Produkte Products			Δ Τυν	Rheinland®
Prüfbericht-Nr.: Test Report No.:	CN223SFJ 001	Auftrags-Nr.: Order No.:	168384197	Seite 1 von 33 Page 1 of 33
Kunden-Referenz-Nr.: Client Reference No.:	N/A	Auftragsdatum: Order date:	2022.07.27	
Auftraggeber: Client:	Ropla Elektronik Sp. z o.o. ul. Wrocławska 1C, 52-200 S	Suchy Dwór, Poland	I	
Prüfgegenstand: Test item:	Polymer Lithium-Ion Cell			
Bezeichnung / Typ-Nr.: Identification / Type No.:	See table 4 on page 4&5			
Auftrags-Inhalt: Order content:	Test report			
Prüfgrundlage: Test specification:	UL 1642:2020			
Wareneingangsdatum: Date of sample receipt.	2022.07.27	9 50 1	YNS. T.	
Prüfmuster-Nr.: Test sample No.:	DSP22070540-001~345	× ×	- LP503759 1350m4h 3.70 + 4.955M LIPc 20206	
Prüfzeitraum: Testing period:	2022.07.28 to 2022.08.11			
Ort der Prüfung: Place of testing:	Dongguan ZRLK Testing Technology Co., Ltd.	2 3	- LP 903759 2200mAh 3 70 8 14Mh Lipo + 202205	
Prüflaboratorium: Testing laboratory:	TÜV Rheinland (Shenzhen) Co., Ltd.	- <u>-</u>		
Prüfergebnis*: Test result*:	Pass	6 1 2	3 4 5 6 7 8 9	
erstellt von:		genehmigt von:	1	
Created by:	Marris Tin	authorized by:	Jue	Wang
Date [.]	Harris Yin	Date [.]	19	Joe Wang
Stellung / Position	Project Engineer	Stellung / Position	n	Reviewer
Sonstiges / Other. Th - A - A Th on de sa pro pri	te complete test report includes Attachment 1: Equipment list (Attachment 2: Photo document is report does not evidence comp ly with the referred tests. This test livered product mentioned above fety mark on this or similar product oduct, any reference to TÜV Rhein or written consent of TÜV Rheinla	s the following attac 1 page); s (4 pages). liance of the provided t report documents the only. This report does tts. Further for sales of hland or a test through ind.	hments: sample with the releva findings of examination not entitle the applica r other application pur n TÜV Rheinland is on	ant standards but on conducted on the nt to carry any poses of the tested ly permissible with
Zustand des Prüfgegens	standes bei Anlieferung:	Prüfmuster vollstä	ndig und unbeschäd	ligt
Condition of the test item	at delivery:	Test item complete	e and undamaged	-
* Legende: P(ass) = entspricht o	.g. Prüfgrundlage(n) F(ail) = entsprict	nt nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar	N/T = nicht getestet
Legena: P(ass) = passed a.m	. test specification(s) F(ail) = failed a.i	m. test specification(s)	IV/A = not applicable	IV/I = not tested
auszugsweise vervi	elfältigt werden. Dieser Bericht	berechtigt nicht zur	Verwendung eines P	rüfzeichens.
This test report only relates t dup	to the a.m. test sample. Without p licated in extracts. This test repor	permission of the test of	center this test report i arry any test mark.	s not permitted to be
TÜV Phoinland (Shanzhan) Ca	1 to 1601 1604 17 19/E Towar & D	uilding 2 Shonzhon Inter	national Innovation Valla	W Dachi 1at Baad Vili

TÜV Rheinland (Shenzhen) Co., Ltd. 1601-1604, 17-18/F., Tower A, Building 2, Shenzhen International Innovation Valley, Dashi 1st Road, Xili Street, Xili Community, Nanshan District, Shenzhen, Guangdong, China Mail: info@bi.chn.tuv.com Web: http://www.chn.tuv.com



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Test item particulars:	
Information about the product needed to establish a correct test program, such as product mobility, type of power connections and similar.	(Test item particulars are selected by the TRF Originator base on the requirements in the standard)
Designation:	See table 4 on page 4&5
Trademark:	N/A
Nominal voltage:	3.7V
Rated capacity:	See table 4 on page 4&5
Maximum charge voltage:	4.25V
Maximum charge current:	1C
Final voltage:	2.75V
Ambient temperature range:	10~45°C (charge), -20~60°C (discharge)
Recommend charging method declared by the manufacturer:	Charge the cell at 0.2C CC to 4.2V, then 4.2V CV until charging current reaches 0.02C at ambient 20±5°C.
Utilization Type:	Technician replaceable cell
Testing:	
Test clauses and results:	
cl.10 Short-Circuit Test:	Р
cl.11 Abnormal Charging Test:	Р
cl.12 Forced-Discharge Test:	N/A
cl.13 Crush Test:	Р
cl.14 Impact Test:	Р
cl.15 Shock Test:	Ρ
cl.16 Vibration Test:	Ρ
cl.17 Heating Test:	Ρ
cl.18 Temperature Cycling Test:	Ρ
cl.19 Low Pressure (Altitude Simulation) Test:	Ρ
cl.20 Projectile Test:	Ρ
Testing location:	
Dongguan ZRLK Testing Technology Co., Ltd. Building 2, No.1, Technology 10th Road, Songshan Lak	e Park, Dongguan City 523808, Guangdong, China
General remarks:	
This report shall not be reproduced, except in full, without The test results presented in this report relate only to the "(see remark #)" refers to a remark appended to the report "(see appended table)" refers to a table appended to the Throughout this report a point is used as the decimal set	ut the written approval of the testing laboratory. e object tested. ort. e report. parator.



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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 cell is evaluated in this test report according to UL 1642:2020, and passed all the tests.

1) These tested cells have not been evaluated in combination with charger(s) or host product(s). Additional evaluation to determine compliance may be required on the combination(s) in the end product evaluation.

2) The tested cells were evaluated for a maximum charge current and maximum voltage limit outlined in the Table below. The end product evaluation shall ensure that current and voltage limits noted are maintained.

3) The fifteen models (Model name: LP 501120, LP 302030, LP 601230, LP 752030, LP 403030, LP 501745, LP 403035, LP 503040, LP 603048, LP 802060, LP 573450, LP 603450, LP503759, LP 953450, LP 903759) are identical (same shape, same chemical system, using same material), except the model name, the size and the capacity. The tested models LP 501120, LP503759 and LP 903759 are representatives of all models.

- Table 1: Electrical parameter of model LP 501120:

Model	Rated capacity	Nominal voltage	Nominal Charge current	Nominal discharge current	Max. charge current	Max. discharge current	Max. charge voltage	End discharge voltage
LP 501120	80mAh	3.7V	16mA	16mA	80mA	80mA	4.25V	2.75V

- Table 2: Electrical parameter of model LP503759:

Model	Rated capacity	Nominal voltage	Nominal Charge current	Nominal discharge current	Max. charge current	Max. discharge current	Max. charge voltage	End discharge voltage
LP503759	1350mAh	3.7V	270mA	270mA	1350mA	1350mA	4.25V	2.75V

- Table 3: Electrical parameter of model LP 903759:

Model	Rated capacity	Nominal voltage	Nominal Charge current	Nominal discharge current	Max. charge current	Max. discharge current	Max. charge voltage	End discharge voltage
LP 903759	2200mAh	3.7V	440mA	440mA	2200mA	2200mA	4.25V	2.75V

Remark: other models feature, see Table 4.

- Table 4: All of the models:

Model	Energy density (Wh/L)	Rated capacity (mAh)	Thickness (mm)	Width (mm)	Height (mm)	Nominal charge current (mA)	Nominal discharge current (mA)	Max. charge current (mA)	Max. discharge current (mA)
LP 501120	269.09	80	5.0	11.0	20.0	16	16	80	80
LP 302030	287.78	140	3.0	20.0	30.0	28	28	140	140
LP 601230	291.20	170	6.0	12.0	30.0	34	34	170	170
LP 752030	246.67	300	7.5	20.0	30.0	60	60	300	300



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LP 403030	339.17	330	4.0	30.0	30.0	66	66	330	330
LP 501745	348.24	360	5.0	17.0	45.0	72	72	360	360
LP 403035	352.38	400	4.0	30.0	35.0	80	80	400	400
LP 503040	345.33	560	5.0	30.0	40.0	112	112	560	560
LP 603048	364.00	850	6.0	30.0	48.0	170	170	850	850
LP 802060	346.88	900	8.0	20.0	60.0	180	180	900	900
LP 573450	374.20	980	5.7	34.0	50.0	196	196	980	980
LP 603450	435.29	1200	6.0	34.0	50.0	240	240	1200	1200
LP5037 59	457.63	1350	5.0	37.0	59.0	270	270	1350	1350
LP 953450	435.29	1900	9.5	34.0	50.0	380	380	1900	1900
LP 903759	414.31	2200	9.0	37.0	59.0	440	440	2200	2200

Remark: All the models have the same nominal voltage 3.7V and the same end discharge voltage 2.75V, and have the same Max. charge voltage 4.25V.

Construction:



Factory: Ropla Elektronik Sp. z o.o. ul. Wrocławska 1C, 52-200 Suchy Dwór, Poland



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INTROD	JCTION					
1	Scope		Р			
2	General					
3	Glossary		Р			
CONSTR	UCTION					
4	General		N/A			
4.1	Casing		N/A			
4.1.1	The casing of a lithium battery shall have the strength and rigidity necessary to resist the abuses to which it may be subjected, without resulting in a risk of fire. The casing of a user-replaceable lithium battery shall have the strength and rigidity necessary to resist the abuses to which it may be subjected without resulting in a risk of injury to persons.	Technician replaceable cell without enclosure.	N/A			
4.1.2	A cell of a user-replaceable battery shall be in a rigid casing of sufficient strength to prevent flexing. A tool providing the mechanical advantage of a pliers, screwdriver, or hacksaw shall be the minimum capable of opening the user-replaceable cell casing, if opening of the casing will expose metallic lithium.	See above	N/A			
4.2	Electrolyte		N/A			
4.2.1	A user-replaceable battery shall not contain pressurized vapor or liquid that could spray materials into the eyes or leak more than 5 mL of liquid when the battery casing is punctured under normal laboratory conditions, $23 \pm 2^{\circ}C$ (73 $\pm 3.6^{\circ}F$).	Technician-replaceable Battery.	N/A			
4.3	Use		N/A			
4.3.1	A lithium battery shall be protected from abnormal charging currents during use. A battery tested and found acceptable for the charging current, IC (see Section 11), under fault conditions specified by the manufacturer, shall be protected from larger charging currents in the end product application by: a) Two blocking components, such as diodes, or b) One blocking component and one current limiting component, such as a resistor or a fuse. The current limiting component shall limit the charging current to one-third the value used in the Abnormal Charging Test, Section 11.	Single cell only	N/A			
PERFOR	MANCE					
5	General		Р			
5.1	Technician-replaceable Batteries		Р			



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Requirement + Test Result - Remark Verdict

5.1.1	Technician-replaceable lithium cells or batteries are to be tested as described in Sections $10 - 20$. Section 12, Forced-Discharge Test, is applicable only to cells intended to be used in series-connected multicell applications such as battery packs. For multicell installations, also see 5.3.1.		Ρ
5.1.2	When a fire or explosion occurs as a result of the Crush Test, Section 13, or the Impact Test,	No fire or explosion occurs	Р
	Section 14, or the cell or battery ruptures to the extent that the aluminum test cage is penetrated during the Projectile Test, Section 20; the use of the technician replaceable cell or battery shall be restricted to applications in which it is not exposed to, or is protected from, any conditions shown to cause a fire or explosion.		
5.1.3	Cells and batteries subjected to the Shock Test, Section 15, Vibration Test, Section 16, Temperature Cycling Test, Section 18, and Low Pressure (Altitude Simulation) Test, Section 19, shall also not leak or vent. For these tests, unacceptable leakage is determined to have occurred when the resulting mass loss exceeds the values shown in Table 5.1, Venting and leakage mass loss criteria.	No leak or vent	Ρ
5.2	User-replaceable Batteries		N/A
5.2.1	User-replaceable lithium cells or batteries are to be tested as described in Sections 10 – 20. Section 12, Forced Discharge Test, is applicable only to cells intended to be used in multicell applications such as battery packs. In addition to complying with the requirements for a technician replaceable cell or battery as specified in 5.1.1, a user-replaceable cell or battery shall not explode or ignite when subjected to the Crush Test, Section 13, or the Impact Test, Section14. A user-replaceable battery shall comply with the requirements for Sections 10 – 20 and with the applicable construction requirements outlined in Section 4. Secondary lithium cells shall not be considered user-replaceable.	Technician-replaceable cell	N/A
5.2.2	Sets of five specimens each are to be used for the Projectile Test, Section 20.3; see Table 6.1. When only one specimen from a set of five does not comply with the requirements, another set of five specimens is to be tested. All specimens from this second set shall comply with the requirements.	Technician-replaceable cell	N/A
5.3	Multicell Installations		N/A

Clause



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Clause	Requirement + Test	Result - Remark	Verdict
5.3.1	A technician-replaceable or user-replaceable cell intended for use in multicell installations or battery packs shall also be tested as described in 10.3 and Section 12. No fire or explosion shall occur as a result of these tests. In addition, batteries subjected to the test described in 10.3 shall meet the requirements as described in 5.1.1 and 5.2.1 for a cell or battery subjected to the Short-Circuit Test, Section10.	Single cell.	N/A
6	Samples		Р
6.1	Fully charged primary cells or batteries and primary cells or batteries that have been conditioned by partial or complete discharge, or both, are to be used for the tests described in Sections $10 - 20$. The number of samples to be used in each test for a primary cell or battery is shown in Table 6.1. When a group of cells or batteries of different sizes, but similar chemistries is involved, selected sizes representative of the range are to be tested.	The samples are secondary cells.	N/A
6.2	Fully charged secondary cells or batteries and secondary cells or batteries that have been conditioned by charge-discharge cycling are to be used for the tests described in Sections $10 - 20$. The number of samples to be used in each test for a secondary cell or battery is shown in Table 6.2. When a group of cells or batteries of different sizes, and similar chemistries is involved, selected sizes representative of the range are to be tested.	The samples are secondary technician- replaceable cells. Prepared as required.	Ρ
6.3	Prior to conducting the testing in Section 17, the lithium ion cell samples shall be pre-conditioned as outlined in 6.4 and 6.5.	Prepared as required.	Р
6.4	For the heating test of Section 17, two sets of five lithium ion cell samples are to be fully discharged (i.e. to the manufacturer's specified end point voltage). The samples are then placed in a test chamber and conditioned for 1 to 4 h (5 samples at the upper temperature limit and 5 samples at the lower temperature limit of the operating region) as outlined in Table 6.3.	Prepared as required.	Ρ
6.5	While still in the test chamber set at the temperature limits, the samples are charged (5 samples at	Prepared as required.	Р
	the upper temperature limit and 5 samples at lower temperature limit) at the specified maximum charging current and upper limit charging voltage per Table 6.3, using a constant voltage charging method. Charging is continued until the charge current is reduced to the specified end of charge conditions (i.e. 0.05 times the charge current).		
7	Conditioning of Samples		Р
7.1	Discharge		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
	-	•	
7.1.1	Primary batteries are to be completely discharged by connecting their terminals through resistors that provide the desired level of discharge within 60 days. Batteries are to be discharged at room temperature. Cells with a liquid cathode such as thionyl chloride or sulfur dioxide, shall also be conditioned by one-half discharge	The samples are secondary cells.	N/A
7.1.2	For solid electrolyte and other types of primary lithium batteries that cannot be discharged within 60 days because of the small currents they inherently produce, longer discharge times plus discharge at higher temperatures may be used to obtain the desired level of discharge. The manufacturer's recommended discharge procedures are to be followed so as to obtain the required discharge level in the minimum time.	The samples are secondary cells.	N/A
7.2	Charge-discharge cycling		Р
7.2.1	Secondary cells are to be conditioned at 25°C (77°F). Cells are continuously cycled as per the manufacturer's specifications. The specification shall be such that the full rated capacity of the cell is utilized and the number of cycles accumulated shall be at least equal to 25% of the advertised cycle life of the cell or cycled continuously for 90 days, whichever is shorter. Cycling is to be done either individually or in groups. Cells are to be recharged prior to testing as indicated in Table 6.2.	The samples are cycled at manufacturer's factory before they were sent for test.	Ρ
8	Important test considerations		Р
8.1	Some lithium batteries are capable of exploding when the tests described in Sections $10 - 20$ are conducted. It is important that personnel be protected from the flying fragments, explosive force, sudden release of heat, and noise that results from such explosions. The test area is to be well ventilated to protect personnel from possible harmful fumes or gases.	Prepared the tests as required.	Ρ
8.2	As an additional precaution, the temperatures on the surface of the battery casings shall be monitored during the tests described in Sections 10, 11, 12, 13, and 14. All personnel involved in the testing of lithium batteries are to be instructed never to approach a lithium battery while the surface temperature exceeds 90°C (194°F) and not to touch the lithium battery while the surface temperature exceeds 45°C (113°F).	Prepared the tests as required.	Ρ
8.3	For protection, the Projectile Test, Section 20 is to be conducted in a room separate from the observer.	Prepared the tests as required.	Р
9	Temperature Measurements		Р
9.1	Temperatures are to be measured by thermocouples consisting of wires not larger than 24 AWG (0.21 mm2) and not smaller than 30 AWG (0.05 mm2) and a potentiometer-type instrument.	Prepared the tests as required.	Ρ



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Clause	Requirement + Test	Result - Remark	Verdict			
9.2	The temperature measurements on the batteries are to be made with the measuring junction of the	Prepared the tests as required.	Р			
	thermocouple held tightly against the metal casing of the battery.	Casing temperature was recorded on the center of the cell surface.				
TESTS FO	OR TECHNICIAN-REPLACEABLE AND USER	-REPLACEABLE BATTI	ERIES			
ELECTRI	CAL TESTS					
10	Short-Circuit Test		Р			
10.1	Each test sample battery, in turn, is to be short- circuited by connecting the positive and negative terminals of the battery with a circuit load having a resistance load of 80 ± 20 m Ω . The temperature of the battery case is to be recorded during the test. The battery is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.2 V and the battery case temperature has returned to $\pm10^{\circ}$ C ($\pm18^{\circ}$ F) of ambient temperature. The voltage at the end of the test may not reach 0.2 V due to operation of protective devices in the circuit. The return to near ambient of the battery (cell) casing in an indication of ultimate results.	Tested as required. See table 10	Ρ			
10.2	Tests are to be conducted at $20 \pm 5^{\circ}C$ (68 $\pm 9^{\circ}F$) and at 55 $\pm 5^{\circ}C$ (131 $\pm 9^{\circ}F$). The batteries are to reach equilibrium at 20 $\pm 5^{\circ}C$ or 55 $\pm 5^{\circ}C$, as applicable, before the terminals are connected.	Tested as required.	Р			
10.3	A battery is to be tested individually unless the manufacturer indicates that it is intended for use in series or parallel. For series or parallel use, additional tests on five sets of batteries are to be conducted using the maximum number of batteries to be covered for each configuration.	Tested as required.	Ρ			
10.4	When an overcurrent protective device activates during the test, the test shall be repeated with the battery supply connected to the maximum load that does not cause the protective device to open. Protective devices that are relied upon to meet the compliance criteria for the short circuit test shall comply with 2.3.1.	Only one single lithium-ion cell, no over-current or thermal protective device was integrated into the cell.	N/A			
10.5	The samples shall not explode or catch fire.	The test results meet the requirements.	Ρ			
11	Abnormal Charging Test		Р			
11.1	Primary cells or batteries shall comply with 11.2 – 11.7.	Secondary cell	N/A			
11.2	Cells or batteries conditioned in accordance with Tables 6.1, as applicable, are to be used for this test. The batteries are to be tested in an ambient temperature of 20 \pm 5°C (68 \pm 9°F).		N/A			



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Clause	Requirement + Test	Result - Remark	Verdict	
11.3	Each test sample battery is to be subjected to a charging current of three times the current lc, specified by the manufacturer by connecting it in opposition to a		N/A	
	de nower supply. The specified charging surrent is to			

	by the manufacturer by connecting it in opposition to a dc-power supply. The specified charging current is to be obtained by connecting a resistor of the specified size and rating in series with the battery. The test charging time is to be calculated using the formula:		
	$t_c = \frac{2.5C}{3(l_c)}$, in which		
	tc is the charging time in hour		
	C is the capacity of the cell/batteiy in ampere-hours, and		
	Ic is the maximum charging current, in amperes, specified by the manufacturer.		
	The minimum charging time is to be 7 hours.		
11.4	When a non-resettable overcurrent or protective device operates during the test, the test is to be repeated at a charge current below the level that the protective device operates. When a resettable protective device operates during the test, the protector is allowed to reset to a total of 10 cycles; or until the appropriate charging time has been completed, but not less than 7 hours. Protective devices that are relied upon to meet the compliance criteria for the abnormal charging test shall comply with 2.3.1.		N/A
11.5	The samples shall not explode or catch fire.		N/A
11.6	Secondary cells or batteries shall comply with 11.7 – 11.10.	See table 11, tested as required	Р
11.7	Cells or batteries conditioned in accordance with Tables 6.2, as applicable, are to be used for this test. The batteries are to be tested in an ambient temperature of 20 \pm 5°C (68 \pm 9°F).	Tested as required.	Ρ
11.8	Each test sample battery is to be discharged at a constant current of 0.2 C/1 h, to a manufacturer specified discharge endpoint voltage. The cell or battery is then to be charged with a constant maximum specified output voltage and a current limit of three times the maximum charging current Ic, specified by the manufacturer. Charging duration is to be 7 hours or the time required to reach the manufacturer's specified end-of-charge condition, whichever is greater.	Tested as required.	Р



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Clause	Requirement + Test	Result - Remark	Verdict

11.9	When a non-resettable overcurrent or protective device operates during the test, the test shall be repeated at an overcharging current below the level that the protection device operates. When a resettable protective device operates during the test, the protector is to be allowed to reset to a total of 10 cycles; or until the appropriate charging time has been completed, but not less than 7 hours. Protective devices that are relied upon to meet the compliance criteria for the abnormal charging test shall comply with 2.3.1.	The samples are to be tested without any assistance of over-current or thermal protective devices.	N/A
11.10	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	Р
12	Forced-Discharged Test		N/A
12.1	This test is intended for cells that are to be used in series-connected, multicell applications, such as battery packs.	One single cell	N/A
12.2	A fully discharged cell is to be force-discharged by connecting it in series with fully charged cells of the same kind. The number of fully charged cells to be connected in series with the discharged cell is to equal the maximum number less one of the cells to be covered for series use. Five cells are to be completely discharged, at room temperature.		N/A
12.3	Once the fully discharged cell is connected in series with the specified number of fully charged cells the resultant battery pack is to be short circuited.		N/A
12.4	The positive and negative terminals of the sample are to be connected with a copper wire with a resistance load of $80\pm 20m\Omega$. The sample is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.2V and the battery case temperature has returned to $\pm 10^{\circ}C$ (18°F) of ambient temperature. The voltage at the end of the test may not reach 0.2V due to operation of protective devices in the circuit. The return to near ambient of the cell casing is an indication of ultimate results.		N/A
12.5	When an overcurrent or protective operates during the test, the test shall be repeated with the battery supply connected to the maximum load that does not cause the protective device to open. Protective devices that are relied upon to meet the compliance criteria for the forced discharge test shall comply with 2.3.1.		N/A
12.6	The samples shall not explode or catch fire.		N/A
MECHAN	ICAL TESTS		
13	Crush Test		Р



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Requirement + Test	Result - Remark	Verdict

13.1	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until an applied force of $13 \pm 1 \text{ kN}$ (3000 ±224 lbs) is reached. Once the maximum force has been obtained it is to be released.	Tested as required. See table 13	Ρ
13.2	A cylindrical, pouch or prismatic cell is to be crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus. A prismatic cell is also to be rotated 90° around its longitudinal axis so that both the wide and narrow sides will be subjected to the crushing force. Each sample is to be subjected to a crushing force in only one direction. Separate samples are to be used for each test.	Tested as required. The sample are pouch lithium- ion cells.	Ρ
	Exception: For Lithium ion systems, a cylindrical, pouch or prismatic cell is to be crushed with its longitudinal axis parallel to the flat surface of the crushing apparatus. Each sample is to be subjected to a crushing force in only one direction. Test only the wide side of pouch and prismatic cells.	Li-ion cell.	Р
13.3	A coin or button battery is to be crushed with the flat surface of the battery parallel with the flat surfaces of the crushing apparatus.	Not a coin or button battery	N/A
13.4	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	Р
14	Impact Test		Р
14.1	A test sample battery is to be placed on a flat surface. A 15.8 \pm 0.1-mm (5/8 \pm 0.004-in) diameter bar is to be placed across the center of the sample. A 9.1 \pm 0.46- kg (20 \pm 1-lb) weight is to be dropped from a height of 610 \pm 25 mm (24 \pm 1 in) onto the sample. See Figure 14.1.	Prepared the test as required. See table 14	Р
14.2	A cylindrical, pouch or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8-mm (5/8-in) diameter curved surface lying across the center of the test sample. A prismatic cell is also to be rotated 90° around its longitudinal axis so that both the wide and narrow sides are subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each test.	Tested as required. The samples are pouch lithium- ion cells.	Ρ

Clause



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Clause	Requirement + Test	Result - Remark	Verdict
	Execution, For Lithium ion exetems, a extindrical		Р

	Exception: For Lithium ion systems, a cylindrical, pouch or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8-mm (5/8-in) diameter curved surface lying across the center of the test sample. Each sample is to be subjected to only a single impact. Test only the wide side of pouch and prismatic cells.	Li-ion cell.	Ρ
14.3	A coin or button battery is to be impacted with the flat surface of the test sample parallel to the flat surface and the 15.8-mm (5/8-in) diameter curved surface lying across its center.	Not a coin or button battery	N/A
14.4	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	Р
15	Shock Test		Р
15.1	The cell is to be secured to the testing machine by means of a rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions unless it has only two axes of symmetry in which case only two directions shall be tested. Each shock is to be applied in a direction normal to the face of the cell. For each shock the cell is to be accelerated in such a manner that during the initial 3 ms the minimum average acceleration is 75 g (where g is the local acceleration due to gravity). The peak acceleration shall be between 125 and 175 g. Cells shall be tested at a temperature of $20 \pm 5^{\circ}$ C (68 $\pm 9^{\circ}$ F).	Prepared the test as required. See table 15	Ρ
15.2	The samples shall not explode or catch fire. In addition, the sample shall not vent or leak as described in 5.1.1.	No explosion or catch fire, the sample not vent or leak	Р
16	Vibration Test		Р
16.1	A battery is to be subjected to simple harmonic motion with an amplitude of 0.8 mm (0.03 inch) [1.6 mm (0.06 inch) total maximum excursion].	Prepared the test as required. See table 16.	Р
16.2	The frequency is to be varied at the rate of 1 Hz/min between 10 and 55 Hz, and return in not less than 90 nor more than 100 min. The battery is to be tested in three mutually perpendicular directions. For a battery that has only two axes of symmetry, the battery is to be tested perpendicular to each axis.	Tested as required.	Ρ
16.3	The samples shall not explode or catch fire. In addition the sample shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	Р
ENVIRON	IMENTAL TESTS		
17	Heating Test		Р



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Result - Remark	Verdict

17.1	A battery is to be heated in a gravity convection or circulating air oven with an initial temperature of $20 \pm 5^{\circ}C$ ($68\pm 9^{\circ}F$). The temperature of the oven is to be raised at a rate of $5 \pm 2^{\circ}C$ ($9\pm 3.6^{\circ}F$) per minute to a temperature of $130 \pm 2^{\circ}C$ ($266\pm 3.6^{\circ}F$) and remain for 10 min. The sample shall return to room temperature ($20\pm 5^{\circ}C$) and then be examined. For batteries specified for temperatures above $100^{\circ}C$ ($212^{\circ}F$), the conditioning temperature shall be increased from 130 $\pm 2^{\circ}C$ ($266\pm 3.6^{\circ}F$), to $30\pm 2^{\circ}C$ ($86\pm 3.6^{\circ}F$) above the manufacturers maximum specified temperature. For a battery of lithium metal chemistry, the conditioning temperature shall be increased to a maximum of 170 $\pm 2^{\circ}C$ ($338\pm 3.6^{\circ}F$).	Tested as required. Oven temperature: 130°C.	Ρ
17.2	The samples shall not explode or catch fire.	The test results meet the requirements.	Р
18	Temperature Cycling Test		Р
18.1	The batteries are to be placed in a test chamber and subjected to the following cycles: a) Raising the chamber-temperature to 70 ±3°C (158 ±5°F) within 30 minutes and maintaining this temperature for 4 hours. b) Reducing the chamber temperature to 20 ±3°C (68 ±5°F) within 30 minutes and maintaining this temperature for 2 hours. c) Reducing the chamber temperature to minus 40 ±3°C (minus 40 ±5°F) within 30 minutes and maintaining this temperature for 4 hours. d) Raising the chamber temperature to 20 ±3°C (68 ±5°F) within 30 minutes. e) Repeating the sequence for a further 9 cycles. f) After the 10th cycle, storing the batteries for a minimum of 24 hours, at a temperature of 20 ±5°C (68 ±9°F) prior to examination.	Tested as required. See table 18	Ρ
18.2	The samples shall not explode or catch fire. In addition, the samples shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	Р
19	Low Pressure (Altitude Simulation) Test		Р
19.1	Sample batteries are to be stored for 6 hours at an absolute pressure of 11.6 kPa (1.68 psi) and a temperature of $20 \pm 3^{\circ}$ C (68 $\pm 5^{\circ}$ F).	Tested as required. See table 19	P
19.2	The samples shall not explode or catch fire as a result of the Low Pressure (Altitude Simulation) Test. In addition, the samples shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	Р
FIRE EXP			
20	Projectile Test		Р

Clause

Requirement + Test



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Clause	Requirement + Test	Result - Remark	Verdict
20.1	When subjected to the test described in 20.2 - 20.5 no part of an exploding cell or battery shall penetrate the wire screen such that some or all of the cell or battery protrudes through the screen.	The test results meet the requirements.	Ρ
20.2	Each test sample cell or battery is to be placed on a screen that covers a 102-mm (4-inch) diameter hole in the center of a platform table. The screen is to be constructed of steel wire mesh having 20 openings per 25.4 mm (1 in) and a wire diameter of 0.43 mm (0.017 in).	Prepared the test as required.	Ρ
20.3	The screen is to be mounted 38 mm (1-1/2 in) above a Meker type burner. The fuel and air flow rates are to be set to provide a bright blue flame that causes the supporting screen to glow a bright red.	Prepared the test as required.	Ρ
20.4	An eight-sided covered wire cage, 610-mm (2-ft) across and 305-mm (1-ft) high, made from metal screening is to be placed over the test sample. See Figure 20.1. The metal screening is to be constructed from 0.25-mm (0.010-in) diameter aluminum wire with 16 -18 wires per 25.4 mm (1 inch) in each direction.	Tested as required.	Ρ
20.5	The sample is to be heated and shall remain on the screen until it explodes or the cell or battery has ignited and burned out. It is not required to secure the sample in place unless it is at risk of falling off the screen before the test is completed. When required, the sample shall be secured to the screen with a single wire tied around the sample.	Tested as required.	Ρ
MARKI	NG		
21	General		Р
21.1	A battery shall be legibly and permanently marked with:	See marking plate on page 3	Р
	The manufacturer's name, trade name, or trademark or other descriptive marking by which the organization responsible for the product may be identified;		
	A distinctive ("catalog" or "model") number or the equivalent;		
	The date or other dating period of manufacture not exceeding any three consecutive months.		
21.2	If a manufacturer produces a battery at more than one factory, each battery package shall have a distinctive marking to identify it as the product of a particular factory.	One factory only.	N/A
22	Primary Batteries		N/A
22.1	A primary battery shall be marked with the word "WARNING" and the following or an equivalent statement: "Risk of fire and burns. Do not recharge, open, crush, heat above (the manufacturer's specified temperature rating), or incinerate." If space does not permit marking on the battery, the marking may be on the smallest unit package.	Secondary cell	N/A



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Clause	Requirement + Test	Result - Remark	Verdict
22.2	The packaging for a user-replaceable battery shall be marked with the word "CAUTION" and the following or equivalent statements:		N/A
	"Risk of fire and burns. Do not recharge, disassemble, heat above (the manufacturer's specified temperature rating), or incinerate. Keep battery out of reach of children and in original package until ready to use. Dispose of used batteries promptly."		
22.3	For user replaceable lithium primary coin cells (3.0 V) the packaging shall also include the following or equivalent: "WARNING – Never put batteries in mouth. Swallowing may lead to serious injury or death. If ingested, immediately seek medical attention and have the doctor phone the National Capital Poison Control Center." This marking may be combined with the marking of 22.2, if the signal word "WARNING" is used instead of "CAUTION."		N/A



10	TABLE: S	hort-Circuit Tes	t (model: LP 501	120)		Р
Fully Charg	ged Cell					
Sampl	le No.	DSP22070540- 001	DSP22070540- 002	DSP22070540- 003	DSP22070540- 004	DSP2207054 0-005
Ambient ter (at 20±5	mperature: 5°C, °C)	23.9	23.9	23.9	23.9	23.9
Max. cas Tmax	ing temp ‹ (°C)	118.7	114.5	117.3	112.6	116.0
Failure	Mode	No	No	No	No	No
Sampl	le No.	DSP22070540- 006	DSP22070540- 007	DSP22070540- 008	DSP22070540- 009	DSP2207054 0-010
Ambient ter (at 55 ±	mperature: 5°C, °C)	56.9	56.9	56.9	56.9	56.9
Max. cas Tmax	ing temp ‹ (°C)	122.2	119.3	124.7	123.0	121.6
Failure	Mode	No	No	No	No	No
Cycled Cel	I					
Sampl	le No.	DSP22070540- 011	DSP22070540- 012	DSP22070540- 013	DSP22070540- 014	DSP2207054 0-015
Ambient ter (at 20±5	mperature: 5°C, °C)	24.4	24.4	24.4	24.4	24.4
Max. cas Tmax	ing temp ‹ (°C)	107.0	110.3	115.1	109.6	110.4
Failure	Mode	No	No	No	No	No
Sampl	le No.	DSP22070540- 016	DSP22070540- 017	DSP22070540- 018	DSP22070540- 019	DSP2207054 0-020
Ambient ter (at 55 ±5	mperature: 5°C, °C)	55.6	55.6	55.6	55.6	55.6
Max. cas Tmax	ing temp ‹ (°C)	120.8	122.5	118.0	123.6	121.3
Failure	Mode	No	No	No	No	No
Supplement	tary informat	tion:				
-						

Tmax was recorded on the centre of the cell surface.

No explode or catch fire.



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10	TABLE: S	hort-Circuit Tes	t (model: LP503	759)		Р		
Fully Charg	ged Cell							
Sampl	e No.	DSP22070540- 116	DSP22070540- 117	DSP22070540- 118	DSP22070540- 119	DSP2207054 0-120		
Ambient ter (at 20±5	nperature: °C, °C)	23.9	23.9	23.9	23.9	23.9		
Max. cas Tmax	ing temp (°C)	102.5	104.5	109.7	111.1	109.4		
Failure	Mode	No	No	No	No	No		
Sampl	e No.	DSP22070540- 121	DSP22070540- 122	DSP22070540- 123	DSP22070540- 124	DSP2207054 0-125		
Ambient ter (at 55 ±5	mperature: 5°C, °C)	56.9	56.9	56.9	56.9	56.9		
Max. cas Tmax	ing temp (°C)	116.4	115.7	113.5	118.7	119.2		
Failure Mode		No	No	No	No	No		
Cycled Cel	Cycled Cell							
Sampl	e No.	DSP22070540- 126	DSP22070540- 127	DSP22070540- 128	DSP22070540- 129	DSP2207054 0-130		
Ambient ter (at 20±5	nperature: °C, °C)	24.4	24.4	24.4	24.4	24.4		
Max. cas Tmax	ing temp (°C)	107.7	117.3	111.0	107.4	116.7		
Failure	Mode	No	No	No	No	No		
Sampl	e No.	DSP22070540- 131	DSP22070540- 132	DSP22070540- 133	DSP22070540- 134	DSP2207054 0-135		
Ambient ter (at 55 ±5	mperature: 5°C, °C)	55.8	55.8	55.8	55.8	55.8		
Max. cas Tmax	ing temp (°C)	121.8	119.5	118.7	120.8	115.7		
Failure	Mode	No	No	No	No	No		
Supplement	Supplementary information:							
Tmax was r	Tmax was recorded on the centre of the cell surface.							
No explode	or catch fire).						



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10	TABLE: S	hort-Circuit Tes		Р				
Fully Charg	ged Cell							
Sampl	e No.	DSP22070540- 231	DSP22070540- 232	DSP22070540- 233	DSP22070540- 234	DSP2207054 0-235		
Ambient ter (at 20±5	mperature: °C, °C)	23.8	23.8	23.8	23.8	23.8		
Max. casi Tmax	ing temp (°C)	118.7	116.7	116.0	113.9	117.6		
Failure	Mode	No	No	No	No	No		
Sampl	e No.	DSP22070540- 236	DSP22070540- 237	DSP22070540- 238	DSP22070540- 239	DSP2207054 0-240		
Ambient ter (at 55 ±5	mperature: 5°C, °C)	57.0	57.0	57.0	57.0	57.0		
Max. casi Tmax	ing temp (°C)	120.7	124.7	121.9	118.2	125.6		
Failure	Mode	No	No	No	No	No		
Cycled Cel	Cycled Cell							
Sampl	e No.	DSP22070540- 241	DSP22070540- 242	DSP22070540- 243	DSP22070540- 244	DSP2207054 0-245		
Ambient ter (at 20±5	mperature: °C, °C)	24.0	24.0	24.0	24.0	24.0		
Max. casi Tmax	ing temp (°C)	117.3	118.5	119.2	114.0	112.6		
Failure	Mode	No	No	No	No	No		
Sampl	e No.	DSP22070540- 246	DSP22070540- 247	DSP22070540- 248	DSP22070540- 249	DSP2207054 0-250		
Ambient ter (at 55 ±5	mperature: 5°C, °C)	55.9	55.9	55.9	55.9	55.9		
Max. casi Tmax	ing temp (°C)	121.3	124.2	121.4	123.7	117.6		
Failure	Mode	No	No	No	No	No		
Supplement	ary informat	tion:						
Tmax was re	Tmax was recorded on the centre of the cell surface.							
No explode	or catch fire							



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11 TABLE: A	bnormal Chargii	ormal Charging Test (model: LP 501120) P						
ld	<u>0.01</u>	<u>6</u> A	Ue			<u>2.75</u> V		
lc	<u>0.0</u> 8	<u>8</u> A		Uc		4	<u>4.25</u> V	
Fully Charged Cell								
Sample No.	DSP22070540- 251	DSP2207054 252	0- D	SP22070540- 253	DSP2	22070540- 254	DSP2207054 0-255	
Ambient temperature: (°C)	23.9	23.9		23.9		23.9	23.9	
Max. casing temp Tmax (°C)	26.4	27.0		26.3		26.9	27.2	
Failure Mode	No	No		No		No	No	
Cycled cell								
Sample No.	DSP22070540- 256	DSP2207054 257	0- D	SP22070540- 258	DSP2	22070540- 259	DSP2207054 0-260	
Ambient temperature: (°C)	22.6	22.6		22.6		22.6	22.6	
Max. casing temp Tmax (°C)	25.4	25.5		25.5		25.6	25.2	
Failure Mode	No	No		No		No	No	
Supplementary information:								
Test current is 0.24A.								
No explode or catch fire								



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11 TABLE: A	bnormal Chargii	ormal Charging Test (model: LP503759) P					
ld	0.2	<u>7</u> A	Ue		<u>2.75</u> V		
lc	<u>1.3</u>	<u>5</u> A	Uc		4	<u>l.25</u> ∨	
Fully Charged Cell							
Sample No.	DSP22070540- 261	DSP2207054 262	DSP22070540- 263	DSP22 2	2070540- 264	DSP2207054 0-265	
Ambient temperature: (°C)	23.8	23.8	23.8	2	3.8	23.8	
Max. casing temp Tmax (°C)	30.7	29.9	30.4	3	2.0	31.5	
Failure Mode	No	No	No	1	No	No	
Cycled cell							
Sample No.	DSP22070540- 266	DSP2207054 267	DSP22070540- 268	DSP22 2	2070540- 269	DSP2207054 0-270	
Ambient temperature: (°C)	23.8	23.8	23.8	2	3.8	23.8	
Max. casing temp Tmax (°C)	31.0	32.7	33.8	3	2.0	31.6	
Failure Mode	No	No	No	1	No	No	
Supplementary information:							
Test current is 4.05A.							
No explode or catch fire							



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11 TABLE: A	bnormal Chargir	ormal Charging Test (model: LP 903759)						
ld	0.4	<u>0.44</u> A		Ue		<u>2.75</u> V		
lc	2.2	<u>2</u> A		Uc		4	4. <u>25</u> V	
Fully Charged Cell								
Sample No.	DSP22070540- 271	DSP220705- 272	40-	DSP22070540- 273	DSP	22070540- 274	DSP2207054 0-275	
Ambient temperature: (°C)	23.7	23.7		23.7		23.7	23.7	
Max. casing temp Tmax (°C)	44.3	46.1		45.9		41.3	50.3	
Failure Mode	No	No		No		No	No	
Cycled cell								
Sample No.	DSP22070540- 276	DSP220705- 277	40-	DSP22070540- 278	DSP	22070540- 279	DSP2207054 0-280	
Ambient temperature: (°C)	23.7	23.7		23.7		23.7	23.7	
Max. casing temp Tmax (°C)	45.5	43.9		43.1		42.9	49.9	
Failure Mode	No	No		No		No	No	
Supplementary information:								
Test current is 6.6A.								
No explode or catch fire								



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13	TABLE: C	rush Test (mode		Р					
Ambient terr	Ambient temperature: 23.2°C								
Fully Charg	Fully Charged Cell								
Sampl	e No.	DSP22070540- 281	DSP22070540- 282	DSP22070540- 283	DSP22070540- 284	DSP2207054 0-285			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Crush d	irection	Wide side							
Failure	mode	No	No	No	No	No			
Cycled cell									
Sampl	e No.	DSP22070540- 286	DSP22070540- 287	DSP22070540- 288	DSP22070540- 289	DSP2207054 0-290			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Crush d	irection	Wide side							
Failure	mode	No	No	No	No	No			
Supplement	ary informat	tion: no explosion	or catch fire.						

13	TABLE: C	ABLE: Crush Test (model: LP503759)						
Ambient terr	nperature: 2	3.7°C						
Fully Charg	ged Cell							
Sampl	e No.	DSP22070540- 291	DSP22070540- 292	DSP22070540- 293	DSP22070540- 294	DSP2207054 0-295		
Catch	n fire	No	No	No	No	No		
Expl	ode	No	No	No	No	No		
Crush d	irection	Wide side	Wide side	Wide side	Wide side	Wide side		
Failure	mode	No	No	No	No	No		
Cycled cell								
Sampl	e No.	DSP22070540- 296	DSP22070540- 297	DSP22070540- 298	DSP22070540- 299	DSP2207054 0-300		
Catch	n fire	No	No	No	No	No		
Expl	ode	No	No	No	No	No		
Crush d	irection	Wide side	Wide side	Wide side	Wide side	Wide side		
Failure	mode	No	No	No	No	No		
Supplement	ary informa	tion: no explosior	or catch fire.	<u>.</u>				



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13	TABLE: C	rush Test (mode		Р					
Ambient terr	Ambient temperature: 23.2°C								
Fully Charg	Fully Charged Cell								
Sampl	e No.	DSP22070540- 301	DSP22070540- 302	DSP22070540- 303	DSP22070540- 304	DSP2207054 0-305			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Crush d	irection	Wide side							
Failure	mode	No	No	No	No	No			
Cycled cell									
Sampl	e No.	DSP22070540- 306	DSP22070540- 307	DSP22070540- 308	DSP22070540- 309	DSP2207054 0-310			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Crush d	irection	Wide side							
Failure	mode	No	No	No	No	No			
Supplement	ary informat	tion: no explosion	or catch fire.						

14	TABLE: In	ABLE: Impact Test (model: LP 501120)							
Ambient terr	nperature: 2	3.0°C							
Fully Charg	Fully Charged Cell								
Sampl	e No.	DSP22070540- 311	DSP22070540- 312	DSP22070540- 313	DSP22070540- 314	DSP2207054 0-315			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Impact d	lirection	Wide side	Wide side	Wide side	Wide side	Wide side			
Failure	mode	No	No	No	No	No			
Cycled cell									
Sampl	e No.	DSP22070540- 316	DSP22070540- 317	DSP22070540- 318	DSP22070540- 319	DSP2207054 0-320			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Impact d	lirection	Wide side	Wide side	Wide side	Wide side	Wide side			
Failure	mode	No	No	No	No	No			
Supplement	ary informa	tion: no explosion	or catch fire.						



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14 TABLE: Impact Test (model: LP503759) Ρ Ambient temperature: 23.1°C **Fully Charged Cell** Sample No. DSP22070540-DSP22070540-DSP22070540-DSP22070540-DSP2207054 0-325 321 322 323 324 Catch fire No No No No No Explode No No No No No Impact direction Wide side Wide side Wide side Wide side Wide side Failure mode No No No No No Cycled cell Sample No. DSP22070540-DSP22070540-DSP22070540-DSP22070540-DSP2207054 0-330 326 327 328 329 Catch fire No No No No No Explode No No No No No Wide side Wide side Impact direction Wide side Wide side Wide side Failure mode No No No No No Supplementary information: no explosion or catch fire.

14	TABLE: In	TABLE: Impact Test (model: LP 903759)							
Ambient ten	Ambient temperature: 23.8°C								
Fully Charged Cell									
Sampl	e No.	DSP22070540- 331	DSP22070540- 332	DSP22070540- 333	DSP22070540- 334	DSP2207054 0-335			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Impact c	lirection	Wide side	Wide side	Wide side	Wide side	Wide side			
Failure	mode	No	No	No	No	No			
Cycled cell									
Sampl	e No.	DSP22070540- 336	DSP22070540- 337	DSP22070540- 338	DSP22070540- 339	DSP2207054 0-340			
Catch	n fire	No	No	No	No	No			
Expl	ode	No	No	No	No	No			
Impact c	lirection	Wide side	Wide side	Wide side	Wide side	Wide side			
Failure	mode	No	No	No	No	No			
Supplement	ary informa	tion: no explosion	or catch fire.						



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15	TABLE: S	BLE: Shock Test (model: LP 501120)							
Ambient terr	Ambient temperature: 22.3°C								
Fully Charg	Fully Charged Cell								
Sampl	e No.	DSP22070540- 341	DSP22070540- 342	DSP22070540- 343	DSP22070540- 344	DSP2207054 0-345			
Mass befor	re test (g)	1.8746	1.8527	1.8642	1.8415	1.8367			
Mass afte	r test (g)	1.8745	1.8525	1.8641	1.8413	1.8366			
Mass loss	ratio (%)	0.005	0.011	0.005	0.011	0.005			
Cycled cell									
Sampl	e No.	DSP22070540- 346	DSP22070540- 347	DSP22070540- 348	DSP22070540- 349	DSP2207054 0-350			
Mass befor	re test (g)	1.8635	1.8718	1.8827	1.8425	1.8728			
Mass afte	r test (g)	1.8634	1.8717	1.8826	1.8423	1.8726			
Mass loss	ratio (%)	0.005	0.005	0.005	0.011	0.011			
Supplemental less than 0.2	ary informat 2%	tion: no explosion	or catch fire, in a	ddition the sample	e did not vent or le	eak. Max loss			

15	TABLE: S	TABLE: Shock Test (model: LP503759)							
Ambient ter	Ambient temperature: 21.7°C								
Fully Char	ged Cell								
Samp	le No.	DSP22070540- 351	DSP22070540- 352	DSP22070540- 353	DSP22070540- 354	DSP2207054 0-355			
Mass befo	ore test (g)	21.178	21.009	21.247	21.096	21.358			
Mass afte	er test (g)	21.176	21.008	21.246	21.094	21.356			
Mass loss	s ratio (%)	0.009	0.005	0.005	0.009	0.009			
Cycled cel	I								
Samp	le No.	DSP22070540- 356	DSP22070540- 357	DSP22070540- 358	DSP22070540- 359	DSP2207054 0-360			
Mass befo	ore test (g)	21.728	21.527	21.396	21.427	21.518			
Mass afte	er test (g)	21.727	21.526	21.395	21.426	21.516			
Mass loss	s ratio (%)	0.005	0.005	0.005	0.005	0.009			

Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%



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15	TABLE: S	ABLE: Shock Test (model: LP 903759)					
Ambient terr	Ambient temperature: 23.7°C						
Fully Charg	jed Cell						
Sampl	e No.	DSP22070540- 361	DSP22070540- 362	DSP22070540- 363	DSP22070540- 364	DSP2207054 0-365	
Mass befor	re test (g)	36.706	36.837	36.976	36.818	36.575	
Mass afte	r test (g)	36.702	36.835	36.973	36.815	36.572	
Mass loss	ratio (%)	0.011	0.005	0.008	0.008	0.008	
Cycled cell							
Sampl	e No.	DSP22070540- 366	DSP22070540- 367	DSP22070540- 368	DSP22070540- 369	DSP2207054 0-370	
Mass befor	re test (g)	36.425	36.718	36.424	36.375	36.751	
Mass afte	r test (g)	36.424	36.715	36.420	36.372	36.749	
Mass loss	ratio (%)	0.003	0.008	0.011	0.008	0.005	
Supplement loss less that	Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

16 TABLE: V	TABLE: Vibration Test (model: LP 501120)						
Ambient temperature: 23.1°C							
Fully Charged Cell							
Sample No.	DSP22070540- 371	DSP22070540- 372	DSP22070540- 373	DSP22070540- 374	DSP2207054 0-375		
Mass before test (g)	1.8528	1.8673	1.8818	1.8718	1.8517		
Mass after test (g)	1.8525	1.8672	1.8817	1.8716	1.8514		
Mass loss ratio (%)	0.016	0.005	0.005	0.011	0.016		
Cycled cell							
Sample No.	DSP22070540- 376	DSP22070540- 377	DSP22070540- 378	DSP22070540- 379	DSP2207054 0-380		
Mass before test (g)	1.8428	1.8508	1.8728	1.8677	1.8528		
Mass after test (g)	1.8425	1.8507	1.8727	1.8676	1.8527		
Mass loss ratio (%)	0.016	0.005	0.005	0.005	0.005		

Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.2%



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16	TABLE: V	ABLE: Vibration Test (model: LP503759)					
Ambient terr	Ambient temperature: 22.8°C						
Fully Charg	jed Cell						
Sampl	e No.	DSP22070540- 381	DSP22070540- 382	DSP22070540- 383	DSP22070540- 384	DSP2207054 0-385	
Mass befor	re test (g)	21.457	21.396	21.596	21.443	21.596	
Mass afte	r test (g)	21.454	21.394	21.592	21.440	21.592	
Mass loss	ratio (%)	0.014	0.009	0.019	0.014	0.019	
Cycled cell							
Sampl	e No.	DSP22070540- 386	DSP22070540- 387	DSP22070540- 388	DSP22070540- 389	DSP2207054 0-390	
Mass befor	re test (g)	21.635	21.425	21.993	21.685	21.725	
Mass afte	r test (g)	21.631	21.424	21.990	21.682	21.721	
Mass loss	ratio (%)	0.018	0.005	0.014	0.014	0.018	
Supplemental less than 0.1	Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

16	TABLE: V	TABLE: Vibration Test (model: LP 903759)						
Ambient te	mperature: 2	3.0°C						
Fully Char	ged Cell							
Samp	ole No.	DSP22070540- 391	DSP22070540- 392	DSP22070540- 393	DSP22070540- 394	DSP2207054 0-395		
Mass bef	ore test (g)	36.517	36.443	36.719	36.625	36.425		
Mass aft	ter test (g)	36.512	36.438	36.713	36.620	36.421		
Mass los	s ratio (%)	0.014	0.014	0.016	0.014	0.011		
Cycled ce	II							
Samp	ole No.	DSP22070540- 396	DSP22070540- 397	DSP22070540- 398	DSP22070540- 399	DSP2207054 0-400		

oumpie no.	DOI 22070340	DOI 22070340	DOI 22070340	DOI 22070340	DOI 2207004
	396	397	398	399	0-400
Mass before test (g)	36.912	36.450	36.728	36.419	36.195
Mass after test (g)	36.907	36.445	36.722	36.413	36.191
Mass loss ratio (%)	0.014	0.014	0.016	0.016	0.011
		•	•		

Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%



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18	TABLE: T	TABLE: Temperature Cycling Test (model: LP 501120)					
Ambient ten	Ambient temperature: 22.7°C						
Fully Charg	ged Cell						
Samp	le No.	DSP22070540- 401	DSP22070540- 402	DSP22070540- 403	DSP22070540- 404	DSP2207054 0-405	
Mass befo	re test (g)	1.8527	1.8718	1.8925	1.8528	1.8428	
Mass afte	er test (g)	1.8518	1.8710	1.8916	1.8517	1.8418	
Mass loss	ratio (%)	0.049	0.043	0.048	0.059	0.054	
Cycled cell							
Samp	le No.	DSP22070540- 406	DSP22070540- 407	DSP22070540- 408	DSP22070540- 409	DSP2207054 0-410	
Mass befo	re test (g)	1.8319	1.8418	1.8372	1.8518	1.8609	
Mass afte	er test (g)	1.8311	1.8410	1.8363	1.8507	1.8601	
Mass loss	ratio (%)	0.044	0.043	0.049	0.059	0.043	
Supplement loss less that	Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.2%						

18	TABLE: T	TABLE: Temperature Cycling Test (model: LP503759)					
Ambient ten	Ambient temperature: 23.0°C						
Fully Charg	ged Cell						
Samp	le No.	DSP22070540- 411	DSP22070540- 412	DSP22070540- 413	DSP22070540- 414	DSP2207054 0-415	
Mass befo	ore test (g)	21.518	21.396	21.417	21.518	21.442	
Mass afte	er test (g)	21.507	21.385	21.405	21.505	21.430	
Mass loss	s ratio (%)	0.051	0.051	0.056	0.060	0.056	
Cycled cell	l						
Samp	le No.	DSP22070540- 416	DSP22070540- 417	DSP22070540- 418	DSP22070540- 419	DSP2207054 0-420	
Mass befo	ore test (g)	21.576	21.662	21.451	21.395	21.728	
Mass afte	er test (g)	21.566	21.651	21.440	21.383	21.715	
Mass loss ratio (%) 0		0.046	0.051	0.051	0.056	0.060	
Supplement loss less that	Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						



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18	TABLE: T	ABLE: Temperature Cycling Test (model: LP 903759)					
Ambient terr	Ambient temperature: 23.1°C						
Fully Charg	jed Cell						
Sampl	e No.	DSP22070540- 421	DSP22070540- 422	DSP22070540- 423	DSP22070540- 424	DSP2207054 0-425	
Mass befor	re test (g)	36.712	36.592	36.665	36.443	36.727	
Mass afte	r test (g)	36.690	36.575	36.645	36.425	36.708	
Mass loss	ratio (%)	0.060	0.046	0.055	0.049	0.052	
Cycled cell							
Sampl	e No.	DSP22070540- 426	DSP22070540- 427	DSP22070540- 428	DSP22070540- 429	DSP2207054 0-430	
Mass befor	re test (g)	36.572	36.667	36.595	36.727	36.456	
Mass afte	r test (g)	36.550	36.651	36.573	36.706	36.438	
Mass loss	ratio (%)	0.060	0.044	0.060	0.057	0.049	
Supplemental less than 0.1	Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

19 TABLE	TABLE: Low Pressure (Altitude Simulation) Test (model: LP 501120)							
Ambient temperature: 21.9°C								
Fully Charged Cell	Fully Charged Cell							
Sample No.	DSP22070540- 431	DSP22070540- 432	DSP22070540- 433	DSP22070540- 434	DSP2207054 0-435			
Mass before test (g	g) 1.8328	1.8518	1.8718	1.8628	1.8172			
Mass after test (g)	1.8327	1.8516	1.8717	1.8626	1.8170			
Mass loss ratio (%) 0.005	0.011	0.005	0.011	0.011			
Cycled cell								
Sample No.	DSP22070540- 436	DSP22070540- 437	DSP22070540- 438	DSP22070540- 439	DSP2207054 0-440			
Mass before test (g	g) 1.8502	1.8714	1.8807	1.8375	1.8459			
Mass after test (g)	1.8501	1.8713	1.8806	1.8373	1.8458			
Mass loss ratio (%) 0.005	0.005	0.005	0.011	0.005			
Supplementary infor less than 0.2%	mation: no explosion	or catch fire, in a	ddition the sample	e did not vent or le	eak. Max loss			



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19	TABLE: L	ABLE: Low Pressure (Altitude Simulation) Test (model: LP503759)						
Ambient tem	Ambient temperature: 21.9°C							
Fully Charg	ed Cell							
Sample	e No.	DSP22070540- 441	DSP22070540- 442	DSP22070540- 443	DSP22070540- 444	DSP2207054 0-445		
Mass befor	e test (g)	21.592	21.425	21.392	21.418	21.395		
Mass after	r test (g)	21.591	21.424	21.390	21.416	21.394		
Mass loss	ratio (%)	0.005	0.005	0.009	0.009	0.005		
Cycled cell								
Sample	e No.	DSP22070540- 446	DSP22070540- 447	DSP22070540- 448	DSP22070540- 449	DSP2207054 0-450		
Mass befor	e test (g)	21.411	21.372	21.575	21.693	21.718		
Mass after	r test (g)	21.410	21.370	21.574	21.692	21.717		
Mass loss	ratio (%)	0.005	0.009	0.005	0.005	0.005		
Supplementa	ary informa	tion: no explosion	or catch fire, in a	ddition the sample	e did not vent or le	eak. Max loss		

19	TABLE: L	TABLE: Low Pressure (Altitude Simulation) Test (model: LP 903759)					
Ambient terr	Ambient temperature: 21.9°C						
Fully Charg	Fully Charged Cell						
Sampl	e No.	DSP22070540- 451	DSP22070540- 452	DSP22070540- 453	DSP22070540- 454	DSP2207054 0-455	
Mass befo	re test (g)	36.715	36.427	36.583	36.417	36.555	
Mass afte	er test (g)	36.712	36.425	36.580	36.416	36.553	
Mass loss	ratio (%)	0.008	0.005	0.008	0.003	0.005	
Cycled cell							
Sampl	e No.	DSP22070540- 456	DSP22070540- 457	DSP22070540- 458	DSP22070540- 459	DSP2207054 0-460	
Mass befo	re test (g)	36.427	36.495	36.088	36.510	36.775	
Mass afte	er test (g)	36.426	36.494	36.085	36.507	36.772	
Mass loss	ratio (%)	0.003	0.003	0.008	0.008	0.008	
Supplement less than 0.2	Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						



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Critical components information

Material: e.g. external enclosure, PCB, closed-end connector, sleeves, cord anchorage etc.

Components with winding: e.g. motor, transformer, magnetic coil etc.

Other components: e.g. switch, thermostat, heater, plug, internal wire, capacitor, relay, varistor etc.

Object/ Part No.	Manufacturer/ trademark	Type/ Model	Technical data	Standard	Mark(s) of conformity
Cell	Ropla Elektronik Sp. z o.o.	LP 501120, LP 302030, LP 601230, LP 752030, LP 403030, LP 501745, LP 403035, LP 503040, LP 603048, LP 802060, LP 573450, LP 603450, LP 903759, LP 903759	LP 501120: 3.7V, 80mAh; LP 302030: 3.7V, 140mAh; LP 601230: 3.7V, 170mAh; LP 752030: 3.7V, 300mAh; LP 403030: 3.7V, 330mAh; LP 501745: 3.7V, 360mAh; LP 403035: 3.7V, 400mAh; LP 503040: 3.7V, 560mAh; LP 603048: 3.7V, 850mAh; LP 603048: 3.7V, 980mAh; LP 573450: 3.7V, 980mAh; LP 603450: 3.7V, 1200mAh; LP 503759: 3.7V, 1350mAh; LP 953450: 3.7V, 1900mAh; LP 903759: 3.7V, 2200mAh	UL 1642	Tested with appliance
-Positive electrode	Soundon New Energy Technology Co., Ltd.	SN2A	LiNi _x Co _y Mn _{1-x-y} O ₂ , Ni: Co: Mn= 5: 2: 3, Carbon black, PVDF, Conductive Additive, Aluminum foil		
-Negative electrode	KEDA (ANHUI) CLEAN ENERGY NEW MATERIAL CO.,LTD	KD6B	Graphite, CMC, SBR, Distilled water, Conductive Additive, Copper foil		
-Separator	Dongguan Mochuan New Energy Material Co.,Ltd	16	PE + ceramics, 16µm, Shutdown temperature: 130°C		
-Electrolyte	Dongguan Tianfeng Power Material Co., Ltd	TF-3142	LiPF ₆ , DMC, EMC, EC, PC		
-Aluminum plastic film	Crown Advanced Material Co.,Ltd	CAN113	Nylon, PP, Aluminum, Thickness: 113µm		

--End of main report--

Attachment 1 CN223SFJ 001



Produkte Products

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	Eq. No.	Name	Manufacturer	Model No.	Date of Calibration	Date of next Calibration
\boxtimes	ZKSB-1001	Battery Test System	RePower	CTS 5V-5A	2022-01-12	2023-01-11
\boxtimes	ZKSB-1002	Battery Test System	RePower	CTS 5V-10A	2022-01-12	2023-01-11
\boxtimes	ZKSB-1003	Battery Test System	RePower	CTS 20V-10A	2022-01-12	2023-01-11
	ZKSB-1004	Power bank test system	RePower	CTS 6V-5A	2022-01-12	2023-01-11
\boxtimes	ZKSB-1006	Temperature Chamber cycling	Kewen	TEMI880(408)	2022-01-12	2023-01-11
\boxtimes	ZKSB-1007	Impact tester	DGBELL	BE-5066	2022-01-12	2023-01-11
	ZKSB-1009	Free fall tester	DGBELL	BE-F-315S	2022-01-12	2023-01-11
\boxtimes	ZKSB-1010	Oven	GWS	SPH101	2022-01-12	2023-01-11
\boxtimes	ZKSB-1011	Oven	Shengxin	101-3	2022-01-12	2023-01-11
\boxtimes	ZKSB-1012	Vacuum chamber	GaoXin	GX3020-ZC80	2022-01-12	2023-01-11
\boxtimes	ZKSB-1013	Vibration tester	LABTONE	EV203	2022-01-12	2023-01-11
\boxtimes	ZKSB-1014	Shock tester	LABTONE	HSKT10	2022-01-12	2023-01-11
\boxtimes	ZKSB-1015	Projectile Tester	DGBELL	BE-6046	2022-01-12	2023-01-11
	ZKSB-1016	Battery function tester	Chaoshishi	RBM-200	2022-01-12	2023-01-11
	ZKSB-1017	Forced internal short circuit tester	DGBELL	BE-6045W	2022-01-12	2023-01-11
	ZKSB-1018	Electronic Digital Calliper	UPM	ST-089	2022-01-12	2023-01-11
\boxtimes	ZKSB-1020	Electronic balance	Huazhi	HZK-FA 300	2022-01-12	2023-01-11
\boxtimes	ZKSB-1021	Multimeter	FLUKE	287C	2022-01-12	2023-01-11
	ZKSB-1022	Electronic Load	ITECH	IT8511	2022-01-12	2023-01-11
\boxtimes	ZKSB-1023	Temperature measurement recorder	Toprie Electronic Co., Ltd.	TP700	2022-01-12	2023-01-11
	ZKSB-1025	Resister	ZRLK	ZKSB-033	2022-01-12	2023-01-11
	ZKSB-1026	Washing tester	CEPREI	7206A	2022-01-12	2023-01-11
	ZKSB-1027	Battery protect circuit test system	CEPREI	7207A	2022-01-12	2023-01-11
\boxtimes	ZKSB-1028	DC Low-resistance tester	Yangzi	YD 2511	2022-01-12	2023-01-11
	ZKSB-1029	DC power supply	GWINSTEK	PSP-2010	2022-01-12	2023-01-11
	ZKSB-1030	DC power supply	GWINSTEK	PSW 80-27	2022-01-12	2023-01-11
	ZKSB-1037	Glove box	Nangjing Nangda	1	2022-01-12	2023-01-11
\boxtimes	ZKSB-1039	Rapid temperature changes test chamber	Xingtuo	AFT-150B	2022-01-12	2023-01-11
	ZKSB-1045	Battery Test System	RePower	CTS 60V-40A	2022-01-12	2023-01-11
\boxtimes	ZKSB-1064	Digital Thermometer & Hygrometer	Shenzhen UYIGAO	CTH-608	2022-01-12	2023-01-11
	ZKSB-1078	ESD TEST GENERATOR	TESEQ	NSG438	2022-01-12	2023-01-11
\boxtimes	ZKSB-1081	External short circuit tester	ZRLK	ZKSB-032	2022-01-12	2023-01-11
\boxtimes	ZKSB-1090	Crush tester	DGBELL	BE-6047	2022-01-12	2023-01-11
	ZKSS-1051	Timer	AnBiao instrument	PC396	2022-01-12	2023-01-11
\bowtie	ZKSS-1100	Digital caliper	N/A	1-150mm	2022-01-12	2023-01-11

Dongguan ZRLK Testing Technology Co., Ltd. Building 2, No.1, Technology 10th Road, Songshan Lake Park, Dongguan City 523808, Guangdong, China



Photo Documentation



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Report No.: CN223SFJ 001

Product: Polymer Lithium-Ion Cell

<u>Type Designation:</u> LP 501120, LP 302030, LP 601230, LP 752030, LP 403030, LP 501745, LP 403035, LP 503040, LP 603048, LP 802060, LP 573450, LP 603450, LP503759, LP 953450, LP 903759

Remark: The tested models LP 501120, LP503759 and LP 903759 are representatives of all models.



Figure 1 Front view of cell (Model: LP 501120)



Figure 2 Back view of cell (Model: LP 501120)

ATTACHMENT 2

Photo Documentation A TUVRhe



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Report No.: CN223SFJ 001

Product:

Polymer Lithium-Ion Cell

<u>Type Designation:</u> LP 501120, LP 302030, LP 601230, LP 752030, LP 403030, LP 501745, LP 403035, LP 503040, LP 603048, LP 802060, LP 573450, LP 603450, LP503759, LP 953450, LP 903759



Figure 3 Front view of cell (Model: LP503759)



Figure 4 Back view of cell (Model: LP503759)

ATTACHMENT 2

Photo Documentation



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Report No.: CN223SFJ 001

Product:

Polymer Lithium-Ion Cell

LP 501120, LP 302030, LP 601230, LP 752030, LP 403030, LP 501745, LP 403035, Type Designation: LP 503040, LP 603048, LP 802060, LP 573450, LP 603450, LP503759, LP 953450, LP 903759



Figure 5 Front view of cell (Model: LP 903759)



Figure 6 Back view of cell (Model: LP 903759)