Test Report issued under the responsibility of:

SGS Fimko Ltd.

TEST REPORT

IEC 62133

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

Report Number. ..... :	SZES180800377201
Date of issue ..... :	2018-09-03
Total number of pages ..... :	22 Pages
Name of Testing Laboratory preparing the Report ..... :	**SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch**
Applicant's name ..... :	Tianjin Lishen Battery Joint-Stock Co., Ltd.
Address ..... :	No.6 Lanyuan Road, Huayuan Hi-tech Industry Park, Tianjin, China
Test specification:	
Standard ..... :	IEC 62133:2012
Test procedure ..... :	CB Scheme
Non-standard test method ..... :	N/A
Test Report Form No. ..... :	IEC62133C
Test Report Form(s) Originator .... :	UL (Demko)
Master TRF ..... :	2018-07-27

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description ..... :	Cylindrical Rechargeable Lithium-Ion Cell
Trade Mark ..... :	--
Manufacturer ..... :	Lishen Battery (Suzhou) Co., Ltd. No.88 Kunlunshan Road, New District, Suzhou, Jiangsu, China
Model/Type reference ..... :	03BCEA2
Ratings ..... :	Rated Voltage: 3,6 V d.c. Rated Capacity: 4500 mAh

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**CB Testing Laboratory:**	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch	
Testing location/ address ..... :		No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China 518057	
Tested by (name, function, signature) ..... :		Rachel Long / Project Engineer	Rachel Long
Approved by (name, function, signature)... :		Wilson Zhu / Reviewer	Wilson Zhu
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature)... :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature)... :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature)... :			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment):

Attachment 1: 2 pages of Photos;

Attachment 2: 2 pages of Information for safety;

Attachment 3: 1 page of Packaging;

Attachment 4: 1 page of Product specification;

Attachment 5: 1 page of ISO9001 certificate.

Summary of testing:

The sample(s) tested complies with the requirements of IEC 62133: 2012.

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

Remark:

1. Cell was considered and tested according to standard in this report;
2. Clause 8.3.8 Transport tests had been considered by the applicant.

Tests performed (name of test and test clause):

Specific requirements and tests (lithium systems)

☐5.2 Insulation resistance

☒8.2.1 Continuous charging at constant voltage (cells)

☐8.2.2 Moulded case stress at high ambient temperature (battery)

☒8.3.1 External short circuit (cell)

☐8.3.2 External short circuit (battery)

☒8.3.3 Free fall

☒8.3.4 Thermal abuse (cells)

☒8.3.5 Crush (cells)

☐8.3.6 Over-charging of battery

☒8.3.7 Forced discharge (cells)

☒8.3.8 Transport tests

☒8.3.9 Design evaluation – Forced internal short circuit (cells)

Testing location:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Summary of compliance with National Differences (List of countries addressed): None

☒ **The product fulfils the requirements of EN 62133: 2013.**

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.

Remark: Agreement between the manufacturer and user provided, cells fused in the manufacture of a battery need not be marked.

Test item particulars.....:	
Recommend charging method declaired by the manufacturer ..... :	CC/CV
Discharge current (0,2 I_t A) ..... :	0,9 A
Specified final voltage..... :	2,5 V
Chemistry ..... :	☐ nickel systems ..... ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell.....:	4,2 V (considered 4,25V according to standard requirement)
Maximum charging current.....:	450 mA (0-5°C); 900 mA (5-15°C); 2250 mA (15-45°C)
Charging temperature upper limit.....:	45°C
Charging temperature lower limit.....:	0°C
Polymer cell electrolyte type ..... :	☐ gel polymer ..... ☐ solid polymer
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 .....:	2018-08-08
Date (s) of performance of tests.....:	2018-08-10 to 2018-08-20
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.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate 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 ..... :	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) ..... : Same as manufacturer

General product information and other remarks:

Product description:	Cylindrical Rechargeable Lithium-Ion Cell
Model of cell:	03BCEA2
Designation of cell:	INR22/72
Rated voltage of cell:	3,6 V d.c.
Rated capacity of cell:	4500 mAh
Maximum charge current of cell:	450 mA (0-5°C); 900 mA (5-15°C); 2250 mA (15-45°C)

Remark: See Attachment 4 for more detail.

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
4	**Parameter measurement tolerances**		**P**
	Parameter measurement tolerances		P
5	**General safety considerations**		**P**
5.1	General		P
5.2	Insulation and wiring		N/A
	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		N/A
	Insulation resistance (MΩ) ..... :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		N/A
	Orientation of wiring maintains adequate creepage and clearance distances between conductors		N/A
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		N/A
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	A pressure relief mechanism used to relieve excessive internal pressure	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/current management	Cell only.	N/A
	Batteries are designed such that abnormal temperature rise conditions are prevented		N/A
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		N/A
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that associated chargers are designed to maintain charging within the temperature, voltage and current limits specified		N/A
5.5	Terminal contacts		N/A
	Terminals have a clear polarity marking on the external surface of the battery		N/A
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		N/A

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		N/A
	Terminal contacts are arranged to minimize the risk of short circuits		N/A
5.6	Assembly of cells into batteries	Cell only.	N/A
5.6.1	If there is more than one battery housed in a single battery case, cells used in the assembly of each battery have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer		N/A
	Each battery has an independent control and protection		N/A
	Manufacturers of cells make recommendations about current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		N/A
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate separate circuitry to prevent the cell reversal caused by uneven discharges		N/A
	Protective circuit components are added as appropriate and consideration given to the end-device application		N/A
	When testing a battery, the manufacturer of the battery provides a test report confirming the compliance according to this standard		N/A
5.6.2	Design recommendation for lithium systems only		N/A
	For the battery consisting of a single cell or a single cellblock: - Charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Clause 8.1.2, Table 4; or		N/A
	- Charging voltage of the cell does not exceed the different upper limit of the charging voltage determined through Clause 8.1.2, NOTE 1.		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - The voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, by monitoring the voltage of every single cell or the single cellblocks; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- The voltages of any one of the single cells or single cellblocks does not exceed the different upper limit of the charging voltage, determined through Clause 8.1.2, NOTE 1, by monitoring the voltage of every single cell or the single cellblocks		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - Charging is stopped when the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks; or		N/A
	- Charging is stopped when the upper limit of the different charging voltage, determined through Clause 8.1.2, NOTE 1, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		N/A
5.7	Quality plan		P
	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	ISO 9001 certificate was submitted. See Attachment 5 for details.	P
6	**Type test conditions**		—
	Tests were made with the number of cells or batteries specified in Table 1 for nickel-cadmium and nickel-metal hydride systems and Table 2 for lithium systems, using cells or batteries that are not more than six months old	Tests are performed according to test items specified in table 2 of the standard The production date is May, 2018.	P
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.	The tests are conducted in ambient 20°C ± 5°C.	P
7	**Specific requirements and tests (nickel systems)**		--
7.1	Charging procedure for test purposes	Lithium Systems	N/A
7.2	Intended use		N/A
7.2.1	Continuous low-rate charging (cells)		N/A
	Results: No fire. No explosion	(See Table 7.2.1)	N/A
7.2.2	Vibration		N/A
	Results: No fire. No explosion. No leakage	(See Table 7.2.2)	N/A
7.2.3	Moulded case stress at high ambient temperature		N/A
	Oven temperature (°C) ..... :		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.4	Temperature cycling		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3	Reasonably foreseeable misuse		N/A
7.3.1	Incorrect installation cell		N/A
	The test was carried out using: - Four fully charged cells of the same brand, type, size and age connected in series, with one of them reversed; or		N/A
	- A stabilized dc power supply.		N/A
	Results: No fire. No explosion..... :		N/A
7.3.2	External short circuit		N/A
	The cells or batteries were tested until one of the following occurred: - 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
7.3.3	Free fall		N/A
	Results: No fire. No explosion.		N/A
7.3.4	Mechanical shock (crash hazard)		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3.5	Thermal abuse		N/A
	Oven temperature (°C)..... :		—
	Results: No fire. No explosion.		N/A
7.3.6	Crushing of cells		N/A
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	The cell is prismatic type and a second set of samples was tested, rotated 90° around longitudinal axis compared to the first set		N/A
	Results: No fire. No explosion..... :		N/A
7.3.7	Low pressure		N/A
	Chamber pressure (kPa)..... :		—
	Results: No fire. No explosion. No leakage.		N/A
7.3.8	Overcharge		N/A
	Results: No fire. No explosion..... :		N/A

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.9	Forced discharge		N/A
	Results: No fire. No explosion..... :		N/A
8	**Specific requirements and tests (lithium systems)**		—
8.1	Charging procedures for test purposes		P
8.1.1	First procedure: This charging procedure applied to tests other than those specified in 8.1.2		P
8.1.2	Second procedure: This charging procedure applied to the tests of 8.3.1, 8.3.2, 8.3.4, 8.3.5, and 8.3.9		P
	If a cell's specified upper and/or lower charging temperature exceeds values for the upper and/or lower limit test temperatures of Table 4, the cells were charged at the specified values plus 5 °C for the upper limit and minus 5 °C for the lower limit	The upper charging temperature is 45 °C. The lower charging temperature is -5°C.	P
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) ..... :	See the test result.	P
	For a different upper limit charging voltage (i.e. other than for lithium cobalt oxide systems at 4,25 V), the applied upper limit charging voltage and upper limit charging temperatures were adjusted accordingly	The upper limit charging voltage is 4,25 V during test.	N/A
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) ..... :		N/A
8.2	Intended use		P
8.2.1	Continuous charging at constant voltage (cells)		P
	Results: No fire. No explosion..... :	(See Table 8.2.1)	P
8.2.2	Moulded case stress at high ambient temperature (battery)	No moulded case.	N/A
	Oven temperature (°C) ..... :	--	—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A
8.3	Reasonably foreseeable misuse		P
8.3.1	External short circuit (cell)		P
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		P
	Results: No fire. No explosion..... :	(See Table 8.3.1)	P
8.3.2	External short circuit (battery)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		N/A
	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
	Results: No fire. No explosion..... :		N/A
8.3.3	Free fall		P
	Results: No fire. No explosion.		P
8.3.4	Thermal abuse (cells)		P
	The cells were held at 130°C ± 2°C for: - 10 minutes; or		P
	- 30 minutes for large cells (gross mass of more than 500 g as defined in IEC 62281)		N/A
	Oven temperature (°C)..... :	130°C	—
	Gross mass of cell (g) ..... :	72,5 g	—
	Results: No fire. No explosion.		P
8.3.5	Crush (cells)		P
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N/A
	- 10% of deformation has occurred compared to the initial dimension		P
	Results: No fire. No explosion..... :	(See Table 8.3.5)	P
8.3.6	Over-charging of battery		N/A
	Test was continued until the temperature of the outer casing: - Reached steady state conditions (less than 10°C change in 30-minute period); or		N/A
	- Returned to ambient		N/A
	Results: No fire. No explosion..... :	(See Table 8.3.6)	N/A
8.3.7	Forced discharge (cells)		P
	Results: No fire. No explosion..... :	(See Table 8.3.7)	P
8.3.8	Transport tests		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods	Had been considered by the applicant.	P
8.3.9	Design evaluation – Forced internal short circuit (cells)		P
	The cells complied with national requirement for .... :		—
	The pressing was stopped upon: - 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	Cylindrical cell: 800 N	P
	Results: No fire ..... :	(See Table 8.3.9)	P
9	**Information for safety**		—
	The manufacturer of secondary cells ensures that information is provided about current, voltage and temperature limits of their products.	See Attachment 4 for detail.	P
	The manufacturer of batteries ensures that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards.	Cell only.	N/A
	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, information relating to hazard avoidance resulting from a system analysis is provided to the end user ..... :		N/A
10	**Marking**		—
10.1	Cell marking		P
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.	See marking plate.	P
10.2	Battery marking	Cell only.	N/A
	Batteries marked in accordance with the requirements for the cells from which they are assembled.		N/A
	Batteries marked with an appropriate caution statement.		N/A
10.3	Other information		N/A
	Storage and disposal instructions marked on or supplied with the battery.		N/A
	Recommended charging instructions marked on or supplied with the battery.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
11	**Packaging**		—
	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.	See Attachment 3 for detail.	P
Annex A	**Charging range of secondary lithium ion cells for safe use**		—
A.1	General		P
A.2	Safety of lithium-ion secondary battery		P
A.3	Consideration on charging voltage		P
A.3.1	General		P
A.3.2	Upper limit charging voltage		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	The upper limit charging voltage is 4,25 V in specification.	N/A
A.4	Consideration of temperature and charging current		P
A.4.1	General		P
A.4.2	Recommended temperature range		P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied	The recommended temperature range: 0 to 45°C in specification.	P
A.4.3	High temperature range	The upper charging temperature is 45°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 high temperature range		N/A
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range		N/A
A.4.4	Low temperature range	The lower charging temperature is 0°C	P
A.4.4.1	General		P
A.4.4.2	Explanation of safety viewpoint		P
A.4.4.3	Safety considerations, when specifying charging conditions in low temperature range		P

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	The cells charged at -5°C by the methods specified in 8.2 to 8.3.	P
A.4.5	Scope of the application of charging 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
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point		P
A.5.3	Disassembly of charged cell		P
A.5.4	Shape of nickel particle		P
A.5.5	Insertion of nickel particle to cylindrical cell		P
A.5.5.1	Insertion of nickel particle to winding core		P
A.5.5.2	Mark the position of nickel particle on the both end of winding core of the separator		P
A.5.6	Insertion of nickel particle to prismatic cell		N/A

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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)]**
Cell	Lishen Battery(Suzhou) Co., Ltd.	03BCEA2	3,6 Vdc, 4500 mAh	IEC 62133: 2012 EN 62133:2013	Tested with appliance
-Cathode	Bamo	NCA	D50=12μm±3μm	--	--
-Anode	BTR	Graphite+Si	D50=10μm±3μm	--	--
-Separator	hongtu	PE+Ceramics	Thickness: 0,016mm (±0,002 mm)	--	--
-Electrolyte	Jinniu	$LiPF_6$ salt+EC solvent	H_2O<20ppm, HF<50ppm	--	--

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
7.2.1	**TABLE: Continuous low rate charge (cells)**		**N/A**
7.2.2	**TABLE: Vibration**		**N/A**
7.3.1	**TABLE: Incorrect installation (cells)**		**N/A**
7.3.2	**TABLE: External short circuit**		**N/A**
7.3.6	**TABLE: Crush**		**N/A**
7.3.8	**TABLE: Overcharge**		**N/A**
7.3.9	**TABLE: Forced discharge (cells)**		**N/A**

8.2.1	**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: 03BCEA2 (#1)	4,20	2,25	4,18	Pass
Cell: 03BCEA2 (#2)	4,20	2,25	4,18	Pass
Cell: 03BCEA2 (#3)	4,20	2,25	4,17	Pass
Cell: 03BCEA2 (#4)	4,20	2,25	4,18	Pass
Cell: 03BCEA2 (#5)	4,20	2,25	4,18	Pass
Supplementary information: - No fire or explosion - No leakage				

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.1	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[1)]					
Cell: 03BCEA2 (#6)	23,8	4,15	0,085	87,2	Pass
Cell: 03BCEA2 (#7)	23,8	4,15	0,087	85,2	Pass
Cell: 03BCEA2 (#8)	23,8	4,15	0,086	88,2	Pass
Cell: 03BCEA2 (#9)	23,8	4,15	0,083	80,0	Pass
Cell: 03BCEA2 (#10)	23,8	4,15	0,086	82,0	Pass
Samples charged at charging temperature 10°C[2)]					
Cell: 03BCEA2 (#11)	22,5	4,15	0,084	89,4	Pass
Cell: 03BCEA2 (#12)	22,5	4,15	0,086	90,8	Pass
Cell: 03BCEA2 (#13)	22,5	4,14	0,085	92,7	Pass
Cell: 03BCEA2 (#14)	22,5	4,15	0,083	96,0	Pass
Cell: 03BCEA2 (#15)	22,5	4,15	0,088	88,5	Pass
Samples charged at charging temperature 0°C[3)]					
Cell: 03BCEA2 (#16)	22,8	4,13	0,085	99,7	Pass
Cell: 03BCEA2 (#17)	22,8	4,13	0,086	89,2	Pass
Cell: 03BCEA2 (#18)	22,8	4,13	0,085	95,0	Pass
Cell: 03BCEA2 (#19)	22,8	4,12	0,084	98,4	Pass
Cell: 03BCEA2 (#20)	22,8	4,13	0,087	89,7	Pass
Samples charged at charging temperature lower limit[4)]					
Cell: 03BCEA2 (#21)	24,2	4,12	0,084	100,0	Pass
Cell: 03BCEA2 (#22)	24,2	4,11	0,085	100,7	Pass
Cell: 03BCEA2 (#23)	24,2	4,11	0,087	95,2	Pass

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

Cell: 03BCEA2 (#24)	24,2	4,12	0,086	103,2	Pass
Cell: 03BCEA2 (#25)	24,2	4,11	0,084	105,4	Pass

Supplementary information:

- No fire or explosion

1) Cells charged at 45°C by using 4,25 V and 2250 mA until the charging current reduced to 225 mA.
2) Cells charged at 10°C by using 4,25 V and 2250 mA until the charging current reduced to 225 mA.
3) Cells charged at 0°C by using 4,25 V and 900 mA until the charging current reduced to 225 mA.
4) Cells charged at -5°C by using 4,25 V and 450 mA until the charging current reduced to 225 mA.

8.3.2	TABLE: External short circuit (battery)				N/A
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					
--	--	--	--	--	--
Samples charged at charging temperature lower limit					
--	--	--	--	--	--

Supplementary information:

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8.3.5	TABLE: Crush				P
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[1)]					
Cell: 03BCEA2 (#49)	4,16	4,16	21,63	2,163	Pass
Cell: 03BCEA2 (#50)	4,15	0	21,72	2,172	Pass
Cell: 03BCEA2 (#51)	4,16	4,16	21,65	2,165	Pass
Cell: 03BCEA2 (#52)	4,15	0,13	21,70	2,170	Pass
Cell: 03BCEA2 (#53)	4,16	0	21,66	2,166	Pass
Samples charged at charging temperature 10°C[2)]					
Cell: 03BCEA2 (#54)	4,13	0	21,60	2,160	Pass

IEC 62133					
Clause	Requirement + Test		Result - Remark		Verdict
Cell: 03BCEA2 (#55)	4,15	0	21,64	2,164	Pass
Cell: 03BCEA2 (#56)	4,14	0	21,75	2,175	Pass
Cell: 03BCEA2 (#57)	4,15	4,15	21,68	2,168	Pass
Cell: 03BCEA2 (#58)	4,14	4,14	21,66	2,166	Pass
Samples charged at charging temperature 0°C[3)]					
Cell: 03BCEA2 (#59)	4,13	4,13	21,70	2,170	Pass
Cell: 03BCEA2 (#60)	4,13	0,23	21,64	2,164	Pass
Cell: 03BCEA2 (#61)	4,13	0	21,63	2,163	Pass
Cell: 03BCEA2 (#62)	4,13	0	21,68	2,168	Pass
Cell: 03BCEA2 (#63)	4,13	0	21,72	2,172	Pass
Samples charged at charging temperature lower limit[4)]					
Cell: 03BCEA2 (#64)	4,12	0	21,65	2,165	Pass
Cell: 03BCEA2 (#65)	4,12	0	21,62	2,162	Pass
Cell: 03BCEA2 (#66)	4,12	0	21,68	2,168	Pass
Cell: 03BCEA2 (#67)	4,12	0	21,71	2,171	Pass
Cell: 03BCEA2 (#68)	4,11	0	21,73	2,173	Pass

Supplementary information:

- No fire or explosion

1) Cells charged at 45°C by using 4,25 V and 2250 mA until the charging current reduced to 225 mA.
2) Cells charged at 10°C by using 4,25 V and 2250 mA until the charging current reduced to 225 mA.
3) Cells charged at 0°C by using 4,25 V and 900 mA until the charging current reduced to 225 mA.
4) Cells charged at -5°C by using 4,25 V and 450 mA until the charging current reduced to 225 mA.

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

8.3.6	TABLE: Over-charging of battery	N/A
Constant charging current (A) ..... :	--	—
Supply voltage (Vdc) ..... :	--	—

Model	OCV before charging, (Vdc)	Resistance of circuit, (Ω)	Maximum outer casing temperature, (°C)	Results
--	--	--	--	--

Supplementary information:
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8.3.7	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: 03BCEA2 (#69)	2,926	4,5	90	Pass
Cell: 03BCEA2 (#70)	2,903	4,5	90	Pass
Cell: 03BCEA2 (#71)	2,899	4,5	90	Pass
Cell: 03BCEA2 (#72)	2,912	4,5	90	Pass
Cell: 03BCEA2 (#73)	2,920	4,5	90	Pass

Supplementary information:
- No fire or explosion

8.3.9	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**
Samples charged at charging temperature upper limit[1)]					
Cell: 03BCEA2 (#74)	45	4,15	1	800	Pass
Cell: 03BCEA2 (#75)	45	4,15	1	800	Pass
Cell: 03BCEA2 (#76)	45	4,15	1	800	Pass
Cell: 03BCEA2 (#77)	45	4,15	1	800	Pass

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

Cell: 03BCEA2 (#78)	45	4,15	1	800	Pass
Cell: 03BCEA2 (#79)	10	4,14	1	800	Pass
Cell: 03BCEA2 (#80)	10	4,15	1	800	Pass
Cell: 03BCEA2 (#81)	10	4,15	1	800	Pass
Cell: 03BCEA2 (#82)	10	4,14	1	800	Pass
Cell: 03BCEA2 (#83)	10	4,15	1	800	Pass
Cell: 03BCEA2 (#84)	0	4,13	1	800	Pass
Cell: 03BCEA2 (#85)	0	4,13	1	800	Pass
Cell: 03BCEA2 (#86)	0	4,12	1	800	Pass
Cell: 03BCEA2 (#87)	0	4,13	1	800	Pass
Cell: 03BCEA2 (#88)	0	4,13	1	800	Pass
Cell: 03BCEA2 (#89)	-5	4,12	1	800	Pass
Cell: 03BCEA2 (#90)	-5	4,11	1	800	Pass
Cell: 03BCEA2 (#91)	-5	4,11	1	800	Pass
Cell: 03BCEA2 (#92)	-5	4,12	1	800	Pass
Cell: 03BCEA2 (#93)	-5	4,11	1	800	Pass

Supplementary information:

1) Identify one of the following:

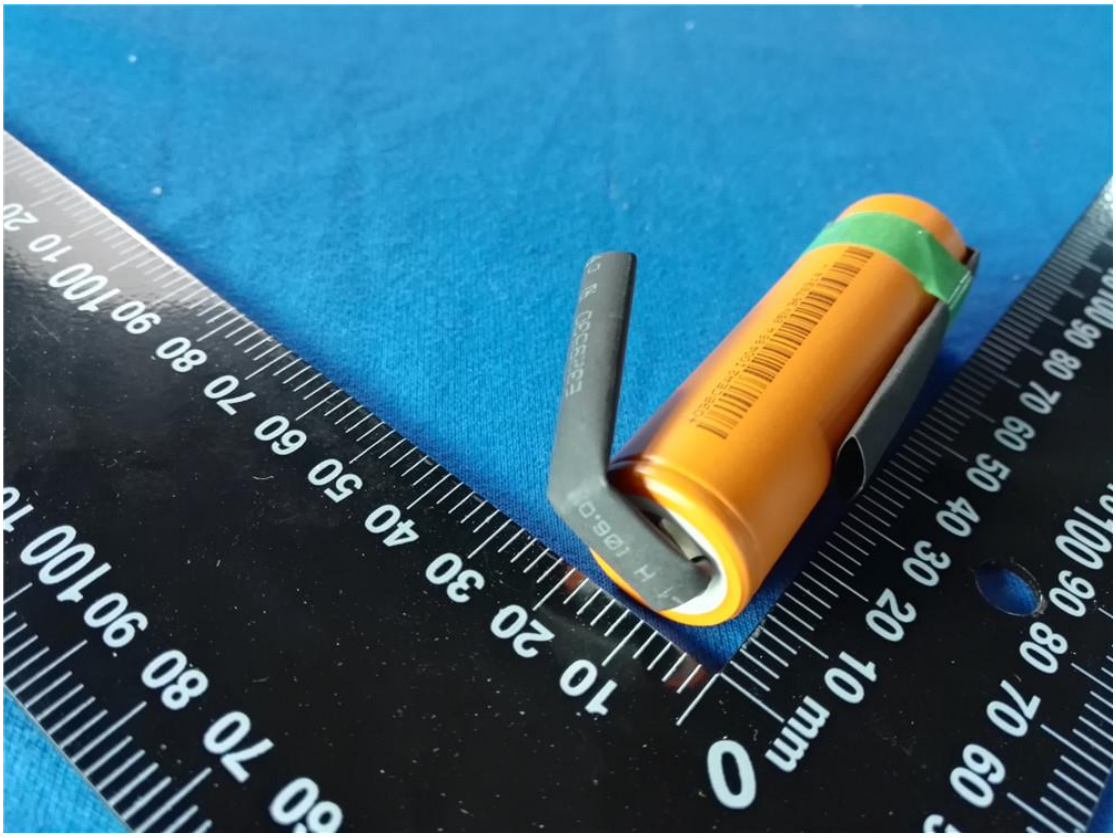
1: Nickel particle inserted between positive and negative (active material) coated area.

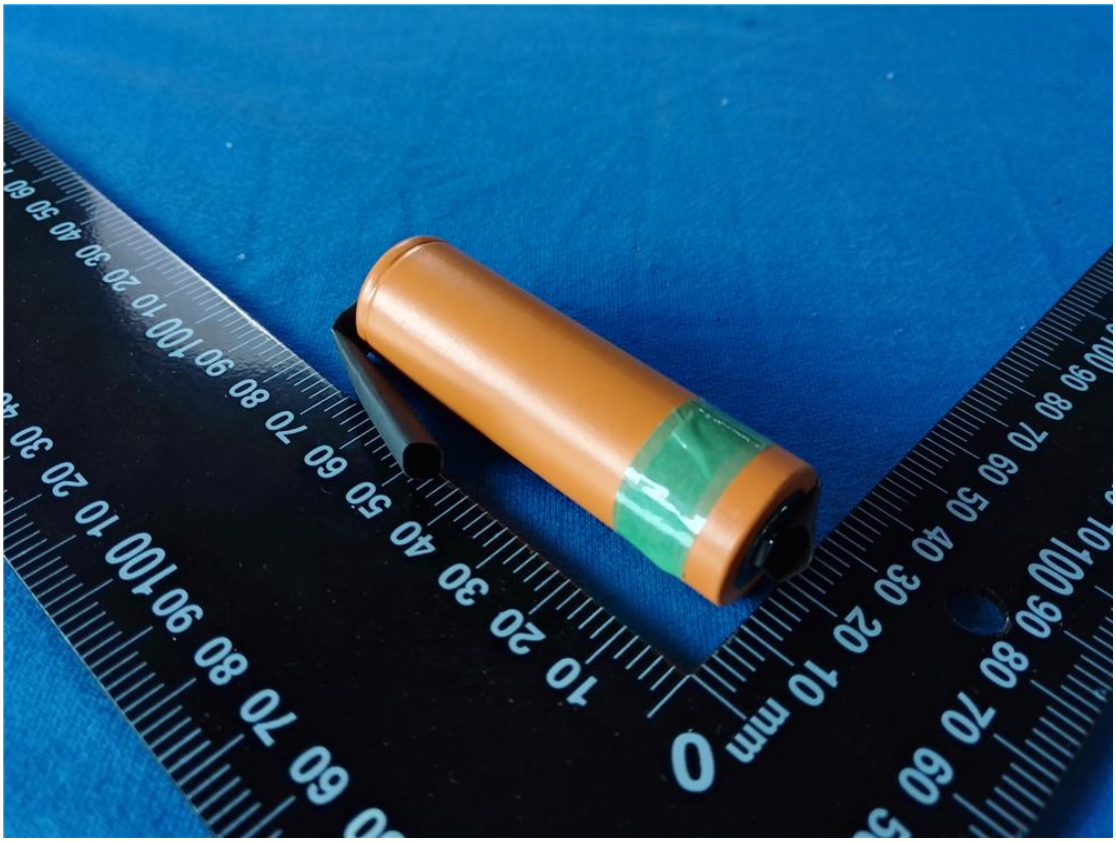
2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

- No fire

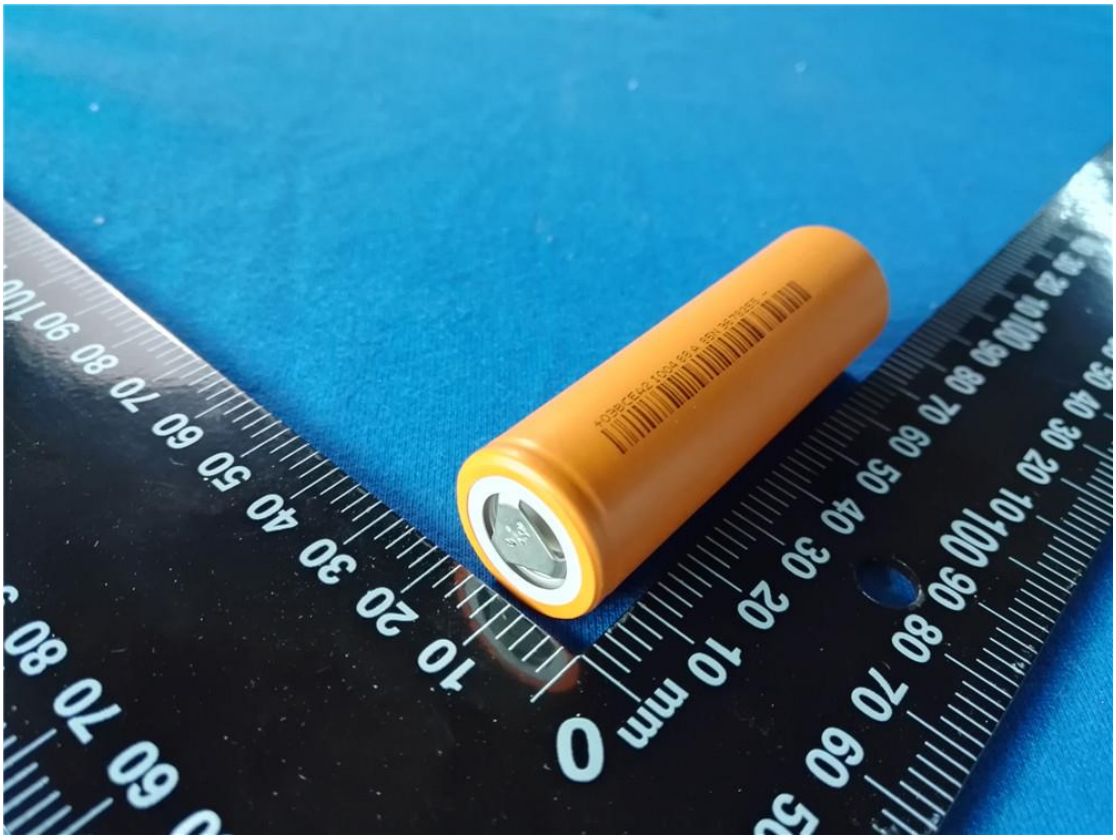
---End report---

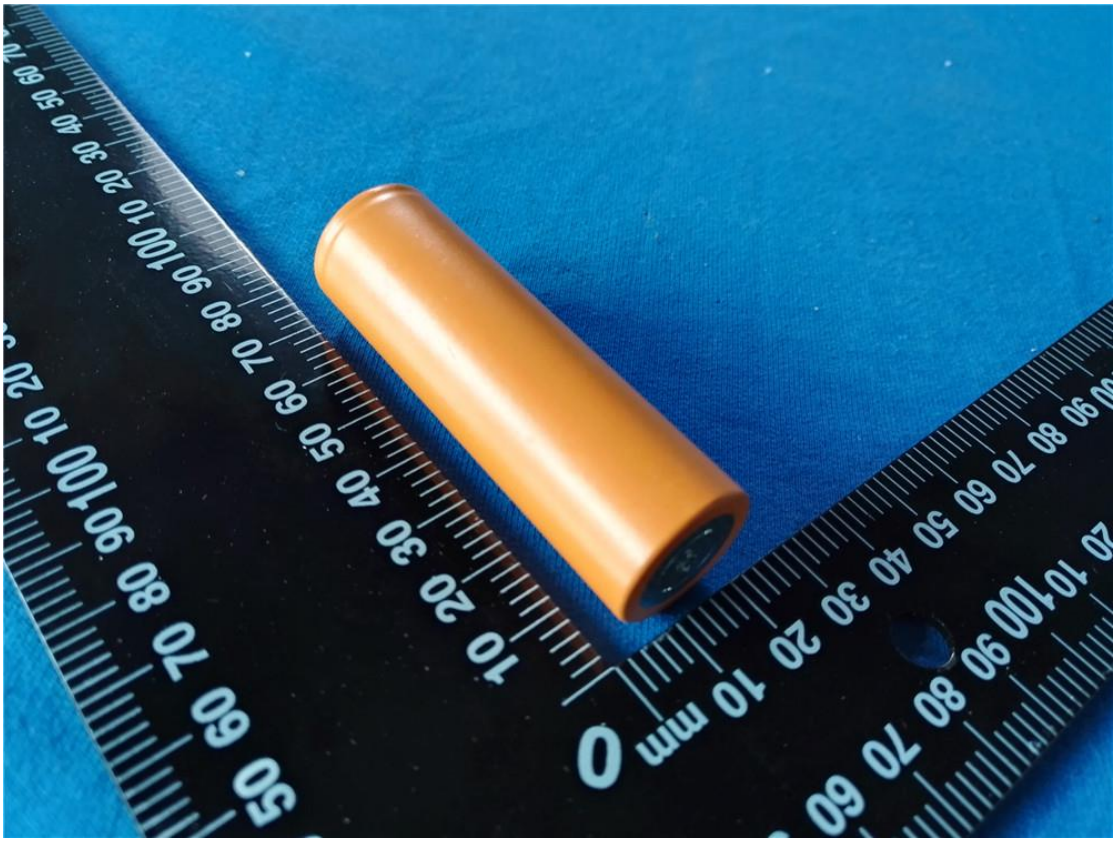
Attachment 1 Photo documentation





Attachment 1 Photo documentation





- - - End of Attachment 1 - - -

Attachment 2 Information for safety

2 SAFETY INSTRUCTIONS

Batteries containing organic solvents and other flammable substances, such as improper use may cause the core heat or fire, resulting in damage to the battery or personal injury. Please pay attention to the use of prohibited items, while the protection device should be added to avoid the use of equipment caused by abnormal batteries accident. Before using lithium-ion rechargeable batteries, please read the following safety guidelines carefully. In addition, God strongly recommends adding these instructions to the user manual.

2.1 Dangerous matter

2.1.1 Don't use or place batteries in high temperature (above 60 ° C) environment. Do not put it into fire,wate or make it moisture. Do not repair or disassemble batteries, there is a risk of causing the batteries to ignite, overheat, leak or explode.

2.1.2 Don't place the batteries in a chaotic manner, away from metal and other conductive materials to avoid positive (+) negative (-) short circuit, do not reverse the positive (+) negative (-) pole

2.1.3 Don't use non-specified charging equipment and violate charging requirements. Non-specified conditions charge will cause the battery to overcharge or abnormal chemical reactions, heat generation, smoke, rupture or fire.

2.1.4 Don't connect the battery to the AC plug (outlet) or the car plug. The battery needs to have a specific charger. If the battery is connected directly to the plug, the battery may catch fire, smoke, explode, or cause heat.

2.1.5 Don't overcharge, over-discharge, drive nail into the cell, strike it by hammer or tread it.

2.1.6 Don't hit or throw batteries. If the batteries appear to fall, please treat the waste, can not continue to use.

2.1.7 Don't dissect the battery. If the protection line is damaged, the battery will no longer be protected. Then, the battery may fire, smoke, explode or cause heat.

2.1.8 Don't charge near high temperatures. If the battery is charged near the high temperature, the battery can not be recharged due to the protection line. In this case, the protection circuit may be interrupted, the battery may fire, smoke, explode or cause heat.

2.1.9 Don't use batteries that are clearly damaged or deformed. May cause fever, smoke, rupture or burning.

2.1.10 Don't direct soldering of batteries, overheating will lead to insulation gaskets and other parts of the deformation, causing cell deformation, leakage, explosion or fire.

2.1.11 Don't reverse polarity charge. In the case of charging, the battery is reverse charging will be abnormal chemical reaction. In addition, there is an unpredictable high current through the discharge. These may cause heat, smoke, rupture or burning.

2.2 Warning

2.2.1 Batteries should be kept away from infants and young children. In case of swallowing the battery, please seek medical attention immediately.

2.2.2 Don't place the battery in a microwave oven or other cooking utensils. Due to the heating and electrical shock of the microwave oven, the battery may ignite, smoke, explode or cause heat.

2.2.3 Don't mix with other batteries. The battery can not be mixed with other different capacities, chemical systems, or manufacturers' batteries. Do not connect other batteries or mix other batteries. The battery may catch fire, smoke, explode or cause heat.

2.2.4 Don't use an abnormal battery. If there are obvious abnormalities, such as odor, fever, deformity or discoloration, stop using the battery. Such batteries may be defective and, if used, may cause fire, smoke, heat or explosion.

2.2.5 If the charging process does not end, stop charging. If the battery can not complete the charging process for a specified period of time, stop the charging step. The battery may catch fire, smoke, explode or cause heat.

Attachment 2 Information for safety

2.2.6 Don't use a leaky battery near a flame. If the battery or liquid out of the battery produces a pungent odor, the battery should remain away from the flame. The battery may be ignited or exploded.

2.2.7 Don't touch the leaky battery. If the liquid leaking from the battery into the eyes, will cause serious damage. If you come from your leaked liquid into your eyes, rinse your eyes with water immediately. Please consult a doctor immediately. If the liquid is left in the eyes, it will cause serious damage.

2.2.8 In order to avoid short circuit or damage, please tightly put the battery into a box or carton.

2.3 Precautions

2.3.1 Don't use or place batteries in high temperature environments, such as in direct sunlight. The battery may catch fire, smoke, explode or cause heat. At the same time, may cause battery performance and life degradation.

2.3.2 Battery pack has a protective line. Do not use batteries in places where static electricity (over 100V) is generated, which may damage the protection circuit. If the protective line of the battery is damaged, the battery may catch fire, smoke, explode or cause heat.Do not use Lithium ion cell with the primary batteries or secondary batteries whose capacity or kinds or maker is different. If do that, the cell will be discharged or charged excessively in use. And it may cause the generating heat, smoke, rupture or flame because of the abnormal chemical reaction in cells.

2.3.3 Charging temperature range specified in the 0 ℃ -45 ℃ between. Do not charge the battery outside the specified temperature range. Failure to do so may result in heat, leakage, or serious damage. In addition, battery performance and life degradation may occur.

2.3 4 Please read the manual before use. Please keep this manual for future reference.

2.3.5 Please read the charging method of the charger manual.

2.3.6 In the first use, if the battery has an abnormal smell, heat or rust, please contact the supplier.

2.3.7 Keep away from flammable materials during charging and discharging. May cause fire, smoke, explode or cause heat.

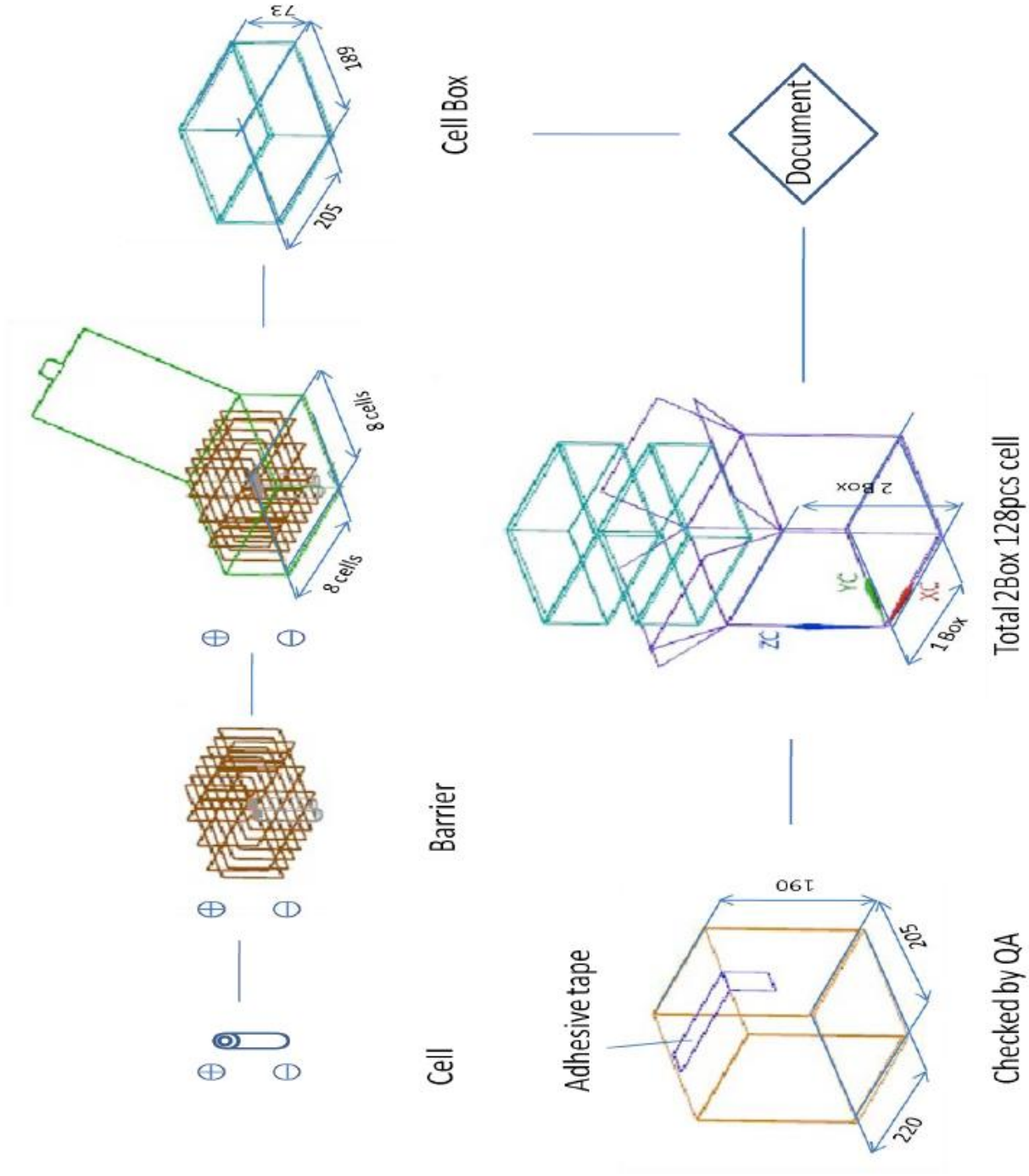
2.3.8 If the electrolyte leaks from the battery, gets on the clothes or on the skin, rinse it immediately with water. Otherwise it may irritate the skin.

2.3.9 If wires or metal objects come out of the battery, completely seal and insulate them. Otherwise, the battery may cause a short circuit, fire, smoke, explosion, or cause heat.

2.3.10 After use, please carry out battery recycling according to local laws and regulations.

- - - End of Attachment 2 - - -

Attachment 3 Packaging



- - - End of Attachment 3 - - -

Attachment 4 Product specification

Specification of Cell

3 GENERAL SPECIFICATIONS

3.1	Nominal Capacity	4500mAh (at 0.2C Discharge)	
	Minimum Capacity	4400mAh (at 0.2C Discharge)	
	Nominal capacity is measured by the discharge at 0.2C to 2.5V end voltage after standard fully charged according to specification at 25℃.		
3.2	Maximum Charge Voltage	4.20V±0.03V	
3.3	Average working Voltage	3.60V@0.2C	
3.4	Standard Charge Method(25℃±2℃)	Constant Current and Constant Voltage (CC/CV)	
		Current	0.5C (2250mA)
		Voltage	4.2V
		End Current	90mA±5mA
3.5	Maximum Charge Current	0℃ ≤ T ≤ 5℃	0.1C(450mA)
		5℃ < T ≤ 15℃	0.2C(900mA)
		15℃ < T ≤45℃	0.5C(2250mA)
3.6	Standard Discharge	Constant Current (CC)	
		Current	0.2C (900mA)
		End Voltage	2.5V
3.7	Maximum Discharge Current	-20℃≤ T ≤5℃	1.0C(4500mA)
		5℃< T ≤ 25℃	2.0C(9000mA)
		25℃< T ≤35℃	3.0C(13500mA)
		35℃ < T ≤ 45℃	1.0C (4500mA)
3.10	Operating Enviromental Temperature	Charge	0℃ ~ 45℃
		Discharge	-20℃ ~ 45℃

- - - End of Attachment 4- - -

Attachment 5 ISO 9001 certificate

DNV·GL

MANAGEMENT SYSTEM CERTIFICATE

Certificate No:
1775-2000-AQ-RGC-UKAS

Initial certification date:
04 August, 2000

Valid:
04 August, 2018 - 04 August, 2021

This is to certify that the management system of

Tianjin Lishen Battery Joint-Stock Co., Ltd.

No. 38 Haitainan Road, Tianjin Binhai Hi-Tech Industrial, Development Area, Tianjin, P.R. China
and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Quality Management System standard:
ISO 9001:2015/GB/T 19001-2016

This certificate is valid for the following scope:

Design and Manufacture of Li-Ion Cells and Batteries

Place and date:
Shanghai, 25 July, 2018

UKAS MANAGEMENT SYSTEMS
0013

For the issuing office:
DNV GL – Business Assurance
Suite A, Building 9, No.1591 Hongqiao Road, Changning District, Shanghai 200336, P.R. China
TEL: +86 21 32799000

Zhu Hai Ming
Management Representative

Lack of fulfilment of conditions as set out in the Certification Agreement may render this Certificate invalid.
ACCREDITED UNIT: DNV GL Business Assurance UK Limited, 4th Floor, Vivo Building, 30 Stamford Street, London, SE1 9LQ, United Kingdom.
TEL:+44(0) 203 816 4000. www.dnvgl.co.uk

- - - End of Attachment 5 - - -