Test Report issued under the responsibility of:

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..... :	211013023SZN-001
Date of issue ..... :	November 26, 2021
Total number of pages ..... :	See page 3 for details
Name of Testing Laboratory preparing the Report ..... :	Intertek Testing Services Shenzhen Ltd. Longhua Branch
Applicant's name ..... :	KHADAS TECHNOLOGY CO., LTD.
Address..... :	D#2101A, Caifugang Building, Baoyuan Road, Xixiang Street, Bao'an District Shenzhen City, China
Test specification:	
Standard ..... :	IEC 62133-2:2017
Test procedure..... :	CB Scheme
Non-standard test method..... :	N/A
Test Report Form No. ..... :	IEC62133_2A
Test Report Form(s) Originator.... :	DEKRA
Master TRF ..... :	Dated 2017-08-10

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..... :	Lithium-ion Polymer Rechargeable Battery
Trade Mark..... :	KHADAS
Manufacturer ..... :	GUANGDONG ZHAONENG TECHNOLOGY CO.,LTD No.8, Nanda Road, Jinsha Chengnan Industrial Zone, Danzao, Nanhai District, Foshan City, Guangdong, P.R.China
Model/Type reference..... :	ZN-285565
Ratings..... :	3.8V, 1160mAh, 4.41Wh

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

☒	**CB Testing Laboratory:**	Intertek Testing Services Shenzhen Ltd. Longhua Branch	
Testing location/ address ..... :		101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China	
Tested by (name, function, signature)..... :		Terrance Yang / Engineer	Terrance Yang
Approved by (name, function, signature) .. :		Jason Zhu/ Reviewer	Jason 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):

- Pages 1 to 22 for IEC 62133-2 TRF (main report)
- Appendix 1 (1 page): Circuit diagram and PCB layout
- Appendix 2 (3 pages): Product photos
- Appendix 3 (3 pages): NATIONAL DIFFERENCES

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
7.1 Charging procedure for test purposes; 7.2.1 Continuous charging at constant voltage (cells); 7.2.2 Case stress at high ambient temperature (battery) 7.3.1 External short circuit (cell); 7.3.2 External short circuit (battery); 7.3.3 Free fall; 7.3.4 Thermal abuse (cells); 7.3.5 Crush (cells); 7.3.6 Over-charging of battery; 7.3.7 Forced discharge (cells); 7.3.8.1 Vibration 7.3.8.2 Mechanical shock	Intertek Testing Services Shenzhen Ltd. Longhua Branch 101, 201, Building B, No. 308 Wuhe Avenue, Zhangkengjing Community, GuanHu Subdistrict, LongHua District, Shenzhen, P.R. China

Summary of compliance with National Differences:

Republic of Korea

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

XXXX株式会社: Here represents the Japanese Notifying Supplier.

Remark:

Code of YYMMDD:

YY: Year, MM: Month, DD: Day.

Test item particulars..... :	
Classification of installation and use..... :	To be defined in final product
Supply Connection..... :	DC Connector
Recommend charging method declared by the manufacturer..... :	Charge at constant current 232mA until the voltage reaches 4.35V, then charge at 4.35V till charge current is 11.6mA.
Discharge current (0,2 It A) ..... :	232mA
Specified final voltage..... :	3.0V
Upper limit charging voltage per cell..... :	4.35V
Maximum charging current..... :	580mA
Charging temperature upper limit..... :	45°C
Charging temperature lower limit..... :	10°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 ..... :	Nov. 03, 2021
Date (s) of performance of tests..... :	Nov. 03, 2021 to Nov. 12, 2021

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.
Througho4ut this report a ☐ comma / ☒ point is used as the decimal separator.

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

The clause which indicated with * is the subcontract test item. (if there is subcontracting test).

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:

The product covered by this report is Li-ion Battery consists of 1 cell in 1S1P which tested with appliance as per IEC 62133-2:2017 in the report.

Product	Cell	Battery
Recommend charging voltage	4.35V	4.35V
Recommend charging current	232mA	232mA
Max. charging current	580mA	580mA
Recommend discharging voltage	3.0V	3.0V
Recommend discharging current	232mA	232mA
Operation Charge Temperature	10°C ~ 45°C	10°C ~ 45°C

IEC 62133-2			
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 externally exposed metal surfaces.	N/A
	Insulation resistance (MΩ) ..... :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate clearance and creepage distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		P
5.3	**Venting**		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition	Venting mechanism exists on the side of the 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/A
5.4	**Temperature, voltage and current management**	See below	P
	Batteries are designed such that abnormal temperature rise conditions are prevented		P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		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	Specification provided.	P
5.5	**Terminal contacts**		P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	Complied. DC connector used.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		P
	Terminal contacts are arranged to minimize the risk of short-circuit		P
5.6	**Assembly of cells into batteries**		P
5.6.1	General		P
	Each battery have an independent control and protection for current, voltage, temperature and any other parameter required for safety and to maintain the cells within their operating region	Protective circuit equipped on the battery.	P
	This protection may be provided external to the battery such as within the charger or the end devices		N/A
	If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation		N/A
	If there is more than one battery housed in a single battery case, each battery have protective circuitry that can maintain the cells within their operating regions		N/A
	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/A
	Protective circuit components added as appropriate and consideration given to the end-device application		P
	The manufacturer of the battery provide a safety analysis of the battery safety circuitry with a test report including a fault analysis of the protection circuit under both charging and discharging conditions confirming the compliance		N/A
5.6.2	Design recommendation		P
	For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2	Single cell battery, charging voltage 4.35V, not exceed 4.35V specified in Table 2.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks		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		P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system		N/A
5.6.3	Mechanical protection for cells and components of batteries		P
	Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse		P
	The mechanical protection can be provided by the battery case or it can be provided by the end product enclosure for those batteries intended for building into an end product	Build-in batteries, mechanical protection for cells should be provided by end product.	N/A
	The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer		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

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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	ISO 9001: 2015 provided.	P
5.8	**Battery safety components**		N/A
	According annex F		N/A
6	**TYPE TEST AND SAMPLE SIZE**		P
	Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old	Tests are performed according to specified in Table 1 of this standard. The samples are not more than six months old.	P
	Coin cells with resistance ≤ 3 Ω (measured according annex D) are tested according table 1	Not coin cell.	N/A
	Unless otherwise specified, tests are carried out in an ambient temperature of 20 °C ± 5 °C		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		N/A
	When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test		P
7	**SPECIFIC REQUIREMENTS AND TESTS**		P
7.1	**Charging procedure for test purposes**		P
7.1.1	First procedure		P
	This charging procedure applies to subclauses other than those specified in 7.1.2		P
	Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of 20 °C ± 5 °C, using the method declared by the manufacturer		P
	Prior to charging, the battery have been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage		P
7.1.2	Second procedure		P
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		P

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Clause	Requirement + Test	Result - Remark	Verdict
	After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method	Charging temperature specified by client is 10-45°C, 45°C and 10°C were used as highest test temperature and lowest test temperature during tests.	P
7.2	**Intended use**		P
7.2.1	Continuous charging at constant voltage (cells)	Test complied.	P
	Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer		P
	Results: No fire. No explosion. No leakage.....:	(See appended table 7.2.1)	P
7.2.2	Case stress at high ambient temperature (battery)	Tested as client requested.	P
	Oven temperature (°C).....:	70	—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells	No physical distortion of the battery case.	P
7.3	**Reasonably foreseeable misuse**		P
7.3.1	External short-circuit (cell)	Test complied.	P
	The cells were tested until one of the following occurred:		P
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20 % of the maximum temperature rise		P
	Results: No fire. No explosion.....:	(See appended table7.3.1)	P
7.3.2	External short-circuit (battery)	Test complied.	P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		N/A
	- 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 conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test	Single failure conducted on 3 samples.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor	Single fault on short MOSFET.	P
	Results: No fire. No explosion.....:	(See appended table7.3.2)	P
7.3.3	Free fall	Test complied.	P
	Results: No fire. No explosion		P
7.3.4	Thermal abuse (cells)	Test complied.	P
	Oven temperature (°C).....:	130	—
	Results: No fire. No explosion		P
7.3.5	Crush (cells)	Test complied.	P
	The crushing force was released upon:		P
	- The maximum force of 13 kN ± 0,78 kN has been applied; or		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	Test complied.	P
	The supply voltage which is:		P
	- 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or	6V used for test.	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		N/A
	- Returned to ambient		P
	Results: No fire. No explosion.....:	(See appended table7.3.6)	P
7.3.7	Forced discharge (cells)	Test complied.	P
	If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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	Test complied.	P
	Results: No fire, no explosion, no rupture, no leakage or venting. ..... :	(See appended table 7.8.1)	P
7.3.8.2	Mechanical shock	Test complied.	P
	Results: No leakage, no venting, no rupture, no explosion and no fire ..... :	(See appended table 7.8.2)	P
7.3.9	Design evaluation – Forced internal short-circuit (cells)		N/A
	The cells complied with national requirement for .....:		—
	The pressing was stopped upon:		N/A
	- 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		N/A
	Results: No fire ..... :	(See appended table 7.3.9)	N/A
8	**INFORMATION FOR SAFETY**		P
8.1	**General**		P
	Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products	Information for safety mentioned in manufacturer's specifications.	P
	Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards	Information for safety mentioned in manufacturer's specifications.	P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N/A
	As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user		N/A
	Do not allow children to replace batteries without adult supervision		N/A
8.2	**Small cell and battery safety information**		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them:	Not small battery	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**	The final product is battery.	N/A
	Cells marked as specified in IEC 61960, except coin cells		N/A
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity		N/A
	By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked		N/A
9.2	**Battery marking**		P
	Batteries marked as specified in IEC 61960, except for coin batteries	The battery is marked in according with IEC61960.	P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement	Not coin battery.	N/A
	Terminals have clear polarity marking on the external surface of the battery	Polarity marked on the connector.	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	DC connector used and prevents reverse polarity connections	P
9.3	**Caution for ingestion of small cells and batteries**	Not small battery.	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 is given in manufacturer's specifications.	P
	Recommended charging instructions	Information is given in manufacturer's specifications.	P
10	**PACKAGING AND TRANSPORT**		P
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3	Not coin cells	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	4.35V	P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		N/A
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied	4.35V 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	Charing temperature range declared by client is 10~45°C	N/A
A.4.3	High temperature range	Charging high temperature declared by client is: 45°C.	P
A.4.3.1	General		P
A.4.3.2	Explanation of safety viewpoint		P

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.3.3	Safety considerations when specifying charging conditions in the high temperature range		P
A.4.3.4	Safety considerations when specifying a new upper limit in the high temperature range	45°C applied.	N/A
A.4.4	Low temperature range	Charging low temperature declared by client is: 10°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	10°C applied.	N/A
A.4.5	Scope of the application of charging current		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	Cell specified final voltage 3.0V, not exceed 3.0V specified by cell manufacturer.	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**		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

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Clause	Requirement + Test	Result - Remark	Verdict
A.6.7	Caution when disassembling a cell		N/A
A.6.8	Protective equipment for safety		N/A
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**	Not coin cells	N/A
D.2	**Method**		N/A
	A sample size of three coin cells is required for this measurement..... :		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**

	TABLE: Critical components information				P
Object / part No.	**Manufacturer / trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
PCB	XIAMEN G&P ELECTRONICS CO., LTD	2C	V-0, 130°C	UL 796 UL 94	UL E230743
PCB (Alt.)	Interchangeable	Interchangeable	V-0, 130°C	UL 94 UL 796	UL approved
IC (U1)	HYCON Technology Corp.	3OBH0A	Over-charge Threshold Voltage: 4.40V±0.025V@Topt=25°C; Over-discharge Threshold Voltage: 2.80V±0.05V; Topt: -40°C ~ 85°C	--	Tested with appliance
MOSFET (Q1)	SHENZHEN TUOFENG SEMICONDUCTOR TECHNOLOGY CO., LTD	2009 TFX80C	V_{DS}:20V, V_{GS}: ±12V I_D(at Ta=25°C): 9A T_{STG}: -55°C ~ 150°C	--	Tested with appliance
DC Connector	JAPAN AVIATION ELECTRONICS INDUSTRY., LTD	WP10-P004VA	Number of Positions: 4 pos. (Signal terminal, +4 Power terminals); Rated Current: 0.4 A (Signal)/ 5.0 A (Power); Rated Voltage: AC, DC 50 V; Operating Temperature Range: -40 deg. C to +85 deg. C	--	Tested with appliance
NTC	Shenzhen Sunlord Electronics Co., Ltd.	SDNT1005 Series	Resistance at 25°C (K ohm): 10K, Tmoa (°C): 125°C	--	Tested with appliance
Cell	GUANGDONG ZHAONENG TECHNOLOGY CO., LTD.	ZN-285565	3.8V, 1160mAh, 4.41Wh	IEC 62133-2: 2017	Tested with appliance
- Electrolyte	Anhui Xingli New Energy Co., Ltd.	ZN-82	$LiPF_6$+EC+DEC	--	--
- Separator	ShenZhen Xuran Electronic Co., Ltd.	60.0mm*14um	PE+AL_2O_3, Shutdown temperature: 135~140°C	--	--
-Negative electrode	Long Time Technology Co., Ltd.	16HY	Graphite, CMC, SBR, Distilled Water, Conductive Additive	--	--
-Positive electrode	Jiangmen KanHoo Industry Co., Ltd.	LCO-4	$LiCoO_2$, Carbon black, NMP, PVDF, Conductive Additive	--	--
Supplementary information: [1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

7.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Sample no.	**Recommended charging voltage Vc (Vdc)**	**Recommended charging current I_{rec} (A)**	**OCV before test (Vdc)**	**Results**
C001	4.35	0.232	4.35	P
C002	4.35	0.232	4.35	P
C003	4.35	0.232	4.35	P
C004	4.35	0.232	4.35	P
C005	4.35	0.232	4.35	P

Supplementary information:
- No fire or explosion
- No leakage
- The ambient temperature is 22.5°C

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 ~~rise ΔT~~ (°C)**	**Results**
Samples charged at charging temperature upper limit[1)]					
C006	57.9	4.30	85	108.1	P
C007	57.9	4.30	84	113.4	P
C008	57.9	4.30	82	107.2	P
C009	57.9	4.31	84	108.5	P
C010	57.9	4.30	83	109.3	P
Samples charged at charging temperature lower limit[2)]					
C011	58.1	4.27	84	111.8	P
C012	58.1	4.28	83	114.7	P
C013	58.1	4.27	84	107.2	P
C014	58.1	4.27	84	101.6	P
C015	58.1	4.28	82	103.7	P

Supplementary information:
- No fire or explosion
1) Cells charged at 45°C
2) Cells charged at 10°C

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**
B004	22.3	4.34	84	105.8	MOSFET (Q1 pin2-pin5) S-C	P
B005	22.3	4.33	83	99.8	MOSFET (Q1 pin2-pin5) S-C	P
B006	22.3	4.34	84	100.3	MOSFET (Q1 pin2-pin5) S-C	P
B007	22.3	4.34	84	23.2	--	P
B008	22.3	4.33	83	23.2	--	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[1)]				
C029	4.30	4.30	13.43	P
C030	4.30	4.30	13.47	P
C031	4.30	4.30	13.46	P
C032	4.31	4.31	13.45	P
C033	4.30	4.30	13.51	P
Samples charged at charging temperature lower limit[2)]				
C034	4.28	4.28	13.45	P
C035	4.27	4.27	13.44	P
C036	4.28	4.28	13.57	P
C037	4.28	4.28	13.46	P
C038	4.27	4.27	13.49	P
Supplementary information: - No fire or explosion 1) Cells charged at 45°C 2) Cells charged at 10°C				

7.3.6	TABLE: Over-charging of battery				P
Constant charging current (A) .....:		2.32			—
Supply voltage (Vdc) .....:		6			—
Sample no.	**OCV before charging (Vdc)**	**Total charging time (minute)**	**Maximum outer case temperature (°C)**	**Results**	
B012	3.40	60	34.3	P	
B013	3.40	60	35.3	P	
B014	3.40	60	34.9	P	
B015	3.41	60	34.9	P	
B016	3.41	60	33.4	P	
Supplementary information: - No fire or explosion					

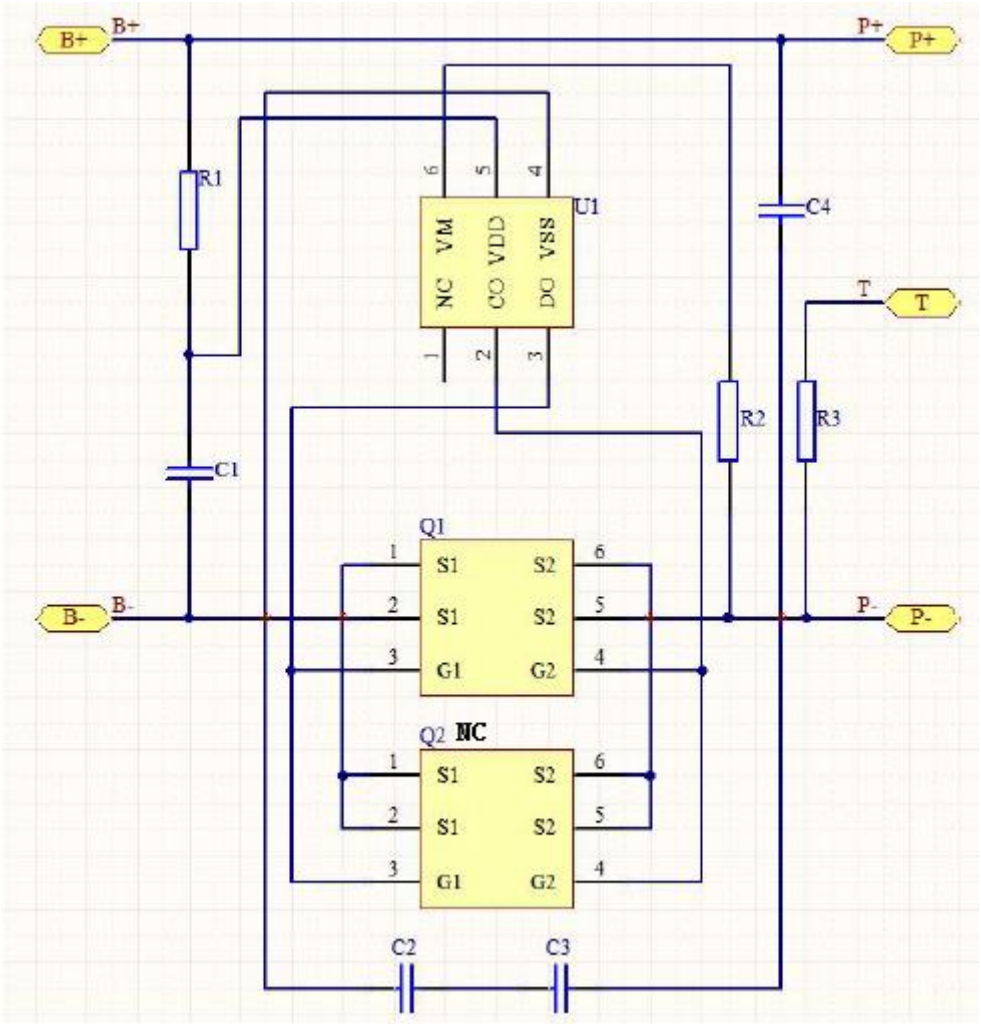
7.3.7	TABLE: Forced discharge (cells)			P
Sample no.	**OCV before application of reverse charge (Vdc)**	**Measured reverse charge I_t (A)**	**Lower limit discharge voltage (Vdc)**	**Results**
C039	3.43	1.16	3.0	P
C040	3.43	1.16	3.0	P
C041	3.42	1.16	3.0	P
C042	3.42	1.16	3.0	P
C043	3.42	1.16	3.0	P
Supplementary information: - No fire or explosion - The ambient temperature is 23.2°C				

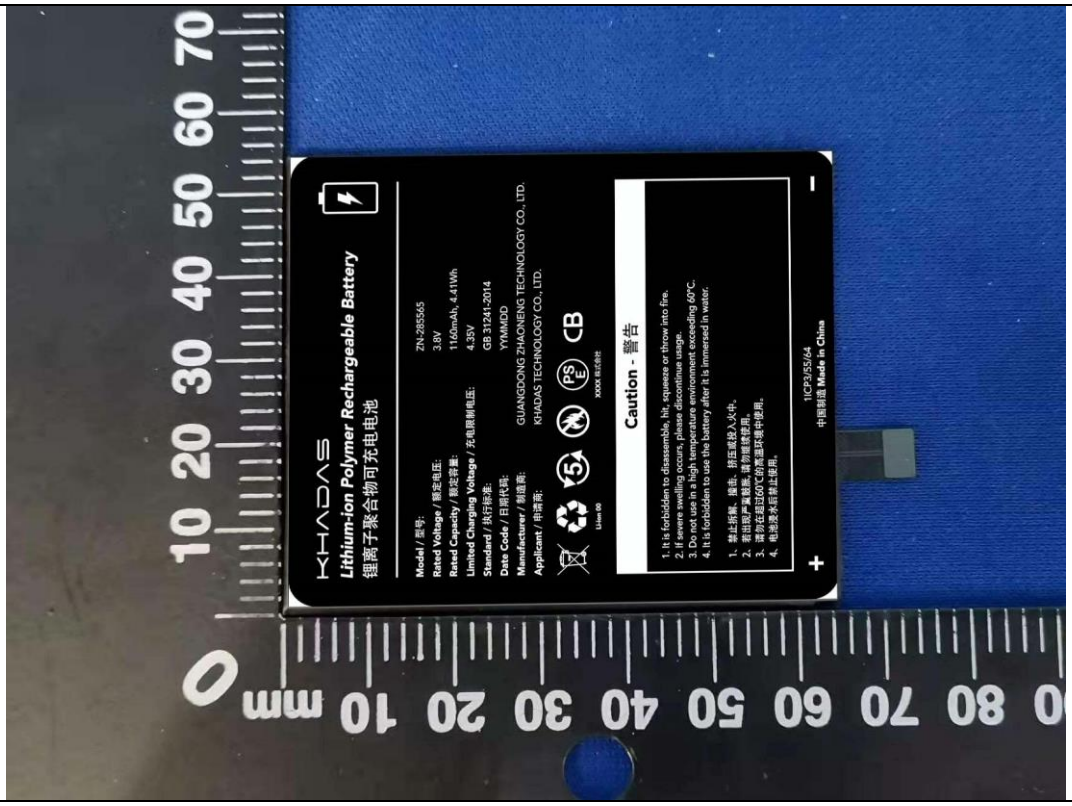
7.3.8.1	TABLE: Vibration				P
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test (g)**	**Results**
B017	4.34	4.34	20.993	20.992	P
B018	4.34	4.33	20.762	20.761	P
B019	4.33	4.33	20.958	20.958	P
Supplementary information: **-** No fire, no explosion, no rupture, no leakage or venting - The ambient temperature is 23.1°C					

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**
B020	4.34	4.34	20.797	20.796	P
B021	4.34	4.34	20.765	20.765	P
B022	4.33	4.33	20.650	20.649	P
Supplementary information: **-** No fire, no explosion, no rupture, no leakage or venting - The ambient temperature is 23.1°C					

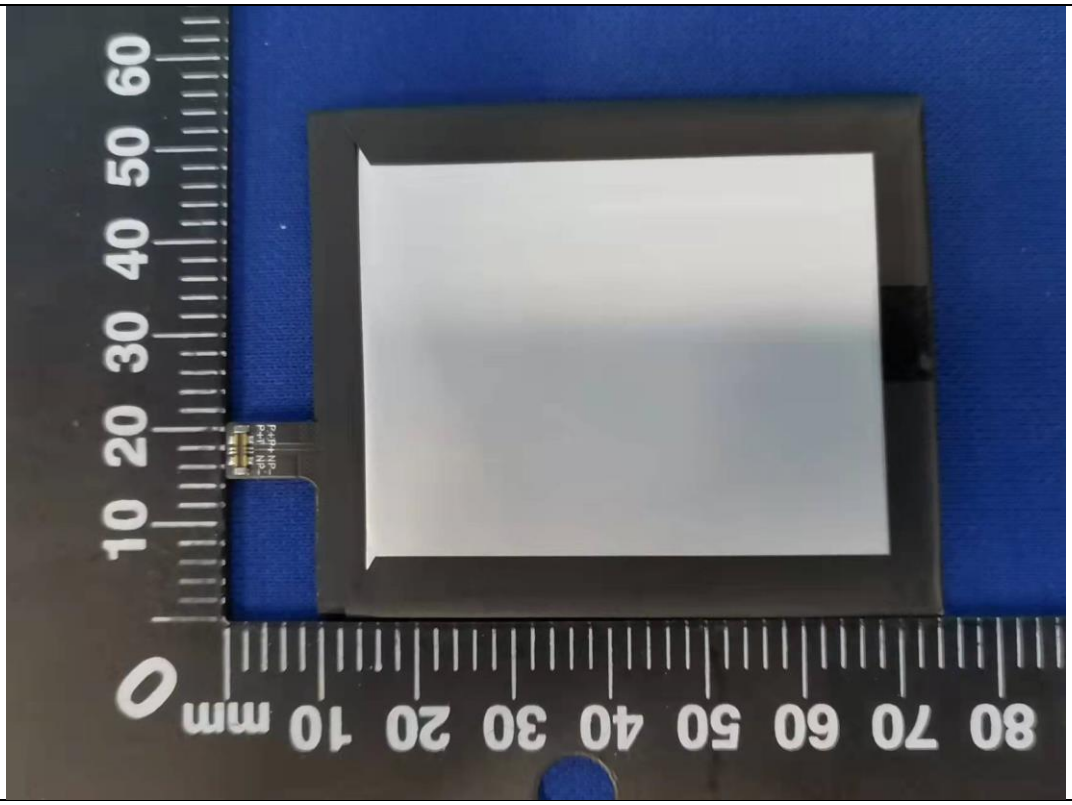
7.3.9	TABLE: Forced internal short circuit (cells)				N/A
Sample no.	**Chamber ambient T (°C)**	**OCV before test (Vdc)**	**Particle location [1)]**	**Maximum applied pressure (N)**	**Results**
Samples charged at charging temperature upper limit[1)]					
Samples charged at charging temperature lower limit[2)]					
Supplementary information:					

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:				

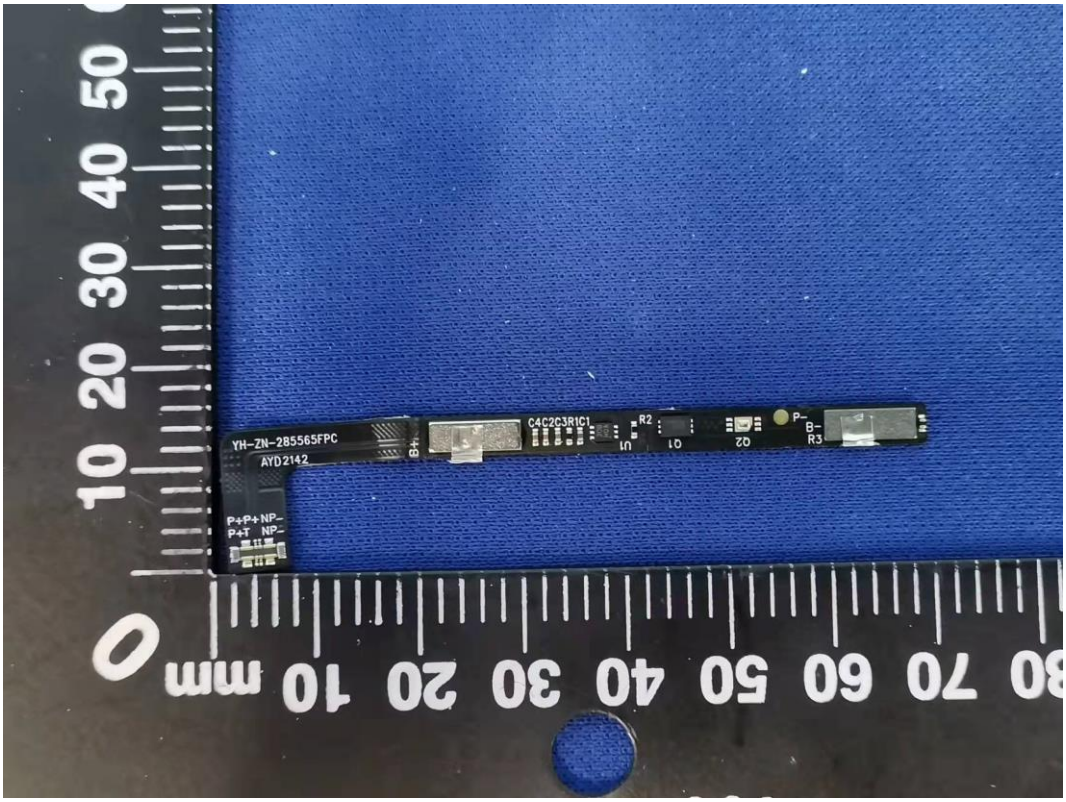

B+
B+
P+
P+
R1
U1
NC VM CO VDD DO VSS
C4
T
T
R2
R3
C1
Q1
S1 S2
S1 S2
G1 G2
B-
B-
P-
P-
Q2 NC
S1 S2
S1 S2
G1 G2
C2
C3



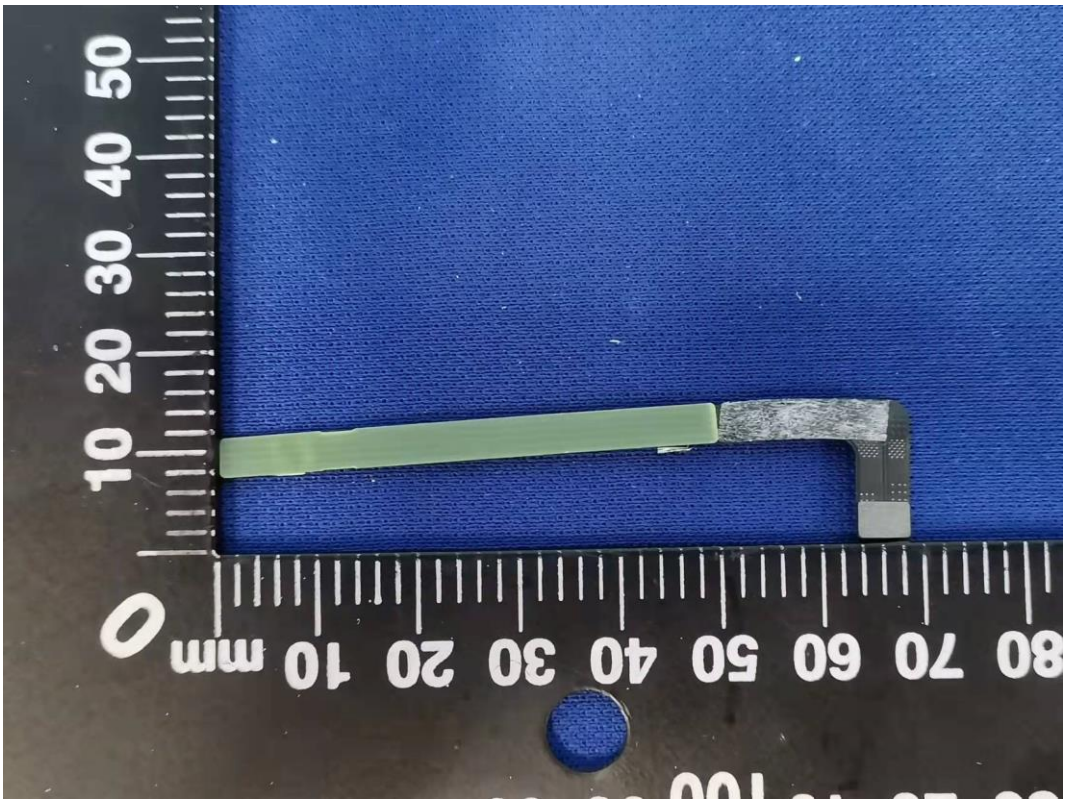
Front view of Battery



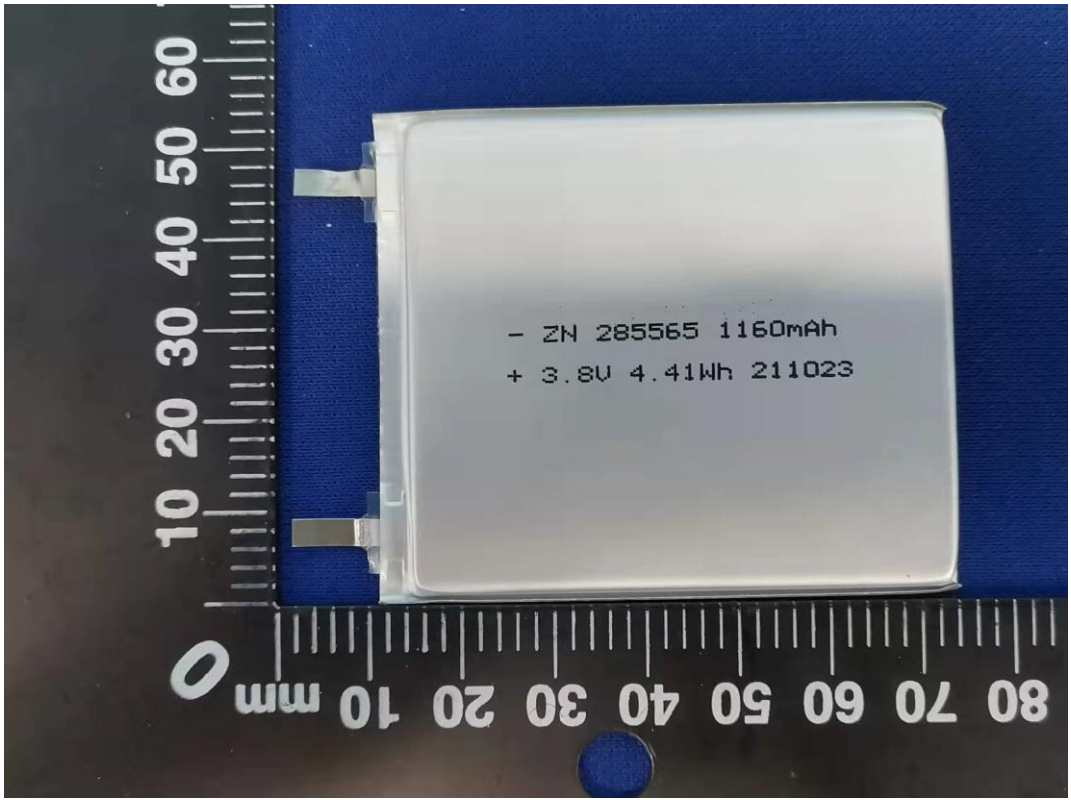
Back view of Battery



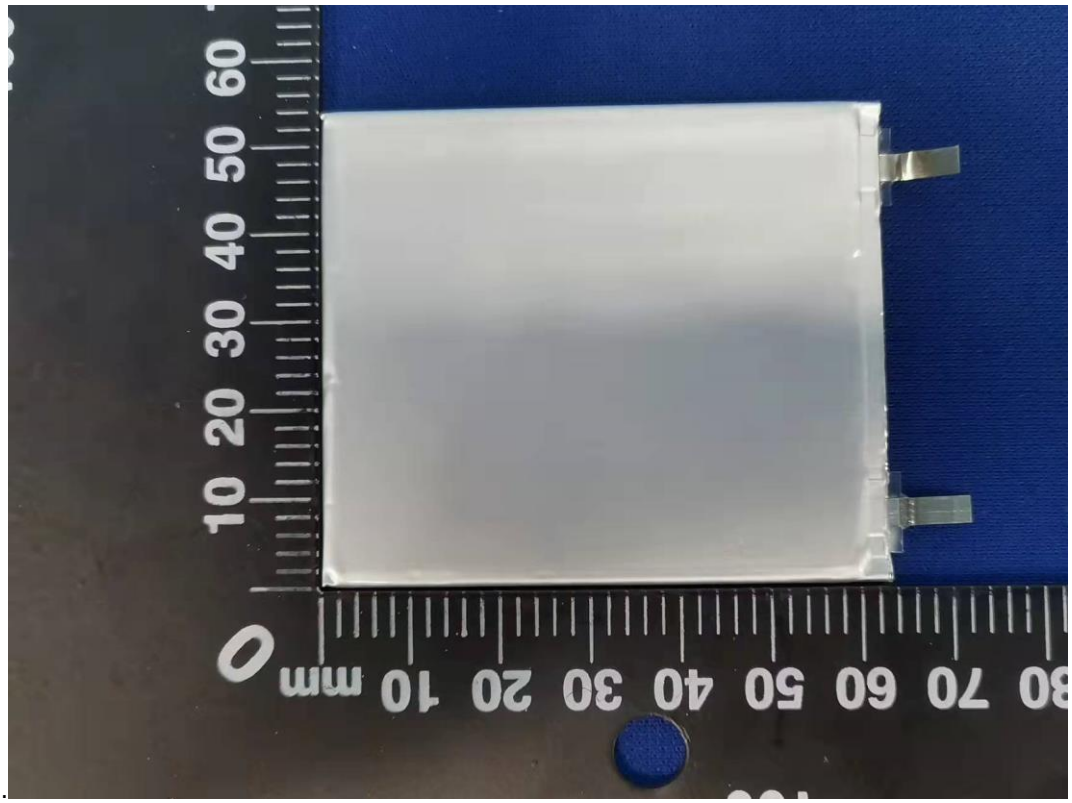
Front view of PCM



Back view of PCM



Front view of cell



Back view of cell

IEC62133_2A - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT

IEC 62133-2

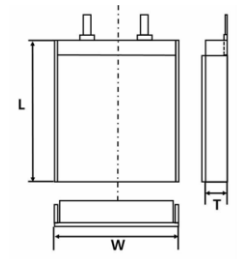
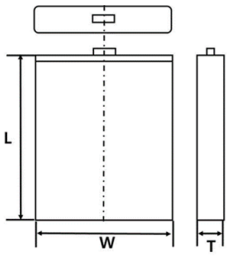
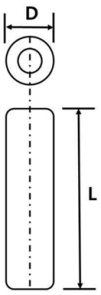
(Republic of Korea) NATIONAL DIFFERENCES

(Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems)

Differences according to ..... :	National standard KC62133-2(2020-07)
TRF template used: ..... :	IECEE OD-2020-F3, Ed. 1.1
Attachment Form No. ..... :	KR_ND_IEC62133_2A
Attachment Originator ..... :	KTR
Master Attachment..... :	Dated 2020-09-25

	National Differences		N/A
7.3.6	**Over-charging of battery**		N/A
(Revision)	***[Add the bolded text]*** b) Test The test shall be carried out in an ambient temperature of 20 °C ± 5 °C. Each test battery shall be discharged at a constant current of 0,2 It A, to a final discharge voltage specified by the manufacturer. Sample batteries shall then be charged at a constant current of 2,0 It A, using a supply voltage which is: • 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 • 1,2 times the upper limit charging voltage presented in Table A.1 per cell for series connected multi-cell batteries, and • sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached. **• In case the charging voltage specified by the manufacturer is higher than the overcharge test voltage, the maximum charging voltage specified by manufacturer should be applied with 2.0 ItA,** **(e.g., quick charging power bank, etc.)**		N/A

IEC62133_2A - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	[Replace to the following statement] c) Acceptance criteria Overcharging exceeding to the limits specified by the manufacturer should not result in fire or explosion.		N/A
Annex G	**Definition for shape and materials of outer case for cell**		—
(Addition)	G.1 General Annex G provides definitions for shape and materials of outer case for cell G.2 Shape of outer case for cell G 2.1 Cylindrical cell Cell with a cylindrical shape in which the overall height is equal to or greater than diameter. G 2.2 Prismatic cell Cell having the shape of a parallelepiped whose faces are rectangular G.3 Materials of outer case for cell G.3.1 Soft case Non-metallic outer case or container for cell G.3.2 Hard case Metallic outer case or container for cell.	(Shape of outer cases) ☐ Cylindrical ☒ Prismatic (Materials of outer cases) ☐ Hard ☒ Soft	—
Annex H	**Calculation method of the volumetric energy density for cell**		—
(Addition)	Annex H provide a calculation method of the volumetric energy density for cell in use of smart phone, tablet, notebook. H.1 General Unless otherwise stated in the Annex E, the dimensions for calculation are based on these for cell before shipment and the volumetric energy density shall be calculated with a maximum values specified by manufacturer. If the specification for cell can't be provided a dimension for calculation, the manufacturer's other documentation shall be provided to demonstrate compliance for its calculation.	450.52Wh / L	—

IEC62133_2A - ATTACHMENT			
Clause	Requirement + Test	Result - Remark	Verdict
	H.2 Calculation Method  L : Length (max.) of cell (including terrace) W : Width (max.) of cell T : Thickness (max.) when shipping charge (For reference, Please Exclude the dimension of any tape that Is attached to cell) $Volumetric\ energy\ density\ (Wh/L) = \frac{Nominal\ voltage\ (V) \times Rated\ capacity\ (Ah)}{Length\ (L) \times Width\ (W) \times Thickness\ (T)}$ [H.1 – Prismatic cell using soft case]  L : Length (max.) of cell W : Width (max.) of cell T : Thickness when shipping charge (For reference, Please Exclude the dimension of any tape that Is attached to cell) $Volumetric\ energy\ density\ (Wh/L) = \frac{Nominal\ voltage\ (V) \times Rated\ capacity\ (Ah)}{Length\ (L) \times Width\ (W) \times Thickness\ (T)}$ [H.2 – Prismatic cell using hard case]  D : Diameter (max.) of cell L : Length (max.) of cell (According to shape of cell at shipping, The dimension of tube for cell may be included In overall dimension of cell) $Volumetric\ energy\ density\ (Wh/L) = \frac{Nominal\ voltage\ (V) \times Rated\ capacity\ (Ah)}{3.14159 \times \frac{Diameter\ (D)^2}{4} \times Length(L)}$ [H.3 – Cylindrical cell using hard case]		—

**********End of report**********