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TEST REPORT

Product Name : Rechargeable Li-ion Battery Pack

Model Number : VT-606N

Prepared for	:	V-TAC EXPORTS LIMITED
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Prepared by	:	EMTEK(DONGGUAN) CO., LTD.
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Report Number	:	EDG2304030095S01401R
Date(s) of Tests	:	April 06, 2023 to April 25, 2023
Date of issue	:	April 26, 2023

TEST REPORT
IEC 62133-2
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems

Report Number..... :	EDG2304030095S01401R
Date of issue..... :	April 26, 2023
Total number of pages..... :	28
Testing Laboratory..... :	EMTEK(DONGGUAN) CO., LTD.
Address..... :	-1&2F., Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No. 9, Xincheng Avenue, Songshanhu High-technology Industrial Development Zone, Dongguan, Guangdong, China
Tested by (name + signature)..... :	Silence Li
Approved by (+ signature)..... :	Nicol Lee
Applicant's name..... :	V-TAC EXPORTS LIMITED
Address..... :	Room 301 Kam ON Building 176A, Queen's Road Central HongKong
Test specification:	
Standard..... :	IEC62133-2: 2017
Test procedure..... :	N/A
Non-standard test method..... :	N/A
Test item description..... :	Rechargeable Li-ion Battery Pack
Trade Mark..... :	V-TAC Meaningful Innovation.
Manufacturer..... :	Dongguan Antai Electronic Technology Co., Ltd
Manufacturer address..... :	Building E, 22 Yuhua Street, Hongye Industrial Zone, Tangxia Town, Dongguan City, Guangdong Province
Model/Type reference :	VT-606N
Ratings..... :	12.8V 45Ah 576Wh

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**

cl.7.1 Charging procedure for test purposes (for Cells and Batteries);
cl.7.2.1 Continuous charging at constant voltage (Cells);
cl.7.2.2 Case stress at high ambient temperature (batteries);
cl.7.3.1 External short circuit (Cells);
cl.7.3.2 External short circuit (Batteries);
cl.7.3.3 Free fall (for Cells and Batteries);
cl.7.3.4 Thermal abuse (Cells);
cl.7.3.5 Crush (Cells);
cl.7.3.6 Over-charging of Battery;
cl.7.3.7 Forced discharge (Cells);
cl.7.3.8 Mechanical tests (Batteries);
cl.7.3.8.1 Vibration(Batteries);
cl.7.3.8.2 Mechanical shock(Batteries);
cl.7.3.9 Forced internal short-circuit (cells);
 	
Tests are made with the number of cells and batteries specified in IEC/IEC 62133-2 Table 1.
	All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page 2
	Subcontracted Test Condition:
	N/A

Summary of compliance with National Differences

List of countries addressed:

☒ **The product fulfils the requirements of IEC62133-2:2017 and EN 62133-2:2017**

Copy of marking plate:

Rechargeable Li-ion Battery Pack
Model: VT-606N
12.8V 45Ah 576Wh 4IFR33/135-3
CAUTION:
* Don't decomposition or Short circuit!
* Forbid bum and damage the battery!

Dongguan Antai Electronic Technology Co., Ltd
Date: YYYYMMDD Made in China

Remark:
The above markings are the minimum requirements required by the safety standard. For the final production, the additional markings which do not give rise to misunderstanding may be added.

Test item particulars..... :	
Classification of installation and use.....:	To be defined in final product
Supply connection.....:	N/A
Recommend charging method declaired by the manufacturer.....:	CC/ CV
Discharge current..... :	5000mA
Specified final voltage..... :	8.0V
Chemistry .....:	☐ nickel systems.....☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell.....:	3.65V
Maximum charging current..... :	15.0A
Charging temperature upper limit.....:	55°C
Charging temperature lower limit..... :	0°C
Polymer cell electrolyte type.....:	☐ gel polymer ☐ solid polymer ☒ N/A
Possible test case verdicts:	
- 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)
Testing..... :	
Date of receipt of test item.....:	April 06, 2023
Date (s) of performance of tests.....:	April 06, 2023 to April 25, 2023

General remarks:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

General product information:

The EUT model VT-606N is Rechargeable Li-ion Battery Pack, This battery is constructed with 12 cells in 4S3P, and has overcharge, over-discharge, over current and short-circuits proof circuit.

The main features of the battery pack are shown as below (clause7.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
VT-606N	45.0Ah	12.8V	5.0A	5.0A	45.0A	45.0A	14.5V	8.0V

Continued:

Model	Taper-off current	Upper limit charge voltage	Lower charge temperature	Upper charge temperature
VT-606N	750mA	14.6V	0°C	55°C

The main features of the cell in the battery pack are shown as below (clause 7.1.1):

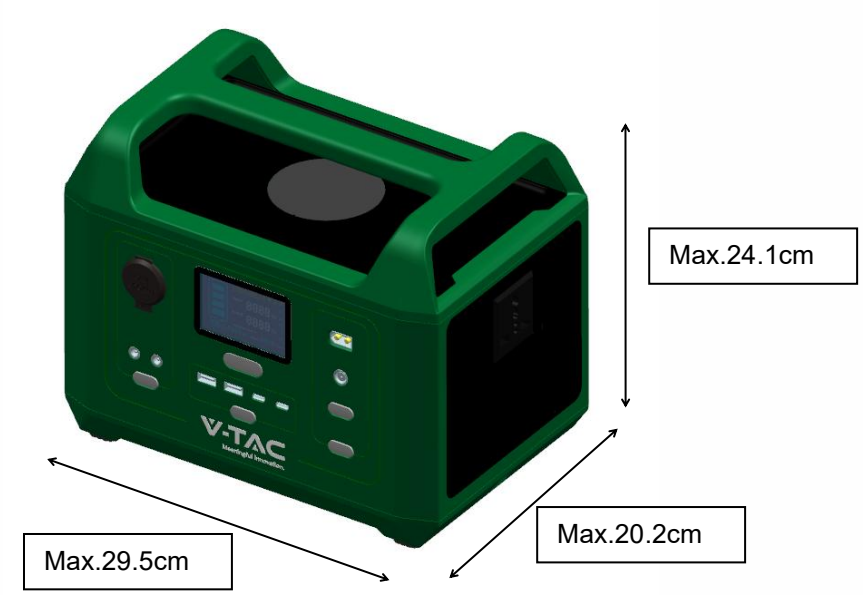
Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
IFR32135-15Ah	15.0Ah	3.2V	3.0A	3.0A	15.0A	15.0A	3.65V	1.8V

Continued: (Clause 7.1.2)

Model	Taper-off current	Upper limit charge voltage	Lower charge temperature	Upper charge temperature
IFR32135-15Ah	750mA	3.65V	0°C	55°C

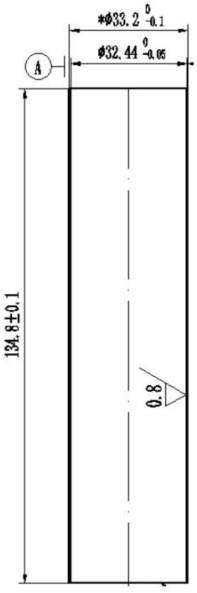
Construction:

Battery



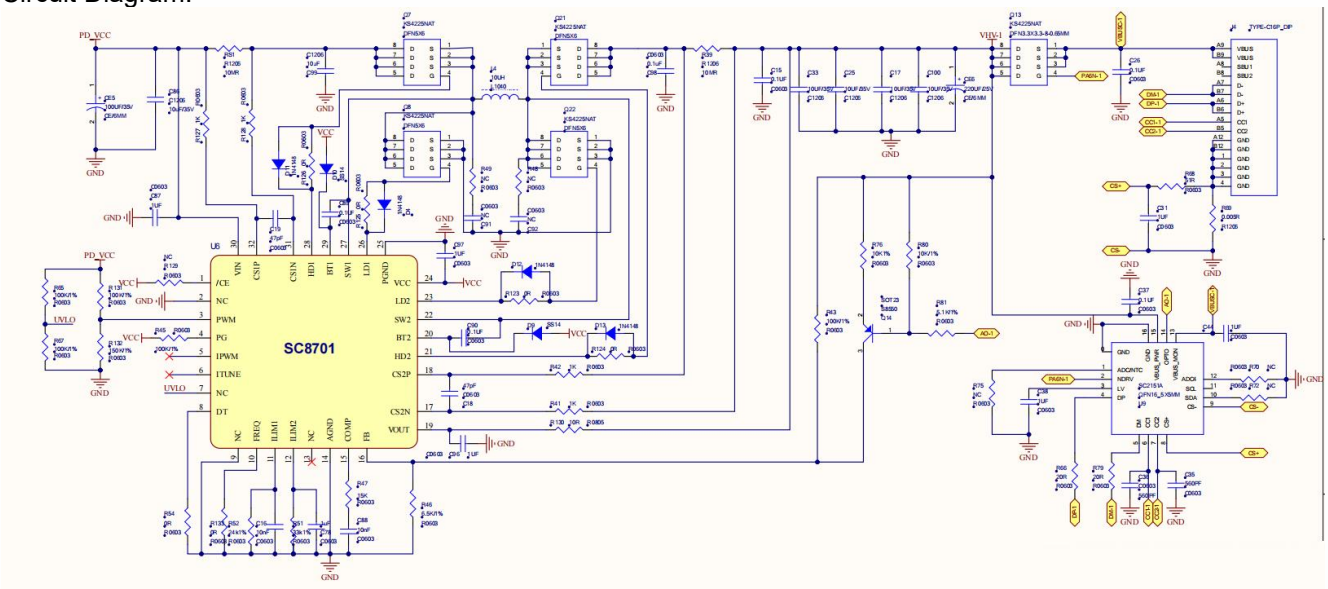
Unit: (cm)

Cell

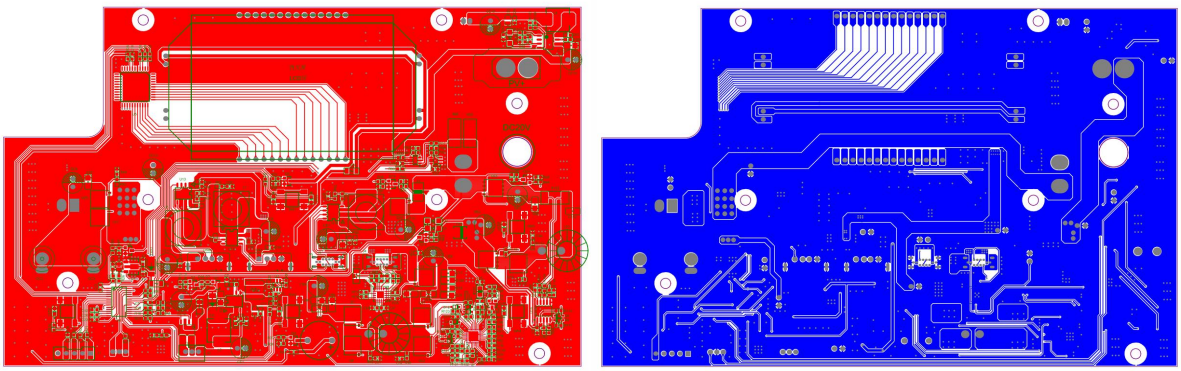


Unit: (mm)

Circuit Diagram:



PCB layout:



Clause	Requirement + Test	Result - Remark	Verdict
4	**PARAMETER MEASUREMENT TOLERANCES**		**P**
	Parameter measurement tolerances.		P
5	**GENERAL SAFETY CONSIDERATIONS**		P
5.1	**General**		P
	Cells and batteries so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse.		P
5.2	**Insulation and wiring**		P
	The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ.	No metal case exists.	N/A
	Insulation resistance (MΩ)..... :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements.		P
	Orientation of wiring maintains adequate clearance and creepage distances between conductors.		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse.		P
5.3	**Venting**		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition.		P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief.		N/A
5.4	**Temperature, voltage and current management**	Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 7.	P
	Batteries are designed such that abnormal temperature rise conditions are prevented.		P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer.	The charging limits specified in the manufacturer's specifications.	P
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that specified chargers are designed to maintain charging within the temperature, voltage and current limits specified.		P
5.5	**Terminal contacts**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current.		P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance.		P
	Terminal contacts are arranged to minimize the risk of short-circuit.		P
5.6	**Assembly of cells into batteries**		P
5.6.1	General		P
	Each battery have an independent control and protection for current, voltage, temperature and any other parameter required for safety and to maintain the cells within their operating region.	6S1P.	P
	This protection may be provided external to the battery such as within the charger or the end devices.		N/A
	If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation.		N/A
	If there is more than one battery housed in a single battery case, each battery have protective circuitry that can maintain the cells within their operating regions.		P
	Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly.		P
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer.		P
	Protective circuit components added as appropriate and consideration given to the end-device application.		P
	The manufacturer of the battery provide a safety analysis of the battery safety circuitry with a test report including a fault analysis of the protection circuit under both charging and discharging conditions confirming the compliance.		N/A
5.6.2	Design recommendation		P
	For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks.		P
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that charging is stopped when the upper limit of the charging voltage is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks.		P
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an overcharge protection.		P
	For batteries consisting of series-connected cells or cell blocks, cells have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer.		P
	It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage.		P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system.		N/A
5.6.3	Mechanical protection for cells and components of batteries.		P
	Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse.		P
	The mechanical protection can be provided by the battery case or it can be provided by the end product enclosure for those batteries intended for building into an end product.		N/A
	The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer.		P
	For batteries intended for building into a portable end product, testing with the battery installed within the end product considered when conducting mechanical tests.		N/A
5.7	**Quality plan**		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery.		P
5.8	**Battery safety components**		P
	According annex F		P
6	**TYPE TEST AND SAMPLE SIZE**		P
	Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old.	Tests are performed according to specified in Table 1 of this standard. The samples are not more than six months old.	P
	Coin cells with resistance ≤ 3 Ω (measured according annex D) are tested according table 1.	Not coin cell.	N/A
	Unless otherwise specified, tests are carried out in an ambient temperature of 20 °C ± 5 °C.	Tests are carried out at 20°C ± 5°C.	P
	The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and overdischarge protection.		P
	When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test.		P
7	**SPECIFIC REQUIREMENTS AND TESTS**		**P**
7.1	**Charging procedure for test purposes**		P
7.1.1	First procedure.		P
	This charging procedure applies to subclauses other than those specified in 7.1.2.		P
	Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of 20 °C ± 5 °C, using the method declared by the manufacturer.		P
	Prior to charging, the battery have been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage.		P
7.1.2	Second procedure		P
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		P

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Clause	Requirement + Test	Result - Remark	Verdict
	After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method.	Charging temperature specified by client is 0-55°C, 55°C and 0°C were used as highest test temperature and lowest test temperature during tests.	P
7.2	**Intended use**		P
7.2.1	Continuous charging at constant voltage (cells).	Test Complied.	P
	Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer.		P
	Results: No fire. No explosion. No leakage..... :	(See appended table 7.2.1)	P
7.2.2	Case stress at high ambient temperature (battery)		N/A
	Oven temperature (°C)..... :		—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells.		N/A
7.3	**Reasonably foreseeable misuse**		P
7.3.1	External short-circuit (cell).		N/A
	The cells were tested until one of the following occurred:		N/A
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20 % of the maximum temperature rise.		N/A
	Results: No fire. No explosion..... :		N/A
7.3.2	External short-circuit (battery)	Test Complied.	P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		P
	- The case temperature declined by 20 % of the maximum temperature rise.		P
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition.		N/A
	A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test.	Single fault conducted on four samples.	P
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor.	Single fault applies on MOS (Q6)	P
	Results: No fire. No explosion..... :	(See appended table 7.3.2)	P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.3	Free fall		N/A
	Results: No fire. No explosion		N/A
7.3.4	Thermal abuse (cells)	Test Complied.	P
	Oven temperature (°C)..... :	130°C for 30min.	—
	Results: No fire. No explosion		P
7.3.5	Crush (cells)		N/A
	The crushing force was released upon:		N/A
	- The maximum force of 13 kN ± 0,78 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained.		N/A
	Results: No fire. No explosion..... :		N/A
7.3.6	Over-charging of battery	Test Complied.	P
	The supply voltage which is:		P
	- 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or		N/A
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and	4S3P	P
	- Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached.	90A	P
	Test was continued until the temperature of the outer casing:		P
	- Reached steady state conditions (less than 10 °C change in 30-minute period); or		N/A
	- Returned to ambient.		P
	Results: No fire. No explosion..... :	(See appended table 7.3.6)	P
7.3.7	Forced discharge (cells)	Test Complied.	P
	If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration.		N/A
	If the discharge voltage does not reach the negative value of upper limit charging voltage within the testing duration, the test is terminated at the end of the testing duration.		P
	Results: No fire. No explosion..... :	(See appended table 7.3.7)	P
7.3.8	Mechanical tests (batteries)		P
7.3.8.1	Vibration		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire, no explosion, no rupture, no leakage or venting.....:		N/A
7.3.8.2	Mechanical shock	Test Complied.	P
	Results: No leakage, no venting, no rupture, no explosion and no fire.....:	(See appended table 7.3.8.2)	P
7.3.9	Design evaluation – Forced internal short-circuit (cells)	Test Complied.	P
	The cells complied with national requirement for.....:	France, Japan, Korea, Switzerland	—
	The pressing was stopped upon:		P
	- A voltage drop of 50 mV has been detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached.	800N	P
	Results: No fire.....:	(See appended table 7.3.9)	P
8	**INFORMATION FOR SAFETY**		P
8.1	**General**		P
	Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products.	Information for safety mentioned in manufacturer's specifications.	P
	Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards.	Information for safety mentioned in manufacturer's specifications.	P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product.		N/A
	As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user.		N/A
	Do not allow children to replace batteries without adult supervision.		N/A
8.2	**Small cell and battery safety information**		P
	The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them:		P
	- Keep small cells and batteries which are considered swallowable out of the reach of children.		P
	- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion.		P
	- In case of ingestion of a cell or battery, seek medical assistance promptly.		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
9	**MARKING**		P
9.1	**Cell marking**	The final product is battery.	N/A
	Cells marked as specified in IEC 61960, except coin cells.		N/A
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity.		N/A
	By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked.		N/A
9.2	**Battery marking**		P
	Batteries marked as specified in IEC 61960, except for coin batteries.	The battery is marked in accordance with IEC 61960, see page 3.	P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement.	Not coin battery.	N/A
	Terminals have clear polarity marking on the external surface of the battery.	See page 3.	P
	Batteries with keyed external connectors designed for connection to specific end products need not be marked with polarity markings if the design of the external connector prevents reverse polarity connections.		P
9.3	**Caution for ingestion of small cells and batteries**		P
	Coin cells and batteries identified as small batteries according to 8.2 include a caution statement regarding the hazards of ingestion in accordance with 8.2.		P
	When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package.		P
9.4	**Other information**		P
	Storage and disposal instructions.	Information is given in manufacturer's specifications.	P
	Recommended charging instructions.	Information is given in manufacturer's specifications.	P

10	**PACKAGING AND TRANSPORT**		N/A
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3.	Not coin cells.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants.		N/A
ANNEX A	**CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE**		P
A.1	**General**		P
A.2	**Safety of lithium ion secondary battery**	Complied.	P
A.3	**Consideration on charging voltage**	Complied.	P
A.3.1	General	Max. Charging voltage 3.65V for the pack.	P
A.3.2	Upper limit charging voltage	3.65V	P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		P
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied.	3.65V applied.	P
A.4	**Consideration of temperature and charging current**		P
A.4.1	General		P
A.4.2	Recommended temperature range.	Charging temperature range declared by client is 0-55°C	P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied.	Charging temperature declared by client is: 0-55°C	P
A.4.3	High temperature range	55°C	N/A
A.4.3.1	General		N/A
A.4.3.2	Explanation of safety viewpoint.		N/A
A.4.3.3	Safety considerations when specifying charging conditions in the high temperature range.		N/A
A.4.3.4	Safety considerations when specifying a new upper limit in the high temperature range.	55°C applied.	N/A
A.4.4	Low temperature range	Charging lower temperature declared by client is: 0°C.	N/A
A.4.4.1	General		N/A
A.4.4.2	Explanation of safety viewpoint		N/A
A.4.4.3	Safety considerations, when specifying charging conditions in the low temperature range.		N/A
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range.	0°C applied.	N/A
A.4.5	Scope of the application of charging current.		P
A.4.6	Consideration of discharge.		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.6.1	General		P
A.4.6.2	Final discharge voltage and explanation of safety viewpoint.		P
A.4.6.3	Discharge current and temperature range.		P
A.4.6.4	Scope of application of the discharging current.		P
A.5	**Sample preparation**		P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short.		P
A.5.3	Disassembly of charged cell.		P
A.5.4	Shape of nickel particle.		P
A.5.5	Insertion of nickel particle in cylindrical cell.		N/A
A.5.5.1	Insertion of nickel particle in winding core.		N/A
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator.		N/A
A.5.6	Insertion of nickel particle in prismatic cell.		P
A.6	**Experimental procedure of the forced internal short-circuit test**		P
A.6.1	Material and tools for preparation of nickel particle.		P
A.6.2	Example of a nickel particle preparation procedure.		P
A.6.3	Positioning (or placement) of a nickel particle.		P
A.6.4	Damaged separator precaution.		P
A.6.5	Caution for rewinding separator and electrode.		P
A.6.6	Insulation film for preventing short-circuit.		P
A.6.7	Caution when disassembling a cell.		P
A.6.8	Protective equipment for safety.		P
A.6.9	Caution in the case of fire during disassembling.		P
A.6.10	Caution for the disassembling process and pressing the electrode core.		P
A.6.11	Recommended specifications for the pressing device.		P
ANNEX B	**RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS**		P
ANNEX C	**RECOMMENDATIONS TO THE END-USERS**		**P**
ANNEX D	**MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS**		**N/A**
D.1	**General**	Not coin cells.	N/A
D.2	**Method**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	A sample size of three coin cells is required for this measurement.....:	(See appended table D.2)	N/A
	Coin cells with an internal resistance of less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1.		N/A
	Coin cells with an internal resistance greater than 3 Ω require no further testing.		N/A
ANNEX E	**PACKAGING AND TRANSPORT**		N/A
ANNEX F	**COMPONENT STANDARDS REFERENCES**		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Critical components information				P
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity 1)**
PCB	Shenzhen Jinchuangyida Electronic Co., Ltd	JCYD02	V-0, 130℃	UL 796	UL E489269
IC (U6)	Shanghai SOUTHCHIP SEMICONDUCTOR	SC8701	V_{IN}=2.7V~36V, V_{OUT}=2V~30V, T_J: -40℃ to+125℃	--	--
IC (U13)	INJOINIC TECHNOLOGY	IP6536	V_{IN}=0.3V~40V, V_{OUT}=0.3V~8V, T_{stg}=-40℃ to 150℃	--	--
IC (U12)	INJOINIC TECHNOLOGY	IP6525T	V_{IN}=0.3V~40V, V_{SW}=0.3V~40V, V_{OUT}=0.3V~30V, T_{stg}=-60℃ to 150℃	--	--
MOSFET (Q18)	Kwansemi Semiconductor	KS6304NAT	V_{DSS}: -60V, V_{GSS}: ±20V T_{STG}: -55℃~+150℃	--	--
MOSFET (Q7, Q8, Q13, Q21, Q22)	Kwansemi Semiconductor	KS4225NAT	V_{DSS}: 40V, V_{GSS}: ±20V T_{STG}: -55℃~+150℃	--	--
Fuse(F1)	Suzhou Walter Electronic Co., Ltd	1206T	Vmax.: 63V, Imax.: 50A	UL 1434	UL E56092
Cell	He Fei Guoxuan High-Tech Powerenergy Co., Ltd	IFR32135-15Ah	3.2V, 15Ah, 48.0Wh	IEC 62133-2:2017	Tested with appliance
-Positive electrode	GUI ZHOU ANDA Technology ENERGY CO.,LTD	B7	$LiFePO_4$, NMP, PVDF, Aluminium foil	--	--
-Negative electrode	ANHUI KEDA XIN CAI LIAO Co.,Ltd	KD-2E	Graphite, CMC, SBR,Conductive, Additive, Copper Foil	--	--
-Separator	LIAOYUAN HONGTU LI DIAN GEMO Technology ENERGY CO., LTD	AI-0903	12um, Polyethylene Thermal shrinkage 120℃	--	--
-Electrolyte	DONGGUAN SHANSHAN BATTERY MATERIALS CO.,LTD	CBLFP180808-01	1.23-1.27 g/cm^3, 10.9-11.9ms/cm, $LiPF_6$+DEC+EC	--	--

Supplementary information:

1) Provided evidence ensures the agreed level of compliance.

7.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Model	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (A)**	**OCV at start of test, (Vdc)**	**Results**
Cell #01	3.65	3.0	3.58	P
Cell #02	3.65	3.0	3.57	P
Cell #03	3.65	3.0	3.58	P
Cell #04	3.65	3.0	3.58	P
Cell #05	3.65	3.0	3.58	P

Supplementary information:

- No fire
- No Explosion
- No leakage

7.3.1	TABLE: External short circuit (cell)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature ~~rise ΔT,~~ (°C)**	**Results**
Samples charged at charging temperature upper limit (55°C)					
Cell #06	55.3	3.56	0.080	93.7	P
Cell #07	55.3	3.55	0.080	91.4	P
Cell #08	55.3	3.55	0.080	95.1	P
Cell #09	55.3	3.56	0.080	93.0	P
Cell #10	55.3	3.56	0.080	98.5	P
Samples charged at charging temperature lower limit(0°C)					
Cell #11	55.4	3.23	0.080	88.2	P
Cell #12	55.4	3.24	0.080	89.9	P
Cell #13	55.4	3.23	0.080	93.2	P
Cell l#14	55.4	3.24	0.080	92.3	P
Cell #15	55.4	3.23	0.080	89.0	P

Supplementary information:

- No fire
- No Explosion

7.3.2	TABLE: External short circuit (battery)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature ~~rise ΔT~~, (°C)**	**Results**
Measurement Record (USB1)					
Battery #01	23.4	5.06	0.080	23.8	P
Battery #02	23.4	5.07	0.080	23.7	P
Battery #03	23.4	5.07	0.080	23.7	P
Battery #04	23.4	5.07	0.080	23.8	P
Battery #05	23.4	5.06	0.080	23.9	P
Measurement Record (USB2)					
Battery #01	23.4	5.08	0.080	23.9	P
Battery #02	23.4	5.09	0.080	24.2	P
Battery #03	23.4	5.09	0.080	23.9	P
Battery #04	23.4	5.09	0.080	23.8	P
Battery #05	23.4	5.09	0.080	23.9	P
Measurement Record (TYPE-C1)					
Battery #01	23.4	5.13	0.080	23.6	P
Battery #02	23.4	5.13	0.080	23.8	P
Battery #03	23.4	5.13	0.080	23.8	P
Battery #04	23.4	5.13	0.080	23.7	P
Battery #05	23.4	5.13	0.080	23.6	P
Measurement Record (TYPE-C2)					
Battery #01	23.4	5.09	0.080	23.8	P
Battery #02	23.4	5.07	0.080	23.9	P
Battery #03	23.4	5.07	0.080	24.3	P
Battery #04	23.4	5.09	0.080	24.2	P
Battery #05	23.4	5.08	0.080	24.1	P
Measurement Record (DC)					
Battery #01	23.4	14.20	0.080	24.1	P
Battery #02	23.4	14.30	0.080	24.2	P
Battery #03	23.4	14.20	0.080	24.1	P
Battery #04	23.4	14.20	0.080	23.9	P
Battery #05	23.4	14.20	0.080	23.9	P
Supplementary information: Single fault: Short Q2 Pin(1,3) of Battery #01~#04 - No fire - No Explosion					

7.3.5	TABLE: Crush				N/A
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Width/ diameter of cell before crush, (mm)**	**Required deformation for crush, (mm)**	**Results**
Samples charged at charging temperature upper limit (55°C)					
Cell #29	3.55	3.55	--	--	P
Cell #30	3.56	3.56	--	--	P
Cell #31	3.56	3.56	--	--	P
Cell #32	3.56	3.56	--	--	P
Cell #33	3.55	3.55	--	--	P
Samples charged at charging temperature lower limit(0°C)					
Cell #34	3.25	3.25	--	--	P
Cell #35	3.24	3.24	--	--	P
Cell #36	3.24	3.24	--	--	P
Cell #37	3.24	3.24	--	--	P
Cell #38	3.24	3.24	--	--	P
Supplementary information: - No fire - No Explosion					

7.3.6	TABLE: Over-charging of battery	P
Constant charging current (A).....:	90	—
Supply voltage (Vdc).....:	17.52	—

Model	OCV before charging, (Vdc)	Resistance of circuit, (Ω)	Maximum outer casing temperature, (°C)	Results
Battery #09	14.30	--	24.3	P
Battery #10	14.30	--	24.5	P
Battery #11	14.30	--	24.6	P
Battery #12	14.20	--	24.5	P
Battery #13	14.30	--	24.3	P

Supplementary information:

- Leakage
- Fire
- Explosion

Test Ambient is23.7°C.

7.3.7	TABLE: Forced discharge (cells)	P

Model	OCV before application of reverse charge, (Vdc)	Measured Reverse Charge I_t, (A)	Time for reversed charge, (minutes)	Results
Cell #39	2.35	3.0	90	P
Cell #40	2.35	3.0	90	P
Cell #41	2.37	3.0	90	P
Cell #42	2.37	3.0	90	P
Cell #43	2.35	3.0	90	P

Supplementary information:

- No fire
- No Explosion

7.3.8.1	TABLE: Vibration		P
Model	**OCV at start of test, (Vdc)**	**OCV after test (Vdc)**	**Results**
Battery #14	14.20	14.20	P
Battery #15	14.30	14.30	P
Battery #16	14.30	14.30	P

Supplementary information:

- No fire or explosion
- No leakage

7.3.8.2	TABLE: Mechanical shock		P
Model	**OCV at start of test, (Vdc)**	**OCV after test (Vdc)**	**Results**
Battery #17	14.30	14.30	P
Battery #18	14.30	14.30	P
Battery #19	14.30	14.30	P

Supplementary information:

- No fire or explosion
- No leakage

7.3.9	TABLE: Forced internal short circuit (cells)				P
Model	**Chamber ambient, (°C)**	**OCV at start of test, (Vdc)**	**Particle location [1)]**	**Maximum applied pressure, (N)**	**Results**
Cell #44	55	3.57	1	803.9	P
Cell #45	55	3.58	1	810.1	P
Cell #46	55	3.57	1	815.7	P
Cell #47	55	3.56	1*	803.3	P
Cell #48	55	3.57	1*	811.3	P
Cell #49	0	3.26	1	813.1	P
Cell #50	0	3.26	1	806.2	P
Cell #51	0	3.25	1	810.6	P
Cell #52	0	3.24	1*	807.5	P
Cell #53	0	3.26	1*	812.4	P

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.

- No fire or explosion
- No leakage

Figure 1 Over view of battery

Figure 2 Back view of Battery

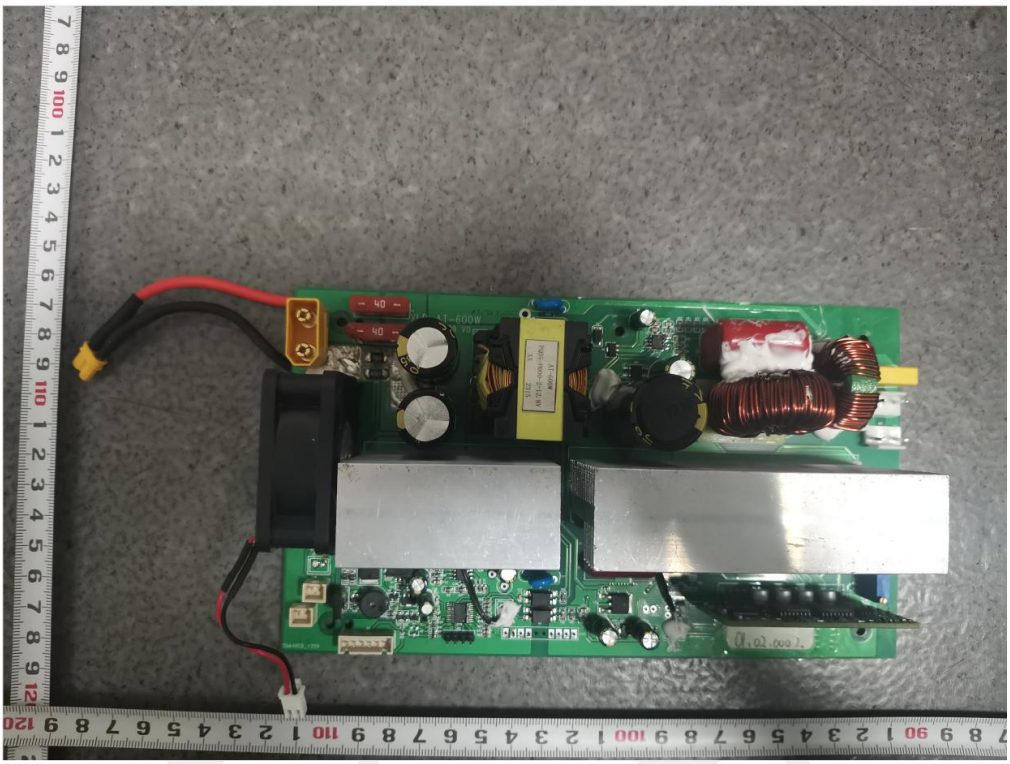

Figure 3 Front view of PCB

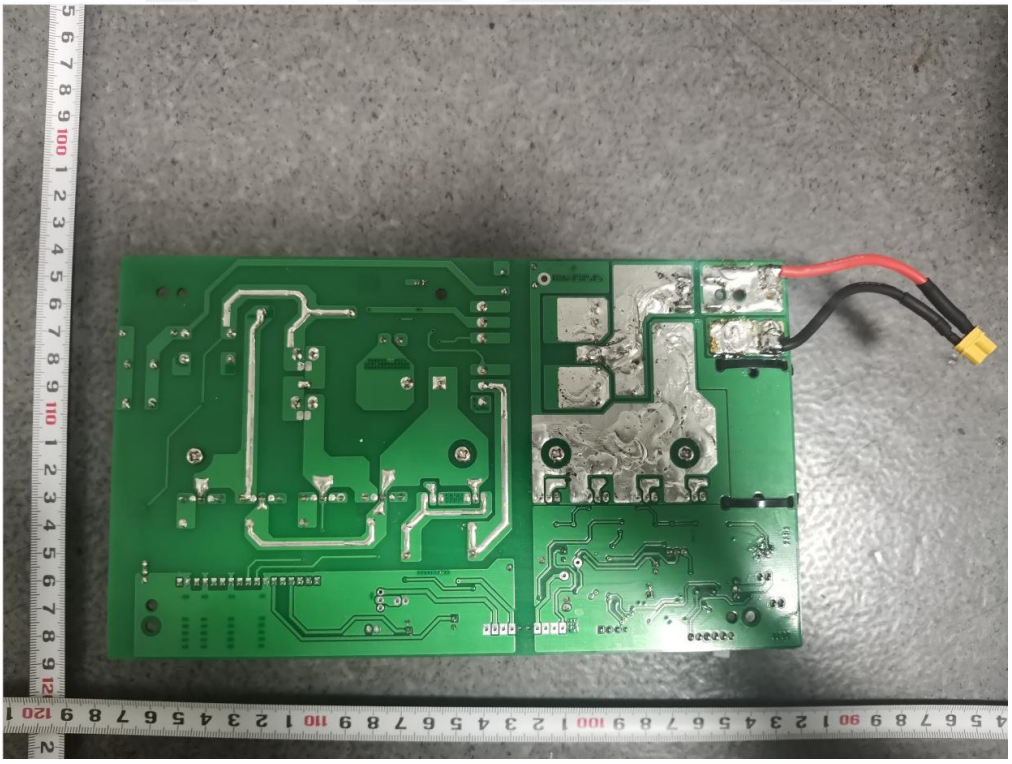

Figure 4 Back view of PCB

Figure 5 Front view of Cell

Figure 6 Side view of Cell

■ **End of Report –**

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