TEST REPORT
EN 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, use in portable applications – Part 2: Lithium systems

Test Report No.:	RDG200106032-SF	
Tested by (+ signature) :	Gary Huang	Gary Huang
Reviewed by (+ signature):	David Yang	David Yang
Date of issue:	2020-04-17	
Testing laboratory:	**Bay Area Compliance Laboratories Corp. (Dongguan)**	
Address :	No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China	
Testing location:	1F., No.91, Luyi Road, Tianxin Community, Tangxia Town, Dongguan, Guangdong/523718	
Applicant's name:	**BAREBONES SYSTEMS,LLC.**	
Address:	1215 East Wilmington Avenue-Ste. 140 Salt Lake City, UT 84106	
Manufacturer's name:	**Ningbo Lanqi Electronic Technology CO.,LTD.**	
Address:	NO.1 Building, NO. 188-1 Shanhai Road, Wangchun Industrial Zone, Haishu, Ningbo, zhejiang	
Test specification:		
Standard:	EN 62133-2:2017	
Test procedure:	Type test	
Test item description:		
Product designation:	Lithium-ion Rechargeable Battery	
Model/Type reference:	INR18650-2200A	
Ratings:	3.7V, 2200mAh, 8.14Wh	

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
Test items: cl.5.6.2 Design recommendation; 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 (Cell) cl.7.3.2 External short circuit (Batteries); cl.7.3.3 Free fall (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) Tests are made with the number of cells and batteries specified in EN 62133-2:2017.	**Bay Area Compliance Laboratories Corp. (Dongguan)** No.20, Puxinhu Road, Tangxia Town, Dongguan, Guangdong, China

Summary of compliance with National Differences:

N/A

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.

Li-ion Rechargeable Battery
Model: INR18650-2200A (INR19/66)
3.7V 2200mAh 8.14Wh
Manufacturer: Ningbo Lanqi Electronic Technology CO.,LTD.
Date: YYYY-MM-DD
Made in China

Test item particulars .....:	
Classification of installation and use.....:	Build-in and use in portable application
Supply connection .....:	N/A
Recommend charging method declaired by the manufacturer.....:	CC/CV
Discharge current (0,2 I_t A) .....:	440mA
Specified final voltage.....:	2.75V
Upper limit charging voltage per cell.....:	4.2V
Maximum charging current.....:	2200mA for cell, 1500mA for pack
Charging temperature upper limit.....:	45°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 .....:	2020-01-14
Date (s) of performance of tests.....:	2020-01-17~2020-04-07

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.
The information is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
"(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 point is used as the decimal separator.

General product information:

This battery is constructed with one cell, and has overcharge, over-discharge, over current and short-circuits proof circuit.

The main features of the battery are shown as below:

Model	Nominal Capacity	Nominal Voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
INR18650-2200A	2200mAh	3.7V	440mA	440mA	2200mA	1500mA	4.2V	2.75V

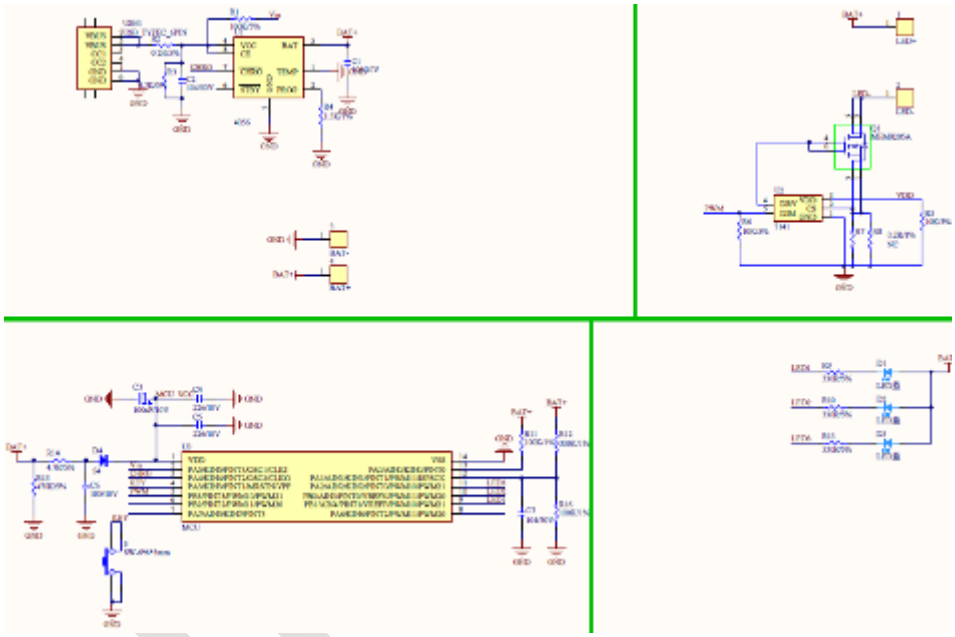
The main features of the cell are shown as below:

Model	Nominal Capacity	Nominal Voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
INR18650-2200A	2200mAh	3.7V	440mA	440mA	2200mA	2200mA	4.2V	2.75V

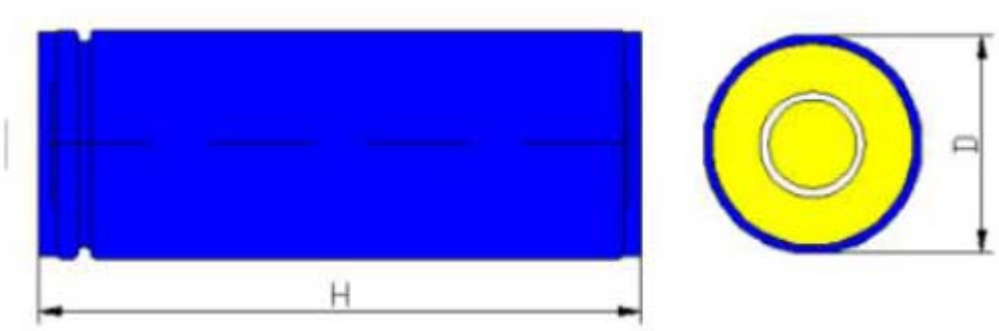
The main features of the cell are shown as below:

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
INR18650-2200A	4.225V	110mA	0°C	45°C

The principle diagram of the PCB:



Construction: (Unit: mm)



Battery

T(max.): H(max.)= 19.5mm: 69.5 mm

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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		N/A
	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	The vents in the side	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		P
5.4	**Temperature, voltage and current management**		P
	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	The voltage and current are within the manufacturer's claim.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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	Specifications are provided by Manufacturers.	P
5.5	**Terminal contacts**		P
	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**	1S1P	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		N/A
	This protection may be provided external to the battery such as within the charger or the end devices		P
	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		N/A
	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		N/A
	Protective circuit components added as appropriate and consideration given to the end-device application		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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		N/A
	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		N/A
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an overcharge protection		N/A
	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		N/A
	It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer		N/A
	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
	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	The manufacturer has ISO9001:2008 certificate and such quality plan	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		P
	Coin cells with resistance ≤ 3 Ω (measured according annex D) are tested according table 1		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

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Clause	Requirement + Test	Result - Remark	Verdict
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
	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 he upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05ItA, using a constant voltage charging method.		P
7.2	**Intended use**		P
7.2.1	Continuous charging at constant voltage (cells)		P
	Fully charged cells are subjected for 7 days to a charge u sing 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)	70°C	P
	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)		P
	The cells were tested until one of the following occurred:		—
	- 24 hours elapsed; or		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- The case temperature declined by 20 % of the maximum temperature rise		P
	Results: No fire. No explosion..... :	(See appended table 7.3.1)	P
7.3.2	External short-circuit (battery)		P
	The 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
	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		P
	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		P
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor	MOSFET	P
	Results: No fire. No explosion..... :	(See appended table 7.3.2)	P
7.3.3	Free fall		P
	Results: No fire. No explosion		P
7.3.4	Thermal abuse (cells)		P
	Oven temperature (°C)..... :		—
	Results: No fire. No explosion		P
7.3.5	Crush (cells)		P
	The crushing force was released upon:		—
	- The maximum force of 13 kN ± 0,78 kN has been applied;		P
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	Results: No fire. No explosion..... :	(See appended table 7.3.5)	P
7.3.6	Over-charging of battery		P
	The supply voltage which is:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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		P
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and		N/A
	- Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached		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		P
	- Returned to ambient		P
	Results: No fire. No explosion..... :	(See appended table 7.3.6)	P
7.3.7	Forced discharge (cells)		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		P
	Results: No fire, no explosion, no rupture, no leakage or venting. ..... :	(See appended table 7.3.8.1)	P
7.3.8.2	Mechanical shock		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)	The manufacturer declares that the electrolyte of the cell belong to gel polymer.	P
	The cells complied with national requirement for ..... :	France, Japan, Korea, Switzerland	—
	The pressing was stopped upon:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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		P
	Results: No fire ..... :		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	Show in cell specification	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		P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		P
	As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user		P
	Do not allow children to replace batteries without adult supervision		P
8.2	**Small cell and battery safety information**		N/A
	The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them:		N/A
	- Keep small cells and batteries which are considered swallowable out of the reach of children		N/A
	- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion		N/A
	- In case of ingestion of a cell or battery, seek medical assistance promptly		N/A
9	**MARKING**		P
9.1	**Cell marking**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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	Battery marked in accordance with IEC 61960.	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		N/A
	Terminals have clear polarity marking on the external surface of the battery		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		N/A
9.3	**Caution for ingestion of small cells and batteries**		N/A
	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		N/A
	When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package		N/A
9.4	**Other information**		P
	Storage and disposal instructions	Information for disposal instructions mentioned in manufacturer's specifications.	P
	Recommended charging instructions	Information for disposal instructions mentioned in manufacturer's specifications.	P

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Clause	Requirement + Test	Result - Remark	Verdict
10	**PACKAGING AND TRANSPORT**		P
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3		N/A
	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		P

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**		P
A.3	**Consideration on charging voltage**		P
A.3.1	General		P
A.3.2	Upper limit charging voltage	4.225V	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		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		N/A
A.4.3	High temperature range		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		N/A
A.4.4	Low temperature range		N/A
A.4.4.1	General		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
A.4.5	Scope of the application of charging current		N/A
A.4.6	Consideration of discharge		N/A
A.4.6.1	General		N/A
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		N/A
A.4.6.3	Discharge current and temperature range		N/A
A.4.6.4	Scope of application of the discharging current		N/A
A.5	**Sample preparation**		N/A
A.5.1	General		N/A
A.5.2	Insertion procedure for nickel particle to generate internal short		N/A
A.5.3	Disassembly of charged cell		N/A
A.5.4	Shape of nickel particle		N/A
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		N/A
A.6	**Experimental procedure of the forced internal short-circuit test**		N/A
A.6.1	Material and tools for preparation of nickel particle		N/A
A.6.2	Example of a nickel particle preparation procedure		N/A
A.6.3	Positioning (or placement) of a nickel particle		N/A
A.6.4	Damaged separator precaution		N/A
A.6.5	Caution for rewinding separator and electrode		N/A
A.6.6	Insulation film for preventing short-circuit		N/A
A.6.7	Caution when disassembling a cell		N/A
A.6.8	Protective equipment for safety		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A.6.9	Caution in the case of fire during disassembling		N/A
A.6.10	Caution for the disassembling process and pressing the electrode core		N/A
A.6.11	Recommended specifications for the pressing device		N/A
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**		N/A
D.2	**Method**		N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: List of Critical Components				P
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
PCB	Shenzhen meiyadi Electronic Co., Ltd	MYD-2A	V-0, 130ºC	UL796	UL E348865
Protection IC	HYCON Technology Corporation	HY2111-HB SOT-23-6	overcharge detection voltage: 4.280±0.025V Overdischarge detection voltage:2.9±0.1V overcurrent:3.0-6.0A	EN62133-2: 2017	Test appliance
MOSFET	Shenzhen Ketong Electronic Co., Ltd	8205A TSSOT-8	VDS:20V; VGS:±8V; ID(atTA=25℃):4.8A; IDM:20A; TJ,TSTG:-55 To:150℃	EN62133-2: 2017	Test appliance
cell	Roofer Energy Technology (Baoshan) Co., Ltd	INR18650-2200A	3.7V, 2200mAh	EN62133-2: 2017	Test appliance
-Electrolyte	Shantou golden light High Tech Co., Ltd.	A2511	DMC/EC/EMC $LiPF_6$	EN62133-2: 2017	Test appliance
-Separator	Xinxiang city science and Technology Co Ltd	61*0.02mm	PP,Shutdown temperature 130°C, One layer	EN62133-2: 2017	Test appliance
-Positive electrode	Hunan Shanshan energy Polytron Technologies Inc	T31D/LM011-HD	Li(Ni,Co,Mn)O2/LiMn2O4 Ni：Co：Mn=5:2:3	EN62133-2: 2017	Test appliance
-Negative electrode	Shenzhen beiterui new energy Limited by Share Ltd	A9	Graphite	EN62133-2: 2017	Test appliance

Supplementary information:
1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.

EN 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Sample no.	**Recommended charging voltage Vc (Vdc)**	**Recommended charging current I_{rec} (mA)**	**OCV before test (Vdc)**	**Results**
C-1	4.20	440	4.162	P
C-2	4.20	440	4.157	P
C-3	4.20	440	4.160	P
C-4	4.20	440	4.163	P
C-5	4.20	440	4.159	P

Supplementary information:

- No fire or explosion
- No leakage
- Others (please explain)

7.3.1	TABLE: External short-circuit (cell)				P
Sample no.	**Ambient T (°C)**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature (°C)**	**Results**
Samples charged at charging temperature upper limit 45°C					
C-1	55.0	4.181	83.5	82.8	P
C-2	55.0	4.181	89.6	81.0	P
C-3	55.0	4.184	70.3	80.2	P
C-4	55.0	4.183	78.5	77.5	P
C-5	55.0	4.183	91.2	79.4	P
Samples charged at charging temperature lower limit 10°C					
C-6	55.0	4.100	83.5	82.1	P
C-7	55.0	4.088	89.6	81.6	P
C-8	55.0	4.095	70.3	77.3	P
C-9	55.0	4.094	78.5	78.7	P
C-10	55.0	4.100	91.2	79.1	P

Supplementary information:

- No fire or explosion
- Others (please explain)

EN 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.2	TABLE: External short-circuit (battery)					P
Sample no.	**Ambient T (°C)**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature (°C)**	**Component single fault condition**	**Results**
B-1	20.0	4.167	89.2	43.4	Yes	P
B-2	20.0	4.165	88.4	40.6	Yes	P
B-3	20.0	4.168	78.6	42.9	Yes	P
B-4	20.0	4.168	90.6	23.2	NO	P
B-5	20.0	4.159	76.5	23.5	NO	P

Supplementary information:

- No fire or explosion
- Others (please explain)

7.3.5	TABLE: Crush (cells)			P
Sample no.	**OCV before test (Vdc)**	**OCV at removal of crushing force (Vdc)**	**Maximum force applied to the cell during crush (kN)**	**Results**
Samples charged at charging temperature upper limit 45°C				
C-1	4.175	--	12.836	P
C-2	4.185	--	12.832	P
C-3	4.184	--	12.860	P
C-4	4.184	--	12.836	P
C-5	4.185	--	12.713	P
Samples charged at charging temperature lower limit -5°C				
C-6	4.279	--	12.880	P
C-7	4.280	--	12.840	P
C-8	4.278	--	12.789	P
C-9	4.279	--	12.864	P
C-10	4.282	--	12.934	P

Supplementary information:

- No fire or explosion
- Others (please explain)

EN 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.6	TABLE: Over-charging of battery	P
Constant charging current (A) ..... :	4.4	—
Supply voltage (Vdc) ..... :	5.88	—

Sample no.	OCV before charging (Vdc)	Total charging time (minute)	Maximum outer case temperature (°C)	Results
B-1	3.322	70	29.8	P
B-2	3.330	70	30.1	P
B-3	3.200	70	28.5	P
B-4	3.335	70	28.7	P
B-5	3.327	70	29.3	P

Supplementary information:

- No fire or explosion
- Others (please explain)

7.3.7	TABLE: Forced discharge (cells)	P

Sample no.	OCV before application of reverse charge (Vdc)	Measured reverse charge I_t (mA)	Lower limit discharge voltage (Vdc)	Results
C-1	3.125	2200	2.75	P
C-2	3.143	2200	2.75	P
C-3	3.136	2200	2.75	P
C-4	3.137	2200	2.75	P
C-5	3.128	2200	2.75	P

Supplementary information:

- No fire or explosion
- Others (please explain)

EN 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.8.1	TABLE: Vibration				P
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test (g)**	**Results**
B-1	4.162	4.162	45.688	45.688	P
B-2	4.159	4.159	45.104	45.104	P
B-3	4.162	4.162	45.396	45.396	P

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting
- Others (please explain)

7.3.8.2	TABLE: Mechanical shock				P
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test (g)**	**Results**
B-1	4.164	4.164	45.695	45.695	P
B-2	4.163	4.163	45.163	45.163	P
B-3	4.158	4.158	45.387	45.387	P

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting
- Others (please explain)

EN 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.9	TABLE: Forced internal short circuit (cells)				P
Sample no.	**Chamber ambient T (°C)**	**OCV before test (Vdc)**	**Particle location [1)]**	**Maximum applied pressure (N)**	**Results**
Samples charged at charging temperature upper limit 45°C					
C-1	45	4.184	1	800	P
C-2	45	4.181	1	800	P
C-3	45	4.183	1	800	P
C-4	45	4.184	1	800	P
C-5	45	4.183	1	800	P
Samples charged at charging temperature lower limit -5°C					
C-6	-5	4.101	1	800	P
C-7	-5	4.102	1	800	P
C-8	-5	4.102	1	800	P
C-9	-5	4.103	1	800	P
C-10	-5	4.098	1	800	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
- Others (please explain)

D.2	TABLE: Internal AC resistance for coin cells			N/A
Sample no.	**Ambient T (°C)**	**Store time (h)**	**Resistance Rac (Ω)**	**Results [1)]**
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Supplementary information:

[1)] Coin cells with internal resistance less than or equal to 3 Ω, see test result on corresponding tables

List of test equipment used:

Instrument Name	No.	Manufacturer	Calibration Date	Due Date	Equipment status
Low Pressure Test Chamber	T-08-BT001	GAOXIN	2019-05-09	2020-05-08	☒Yes ☐No
Battery Crush Tester	T-08-BT002	GAOXIN	2019-04-08	2020-04-07	☒Yes ☐No
High-Low Temperature short-circuit Tester	T-08-BT004	GAOXIN	2020-03-16	2021-03-15	☒Yes ☐No
Battery Thermal Abuse Tester	T-08-BT005	GAOXIN	2020-03-13	2021-03-12	☒Yes ☐No
Drop Tester	T-08-BT006	GAOXIN	2019-04-08	2020-04-07	☒Yes ☐No
Forced Internal Short Circuit Tester	T-08-BT007	BELL	2019-05-09	2020-05-08	☒Yes ☐No
Battery Charge-Discharge Testing System	T-08-BT010	NEWARE	2020-03-16	2021-03-15	☒Yes ☐No
Electric Vibration Test Machine	T-08-BT012	DONGLING	2019-09-12	2020-09-11	☒Yes ☐No
Hydraulic Shock Test Machine	T-08-BT013	LABTONE	2019-09-12	2020-09-11	☒Yes ☐No
DC Power Supply	T-08-BT014	ZHAOXIN	2020-03-16	2021-03-15	☒Yes ☐No
DC Power Supply	T-08-BT015	ZHAOXIN	2020-03-16	2021-03-15	☒Yes ☐No
Digital Multimeter	T-08-BT017	FLUKE	2020-03-03	2021-03-02	☒Yes ☐No
Stopwatch	T-08-BT021	LEAP	2020-03-31	2021-03-30	☒Yes ☐No
High-low Temperature Test Chamber	T-08-BT024	BACL	2020-03-11	2021-03-10	☒Yes ☐No
Multipath Temperature Tester	T-08-BT025	RONGXIN	2019-07-29	2020-07-28	☒Yes ☐No
Milliohmmeter	T-08-BT026	ViCi	2019-07-23	2020-07-22	☒Yes ☐No
Battery Charge-Discharge Testing System	T-08-BT028	NEWARE	2019-10-16	2020-10-15	☒Yes ☐No
Battery Charge-Discharge Testing System	T-08-SF226	NEWARE	2019-06-14	2020-06-13	☒Yes ☐No

Sample Photos

Photo 1 **[√] General view of battery**	
Photo 2 **[√] General view of battery**	

Photo 3 **[√] General view of battery**	
Photo 4 **[√] General view of battery**	

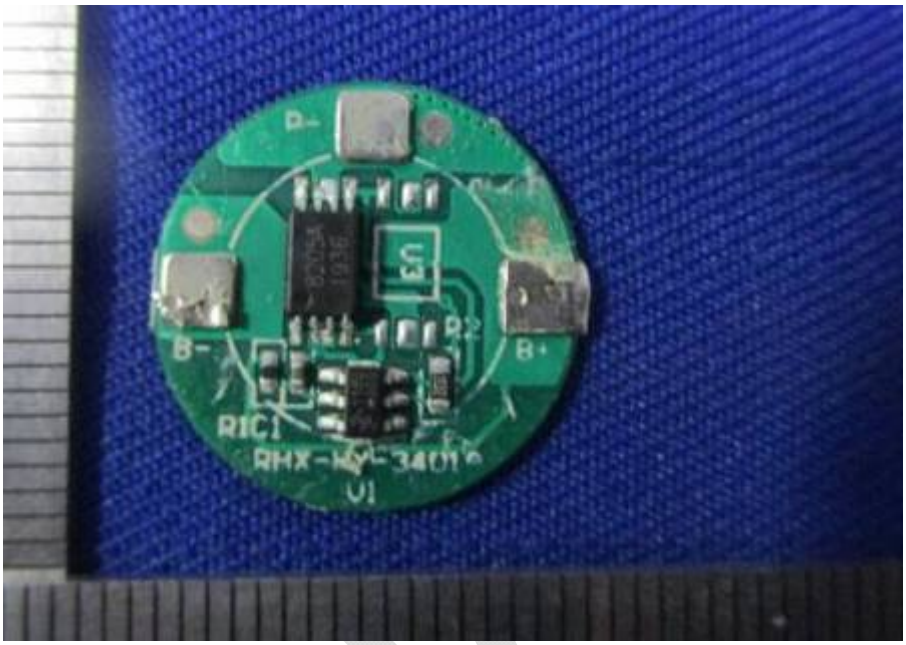
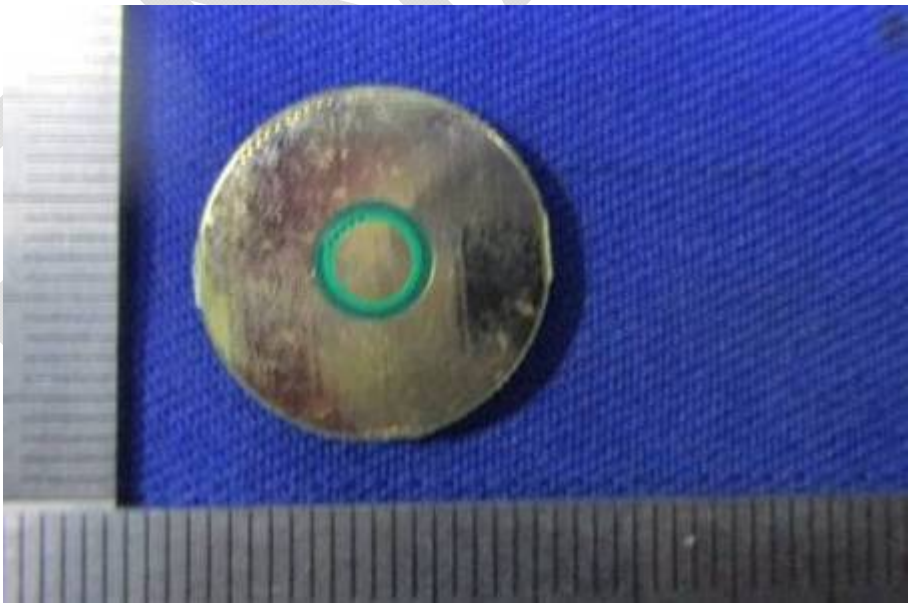
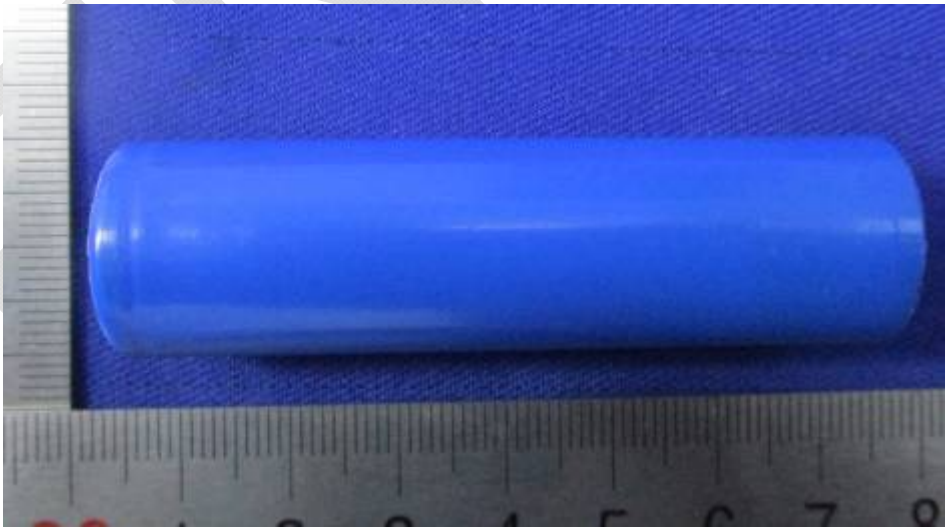
Photo 5 **[√] General view of PCB**	
Photo 6 **[√] General view of PCB**	

Photo 7 **[√] General view of Cell**	
Photo 8 **[√] General view of Cell**	

Directions

1. The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.

2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.

3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.

4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.

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*******END OF REPORT*******