Test Report issued under the responsibility of

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

Report Reference No.....:	16PNS05110 02001
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Applicant's name .....:	LONG SING TECHNOLOGY GROUP (HONG KONG) LIMITED
Address .....:	A/R 22/F SCENIC HORIZON 250 SHAUKEIWAN ROAD HONG KONG
Manufacturer's name.....:	LONG SING TECHNOLOGY GROUP (HONG KONG) LIMITED
Address .....:	A/R 22/F SCENIC HORIZON 250 SHAUKEIWAN ROAD HONG KONG
Factory's name.....:	Wuhan Zhongyuan Changjiang Science and Technology Development Co., Ltd.
Address .....:	231 Xing Third Road, Hannan District, Wuhan, Hubei, P. R. China
Test specification:	
Standard.....:	IEC 62133: 2012 (Second Edition)
Test procedure .....:	N/A
Non-standard test method.....:	N/A
Test item description .....:	Hybrid Pulse Capacitor Rechargeable Cell
Trade Mark .....:	LONGSING
Model/Type reference .....:	HPC1520
Ratings .....:	4.0V, 90mAh, 0.36Wh

List of Attachments (including a total number of pages in each attachment):
- Photos documentation (1 pages)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
Test items: cl.5.6.2 Design recommendation(Lithium system); cl.8.1 Charging procedure for test purposes (for Cells); cl.8.2.1 Continuous charging at constant voltage (Cells); cl.8.3.1 External short circuit (Cells); cl.8.3.3 Free fall (Cells); cl.8.3.4 Thermal abuse (Cells); cl.8.3.5 Crush (Cells); cl.8.3.7 Forced discharge (Cells); cl.8.3.8 Transport tests (Cells); cl.8.3.9 Design evaluation – Forced internal short circuit (Cells); The electrolyte type of this cell doesn't belong to polymer, and the additional test cl.8.3.9 was carried out to evaluate the cell. Tests are made with the number of cells specified in IEC 62133: 2012 (Second Edition) Table 2.	All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page 1.

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.

Test item particulars :	
Classification of installation and use :	To be defined in final system
Supply connection :	N/A
Recommend charging method declaired by the manufacturer :	Charging the battery with 20mA constant current and 4.1V constant voltage until the current reduces to 9mA at ambient 20°C±5°C
Discharge current (0,2 I_t A) :	18mA
Specified final voltage :	2.5V
Chemistry :	☐ nickel systems ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell :	4.1V
Maximum charging current :	80mA
Charging temperature upper limit :	60°C
Charging temperature lower limit :	0°C
Polymer cell electrolyte type :	☐ gel polyme ☐ solid polymer ☒ N/A
Test case verdicts	
Test case does not apply to the test object :	N/A
Test item does meet the requirement :	P(Pass)
Test item does not meet the requirement :	F(Fail)
Testing	
Date of receipt of test item :	2016-05-26
Date(s) of performance of test :	2015-05-26~ 2016-07-06

General remarks

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

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Throughout this report a point (~~comma~~) is used as the decimal separator.

General product information:

This cell consists of the positive electrode plate, negative electrode plate, separator and electrolyte. The positive and negative electrode plates are housed in the case in the state being separated by the separator.

The main features of the battery are shown as below (clause 8.1.1):

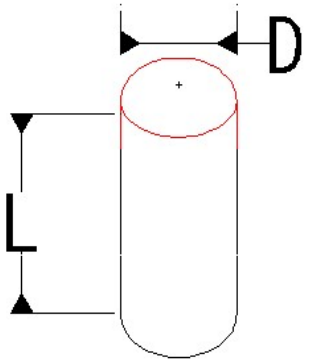
Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
HPC1520	90mAh	4.0V	20mA	50mA	80mA	500mA	4.1V	2.5V

The main features of the battery are shown as below (clause 8.1.2):

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
HPC1520	4.25V	4.5mA	0°C	60°C

Construction:

Cell dimension:



D(max.): L(max.)=15.0mm: 20. 0mm

Circuit diagram:

None, cell only

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
4	**Parameter measurement tolerances**		**P**
	Parameter measurement tolerances		P
5	**General safety considerations**		**P**
5.1	General		P
5.2	Insulation and wiring		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 creepage and clearance 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	Explosion- proof safety value for venting exists.	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		N/A
5.4	Temperature/voltage/current management	Cell only	N/A
	Batteries are designed such that abnormal temperature rise conditions are prevented		N/A
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		N/A
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that associated chargers are designed to maintain charging within the temperature, voltage and current limits specified		N/A
5.5	Terminal contacts		P
	Terminals have a clear polarity marking on the external surface of the battery	See page 2	P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		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 circuits		P
5.6	Assembly of cells into batteries	Cell only	N/A
5.6.1	If there is more than one battery housed in a single battery case, cells used in the assembly of each battery have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer		N/A
	Each battery has an independent control and protection		N/A
	Manufacturers of cells make recommendations about current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		N/A
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate separate circuitry to prevent the cell reversal caused by uneven discharges		N/A
	Protective circuit components are added as appropriate and consideration given to the end-device application		N/A
	When testing a battery, the manufacturer of the battery provides a test report confirming the compliance according to this standard		N/A
5.6.2	Design recommendation for lithium systems only	Cell only	N/A
	For the battery consisting of a single cell or a single cellblock: - Charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Clause 8.1.2, Table 4; or		N/A
	- Charging voltage of the cell does not exceed the different upper limit of the charging voltage determined through Clause 8.1.2, NOTE 1.		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - The voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, by monitoring the voltage of every single cell or the single cellblocks; or		N/A
	- The voltages of any one of the single cells or single cellblocks does not exceed the different upper limit of the charging voltage, determined through Clause 8.1.2, NOTE 1, by monitoring the voltage of every single cell or the single cellblocks		N/A

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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: - Charging is stopped when the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks; or		N/A
	- Charging is stopped when the upper limit of the different charging voltage, determined through Clause 8.1.2, NOTE 1, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		N/A
5.7	Quality plan		P
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery	Complied. ISO 9001 Certificate supplied.	P
6	**Type test conditions**		**P**
	Tests were made with the number of cells or batteries specified in Table 1 for nickel-cadmium and nickel-metal hydride systems and Table 2 for lithium systems, using cells or batteries that are not more than six months old	Complied. Table 2 for Lithium system.	P
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.	Tests are carried out at 20°C ± 5°C.	P
7	**Specific requirements and tests (nickel systems)**		**N/A**
7.1	Charging procedure for test purposes	Lithium system.	N/A
7.2	Intended use		N/A
7.2.1	Continuous low-rate charging (cells)		N/A
	Results: No fire. No explosion		N/A
7.2.2	Vibration		N/A
	Results: No fire. No explosion. No leakage		N/A
7.2.3	Moulded case stress at high ambient temperature		N/A
	Oven temperature (°C) .....:		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A
7.2.4	Temperature cycling		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3	Reasonably foreseeable misuse		N/A
7.3.1	Incorrect installation cell		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	The test was carried out using: - Four fully charged cells of the same brand, type, size and age connected in series, with one of them reversed; or		N/A
	- A stabilized dc power supply.		N/A
	Results: No fire. No explosion .....:		N/A
7.3.2	External short circuit		N/A
	The cells or batteries were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		N/A
	Results: No fire. No explosion .....:		N/A
7.3.3	Free fall		N/A
	Results: No fire. No explosion.		N/A
7.3.4	Mechanical shock (crash hazard)		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3.5	Thermal abuse		N/A
	Oven temperature (°C) .....:		—
	Results: No fire. No explosion.		N/A
7.3.6	Crushing of cells		N/A
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	The cell is prismatic type and a second set of samples was tested, rotated 90° around longitudinal axis compared to the first set		N/A
	Results: No fire. No explosion .....:		N/A
7.3.7	Low pressure		N/A
	Chamber pressure (kPa) .....:		—
	Results: No fire. No explosion. No leakage.		N/A
7.3.8	Overcharge		N/A
	Results: No fire. No explosion .....:		N/A
7.3.9	Forced discharge		N/A
	Results: No fire. No explosion .....:		N/A
8	**Specific requirements and tests (lithium systems)**		**P**
8.1	Charging procedures for test purposes		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.1.1	First procedure: This charging procedure applied to tests other than those specified in 8.1.2	Complied.	P
8.1.2	Second procedure: This charging procedure applied to the tests of 8.3.1, 8.3.2, 8.3.4, 8.3.5, and 8.3.9	Complied.	P
	If a cell's specified upper and/or lower charging temperature exceeds values for the upper and/or lower limit test temperatures of Table 4, the cells were charged at the specified values plus 5 °C for the upper limit and minus 5 °C for the lower limit	Charge temperature 0-60°C declared. -5°C used for lower limit test. 65°C used for upper limit test.	P
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) .....:		P
	For a different upper limit charging voltage (i.e. other than for lithium cobalt oxide systems at 4,25 V), the applied upper limit charging voltage and upper limit charging temperatures were adjusted accordingly	4.1V applied.	P
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) .....:		P
8.2	Intended use	See below.	P
8.2.1	Continuous charging at constant voltage (cells)	Tested complied.	P
	Results: No fire. No explosion .....:	(See Table 8.2.1)	P
8.2.2	Moulded case stress at high ambient temperature (battery)	Cell only	N/A
	Oven temperature (°C) .....:		—
	Results: No physical distortion of the battery casing resulting in exposure of internal components		N/A
8.3	Reasonably foreseeable misuse		P
8.3.1	External short circuit (cell)	Tested complied.	P
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		P
	Results: No fire. No explosion .....:	(See Table 8.3.1)	P
8.3.2	External short circuit (battery)	Cell only	N/A
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		N/A
	Results: No fire. No explosion .....:	(See Table 8.3.2)	N/A
8.3.3	Free fall		P
	Results: No fire. No explosion.	No fire. No explosion.	P
8.3.4	Thermal abuse (cells)		P
	The cells were held at 130°C ± 2°C for: - 10 minutes; or	Tested complied.	P
	- 30 minutes for large cells (gross mass of more than 500 g as defined in IEC 62281)		N/A
	Oven temperature (°C) .....:	130°C	—
	Gross mass of cell (g).....:	<500g, small cell.	—
	Results: No fire. No explosion.	No fire. No explosion.	P
8.3.5	Crush (cells)		P
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or	Tested complied.	P
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N/A
	- 10% of deformation has occurred compared to the initial dimension		N/A
	Results: No fire. No explosion .....:	(See Table 8.3.5)	P
8.3.6	Over-charging of battery	Cell only	N/A
	Test was continued until the temperature of the outer casing: - Reached steady state conditions (less than 10°C change in 30-minute period); or		N/A
	- Returned to ambient		N/A
	Results: No fire. No explosion .....:	(See Table 8.3.6)	N/A
8.3.7	Forced discharge (cells)		P
	Results: No fire. No explosion .....:	(See Table 8.3.7)	P
8.3.8	Transport tests		P
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods	T-1, T-2, T-3 and T-4 tested complied. No leakage, no venting, no short-circuit, no rupture, no explosion and no fire. T-5, See Table 8.3.8. T-6 is identical to clause 8.3.5.	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.9	Design evaluation – Forced internal short circuit (cells)	Tested complied.	P
	The cells complied with national requirement for .....:	France, Japan, Korea and Switzerland.	—
	The pressing was stopped upon: - A voltage drop of 50 mV has been detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached	800 N	P
	Results: No fire.....:	(See Table 8.3.9)	P
9	**Information for safety**		**P**
	The manufacturer of secondary cells ensures that information is provided about current, voltage and temperature limits of their products.	Information for safety mentioned in manufacturer's specification.	P
	The manufacturer of batteries ensures that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards.		N/A
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N/A
	As appropriate, information relating to hazard avoidance resulting from a system analysis is provided to the end user.....:		N/A
10	**Marking**		**P**
10.1	Cell marking		**P**
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.		**P**
10.2	Battery marking		N/A
	Batteries marked in accordance with the requirements for the cells from which they are assembled.		N/A
	Batteries marked with an appropriate caution statement.		N/A
10.3	Other information		P
	Storage and disposal instructions marked on or supplied with the battery.	Information for disposal instructions mentioned in manufacturer's specification.	P
	Recommended charging instructions marked on or supplied with the battery.	Information for recommended charging instructions mentioned in manufacturer's specification.	P

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Clause	Requirement + Test	Result - Remark	Verdict
11	**Packaging**		**P**
	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 range of secondary lithium ion cells for safe use**		**P**
A.1	General		P
A.2	Safety of lithium-ion secondary battery	Complied.	P
A.3	Consideration on charging voltage	Complied.	P
A.3.1	General	Charging voltage is 4.1V	P
A.3.2	Upper limit charging voltage	4.1V	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	4.1V applied.	P
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: 0-60°C	P
A.4.3	High temperature range	Charging high temperature declared by client is: 60°C.	P
A.4.3.1	General		P
A.4.3.2	Explanation of safety viewpoint		P
A.4.3.3	Safety considerations when specifying charging conditions in high temperature range		P
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range	65°C is applied during testing	P
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 low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	-5°C is applied during testing.	P
A.4.5	Scope of the application of charging current		P

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Clause	Requirement + Test	Result - Remark	Verdict
A.5	Sample preparation		P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short		P
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point		P
A.5.3	Disassembly of charged cell		P
A.5.4	Shape of nickel particle		P
A.5.5	Insertion of nickel particle to cylindrical cell		P
A.5.5.1	Insertion of nickel particle to winding core		P
A.5.5.2	Mark the position of nickel particle on the both end of winding core of the separator		P
A.5.6	Insertion of nickel particle to prismatic cell		N/A

Tables

	TABLE: Critical components information				P
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity [1)]**
Cell	LONG SING TECHNOLOGY GROUP (HONG KONG) LIMITED	HPC1520	4.0V, 90mAh, 0.36Wh	IEC 62133: 2012 UL 1642	UL MH61580
Supplementary information:					

Tables

7.2.1	TABLE: Continuous low rate charge (cells)				N/A
Model	**Recommended charging method, (CC, CV, or CC/CV)**	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (A)**	**OCV at start of test, (Vdc)**	**Results**
--	--	--	--	--	--
--	--	--	--	--	--
Supplementary information:					

7.2.2	TABLE: Vibration	N/A
Model	**OCV at start of test, (Vdc)**	**Results**
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Supplementary information:		

7.3.1	TABLE: Incorrect installation (cells)	N/A
Model	**OCV of reversed cell, (Vdc)**	**Results**
--	--	--
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Supplementary information:		

7.3.2	TABLE: External short circuit					N/A
Model	**Ambient (at 20°C ± 5°C or 55°C ± 5°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, (°C)**	**Results**	
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--	--	--	--	--	--	
Supplementary information:						

7.3.6	TABLE: Crush			N/A
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Results**	
--	--	--	--	
--	--	--	--	
Supplementary information:				

7.3.8	TABLE: Overcharge				N/A
Model	**OCV prior to charging, (Vdc)**	**Maximum charge current, (A)**	**Time for charging, (hours)**	**Results**	
--	--	--	--	--	
--	--	--	--	--	

Tables

Supplementary information:

7.3.9	TABLE: Forced discharge (cells)			N/A
Model	**OCV before application of reverse charge, (Vdc)**	**Measured reverse charge I_t, (A)**	**Time for reversed charge, (minutes)**	**Results**
--	--	--	--	--
--	--	--	--	--
Supplementary information:				

8.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Model	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (A)**	**OCV at start of test, (Vdc)**	**Results**
Cell#1	4.10	0.02	4.09	P
Cell#2	4.10	0.02	4.08	P
Cell#3	4.10	0.02	4.08	P
Cell#4	4.10	0.02	4.09	P
Cell#5	4.10	0.02	4.08	P
Supplementary information: No fire, no explosion, no leakage.				

8.3.1	TABLE: External short circuit (cell)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, ~~(°C)~~**	**Results**
Samples charged at charging temperature upper limit (65°C)					
Cell#1	22.4	4.07	0.076	77.8	P
Cell#2	22.4	4.07	0.072	72.3	P
Cell#3	22.4	4.08	0.074	80.1	P
Cell#4	22.4	4.08	0.075	70.9	P
Cell#5	22.4	4.07	0.074	77.8	P
Samples charged at charging temperature lower limit (-5°C)					
Cell#6	22.4	4.07	0.075	87.2	P
Cell#7	22.4	4.07	0.072	80.9	P
Cell#8	22.4	4.06	0.073	87.1	P
Cell#9	22.4	4.06	0.075	81.1	P
Cell#10	22.4	4.06	0.074	71.9	P
Supplementary information: No fire, no explosion.					

Tables

8.3.2	TABLE: External short circuit (battery)				N/A
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, ~~(°C)~~**	**Results**
Samples charged at charging temperature upper limit (°C)					
Samples charged at charging temperature lower limit (°C)					
Supplementary information: No fire, no explosion.					

8.3.5	TABLE: Crush				P
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Width/ diameter of cell before crush, (mm)**	**Required deformation for crush, (mm)**	**Results**
Samples charged at charging temperature upper limit (65°C)					
Cell#1	4.07	4.07	-	-	P
Cell#2	4.08	4.08	-	-	P
Cell#3	4.07	4.07	-	-	P
Cell#4	4.07	4.07	-	-	P
Cell#5	4.08	4.08	-	-	P
Supplementary information: No fire, no explosion.					

8.3.6	TABLE: Over-charging of battery			N/A
Constant charging current (A).....:				—
Supply voltage (Vdc).....:				—
Model	**OCV before charging, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum outer casing temperature, (°C)**	**Results**

Tables

Supplementary information: No fire, no explosion.				

8.3.7	TABLE: Forced discharge (cells)			P
Model	**OCV before application of reverse charge, (Vdc)**	**Measured Reverse charge I_t, (A)**	**Time for reversed charge, (minutes)**	**Results**
Cell#1	2.86	0.09	90	P
Cell#2	2.85	0.09	90	P
Cell#3	2.87	0.09	90	P
Cell#4	2.87	0.09	90	P
Cell#5	2.85	0.09	90	P
Supplementary information: No fire, no explosion.				

8.3.8 T-5	TABLE: External short circuit (cell)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (mΩ)**	**Maximum case temperature rise ΔT, (°C)**	**Results**
Cell#1	55.4	4.08	75	48.2	P
Cell#2	55.4	4.07	73	44.3	P
Cell#3	55.4	4.08	74	44.0	P
Cell#4	55.4	4.08	75	45.2	P
Cell#5	55.4	4.07	78	46.4	P
Cell#6	55.4	4.08	78	55.4	P
Cell#7	55.4	4.08	76	55.4	P
Cell#8	55.4	4.07	74	55.4	P
Cell#9	55.4	4.08	76	55.4	P
Cell#10	55.4	4.08	75	55.4	P
Supplementary information: The external short-circuit test of 10 pcs samples performed after the test of Altitude, Thermal cycling, Vibration and Shock in sequence. - No explosion temperature rise, no rupture, no explosion and no fire					

Tables

8.3.9	TABLE: Forced internal short circuit (cells)				P
Model	**Chamber ambient, (°C)**	**OCV at start of test, (Vdc)**	**Particle location [1)]**	**Maximum applied pressure, (N)**	**Results**
Cell#1	10	4.07	1	800	P
Cell#2	10	4.06	1	800	P
Cell#3	10	4.06	1	800	P
Cell#4	10	4.07	2	800	P
Cell#5	10	4.06	2	800	P
Cell#6	45	4.08	1	800	P
Cell#7	45	4.07	1	800	P
Cell#8	45	4.08	1	800	P
Cell#9	45	4.07	2	800	P
Cell#10	45	4.08	2	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

- No leakage

Photos

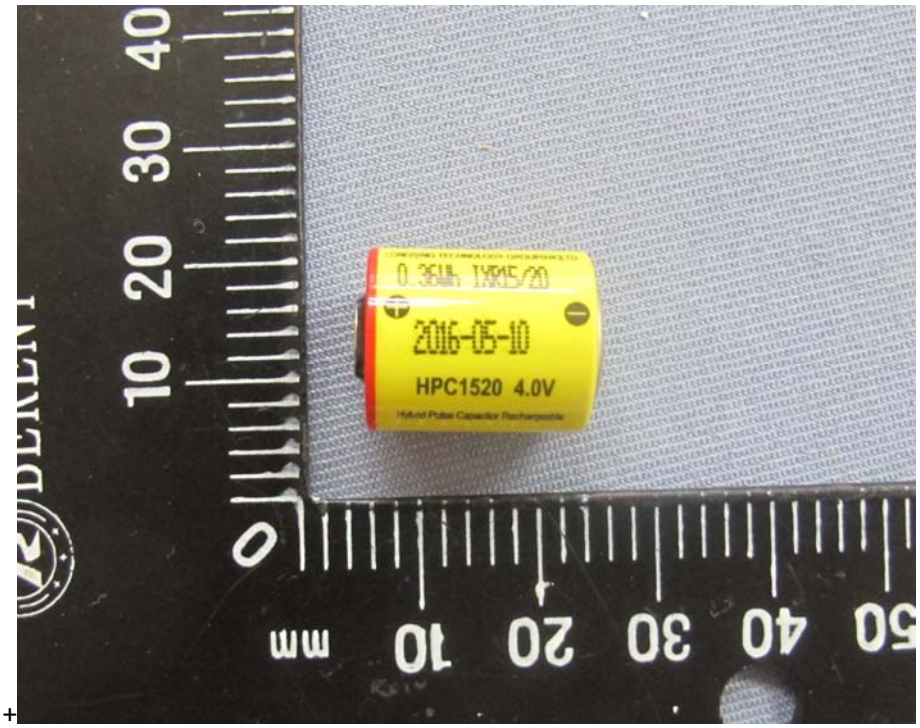

Fig.1 General view 1 of Cell

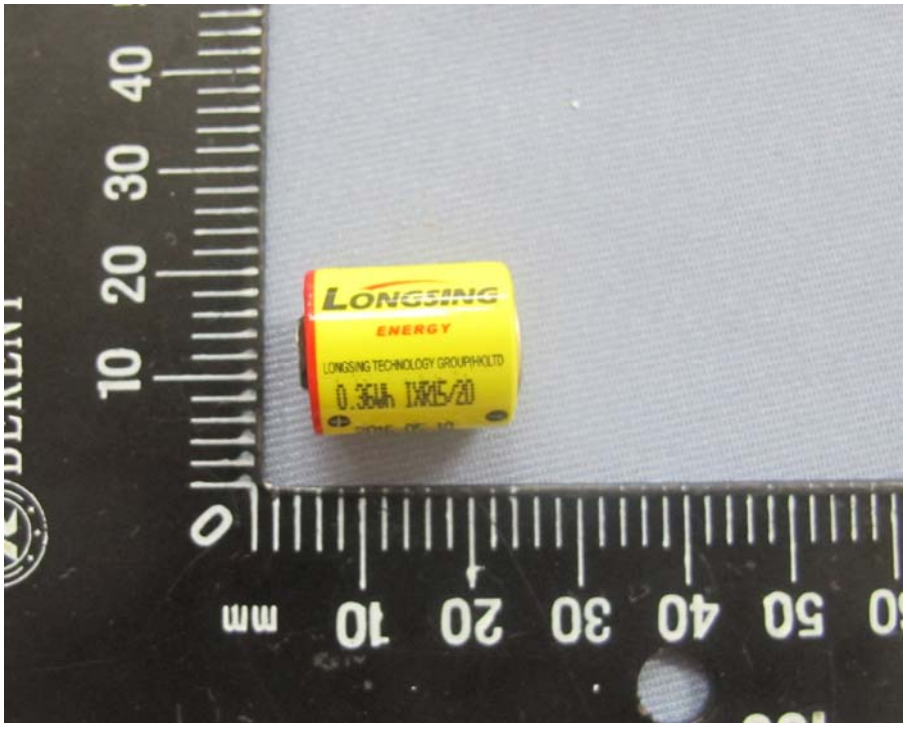

Fig.2 General view 2 of Cell