2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

**Results:**

- A - No fire or explosion
- B – Fire
- C - Explosion
- D – Test concluded when 50 mV voltage drop occurred prior to reaching force limit
- E – Test concluded when 800/400 N pressure was reached and 50 mV voltage drop was not achieved
- F – Test was concluded when fire or explosion occurred
- G - Other (Please explain): \_\_

7.3.3	TABLE: Propagation test (battery system)				P
Sample No.	OCV of Battery System Before Test, (V dc)	OCV of Target Cell Before Test, (V dc)	Maximum Cell Case Temperature, (°C)	Maximum DUT Enclosure Temperature, (°C)	Results
A4	53.3	3.33	182.6	136.5	A, C
Method of cell failure <sup>1)</sup>		Location of target cell		Area for fire protection (m <sup>2</sup> )	
applied heat		B9		battery system has outer covering	

**Supplementary information:**

- 1) Cell can be failed through applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method
- 2) If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.

**Results:**

- A – No fire external to DUT enclosure or area for fire protection or no battery case rupture
- B – Fire external to DUT enclosure or area for fire protection
- C – Explosion
- D – Battery case rupture
- E - Other (Please explain): \_\_



Clause	Requirement + Test	Result - Remark	Verdict
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**8.2.2 TABLE: Overcharge control of voltage (battery system) P**

Sample No.	OCV at start of test for Cell/Cell Blocks, (V dc)	Maximum Charging Current, (A)	Max. Charging Voltage, (V dc)	Max. Voltage of Cell/Cell Blocks, (V dc)	Results
A1	50.94	50	67.33	55.02	A, D, F
			<b>Charge Voltage Applied Battery System: 1)</b>		
			<b>Whole</b>	<b>Part</b>	
			Complied	--	

**Supplementary information:**

1. The exceeded voltage can be applied to only a part of the system such as the cell(s) in the battery system per Figure 6 of IEC 62619, if it is difficult to do it in using the whole battery system.

Results:

A - No Fire or Explosion

B - Fire

C - Explosion

D - The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage

E - The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage

F - All function of battery system did operate as intended during the test.

G - All function of battery system did not operate as intended during the test.

H - Other (Please explain): \_\_\_\_

**8.2.3 TABLE: Overcharge control of current (battery system) P**

Sample No.	OCV at start of test, (V dc)	Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Results
A2	50.39	60	56.16	A, D, F

**Supplementary information:**

Results:

A - No fire or Explosion

B - Fire

C - Explosion

D - Overcurrent sensing function of BMU did operate and then charging stopped

E - Overcurrent sensing function of BMU did not operate and then charging stopped

F - All function of battery system did operate as intended during the test.

G - All function of battery system did not operate as intended during the test.

H - Other (Please explain): \_\_\_\_



Clause	Requirement + Test	Result - Remark	Verdict
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8.2.4	TABLE: Overheating control (battery system)			P
Model No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charging Voltage, V dc	
A3	52.44	50	56.16	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	
53.8		52.6	A, E, F	

**Supplementary information:**

Results:

A – No fire or Explosion

B – Fire

C – Explosion

D - Temperature sensing function of BMU did operate and then charging stopped

E - Temperature sensing function of BMU did not operate and then charging stopped

F - All function of battery system did operate as intended during the test.

G - All function of battery system did not operate as intended during the test.

H - Other (Please explain): \_\_\_\_\_



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VERITAS**

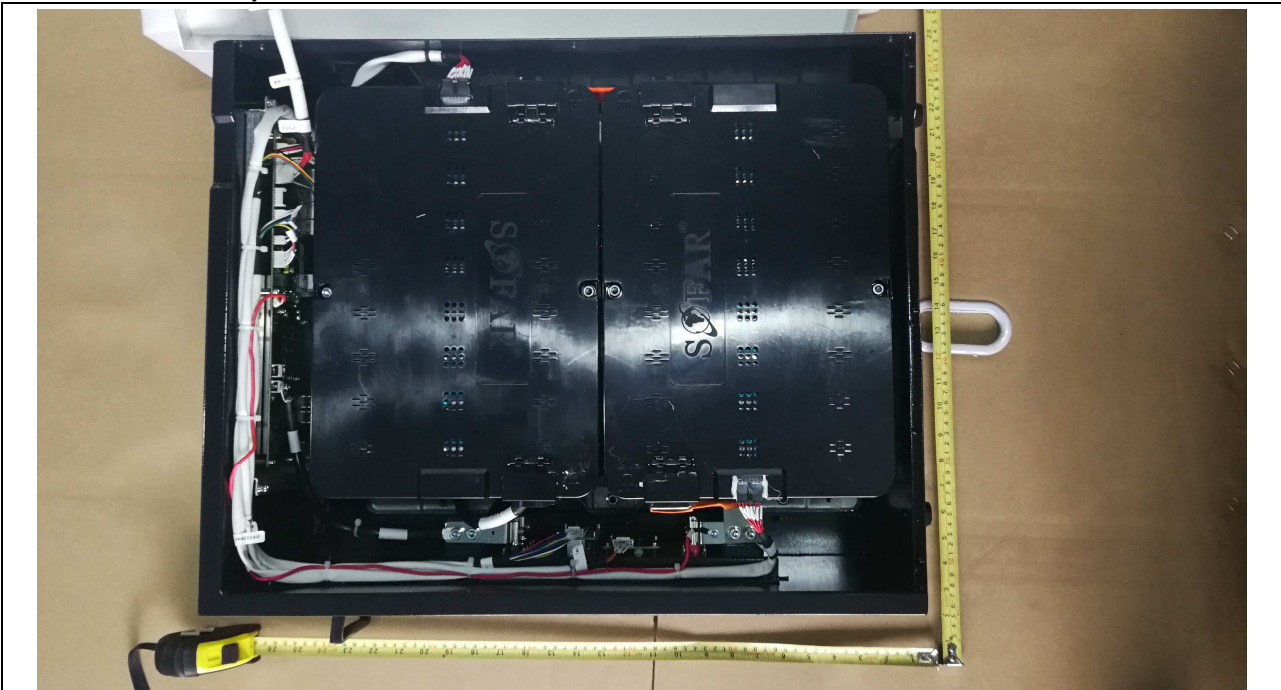
**Test Report No. BAT200109N021-1**



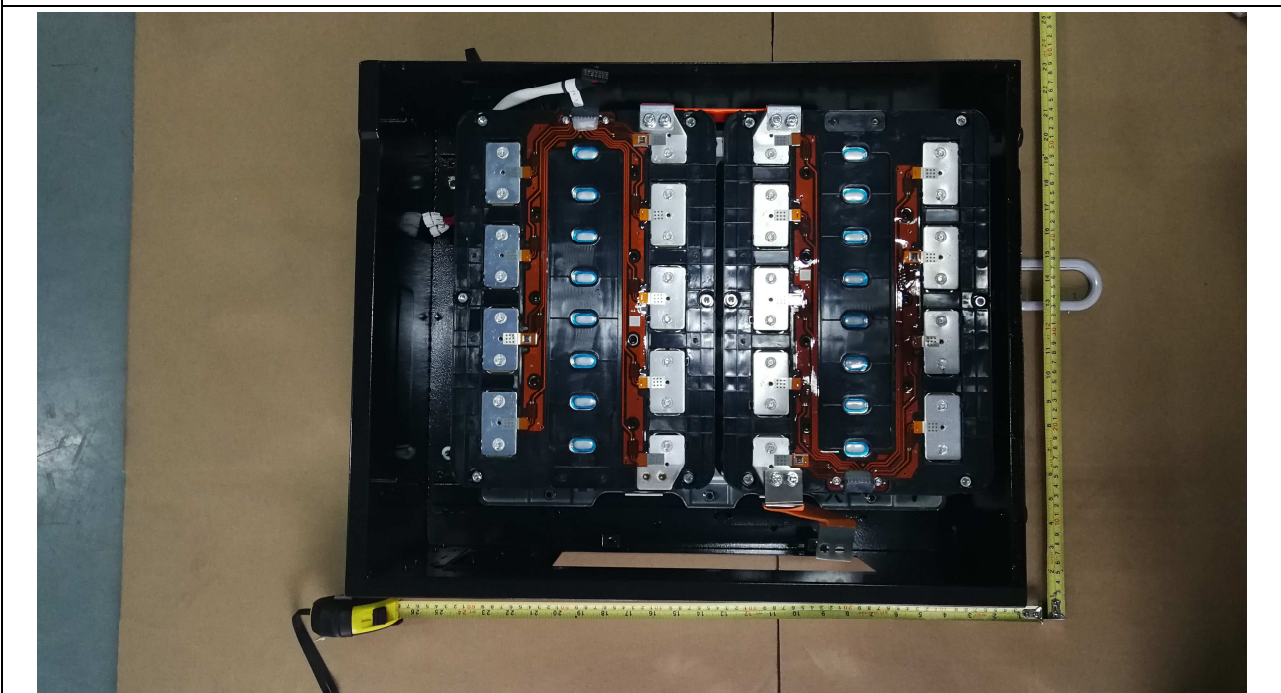
**General view-1 of battery**



**General view-2 of battery**



**Internal view-1 of battery**



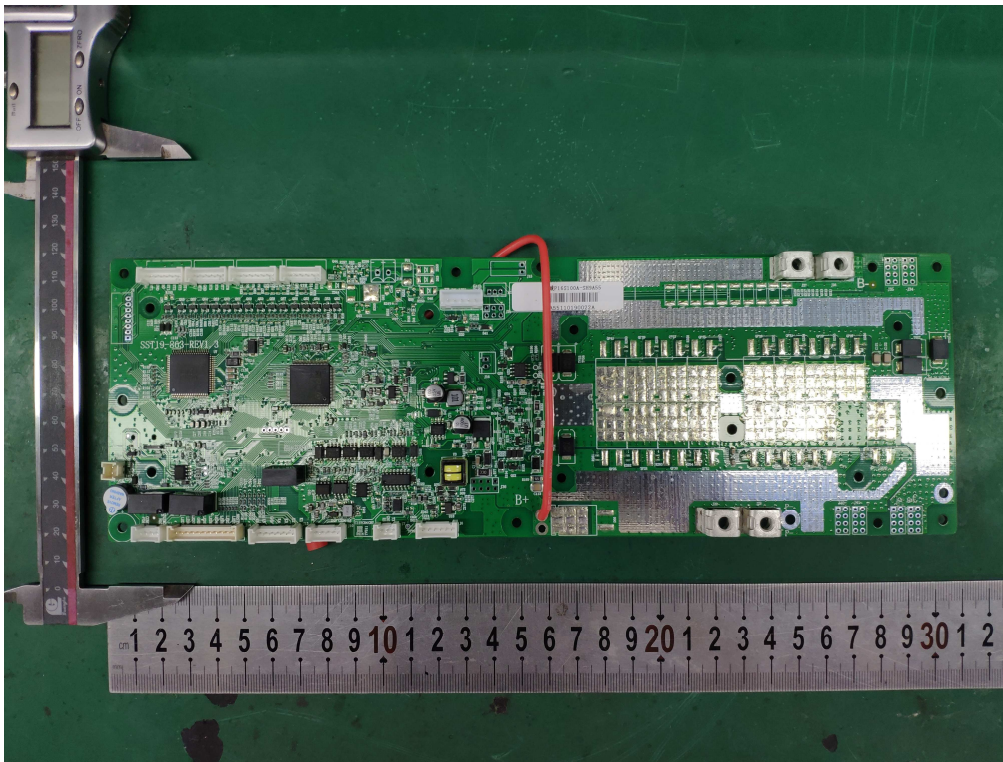
**Internal view-2 of battery**



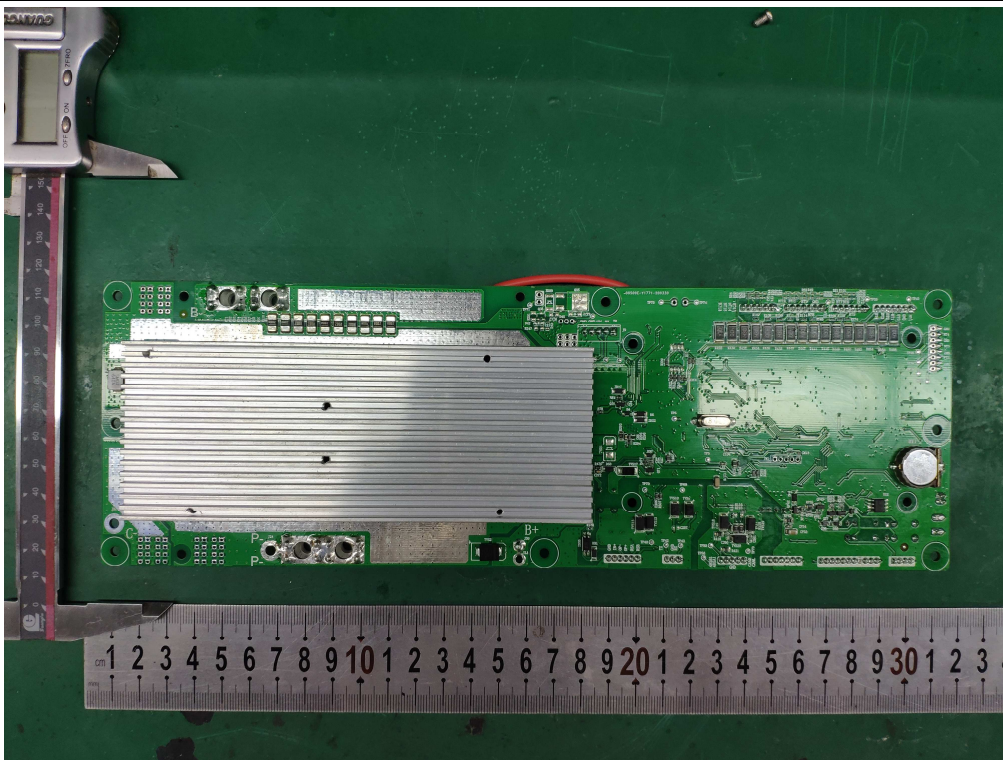
**General view-1 of connect port**



**General view-2 of control panel**



**General view-1 of PCB**



**General view-2 of PCB**