



Test Report issued under the responsibility of:

NCB TÜV SÜD PSB Pte Ltd
1 Science Park Drive,
Singapore 118221



PSB Singapore

**TEST REPORT
IEC 62133**

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

Report Number: 081-150106-000

Date of issue: 2015-01-12

Total number of pages: 26

Applicant's name.....: Samsung SDI Co., Ltd.

Address: 467, Beonyeong-ro, Seobuk-gu, Cheonan-si,
Chungcheongnam-do 331-300, REPUBLIC OF KOREA

Test specification:

Standard: IEC 62133: 2012 (Second Edition)

Test procedure: CB Scheme

Non-standard test method.....: N/A

Test Report Form No.....: IEC62133B

Test Report Form(s) Originator: UL(Demko)

Master TRF.....: Dated 2013-03

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Test item description: Lithium-ion Rechargeable Cell

Trade Mark: **SAMSUNG SDI**

Manufacturer.....: Same as applicant.

Model/Type reference: INR18650-35E+ / INR19/66
(+ - May have an optional single alphanumeric suffix.)

Ratings: 3.6 Vdc, 3480 mAh



Testing procedure and testing location:		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	TÜV SÜD Asia Ltd. Taiwan Branch
Testing location/ address :		7F., No.37, Sec. 2, Zhongyang S., Rd., Beitou District, Taipei City, 11270, TAIWAN.
<input type="checkbox"/>	Associated CB Testing Laboratory:	N/A
Testing location/ address :		N/A
Tested by (name + signature) :		Mr. Tony Hsu 
Approved by (name + signature) :		Mr. Ethan Huang 
<input type="checkbox"/>	Testing procedure: TMP	N/A
Testing location/ address :		N/A
Tested by (name + signature) :		
Approved by (name + signature) :		
<input type="checkbox"/>	Testing procedure: WMT	N/A
Testing location/ address :		N/A
Tested by (name + signature) :		
Witnessed by (name + signature) :		
Approved by (name + signature) :		
<input type="checkbox"/>	Testing procedure: SMT	N/A
Testing location/ address :		N/A
Tested by (name + signature) :		
Approved by (name + signature) :		
Supervised by (name + signature) .. :		



List of Attachments (including a total number of pages in each attachment):	
Attachment No. 1	Group differences 1 page
Attachment No. 2	Photo 2 pages
Summary of testing:	
Tests performed (name of test and test clause): All test results were found satisfactory in accordance with IEC 62133: 2012 and EN 62133:2013 - 8.1 Charging procedures for test purposes (for cells and battery) - 8.1.1 First procedure. (for cells and battery) - 8.1.2 Second procedure (for cells and battery) - 8.2.1 Continuous charging at constant voltage (cells) - 8.3.1 External short circuit (cell) - 8.3.3 Free fall (for cells and battery) - 8.3.4 Thermal abuse (cell) - 8.3.5 Crush - 8.3.7 Force discharge (cell) - 8.3.9 Forced internal short circuit (cells)	Testing location: All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page 2.
Summary of compliance with National Differences The product fulfils the requirements of IEC 62133:2012 / EN 62133:2013.	

Copy of marking plate:

SAMSUNG SDI	
Lithium-ion Rechargeable Cell	
Model	INR18650-35E+ / INR19/66
Rating	3.6 Vdc, 3480 mAh

Date of manufacture designation:



- ① Model
- ② Maker
- ③ Production Date Code
 - 1st Digit : KC Certificate Mark
(1 : under 2400mAh, 2 : over 2400mAh)
 - 2nd Digit : Year
 - 3rd Digit : Month
 - 4th Digit : Week



③ Production Date Code on cell surface

A 0 5 6 2 B 2 B 3

- 6** : Year (6: 2006, 7: 2007,...)
- 2** : Month (1: Jan., ... A: Oct., B: Nov., C: Dec.)
- B** : Date (1: 1st, 2: 2nd, ... A: 10th, B: 11th,...)

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.....:	For use in portable applications.
Supply connection.....:	DC connector
Recommend charging method declared by the manufacturer	CC-CV or clause 8.1.2
Discharge current (0,2 I_t A)	696 mA
Specified final voltage	2.65 Vdc
Chemistry	<input type="checkbox"/> nickel systems <input checked="" type="checkbox"/> lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell.....:	4.2 Vdc
Maximum charging current	3400 mA
Charging temperature upper limit	45 °C
Charging temperature lower limit.....:	0 °C
Polymer cell electrolyte type	<input type="checkbox"/> gel polymer <input type="checkbox"/> solid polymer
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item	2014-12-24
Date (s) of performance of tests	2014-12-25 ~ 2015-01-08
General remarks:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC62133B:	
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	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	



Name and address of factory (ies) :

- 1) SAMSUNG SDI ENERGY MALAYSIA SDN BHD (ID No.: 81509)
LOT 635 & 660, KAWASAN PERINDUSTRIAN TUANKU JAAFAR, SUNGAI GADUT,
71450 DARUL KHUSUS, MALAYSIA
- 2) Tianjin Samsung SDI Co.,Ltd (ID No. 75639)
Yat-sen Scientific Industrial Park, 301726 Tianjin, PEOPLE'S REPUBLIC OF CHINA
- 3) Samsung SDI Co., Ltd. (ID No. 89164)
467, Beonyeong-ro, Seobuk-gu, Cheonan-si, Chungcheongnam-do 331-300,
REPUBLIC OF KOREA

General product information:

This equipment is a Lithium-ion Rechargeable Cell for use in the portable applications.

The maximum ambient temperature specified as 45 °C.

Details information of the Lithium-ion rechargeable cell are as follows:

Product name	Lithium-ion Rechargeable Cell
Type/model	INR18650-35E+ / INR19/66
Nominal voltage (Vdc)	3.6
Nominal capacity (mAh)	3480 mAh
Maximum Charge Voltage (Vdc)	4.2
Optimum charge current (mA)	3400
Maximum discharge current (mA)	8000
End voltage (Vdc)	2.65
Weight (kg)	Approx. 0.05 max.

The final evaluation of the battery must be conducted in the end product for which the battery will be used.

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
4	Parameter measurement tolerances		P
	Parameter measurement tolerances	Both normal and foreseeable misuses are evaluated in the report. All control and measure values were within the tolerances.	P
5	General safety considerations		P
5.1	General	Considered.	P
5.2	Insulation and wiring	Considered in Battery Pack.	N/A
	The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ		N/A
	Insulation resistance (MΩ) :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		N/A
	Orientation of wiring maintains adequate creepage and clearance distances between conductors		N/A
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		N/A
5.3	Venting		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition	For the cell, the pressure relief mechanism along the cell top, this can release the pressure during the abnormal operation.	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief	Considered in Battery Pack.	N/A
5.4	Temperature/voltage/current management	Considered in Battery Pack.	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

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

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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
	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	The manufacturer has ISO 9001:2008 certificate and such quality plan.	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. Lithium system.	P
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.	Considered and evaluated for the cells.	P

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict

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
	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

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
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
8.1.1	First procedure: This charging procedure applied to tests other than those specified in 8.1.2	Discharge current: 696 mA Charge voltage / current: 4.2 Vdc / 3400 mA	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	Considered in 8.3.1, 8.3.4, 8.3.5 and 8.3.9.	P
	If a cell's specified upper and/or lower charging temperature exceeds values for the upper and/or lower limit test temperatures of Table 4, the cells were charged at the specified values plus 5 °C for the upper limit and minus 5 °C for the lower limit	The cell use charged at upper limit temp. 50 °C and lower limit temp. -5 °C.	P
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1)..... :	Checked by above method.	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		N/A
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1)..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8.2	Intended use	See below.	P
8.2.1	Continuous charging at constant voltage (cells)		P
	Results: No fire. No explosion..... :	(See Table 8.2.1)	P
8.2.2	Moulded case stress at high ambient temperature (battery)	Considered in Battery Pack.	N/A
	Oven temperature (°C)..... :		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A
8.3	Reasonably foreseeable misuse	See below.	P
8.3.1	External short circuit (cell)		P
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise	The cells were fully charged and subjected to a short circuit test.	P
	Results: No fire. No explosion..... :	(See Table 8.3.1)	P
8.3.2	External short circuit (battery)	Considered in Battery Pack.	N/A
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		N/A
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		N/A
	Results: No fire. No explosion..... :		N/A
8.3.3	Free fall	The cells were fully charged and tested for this condition.	P
	Results: No fire. No explosion.	No fire, no explosion to the apparatus after the test.	P

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Clause	Requirement + Test	Result - Remark	Verdict
8.3.4	Thermal abuse (cells)	See below.	P
	The cells were held at 130°C ± 2°C for: - 10 minutes; or	The cells were fully charged and tested for this condition.	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)	Cell mass < 500 g.	—
	Results: No fire. No explosion.	No fire, No explosion.	P
8.3.5	Crush (cells)	See below.	P
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N/A
	- 10% of deformation has occurred compared to the initial dimension	The cells were fully charged and tested for this condition.	P
	Results: No fire. No explosion..... :	(See Table 8.3.5)	P
8.3.6	Over-charging of battery	Considered in Battery Pack.	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..... :		N/A
8.3.7	Forced discharge (cells)	The cells were fully charged and tested for this condition.	P
	Results: No fire. No explosion..... :	(See Table 8.3.7)	P
8.3.8	Transport tests	See below.	P
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods	Complied.	P
8.3.9	Design evaluation – Forced internal short circuit (cells)	See below.	P
	The cells complied with national requirement for		—
	The pressing was stopped upon: - A voltage drop of 50 mV has been detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached	Pressing force of 800 N for cylindrical cells.	P
	Results: No fire	(See Table 8.3.9)	P

IEC 62133			
Clause	Requirement + Test	Result - Remark	Verdict
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	See below.	P
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.	Cell of lithium system are marked in accordance with 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		N/A
	Storage and disposal instructions marked on or supplied with the battery.		N/A
	Recommended charging instructions marked on or supplied with the battery.		N/A

IEC 62133			
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.	The proper packaging description is provided in the product specification, which can avoid the mechanical damage during the transport, handling, and stacking.	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		P
A.3.2	Upper limit charging voltage	Charging voltage: 4.2 Vdc	P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint	Charging voltage is 4.2 Vdc, same as the upper limit charging voltage.	P
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied	See 8.1.2 and 8.3.2.	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 0-45 °C.	P
A.4.3	High temperature range	Charging high temperature declared by client is 50 °C.	P
A.4.3.1	General	See below.	P
A.4.3.2	Explanation of safety viewpoint	Considered.	P
A.4.3.3	Safety considerations when specifying charging conditions in high temperature range	Meet the sub-clause 8.2 to 8.3 requirements.	P
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range	See above.	P
A.4.4	Low temperature range	Charging low temperature declared by client is -5 °C.	P
A.4.4.1	General	See below.	P
A.4.4.2	Explanation of safety viewpoint	Considered.	P

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.4.3	Safety considerations, when specifying charging conditions in low temperature range	Meet the sub-clause 8.2 to 8.3 requirements.	P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	See above.	P
A.4.5	Scope of the application of charging current		N/A
A.5	Sample preparation	See below.	P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short	See below.	P
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point	Complied.	P
A.5.3	Disassembly of charged cell	Complied.	P
A.5.4	Shape of nickel particle	Complied.	P
A.5.5	Insertion of nickel particle to cylindrical cell	See below.	P
A.5.5.1	Insertion of nickel particle to winding core	Complied.	P
A.5.5.2	Mark the position of nickel particle on the both end of winding core of the separator	Complied.	P
A.5.6	Insertion of nickel particle to prismatic cell		N/A



TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾
Electrolyte	Interchangeable	Interchangeable	Ethylene carbonate, ethyl methyl carbonate, fluorobenzene, di-methyl carbonate	--	--
Separator	Interchangeable	Interchangeable	PE or PP/PE/PP	--	--
Anode	Interchangeable	Interchangeable	Carbon	--	--
Cathode	Interchangeable	Interchangeable	Lithium Nickel Cobalt Aluminium Oxid (LiNiCoAlO ₂)	--	--

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

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: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 						

7.2.2	TABLE: Vibration		N/A
Model	OCV at start of test, (Vdc)	Results	
--	--	--	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 			

7.3.1	TABLE: Incorrect installation (cells)		N/A
Model	OCV of reversed cell, (Vdc)	Results	
--	--	--	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 			

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	
--	--	--	--	--	--	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 						

7.3.6	TABLE: Crush			N/A
Model	OCV at start of test, (Vdc)	OCV at removal of crushing force, (Vdc)	Results	
--	--	--	--	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 				

7.3.8	TABLE: Overcharge				N/A
Model	OCV prior to charging, (Vdc)	Maximum charge current, (A)	Time for charging, (hours)	Results	
--	--	--	--	--	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 					

7.3.9	TABLE: Forced discharge (cells)				N/A
Model	OCV before application of reverse charge, (Vdc)	Measured reverse charge I_r , (A)	Time for reversed charge, (minutes)	Results	
--	--	--	--	--	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 					

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	
INR18650-35E+ / INR19/66	4.2	3.4	4.19	No fire or explosion, No leakage	
INR18650-35E+ / INR19/66	4.2	3.4	4.19	No fire or explosion, No leakage	
INR18650-35E+ / INR19/66	4.2	3.4	4.18	No fire or explosion, No leakage	
INR18650-35E+ / INR19/66	4.2	3.4	4.19	No fire or explosion, No leakage	
INR18650-35E+ / INR19/66	4.2	3.4	4.18	No fire or explosion, No leakage	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 					

8.3.1	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	
Samples charged at charging temperature upper limit (Charge at 50 °C)						
INR18650-35E+ / INR19/66	21.9	4.22	62	65.3	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.21	87	72.9	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.23	76	77.1	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.20	89	70.5	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.22	76	67.1	No fire or explosion	
Samples charged at charging temperature lower limit (Charge at -5 °C)						
INR18650-35E+ / INR19/66	21.9	4.11	83	56.4	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.11	97	71.1	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.09	90	73.7	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.10	71	72.7	No fire or explosion	
INR18650-35E+ / INR19/66	21.9	4.09	73	71.6	No fire or explosion	
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)						

8.3.2	TABLE: External short circuit (battery)					N/A
Model	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						
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Samples charged at charging temperature lower limit						
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<p>Supplementary information:</p> <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 						

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 (Charge at 50 °C)						
INR18650-35E+ / INR19/66	4.22	4.21	18.22	16.40	No fire or explosion	
INR18650-35E+ / INR19/66	4.20	4.20	18.32	16.49	No fire or explosion	
INR18650-35E+ / INR19/66	4.23	4.22	18.48	16.63	No fire or explosion	
INR18650-35E+ / INR19/66	4.19	4.19	18.49	16.64	No fire or explosion	
INR18650-35E+ / INR19/66	4.20	4.20	18.21	16.39	No fire or explosion	
Samples charged at charging temperature lower limit (Charge at -5 °C)						
INR18650-35E+ / INR19/66	4.11	4.11	18.34	16.51	No fire or explosion	
INR18650-35E+ / INR19/66	4.12	4.11	18.26	16.43	No fire or explosion	
INR18650-35E+ / INR19/66	4.12	4.11	18.29	16.46	No fire or explosion	
INR18650-35E+ / INR19/66	4.11	4.11	18.43	16.59	No fire or explosion	
INR18650-35E+ / INR19/66	4.13	4.12	18.40	16.56	No fire or explosion	
Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)						

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, ($^{\circ}\text{C}$)	Results
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Supplementary information: - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain)				

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	
INR18650-35E+ / INR19/66	2.66	3.48	90	No fire or explosion	
INR18650-35E+ / INR19/66	2.65	3.48	90	No fire or explosion	
INR18650-35E+ / INR19/66	2.66	3.48	90	No fire or explosion	
INR18650-35E+ / INR19/66	2.65	3.48	90	No fire or explosion	
INR18650-35E+ / INR19/66	2.65	3.48	90	No fire or explosion	
Supplementary information: <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 					

8.3.9 TABLE: Forced internal short circuit (cells)					P
Model	Chamber ambient, (°C)	OCV at start of test, (Vdc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results
Samples charged at charging temperature upper limit (Charge at 50 °C)					
INR18650-35E+ / INR19/66	45	4.245	1	807	No fire or explosion
INR18650-35E+ / INR19/66	45	4.245	1	808	No fire or explosion
INR18650-35E+ / INR19/66	45	4.244	1	812	No fire or explosion
INR18650-35E+ / INR19/66	45	4.246	1	813	No fire or explosion
INR18650-35E+ / INR19/66	45	4.244	1	814	No fire or explosion
Samples charged at charging temperature lower limit (Charge at -5 °C)					
INR18650-35E+ / INR19/66	10	4.203	1	809	No fire or explosion
INR18650-35E+ / INR19/66	10	4.201	1	807	No fire or explosion
INR18650-35E+ / INR19/66	10	4.202	1	808	No fire or explosion
INR18650-35E+ / INR19/66	10	4.203	1	806	No fire or explosion
INR18650-35E+ / INR19/66	10	4.205	1	810	No fire or explosion
<p>Supplementary information:</p> <p>¹⁾ Identify one of the following:</p> <p>1: Nickel particle inserted between positive and negative (active material) coated area.</p> <p>2: Nickel particle inserted between positive aluminium foil and negative active material coated area.</p> <ul style="list-style-type: none"> - No fire or explosion - No leakage - Leakage - Fire - Explosion - Bulge - Others (please explain) 					