

UN38.3 Test Summary

Product	Rechargeable Li-ion Battery Pack
Model	B2027LA-2 , AB2027LA-2
Product Description	<input checked="" type="checkbox"/> Lithium ion <input type="checkbox"/> Lithium polymer <input type="checkbox"/> Lithium metal <input type="checkbox"/> Large cell <input type="checkbox"/> Small cell <input checked="" type="checkbox"/> Battery <input type="checkbox"/> Large battery <input checked="" type="checkbox"/> Small battery <input type="checkbox"/> Single cell battery <input type="checkbox"/> Multi-cell battery <input type="checkbox"/> Battery assembly

Item:	Specification	Remark
Rated Voltage (Vdc):	18	
Rated capacity (Ah):	4	
End of discharge voltage (EODV) (Vdc):	13.75	
Standard charge voltage (Vdc):	21	
Maximum charge voltage (Vdc):	21	
Standard charge current (A):	---	
Maximum charge current (A):	7.8	
Standard discharge current (A):	---	4000mA is used for testing
Maximum discharge current (A):	40	
Mass (kg):	Approx. 648 g	
Watt-hour rating , or lithium content:	72 Wh	

Test Report number	10060117 001
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Date of Test Report	2017-5-11
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Testing Laboratory	
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Test Specification	UN Manual of Tests and Criteria(Sixth revised edition),Part III ,Sub-section 38.3
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Tests Performed and Results	Test	Results		
		Pass	Fail	N/A
	T-1: Altitude simulation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T-2: Thermal Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-3: Vibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-4: Shock	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-5: External short circuit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-6: Impact / crush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-7: Overcharge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-8: Forced discharge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/> 38.3.3 (f) applied <input type="checkbox"/> 38.3.3 (g) applied			

Manufactures's contact information	Mobiletron Electronics Co.,Ltd No.85, Sec.4, Chung-Ching Rd., Ta-Ya District,Taichung,428, Taiwan Website: www.durofix.com.tw / Email: Isaac@more.com.tw Tel: 886-4-25683366 Ext :1862
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Name and Title of Signatory	Safety Senior Supervisor Wen-Yao Chi <div style="text-align: right; font-family: cursive; font-size: 1.2em; margin-top: 5px;">  </div>
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Prüfbericht-Nr.: <i>Test Report No.:</i>	10060117 001	Auftrags-Nr.: <i>Order No.:</i>	114062823 and 114064088	Seite 1 von 16 Page 1 of 16
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	Mar. 28, 2017 and Apr. 25, 2017	
Auftraggeber: <i>Client:</i>	Mobiletron Electronics Co. Ltd. No. 85, Sec. 4, Chung-Ching Rd., Ta-Ya District, Taichung 428 Taiwan			
Prüfgegenstand: <i>Test item:</i>	See following pages			
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	See following pages			
Auftrags-Inhalt: <i>Order content:</i>	Service of UN 38.3 test report			
Prüfgrundlage: <i>Test specification:</i>	United Nations: Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria (Sixth revised edition), Part III, sub-section 38.3			
Wareneingangsdatum: <i>Date of receipt:</i>	See following pages	See appendix to this report for photo documentation		
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000535207-001 to -004, A000519351-005 to -008, -011 to -012			
Prüfzeitraum: <i>Testing period:</i>	See following pages			
Ort der Prüfung: <i>Place of testing:</i>	See following pages			
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland Taiwan Ltd.			
Prüfergebnis*: <i>Test result*:</i>	Pass			
geprüft von / tested by:		kontrolliert von / reviewed by:		
May 10, 2017 Bruce Tsai / PE 		May 11, 2017 DENNIS CHIU  / Reviewer		
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>
				Unterschrift <i>Signature</i>
Sonstiges / Other:				
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>		Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested				
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>				

Test item description	Rechargeable Li-ion Battery Pack
Trade Mark	1)  2) 
Manufacturer	Same as applicant
Model/Type reference	1) B2027LA-2, 2) AB2027LA-2
Ratings	DC 18V, 4.0Ah


List of Attachments (including a total number of pages in each attachment):

- Photo Documentation

Total number of pages in each attachment is indicated in each individual attachment.


<p>Summary of testing:</p> <p>Tests performed (name of test and test clause):</p> <p>[x] 38.3.4.1 Test T.1: Altitude simulation [x] 38.3.4.2 Test T.2: Thermal Test [x] 38.3.4.3 Test T.3: Vibration [x] 38.3.4.4 Test T.4: Shock [x] 38.3.4.5 Test T.5: External short circuit [x] 38.3.4.6 Test T-6: Impact / crush [] 38.3.4.6 Test T-7: Overcharge [] 38.3.4.8 Test T-8: Forced discharge</p> <ul style="list-style-type: none"> • Pre-production sample without serial number • Tests conducted on model B2027LA-2 was considered to be representative of model AB2027LA-2 	<p>Testing location:</p> <p>All tests as described in Test Case and Measurement Sections were performed at the laboratory described as below: TÜV Rheinland Taiwan Ltd., Taichung Laboratory No. 9, Ln. 36, Sec. 3, Minsheng Rd., Daya District, Taichung City, 428 Taiwan</p>
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Copy of marking plate:

Durofix
B2027LA-2 18V 
 51CR19/66-2 4.0 Ah
**Rechargeable
 Li-ion Battery Pack**
 MFD/SN

CAUTION
 Do not incinerate, disassemble;
 may explode or release toxic
 materials. Do not short circuit; may
 cause burns. Must be recycled or
 disposed of properly.
 For use only with Durofix Class 2
 Battery Charger. Please refer to
 Charger Instruction Manual for
 more information.



Mobiletron Electronic Co., Ltd.
 No.85, Sec.4, Chung-Ching Rd.,
 Ta-Ya District, Taichung City,
 428, Taiwan

 
 Made in Taiwan

ACDelco
AB2027LA-2 18V 
 51CR19/66-2 4.0 Ah
**Rechargeable
 Li-ion Battery Pack**
 MFD/SN

CAUTION
 Do not incinerate, disassemble;
 may explode or release toxic
 materials. Do not short circuit; may
 cause burns. Must be recycled or
 disposed of properly.
 For use only with ACDelco Class 2
 Battery Charger. Please refer to
 Charger Instruction Manual for
 more information.

Mobiletron Electronic Co., Ltd.
 No.85, Sec.4, Chung-Ching Rd.,
 Ta-Ya District, Taichung City,
 428, Taiwan

 
 Made in Taiwan

Test item particulars	<input type="checkbox"/> Lithium metal <input checked="" type="checkbox"/> Lithium ion <input type="checkbox"/> button <input type="checkbox"/> cell <input checked="" type="checkbox"/> battery <input type="checkbox"/> component cell <input type="checkbox"/> Large <input type="checkbox"/> Small cell <input type="checkbox"/> Large <input checked="" type="checkbox"/> Small battery <input type="checkbox"/> Single cell battery <input type="checkbox"/> battery assembly
Weight of cell or battery	648 g (for battery)
Lithium equivalent content	<input checked="" type="checkbox"/> ≤ 500 g <input type="checkbox"/> more than 500 g
Nominal energy	<input checked="" type="checkbox"/> ≤ 6200 Wh <input type="checkbox"/> more than 6200 Wh
Number of series connected cells	5
EODV	See General product information for details
Testing	:
Date of receipt of test item	Mar. 24, 2017
Date (s) of performance of tests	Mar. 30, 2017 to May. 08, 2017
General remarks:	
<p>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.</p> <p>Throughout this report a point is used as the decimal separator.</p>	
Abbreviations used in the report:	
ND: No disassembly	NT: No excessive temperature rise
NF: No fire	NV: No venting
NL: No leakage	NVD: The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.
NM: No mass loss	
NR: No rupture	

General product information:

- The equipment under test (EUT) is a rechargeable Li-ion battery pack which is constructed with 5 series, 2 parallel cells.
- The circuit design with only one temperature detection.

Model and construction differences:

- The model B2027LA-2 is identical to model AB2027LA-2 except for the trademark and model designation.

Features of battery pack

Item	Specification	Remark
Cell arrangement:	5S2P	
Rated Voltage (Vdc):	18	
Rated capacity (mAh):	4000	
End of discharge voltage (EODV) (Vdc):	13.75	
Standard charge voltage (Vdc):	21.00	
Maximum charge voltage (Vdc): *	21.00	
Standard charge current (mA):	--	
Maximum charge current (mA): *	7800	
Standard discharge current (mA): *	--	4000 mA is used for testing
Maximum discharge current (A):	40	
Discharge current (0,2 I _t A) (mA): *	800	
* denotes the value is used for testing.		

EUT construction:

- The top enclosure and bottom enclosure are secured together by three screws

Engineering Conditions of Acceptability:

- The battery not equipped with overcharge protection that relies on protective devices in end-product and the battery charger, it is not considered to be subject to the requirements of T-7 overcharge test.
- The following component cell used within this product has also been tested and found in compliance with the requirements of UN Manual of Test and Criteria Rev.5, Part III, sub-section 38.3. The suitability of use has been evaluated in this report, only T-6 Impact test was conducted additionally, the T-8 Forced discharge were evaluated in the separate test report of the cell.

Object/part no.	Manufacturer/trademark	Type/model	Technical data	Standard	Remark
Battery cells (5 series by 2 parallel)	LG CHEM, LTD	ICR18650HD2	3.65Vdc, 2000mAh	ST/SG/AC.10/1 1/Rev.5 Part III, sub-section 38.3	Test report no.: QAE-EF02-130128-CY018650HD2 issued by LG CHEM, LTD

Clause	Requirement + Test	Result - Remark	Verdict
38.3.3	TEST METHODS AND REQUIREMENTS		P
	Pre-discharge and pre-cycling	See supplementary information in following appended tables for details.	P
38.3.4	Procedure		P
38.3.4.1	Test T-1: Altitude		P
	Cells or batteries are stored at a pressure of 11.6 kPa or less for at least 6 h at ambient temperature (20 ± 5 °C).	Test according to required.	P
	Results: no mass loss, no leakage, no venting, no disassembly, no rupture and no fire during this test. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	See appended Table T.1. NM, NL, NV, ND, NR, NF, NVD.	P
38.3.4.2	Test T-2: Thermal cycling		P
	Cells or batteries previously subjected to altitude test.	Test according to required.	P
	Cells or batteries are stored for at least 6 h at a test temperature of 72 ± 2 °C, followed by storage for at least 6 h at a test temperature of -40 ± 2 °C. Maximum time for transfer is 30 minutes. This procedure is executed 10 times.	Test according to required.	P
	For large cells or batteries the duration of exposure to the test temperatures is at least 12 h instead of 6 h.	Not large batteries.	N/A
	Storage for at least 24 h at ambient temperature (20 ± 5 °C).	Test according to required.	P
	Results: no mass loss, no leakage, no venting, no disassembly, no rupture and no fire during this test. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	See appended Table T.2. NM, NL, NV, ND, NR, NF, NVD.	P
38.3.4.3	Test T-3: Vibration		P
	Cells or batteries previously subjected to thermal cycling test	Test according to required.	P
	Cells or batteries are subjected to sinusoidal vibration during transport.	Test according to required.	P
	Cycle is repeated 12 times for a total of 3 h for each of three mutually perpendicular mounting positions. One of the directions is perpendicular to the terminal face.	Test according to required.	P
	Results: no mass loss, no leakage, no venting, no disassembly, no rupture and no fire during this test. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	See appended Table T.3. NM, NL, NV, ND, NR, NF, NVD.	P

Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.4	Test T-4: Shock		P
	Cells or batteries previously subjected to vibration test.	Test according to required.	P
	Each cell or battery is subjected to three shocks in each direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.	Test according to required.	P
	Results: no mass loss, no leakage, no venting, no disassembly, no rupture and no fire during this test. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	See appended Table T.4. NM, NL, NV, ND, NR, NF, NVD.	P
38.3.4.5	Test T-5: External short-circuit		P
	Cells or batteries previously subjected to shock test.	Test according to required.	P
	Each cell or battery is heated and stabilized at an external case temperature of 57 ± 4 °C. This period of time depends on the size and design of the cell or battery and is assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries.	Test according to required.	P
	Then the cell or battery at 57 ± 4 °C is subjected to a short-circuit condition with a total external resistance of less than 0.1 ohm. Short-circuit condition is continued for at least 1 h after the cell or battery external case temperature has returned to 57 ± 4 °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.	See appended Table T.5.	P
	The short circuit and cooling down phases is conducted at least at ambient temperature.		P
	The test sample is observed for a further 6 h.	Test according to required.	P
	Results: The external temperature dose not exceed 170 °C, no rupture, no disassembly and no fire during this test and within the 6 h of observation.	See appended Table T.5. NT, ND, NR, NF.	P
38.3.4.6	Test T-6: Impact / crush	See below.	P
	The test is conducted using test cells or component cells that have not been previously subjected to other transport tests.	Test according to required.	P
	Each test cell or component cell shall be subjected to one impact / crush only.	Test according to required.	P

Clause	Requirement + Test	Result - Remark	Verdict
	Cylindrical cells not less than 18.0 mm in diameter is tested with impact test procedure. <i>NOTE: Diameter here refers to the design parameter (for example the diameter of 18 650 cells is 18.0 mm).</i>	Test according to required.	P
	Test cell or component cell is placed on a flat smooth surface. A stainless steel bar with a diameter of 15.8 mm ± 0.1 mm and a length of at least 60 mm or of the longest dimension of the cell, whichever is greater, is placed across the centre of the test sample. A mass of 9.1 kg ± 0.1 kg is dropped from a height of 61 cm ± 2.5 cm at the intersection of the bar and the test sample using a vertical sliding track or channel. The vertical track is oriented 90 degrees from the horizontal supporting surface.		P
	The test sample is impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the steel bar lying across the centre of the test sample.		P
	Prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter is tested with crush test procedure. <i>NOTE: Diameter here refers to the design parameter (for example the diameter of 18 650 cells is 18.0 mm).</i>		N/A
	A cell or component cell is crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1,5 cm/s at the first point of contact.		N/A
	A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.		N/A
	The crushing is to be continued until one of the three conditions below is reached: - the applied force reaches 13 kN ± 0.78 kN; - the voltage of the cell drops by at least 100 mV; - the cell is deformed by 50 % or more of its original thickness. As soon as one of the above conditions has been obtained, the pressure shall be released.		N/A
	The test sample is observed for a further 6 h.	Test according to required.	P
	Results: The external temperature dose not exceed 170 °C, no disassembly and no fire during this test and within the 6 h of observation.	See appended Table T.6. NT, NE, NF.	P

Clause	Requirement + Test	Result - Remark	Verdict
38.3.4.7	Test T-7: Overcharge	See General product information - Engineering Conditions of Acceptability for details.	N/A
	The charge current of the battery or a single cell rechargeable battery is twice the manufacturer's recommended maximum continuous charge current.		N/A
	The manufacturer's recommended charge voltage is not more than 18 V, the minimum voltage of the test is the lesser of two times the maximum charge voltage of the battery or 22 V.		N/A
	The manufacturer's recommended charge voltage is more than 18 V. The voltage of the test is not less than 1.2 times the maximum charge voltage.		N/A
	The test is conducted at ambient temperature. The charging condition is maintained for at least 24 h.		N/A
	The test sample is observed for a further 7 days.		N/A
	Results: no disassembly and no fire during this test and within the 7 days of observation.		N/A
38.3.4.8	Test T-8: Forced discharge	Evaluated in the separate test report of the cell. See General product information - Engineering Conditions of Acceptability for details.	N/A
	Each cell is forced discharged at ambient temperature by connecting it in series with a 12 V direct current power supply at an initial current equal to the maximum continuous discharge current specified by the manufacturer. Time interval for discharging equals to rated capacity divided by the initial test current.		N/A
	The test sample is observed for a further 7 days.		N/A
	Results: no disassembly and no fire during this test, nor within the 7 days of observation.		N/A

Clause	Requirement + Test	Result - Remark	Verdict
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T.1		TABLE: Altitude						P
Sample No.	Precondition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Mass loss limit (%)	Results
1	A	20.99	670	20.99	670	0	0.1	P
2	A	20.99	670	20.99	670	0	0.1	P
3	A	20.98	670	20.98	670	0	0.1	P
4	A	20.98	670	20.98	670	0	0.1	P
5	B	20.93	670	20.93	670	0	0.1	P
6	B	20.97	670	20.97	670	0	0.1	P
7	B	20.87	670	20.87	670	0	0.1	P
8	B	20.93	670	20.93	670	0	0.1	P

Supplementary information:

1. Precondition:

A = test sample at first cycle, in fully charged states.

B = test sample after 50 cycle, in fully charged states

C = test sample after 25 cycle, in fully charged states

2. Observation during test as following:

NL: No leakage

NV: No venting

ND: No disassembly

NR: No rupture

NE: No explosion

NF: No fire

NC: The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

NM: No mass loss

Other: (please explain)

T.2		TABLE: Thermal cycling						P
Sample No.	Precondition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Mass loss limit (%)	Results
1	A	20.99	670	20.79	670	0	0.1	P
2	A	20.99	670	20.78	670	0	0.1	P
3	A	20.98	670	20.77	670	0	0.1	P
4	A	20.98	670	20.78	670	0	0.1	P
5	B	20.93	670	20.71	670	0	0.1	P
6	B	20.97	670	20.74	670	0	0.1	P
7	B	20.87	670	20.71	670	0	0.1	P

Clause	Requirement + Test				Result - Remark			Verdict
8	B	20.93	670	20.65	670	0	0.1	P
<p>Supplementary information:</p> <p>1. Precondition:</p> <p>A = test sample at first cycle, in fully charged states. B = test sample after 50 cycle, in fully charged states C = test sample after 25 cycle, in fully charged states</p> <p>2. Observation during test as following:</p> <p>NL: No leakage NV: No venting ND: No disassembly NR: No rupture NE: No explosion NF: No fire</p> <p>NC: The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. NM: No mass loss Other: (please explain)</p>								

T.3	TABLE: Vibration							P
Sample No.	Precondition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Mass loss limit (%)	Results
1	A	20.79	670	20.79	670	0	0.1	P
2	A	20.78	670	20.78	670	0	0.1	P
3	A	20.77	670	20.77	670	0	0.1	P
4	A	20.78	670	20.78	670	0	0.1	P
5	B	20.71	670	20.71	670	0	0.1	P
6	B	20.74	670	20.74	670	0	0.1	P
7	B	20.71	670	20.71	670	0	0.1	P
8	B	20.65	670	20.65	670	0	0.1	P

Clause	Requirement + Test	Result - Remark	Verdict
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Supplementary information:

1. Precondition:

A = test sample at first cycle, in fully charged states.

B = test sample after 50 cycle, in fully charged states

C = test sample after 25 cycle, in fully charged states

2. Test condition as below table, those with a tick on the checkbox.

Frequency range		Amplitudes (a: acceleration, s: displacement)	Duration of logarithmic sweep cycle (7 Hz – 200 Hz – 7 Hz)	Axis	Number of cycles
From	To				
$f_1 = 7 \text{ Hz}$	f_2	$a_1 = 1 \text{ gn}$	15 min	X	12
f_2	f_3	$s = 0.8 \text{ mm}$		Y	12
f_3	$f_4 = 200 \text{ Hz}$	a_2		Z	12
and back to $f_1 = 7 \text{ Hz}$				Total	36
Key:					
	Type:	f_2	f_3	a_2	
<input checked="" type="checkbox"/>	Cell & small battery	18 Hz	50 Hz	8 gn	
<input type="checkbox"/>	Large battery	18 Hz	25 Hz	2 gn	

3. Observation during test as following:

NL: No leakage

NV: No venting

ND: No disassembly

NR: No rupture

NE: No explosion

NF: No fire

NC: The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

NM: No mass loss

Other: (please explain)

T.4	TABLE: Shock							P
Sample No.	Precondition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Mass loss limit (%)	Results
1	A	20.79	670	20.79	670	0	0.1	P
2	A	20.78	670	20.78	670	0	0.1	P
3	A	20.77	670	20.77	670	0	0.1	P
4	A	20.78	670	20.78	670	0	0.1	P
5	B	20.71	670	20.71	670	0	0.1	P
6	B	20.74	670	20.74	670	0	0.1	P
7	B	20.71	670	20.71	670	0	0.1	P
8	B	20.65	670	20.65	670	0	0.1	P

Clause	Requirement + Test	Result - Remark	Verdict
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Clause	Requirement + Test	Result - Remark	Verdict																	
	<p>Supplementary information:</p> <p>1. Precondition: A = test sample at first cycle, in fully charged states. B = test sample after 50 cycle, in fully charged states C = test sample after 25 cycle, in fully charged states</p> <p>2. Test condition as below table, those with a tick on the checkbox.</p> <table border="1"> <thead> <tr> <th>Type</th> <th>Minimum peak acceleration</th> <th>Pulse duration</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> All cells</td> <td><input type="checkbox"/> 150 gn or</td> <td>6 ms</td> </tr> <tr> <td><input type="checkbox"/> Large cells</td> <td><input type="checkbox"/> 50 gn</td> <td>11 ms</td> </tr> <tr> <td rowspan="2"><input checked="" type="checkbox"/> Small batteries</td> <td><input checked="" type="checkbox"/> 150 gn or result of formula as below:</td> <td rowspan="2">6 ms</td> </tr> <tr> <td><input type="checkbox"/> _____ gn (whichever is smaller) $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$</td> </tr> <tr> <td rowspan="2"><input type="checkbox"/> Large batteries</td> <td><input type="checkbox"/> 50 gn or result of formula as below:</td> <td rowspan="2">11 ms</td> </tr> <tr> <td><input type="checkbox"/> _____ gn (whichever is smaller) $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$</td> </tr> </tbody> </table> <p>3. Observation during test as following:</p> <p>NL: No leakage NV: No venting ND: No disassembly NR: No rupture NE: No explosion NF: No fire</p> <p>NC: The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. NM: No mass loss Other: (please explain)</p>	Type	Minimum peak acceleration	Pulse duration	<input type="checkbox"/> All cells	<input type="checkbox"/> 150 gn or	6 ms	<input type="checkbox"/> Large cells	<input type="checkbox"/> 50 gn	11 ms	<input checked="" type="checkbox"/> Small batteries	<input checked="" type="checkbox"/> 150 gn or result of formula as below:	6 ms	<input type="checkbox"/> _____ gn (whichever is smaller) $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$	<input type="checkbox"/> Large batteries	<input type="checkbox"/> 50 gn or result of formula as below:	11 ms	<input type="checkbox"/> _____ gn (whichever is smaller) $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$		
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T.5	TABLE: External short-circuit					P
Sample No.	Precondition	Open circuit voltage before test (V)	Open circuit voltage after test (V)	Maximum case temperature (°C)	Total external resistance (mΩ)	Results
1	A	20.79	0	57.8	76.6	P
2	A	20.78	0	57.3	71.9	P
3	A	20.77	0	58.2	76.6	P
4	A	20.78	0	58.0	71.9	P
5	B	20.71	0	56.8	76.6	P
6	B	20.74	0	56.4	71.9	P
7	B	20.71	0	58.0	76.6	P

Clause	Requirement + Test	Result - Remark	Verdict
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8	B	20.65	0	57.6	71.9	P

Supplementary information:

1. Precondition:

A = test sample at first cycle, in fully charged states.

B = test sample after 50 cycle, in fully charged states

C = test sample after 25 cycle, in fully charged states

2. Prior to short circuit condition, the case temperature of cell is reached to a steady state temperature of 57.3 °C, and this condition is continued for additional 6 hours.

3. Then the cell or battery at 57.3 °C was subjected to short circuit condition with a total external resistance of less than 0.1Ω and cooling down phases was conducted at ambient temperature of 24.2 °C.

4. The fusible link (CID, Manufacturer: Mobiletron, P/N:20010409) were damaged during above tests.

5. Observation during test and for a further 6 h after the test as following:

ND: No disassembly

NT: No excessive temperature rise

NR: No rupture

(The temperature of cell casing was not exceed 170 °C)

NE: No explosion

Other: (please explain)

NF: No fire

T.6a	TABLE: Impact			P
Sample No.	Open circuit voltage before test (V)	Maximum case temperature (°C)		Results
1	4.10	24.1		P
2	4.12	24.2		P
3	4.12	24.1		P
4	4.12	23.8		P
5	4.10	23.9		P

Supplementary information:

1. Shape of cell: Cylindrical (diameter is not less than 18.0 mm)

2. Precondition: test sample at first cycle, at 50% of the design rated capacity

3. Observation during test and for a further 6 h after the test as following:

ND: No disassembly

NT: No excessive temperature rise

NE: No explosion

(The temperature of cell casings shall not exceed 170 °C)

NF: No fire

T.6b	TABLE: Crush						N/A
Sample No.	Open circuit voltage before test (V)	Voltage drop of the cell (mV)	Applied force (kN)	Thickness before test (mm)	Thickness after test (mm)	Maximum case temperature (°C)	Results
1	--	--	13	--	--	--	--

Clause	Requirement + Test			Result - Remark			Verdict
2	--	--	13	--	--	--	--
3	--	--	13	--	--	--	--
4	--	--	13	--	--	--	--
5	--	--	13	--	--	--	--

Supplementary information:

- Shape of cell: Cylindrical (diameter less than 18.0 mm), Prismatic, Pouch
- Precondition: test sample at first cycle, at 50% of the design rated capacity
- Observation during test and for a further 6 h after the test as following:

ND: No disassembly	NT: No excessive temperature rise
NE: No explosion	(The temperature of cell casings shall not exceed 170 °C)
NF: No fire	

T.7	TABLE: Overcharge					N/A
Sample No.	Precondition	Open circuit voltage before test (V)	Maximum charging current (A)	Maximum charging voltage (V)	Total charging time (h)	Results
1	A	--	--	--	--	--
2	A	--	--	--	--	--
3	A	--	--	--	--	--
4	A	--	--	--	--	--
5	B	--	--	--	--	--
6	B	--	--	--	--	--
7	B	--	--	--	--	--
8	B	--	--	--	--	--

Supplementary information:

- Precondition:
 - A = test sample at first cycle, in fully charged states.
 - B = test sample after 50 cycle, in fully charged states
 - C = test sample after 25 cycle, in fully charged states
- Observation during test and for a further 7 days after the test as following:

ND: No disassembly	NF: No fire
NE: No explosion	

T.8	TABLE: Forced discharge				N/A
Sample No.	Precondition	Open circuit voltage before test (V)	Measured reverse charging current (mA)	Total time for reversed charging application (min)	Results
1	A	--	--	--	--
2	A	--	--	--	--

Clause	Requirement + Test	Result - Remark			Verdict
3	A	--	--	--	--
4	A	--	--	--	--
5	A	--	--	--	--
6	A	--	--	--	--
7	A	--	--	--	--
8	A	--	--	--	--
9	A	--	--	--	--
10	A	--	--	--	--
1	B	--	--	--	--
2	B	--	--	--	--
3	B	--	--	--	--
4	B	--	--	--	--
5	B	--	--	--	--
6	B	--	--	--	--
7	B	--	--	--	--
8	B	--	--	--	--
9	B	--	--	--	--
10	B	--	--	--	--

Supplementary information:

1. Precondition:

A = test sample at first cycle, in fully discharged states.

B = test sample after 50 cycle, in fully discharged states

2. Observation during test and for a further 7 days after the test as following:

ND: No disassembly

NF: No fire

NE: No explosion

- End of Test report -