TEST REPORT

Report No.: **STE23052601S**

Product: Car air pump

Model No.: CZK-3690, (others refer to page 2)

Prepared for: **Yuyao Liuyang Appliances Of Autocar Co., Ltd**

Address: 6-1, Huangjianshan Ind. Zone, Yuyao City, Zhejiang Province, China 315400

Prepared by: **Shenzhen STE Testing Laboratory Co., Ltd.**

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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.....:	STE23052601S
Tested by (name + signature).....:	Ada Lin / Test engineer
Approved by (name + signature).....:	Navy Jiang / Project manager
Date of issue.....:	July 13, 2023
Total number of pages.....:	28
Testing Laboratory .....:	**Shenzhen STE Testing Laboratory Co., Ltd.**
Address .....:	3/F, Building 9, Dehong Factory Building, No. 63 Yuchang Road, Niuhu Community, Guanlan Street, Longhua District, Shenzhen, China
Applicant's name.....:	**Yuyao Liuyang Appliances Of Autocar Co., Ltd**
Address.....:	6-1, Huangjianshan Ind. Zone, Yuyao City, Zhejiang Province, China 315400
Manufacturer's name.....:	**Yuyao Carzkool Appliances Of Autocar Co., Ltd**
Address.....:	6-1, Huangjianshan Ind. Zone, Yuyao City, Zhejiang Province, China 315400
Test specification:	
Standard.....:	IEC 62133-2: 2017
Test procedure.....:	Type test
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC 62133-2_A
Test Report Form(s) Originator.....:	STE
Master TRF.....:	Dated 2022-03

Test item description.....:	Car air pump
Model/Type reference.....:	CZK-3690, CZK-3631, CZK-3632, CZK-3635, CZK-3651, CZK-3652, CZK-3654, CZK-3656, CZK-3658, CZK-3659, CZK-3660, CZK-3667, CZK-3670, CZK-3677, CZK-3679, CZK3685, CZK-3689, CZK-3691, CZK-3692, CZK-3694, CZK-5612, CZK-5613, CZK-5614, CZK-5615, SUP-01, E280, CZK-5611
Trade Mark.....:	N/A

Ratings.....: 11.1V ⎓, 1500mAh, 16.65Wh

Summary of testing:

Testing location:

Shenzhen STE Testing Laboratory Co., Ltd.

3/F, Building 9, Dehong Factory Building, No. 63 Yuchang Road, Niuhu Community, Guanlan Street, Longhua District, Shenzhen, China

Tests performed (name of test and test clause):

IEC 62133-2: 2017

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.

Car air pump

Model: CZK-3690

11.1V ⎓, 1500mAh, 16.65Wh

1INR21/70 Date: YYYY/MM/DD

Warning: Do not disassemble, puncture, crush, heat or burn.

Yuyao Liuyang Appliances Of Autocar Co., Ltd

6-1, Huangjianshan Ind. Zone, Yuyao City, Zhejiang Province, China 315400

Made in China

Remarks:

1. For the date code YYYY/MM/DD:
   "YYYY" means year for manufacture;
   "MM" means month for manufacture;
   "DD" means day for manufacture.

2, The height dimension of CE symbol should not less than 5mm, the height dimension of WEEE symbol should not less than 7mm.

Test item particulars:	
Connection to the mains	Not directly connect to mains
Classification of installation and use	Portable equipment
Recommend charging method declared by the manufacturer	Charging the EUT with 1500mA constant current and 12.6V constant voltage
Standard Discharge current	1500mA
Upper limit charging voltage per cell	4.2VDC
Maximum charging current	1.5A
Maximum discharging current	1.5A
Charging temperature upper limit	45°C
Charging temperature lower limit	0°C
cell electrolyte type	☐ gel ☐ solid ☒ 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	June 08, 2023
Date (s) of performance of tests	June 08, 2023 ~ July 13, 2023

General remarks:

"(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**

General product information

1, The battery pack is constructed with 3 lithium-ion cells (3S1P), and has overcharge, over-discharge, over current and short-circuits proof circuit.

2, The battery pack mainly consists of:

- 3 cells (3S1P)
- PCM (protective circuit module)

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
4	**PARAMETER MEASUREMENT TOLERANCES**		--
	Parameter measurement tolerances		P
5	**GENERAL SAFETY CONSIDERATIONS**		--
5.1	**General**		--
	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**		--
	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 surface exists.	N
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate clearances and creepage distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		P
5.3	**Venting**		--
	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	Venting mechanism exists on the narrow side of cell.	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
5.4	Temperature, voltage and current management		--
	Batteries are designed such that abnormal temperature rise conditions are prevented	Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 7.	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 specification.	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	The charging limits specified in the manufacturer’s specification.	P
5.5	**Terminal contacts**		--

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	DC connector complied with the requirements.	P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance	Complied.	P
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	**Assembly of cells into batteries**		--
5.6.1	General		--
	Each battery has 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	Protective circuit equipped on battery.	P
	This protection may be provided external to the battery such as within the charger or the end devices		N
	If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation	3S1P	P
	If there is more than one battery housed in a single battery case, each battery has protective circuitry that can maintain the cells within their operating regions	3 cells battery.	N
	Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly	Current, Voltage and temperature limits specified by cell manufacturer.	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
	Protective circuit components are 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	Safety analysis report provided by manufacturer.	P
5.6.2	Design recommendation		--
	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	Specified in Clause 7.1.2, Table 2.	P

IEC 62133-2: 2017			
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		N
	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
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage are not counted as an overcharge protection		N
	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
	It is recommended that the cells and cell blocks are not discharged beyond the cell manufacturer's specified final voltage	Final voltage of cell: 2.5V not exceed the final voltage specified by the cell manufacturer.	P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry are incorporated into the battery management system		N
5.6.3	Mechanical protection for cells and components of batteries		P
	Mechanical protection for cells, cell connections and control circuits within the battery are provided to prevent damage as a result of intended use and reasonably foreseeable misuse	Mechanical protection for cell connections and control circuits provided.	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	By enclosure	N
	The battery case and compartments housing cells are designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer		N
	For batteries intended for building into a portable end product, testing with the battery installed within the end product is considered when conducting mechanical tests		N
5.7	**Quality plan**		--

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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	Complied. Quality plan provided.	P
5.8	**Battery safety components**		
	According annex F	See TABLE: Critical components information.	P
6	**TYPE TEST AND SAMPLE SIZE**		--
	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
	The internal resistance of coin cells are measured in accordance with Annex D. Coin cells with internal resistance less than or equal to 3 Ω are tested in accordance with Table 1	Not coin cells.	N
	Unless otherwise specified, tests are carried out in an ambient temperature of 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 over discharge protection		P
	When conducting the short-circuit test, consideration is 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	See clause 7.3.2.	P
7	**Specific requirements and tests (lithium systems)**		--
7.0A	**General**		--
7.1	**Charging procedure for test purposes**		--
7.1.0A	The charging procedure specified in below first procedure and second procedure. However, the procedures not applicable to 7.3.6, 7.3.7, 7.3.8B and 7.3.8D, for which charging is the test purpose.		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

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Clause	Requirement + Test	Result - Remark	Verdict
	Prior to charging, the battery has been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage		P
	The procedure applicable to 7.2.1, 7.2.2, 7.2.2A, 7.3.2, 7.3.3, 7.3.8.1, 7.3.8.2, 7.3.8A and 7.3.8C.		P
7.1.2	**Second procedure**		P
	After stabilization for 1 h to 4 h, at an ambient temperature of the highest test temperature and the lowest test temperature, respectively, 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 current to constant voltage charging method	Charge temperature 0-45°C declared. 45°C used for upper limit tests; -5°C used for lower limit tests.	P
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		P
7.2	**Intended use**		--
7.2.1	**Continuous charging at constant voltage (cells)**	Tested complied.	P
	Fully charged cells according to 7.1.1 are subjected for 28 days to a charge with upper limit charging voltage at upper limit test temperature.		P
	Results: No fire. No explosion. No leakage.:	(See Table 7.2.1)	P
7.2.2	**Moulded case stress at high ambient temperature (battery)**	Tested as client requested.	P
	Fully charged batteries, according to 7.1.1, are exposed to high temperature. The battery is placed in an air circulating oven at a temperature of 70 °C ± 2 °C for 7 h, after which they are removed and return to 20 ± 5 °C.		P
	Oven temperature (°C):	70°C, 7h	--
	Results: No physical distortion of the battery casing resulting in exposure if internal components	No physical distortion of the enclosure.	P
7.3	**Reasonably foreseeable misuse**		P
7.3.1	**External short circuit (cell)**	Tested complied.	P
	Charging procedure: 7.1.2		P
	Ambient temperature: 55 ± 5 °C	(See Table 7.3.1)	P
	Resistance of circuit (mΩ): 80 ± 20 mΩ	(See Table 7.3.1)	P
	The cells were tested until one of the following occurred:		--
	- 24 hours elapsed; or		N
	- The case temperature declined by 20% of the maximum temperature rise		P
	Results: No fire. No explosion:	(See Table 7.3.1)	P

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.2	**External short-circuit (battery)**	Tested 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		P
	A single fault in the discharge protection circuit is 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 (metal oxide semiconductor field-effect transistor), fuse, thermostat or positive temperature coefficient (PTC) thermistor	Single fault applies on MOSFET (U2).	P
	Results: no fire, no explosion..... :	(See appended table 7.3.2)	P
7.3.3	**Free fall**	Tested complied.	P
	Each fully charged cell or battery according to 8.1.1. is dropped three times from a height of 1000 ± 10mm onto a concrete floor. The cells or batteries are dropped so as to obtain impacts in random orientations.		P
	Exception: Not applicable to the batteries more than 7 kg and the batteries with special construction.		P
	Results: No fire. No explosion.	No fire. No explosion.	P
7.3.4	**Thermal abuse (cells)**	Tested complied.	P
	Charging procedure: 7.1.2		
	The oven temperature is raised at a rate of 5 °C/min ± 2 °C/min to a temperature of 130 °C ± 2 °C.		
	The cells were held at 130°C ± 2°C for: - 30 minutes		P
	Oven temperature (°C)..... :	130°C	--
	Results: No fire. No explosion.	No fire. No explosion.	P
7.3.5	**Crush (cells)**	Tested complied.	P
	Charging procedure: 7.1.2		P
	Cells are crushed between 2 flat plates.		P
	The crushing force was released upon: - The maximum force of 13 kN ± 0.78 kN has been applied; or		P

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Clause	Requirement + Test	Result - Remark	Verdict
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N
	A cylindrical or prismatic cell is crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus. Test only the wide side of prismatic cells. A coin cell shall be crushed by applying the force on its flat surface.		P
	Results: No fire. No explosion:	(See Table 7.3.5)	P
7.3.6	**Over-charging of battery**	Tested 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
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and	20.16V applied.	P
	- 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		N
	- Returned to ambient		P
	Results: no fire, no explosion:	(See appended table 7.3.6)	P
7.3.7	**Forced discharge (cells)**	Tested complied.	P
	Discharge a single cell to the lower limit discharge voltage specified by the cell manufacturer		P
	The discharged cell is then subjected to a forced discharge at 1 It A to the negative value of the upper limit charging voltage		P
	- 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
	- 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

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Clause	Requirement + Test	Result - Remark	Verdict
7.3.8.1	Vibration	Tested complied.	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	Tested 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	Forced internal short circuit (cells)	Tested complied.	P
	Charging procedure: 7.1.2:		--
	Press speed: 0.1 mm/sec		P
	The pressing was stopped upon:		P
	- A voltage drop of 50 mV has been detected; or		N
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached	800N	P
	Results: No fire:	(See Table 7.3.9)	P
8	**Information for safety**		P
8.1	**General**		P
	Manufacturers of secondary cells provides information about current, voltage and temperature limits of their products	Information is provided in manufacturer’s specifications.	P
	Manufacturers of batteries provides information regarding how to minimize and mitigate hazards to equipment manufacturers or end-users	Information is provided in manufacturer’s specifications.	P
	Systems analyses are performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N
	As appropriate, any information relating to hazard avoidance resulting from a system analysis is provided to the end user		N
8.2	**Small cell and battery safety information**	Not small cell and battery.	N
	The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them:		N
	- Keep small cells and batteries which are considered swallowable out of the reach of children		N
	- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion		N
	- In case of ingestion of a cell or battery, seek medical assistance promptly		N

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
9	**Marking**		
9.1	**Cell marking**	The final product is battery.	
	Cells are marked as specified in JIS C 8711, except coin cells		
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity		
	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		
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	Not coin batteries.	N
	Batteries are marked with an appropriate caution statement	Batteries marked with an appropriate caution statement.	P
	- Terminals have clear polarity marking on the external surface of the battery, or		P
	- 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**		N
	Coin cells and batteries identified as small batteries include a caution statement regarding the hazards of ingestion in accordance with 8.2	Not coin cells and batteries.	N
	Small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion is given on the immediate package		N
9.4	**Other information**		P
	The following information are marked on or supplied with the battery:	Information for storage and disposal instructions mentioned in manufacturer's specifications.	P
	- Storage and disposal instructions		P
	- Recommended charging instructions		P
10	**Packaging**		N
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3	Not coin cells.	N

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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.		P

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX A	**CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE**		P
A.1	**General**		--
A.2	**Safety of lithium ion secondary battery**	Complied.	P
A.3	**Consideration on charging voltage**	Complied.	P
A.3.1	General		--
A.3.2	Upper limit charging voltage	4.2V	P
A.3.2.1	General		--
A.3.2.2	Explanation of safety viewpoint		N
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied	4.2V	N
A.4	**Consideration of temperature and charging current**		P
A.4.1	General		P
A.4.2	Recommended temperature range	See A.4.2.2.	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: 0~45°C.	P
A.4.3	High temperature range	Not higher than the temperature range specific in this standard.	N
A.4.4	Low temperature range	Charging low temperature declared by client 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 the low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	No documents provided by client explaining reason of 0°C as low temperature limit, -5°C used to meet the requirement.	P
A.4.5	Scope of the application of charging current		P
A.4.5.A	Model acceptance decision		P
A.4.6	Consideration of discharge		P
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**		--

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
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.5.5.1	Insertion of nickel particle in winding core		P
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator		P
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**		N
ANNEX C	**RECOMMENDATIONS TO THE END-USERS**		N
ANNEX D	**MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS**		N
D.1	General	Not coin cells.	N
D.2	Method		N
	A sample size of three coin cells is required for this measurement		N

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
	Coin cells with an internal resistance greater than 3 Ω require no further testing:	(See appended table D.2)	N
	Coin cells with an internal resistance less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1		N
ANNEX E	**PACKAGING AND TRANSPORT**		N
ANNEX F	**COMPONENT STANDARDS REFERENCES**		N

Appended table

TABLE 1: List of Critical Components					**P**
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity [1)]
Enclosure	Formosa Chemicals & Fibre Corp Plastics Div	AC310(+)	PC, V-0, 125°C, Min. thickness:1.5mm	UL 94 UL 746	UL E121562
Cell	ShantouShi Yaohui New Energy Co., LTD	DHD-18650-	3.7VDC, 1500mAh	IEC 62133-2	Tested with appliance
Cell	Jiangxi Ruitongxin Energy Developme nt Co.LTD	DHD-18650-	3.7VDC, 1500mAh	IEC 62133-2	Tested with appliance
- Separator	Wuhan Huiqiang new energy material technology Co., LTD.	20μm	PP, 20μm, Shutdown temperature: 130°C	--	--
PCB	Guangdong Overflow Sheng Technolog Co.,Ltd	0.6*3.5*16m m	130ºC	UL 94	UL
MOSFET (U1)	XINFEIHONG ELECTRONICS CO., LTD	8205	V_{DS}: 20V, V_{GS}: ±18V, I_D: 7A, T_{stg}: -55°C to +150°C	IEC 62133-2	Tested with appliance
Protection IC (U2)	HYCON Technology Corporation	DW01	Overcharge Protection Voltage: 4.30V±0.05V, Overdischarge Protection Voltage: 2.4V±0.1V, T_{opr}: -40°C to +85°C	IEC 62133-2	Tested with appliance
Supplementary information: **[1)] Provided evidence ensures the agreed level of compliance.**					

Appended table

7.2.1	TABLE: Continuous charge (cells)			P
Sample No.	**Charging voltage Vc, (Vdc)**	**Charging current I, (mA)**	**OCV at start of test, (Vdc)**	**Results**
Cell 1#	4.21	2500	4.18	P
Cell 2#	4.21	2500	4.19	P
Cell 3#	4.21	2500	4.19	P
Cell 4#	4.21	2500	4.20	P
Cell 5#	4.21	2500	4.19	P
Supplementary information: - No fire or explosion - No leakage				

7.3.1	TABLE: External short circuit (cell)				P
Sample No.	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (mΩ)**	**Maximum case temperature ~~rise~~ ΔT, (°C)**	**Results**
Samples charged at charging temperature upper limit (45°C)					
Cell 11#	55.6	4.18	85	98.1	P
Cell 12#	55.6	4.17	86	98.5	P
Cell 13#	55.6	4.19	89	98.7	P
Cell 14#	55.6	4.18	89	99.1	P
Cell 15#	55.6	4.16	79	98.2	P
Samples charged at charging temperature lower limit (-5°C)					
Cell 16#	55.5	4.11	79	96.6	P
Cell 17#	55.5	4.10	80	99.1	P
Cell 18#	55.5	4.12	85	98.2	P
Cell 19#	55.5	4.11	84	99.2	P
Cell 20#	55.5	4.13	79	98.0	P
Supplementary information: - No fire or explosion					

Appended table

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 ~~rise~~ ΔT (°C)	Component single fault condition	Results
Battery 9#	23.6	12.36	84	95.1	MOSFET (U1) Short Circuit	P
Battery 10#	23.6	12.35	76	94.7	MOSFET (U1) Short Circuit	P
Battery 11#	23.6	12.37	85	96.3	MOSFET (U1) Short Circuit	P
Battery 12#	23.6	12.35	85	96.2	MOSFET (U1) Short Circuit	P
Battery 13#	23.6	12.40	86	24.6	--	P

Supplementary information:
- No fire or explosion

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)				
Cell 34#	4.18	4.18	13	P
Cell 35#	4.17	4.17	13	P
Cell 36#	4.18	4.17	13	P
Cell 37#	4.18	4.17	13	P
Cell 38#	4.16	4.16	13	P
Samples charged at charging temperature lower limit (-5°C)				
Cell 39#	4.13	4.13	13	P
Cell 40#	4.14	4.14	13	P
Cell 41#	4.12	4.12	13	P
Cell 42#	4.13	4.13	13	P
Cell 43#	4.13	4.13	13	P

Supplementary information:
- No fire or explosion

Appended table

7.3.6	TABLE: Over-charging of battery	P
Constant charging current (A).....:	5A	—
Supply voltage (Vdc).....:	20.16V	—

Sample No.	OCV before charging, (Vdc)	Total charging time (minute)	Maximum outer casing temperature, (°C)	Results
Battery 17#	9.18	144	38.2	P
Battery 18#	9.22	144	38.1	P
Battery 19#	9.19	144	37.2	P
Battery 20#	9.20	144	37.6	P
Battery 21#	9.18	144	35.4	P

Supplementary information:
- No fire or explosion

7.3.7	TABLE: Forced discharge (cells)	P

Sample No.	OCV before application of reverse charge (Vdc)	Measured reverse charge I_t (A)	Lower limit discharge voltage (Vdc)	Results
Cell 44#	3.05	2.5	3.0	P
Cell 45#	3.06	2.5	3.0	P
Cell 46#	3.04	2.5	3.0	P
Cell 47#	3.06	2.5	3.0	P
Cell 48#	3.07	2.5	3.0	P

Supplementary information:
- No fire or explosion

Appended table

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**
Battery 22#	12.38	12.37	448.489	448.480	P
Battery 23#	12.38	12.37	448.501	448.496	P
Battery 24#	12.37	12.36	448.834	448.826	P
Battery 25#	12.37	12.37	448.918	448.911	P
Battery 26#	12.37	12.36	448.762	448.758	P
Supplementary information: No fire, no explosion, no rupture, no leakage or venting.					

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**
Battery 27#	12.38	12.37	448.515	448.510	P
Battery 28#	12.38	12.37	448.563	448.558	P
Battery 29#	12.37	12.37	448.840	448.835	P
Battery 30#	12.37	12.36	448.917	448.913	P
Battery 31#	12.37	12.36	448.820	448.810	P
Supplementary information: No fire, no explosion, no rupture, no leakage or venting.					

Appended table

7.3.9	TABLE: Forced internal short circuit (cells)				P
Sample No.	**Chamber ambient, (°C)**	**OCV at start of test, (Vdc)**	**Particle location 1)**	**Maximum applied pressure, (N)**	**Results**
Cell #62	45	4.18	1	800	P
Cell #63	45	4.16	1	800	P
Cell #64	45	4.19	1	800	P
Cell #65	45	4.16	1	800	P
Cell #66	45	4.18	1	800	P
Cell #67	45	4.19	1	800	P
Cell #68	45	4.18	1	800	P
Cell #69	45	4.17	1	800	P
Cell #70	45	4.20	1*	800	P
Cell #71	45	4.18	1*	800	P
Cell #72	-5	4.19	1	800	P
Cell #73	-5	4.17	1	800	P
Cell #74	-5	4.17	1	800	P
Cell #75	-5	4.16	1	800	P
Cell #76	-5	4.18	1	800	P
Cell #77	-5	4.19	1	800	P
Cell #78	-5	4.16	1	800	P
Cell #79	-5	4.18	1	800	P
Cell #80	-5	4.17	1*	800	P
Cell #81	-5	4.19	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

*Remark: No position 2.

Appended table

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

Supplementary information:

[1)] Coin cells with an internal resistance less than or equal to 3 Ω, see test result on corresponding tables according to Clause 6 and Table 1.

Product Photos

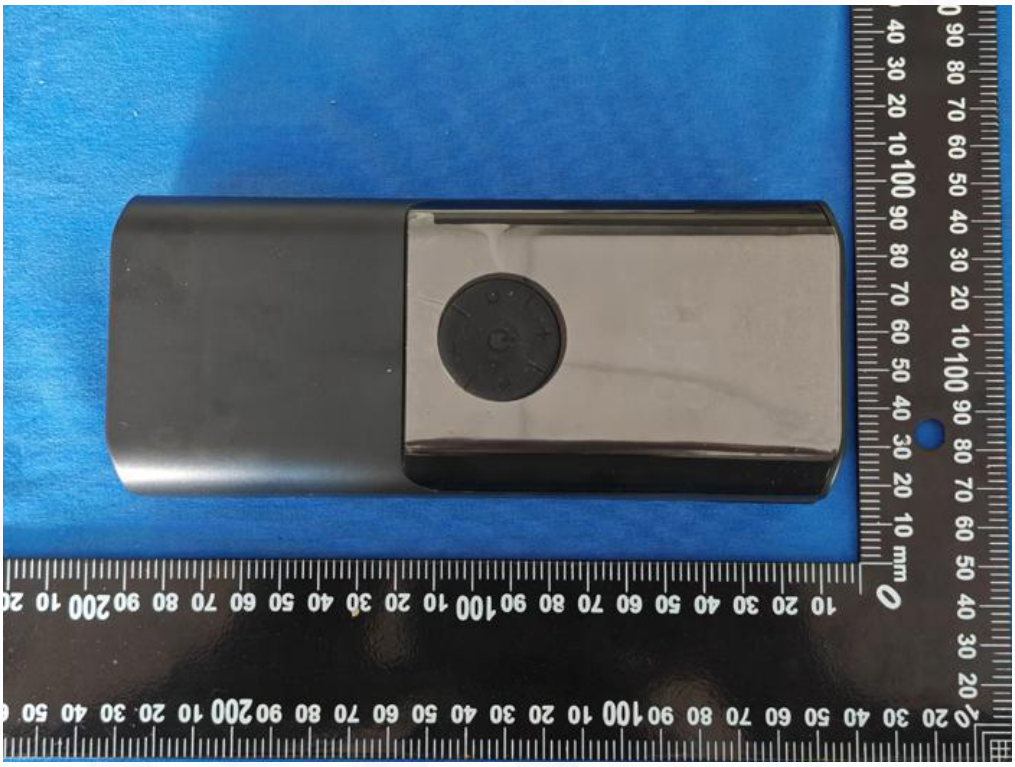

Fig. 1

Fig. 2

Product Photos

Fig. 3

Fig. 4

Product Photos

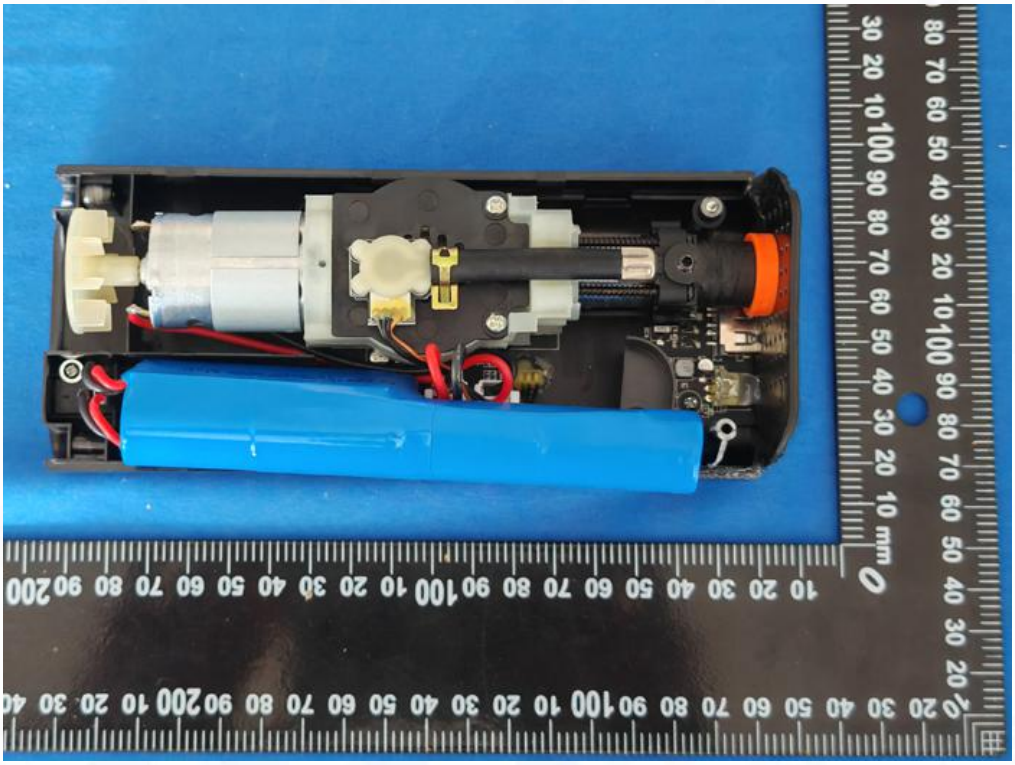

Fig. 5

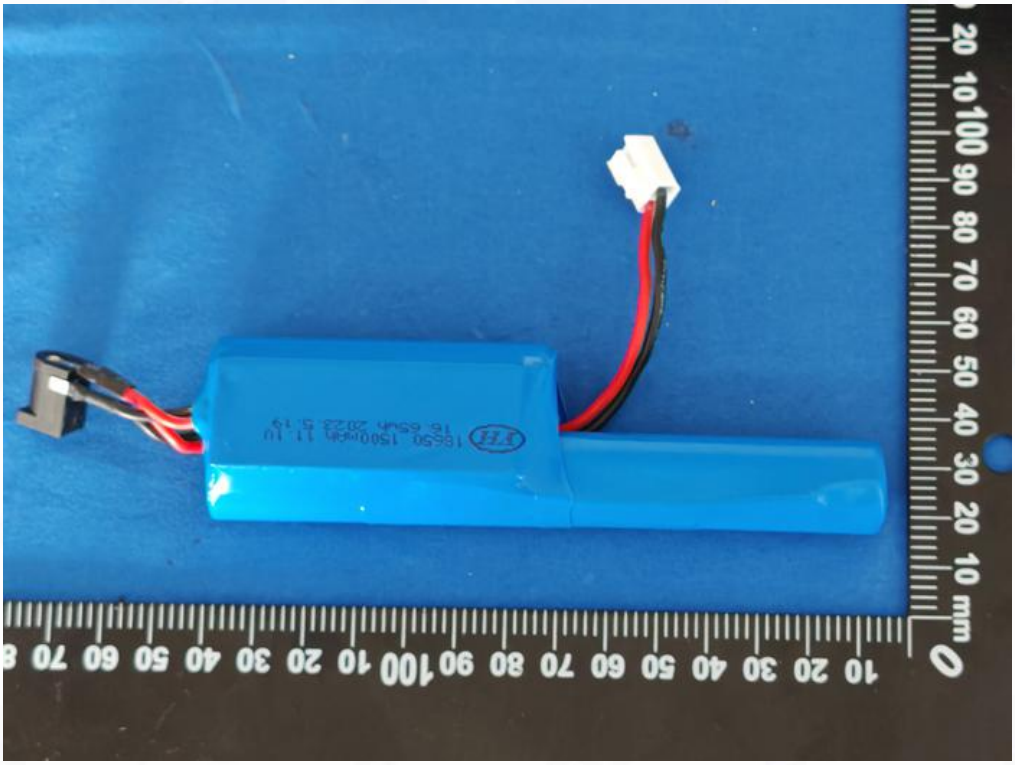

Fig. 6

Product Photos

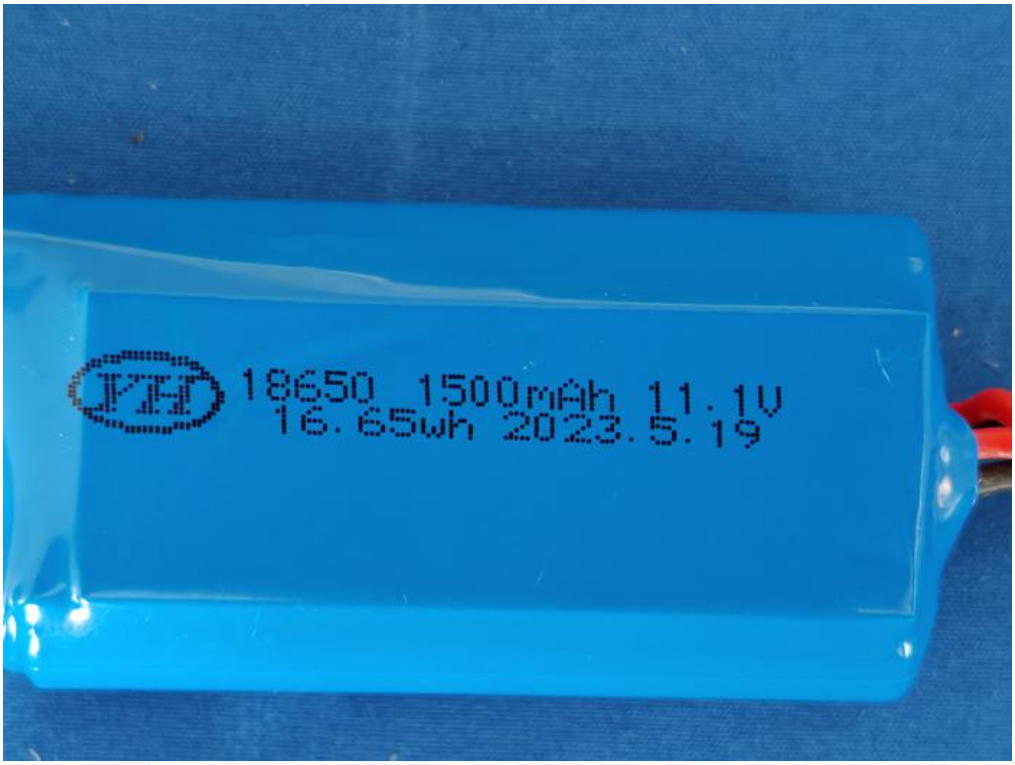

Fig. 7

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