Version: 1 01.08.2011

01.08.2011 Produkte				A	TÜV Rheinland®
Prüfberich Test Report No	nt - Nr.:	17021	048 001		Seite 1 von 58 Page 1 of 58
Auftraggeber: Client:		GlobTek, 186 Vetera	Inc. ans Dr. Northv	ale, NJ 07647 USA	
Gegenstand d Test item:	er Prüfung:	Recharge	able Lithium	Battery Pack	
Bezeichnung: Identification:		BX1600F6 3L	779374SIPH	Serien-Nr.: Serial No.:	N/A
Wareneingang Receipt No.:	js-Nr.:	15317633	D	Eingangsdatum: Date of receipt:	March, 2012
Zustand des P Anlieferung: Condition of te	Prüfgegenstandes est item at deliver	bei Sample is y:	OK for testing	l.	
Prüfort: Testing location	n:	TÜV Rhei 3&4 F, Cy Industrial <i>I</i> Shenzhen	n land (Shenz bio Technolog Area, High-Teo P. R. China	hen) Co., Ltd. gy Building No. 1, Lar ch Industry Park Nor	ngshan No. 2 Road South, 5th th, Nanshan District, 518057
Prüfgrundlage Test specificati	e: ion:	UL2054:20 UL 60950- CAN/CSA	004 R11.09 1:2007 R12.1 ·C22.2 No. 60	1 950-1-07+A1:2011	
Prüfergebnis: Test Result:		Der Prüfg The test ite	egenstand ei em passed th	ntspricht oben gena e test specification(s	annter Prüfgrundlage(n).).
Prüflaboratori Testing Labora	um: tory:	TÜV Rhei	nland (Shenz	hen) Co., Ltd.	
geprüft/ tested 2012-Aug- 13	l by: Charles Cao/ PE	HAPUBS CAD-	kontrolliert/ / 2012-Aug-13	reviewed by: Sean Pan/Review	er Sparts
Datum Date	Name/Stellung Name/Position	Unterschrift Signature	Datum Date	Name/Stellur Name/Positio	ng Unterschrift n Signature
Sonstiges/ Oth TUV Rheinland o UL1642 test repo	her Aspects: cTUVus mark approort (17021048 001	oval procedure. Attachment 1, 19	The complete 9 pages) ; Pho	d test report also incl to documents (5 pag	udes the attachments:
Abkürzungen:	P(ass) = entspricht P F(ail) = entspricht ni N/A = nicht anwen N/T = nicht geteste	rüfgrundlage icht Prüfgrundlage dbar et	Ab	breviations: P(ass) = F(ail) = N/A = N/T =	passed failed not applicable not tested
Dieser Prüf	bericht bezieht sich veise vervielfältigt w	nur auf das o.g. verden. Dieser Be	Prüfmuster ur ericht berechtig	nd darf ohne Genehm gt nicht zur Verwendu	igung der Prüfstelle nicht ung eines Prüfzeichens.
This test report duplica	relates to the a.m.t ted in extracts. This	est sample. Witho test report does no	ut permission o ot entitle to carr	of the test center this te y any safety mark on tl	st report is not permitted to be his or similar products.
TÜV Rheir	nland LGA Products · T	illystrasse 2 · D-904 Mail: service@de.tr	31 Nürnberg · Te ɹv.com · Web: w	l.: +49 911 655 5225 ⋅ Fa: ww.tuv.com	x +49 911 655 5226



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File No. 17021048 001

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:	BX1600F6779374SIPH3L
Nominal voltage	13.2V
Rate capacity:	1600mAh
Maximum charge voltage:	14.6V
Maximum charge current:	1600mA
Final voltage:	9.2V
Max Ambient Temperature:	45 ℃
Manufacturer's charge method:	0.5C CC charge to 14.6V, then CV charge until current reach ≤0.03C
Possible test case verdicts:	
Test case does not apply to the test object	N(/A)
Test object does meet the requirement:	P(ass)
Test object does not meet the requirement:	F(ail)
Testing:	
Date of receipt of test item:	2011-May-10
Date(s) of performance of tests:	2011-May-10~ (re-test) 2012-July-14
General remarks:	
This report shall not be reproduced, except in full, with	nout the written approval of the testing laboratory.
The test results presented in this report relate only to	the object tested.
"(see remark #)" refers to a remark appended to the r	eport.
"(see appended table)" refers to a table appended to t	the report.
Throughout this report a point is used as the decimal	separator.
Copy of marking plate: (2 trademarks are declared an	nd authorised by customers for same product)
т. Т.	
\ <u>+</u>	444b mm
(INSURGICAL	GlobTek, Inc.
CAT.# 3002022	NOTEL NO: EX1600F6779374SIPH3L
CAUTION: PRECAUCION DO NOT DISASSEMIREE NO DESMONTARI DO NOT SHORT CIRCUIT NO CORTOCIRCUITA	CAUTION : PRECAUCIÓN : DO NOT DISASSEMBLE NO DESMONTAR DO NOT SMART CIRCUIT NO CORTOCIPOLITAR
DISPOSE OF PROPERTY RECORDA SLICETIVA DO NOT OPPOSE TO HIGH NO EXPONER A ALTAS TEMPERATURAS TEMPERATURAS	DISPOSE OF PROPERTY RECOULD SELECTIVA 63.63 mm DO NOT EXPOSE TO HIGH NO EXPONER A ALTA:) EMPERATURES TEMPERATURAS
MAXUFe ^W BATTERY 13.2V/1600mAh WATT-HOUR:21.12Wh WATT-HOUR:21.12Wh	RoHS
Moden crima STA	
Manufacturer: Canna	DATE CODE WWWY

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Summary of testing:

The component cell **SR703880F** 1600mAh is evaluated and being passed in this test report: 17021048.001 Attachment 1.

Test items:

cl.9 Short-Circuit Test;

- cl.10 Abnormal Charging Test;
- cl.11 Abusive Overcharge Test;
- cl.12 Forced-Discharged Test;

cl.13A Battery Pack Component Temperature;

- cl.13B Battery Pack Surface Temperature
- cl.19 250N Steady Force Test;

cl.20 Mould Stress Relief Test;

cl.21 Drop Impact Test;

cl.25 General

Description of the product:

This Lithium Polymer Battery is constructed with 4 single lithium-ion cells in series and over current and shortcircuits protective circuit.

1) These battery packs have not been evaluated in combination with charger(s) or host product(s); the Programmable Battery Power Supply source is used during the test. Additional evaluation to determine compliance may be required on the combination(s) in the end product evaluation.

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

3) The battery pack is a built-in battery which shall be fixed in a case with sufficient protective strength as mechanical enclosure and fire enclosure. The max ambient temperature specified for Pack is 45° C, and the enclosure of pack is not operator accessible when the pack is installed inside the end product. The component cells have been evaluated by projectile test. The end product shall be kept away from fire and high temperature area.

Limited Power Source limitation compliance is not declared by manufacturer, so no testing is requested.

Thermal link and PTC in the Protective Circuit:





Verdict

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Clause

Requirement + Test

Result - Remark

1	Scope		Р
1.1	These requirements cover portable primary (nonrechargeable) and secondary (rechargeable) batteries for use as power sources in products. These batteries consist of either a single electrochemical cell or two or more cells connected in series, parallel, or both, that convert chemical energy into electrical energy by chemical reaction		Ρ
1.2	These requirements are intended to reduce the risk of fire or explosion when batteries are used in a product. The proper use of these batteries in a particular application is dependent on their use in a complete product that complies with the requirements applicable to such a product.		Р
1.3	These requirements are intended to cover batteries include the combination of the battery and the host prequirements in the host product standard.	for general use and do not roduct which are covered by	Р
1.4	These requirements are also intended to reduce the to fire or explosion when batteries are removed from stored, or discarded.	risk of injury to persons due a product to be transported,	Р
1.5	These requirements do not cover the toxicity risk that a battery or its contents, nor the risk of injury to perso cut open to provide access to its contents.	results from the ingestion of ons that occurs if a battery is	Р
2	General		Р
2.1	Lithium cells		Р
2.1.1	Component cells constructed of lithium metal, lithium alloy or lithium ion that is used in batteries shall meet the technician-replaceable or user-replaceable requirements in the Standard for Lithium Batteries. UL 1642.		Р
2.1.2	Deleted, effetive November 11, 2011		N/A
2.1.3	Deleted, effetive November 11, 2011		N/A
2.2	Units of measurement		Р
2.3	Terminology		Р
2.4	Components		Р
3	Glossary		Р
CONSTR	JCTION		
4	General		Р
4.1	Casing		Р
4.1.1	The casing of a component cell or battery pack shall have the strength and rigidity required to resist the possible abuses, that it is exposed to during its intended use, in order to reduce the risk of fire or injury to persons.	The component cell has passed UL1642 testing; the casing of Battery Pack as enclosure is against any abuse during the testing.	Ρ
4.1.2	The casing of a battery pack shall be rigid enough to prevent flexing. A tool providing the mechanical advantage of a pliers, screwdriver, hacksaw, or similar tool, shall be the minimum mechanical capability required to open the casing.	The casing of Battery Pack as enclosure is against any abuse during the testing. Ultrasonic welding is to fix enclosure.	Р



Ρ

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Clause	Requirement + Test	Result - Remark	Verdic
4.1.3	For batteries with plastic outer cases, the outer case of the battery shall be designed such that it is not capable of being opened using simple tools, such as a screwdriver. The case shall be ultrasonically	The casing of Battery Pack as enclosure is against any abuse during the testing. Ultrasonic welding is to fix	Р
4.1.4	welded, or sealed by equivalent means. The outer case material of the battery shall be	enclosure. The Plastic enclosure	P
	classed as V-1 or less flammable in the minimum part thickness in accordance with the Standard for Polymeric Materials — Use in Electrical Equipment Evaluations, UL 746C.	material is 94V-1 at least. See Critical component list.	
4.1.5	Openings in battery pack enclosures shall be minimized to prevent damage to cells, connections, and internal circuitry and shorting of electrical spacings within the pack. Enclosure openings shall not be located over cells that do not comply with the rigid casing requirements of 4.1.2 or over protective circuitry and connections where damage or shorting from debris entering the enclosure could result in a hazard	No opening.	Ρ
4.2	Electrolyte		Р
4.2.1	A component cell shall not contain pressurized vapor or liquid that expels materials forcibly when the battery casing is punctured with a grinding wheel under laboratory conditions at a temperature of 23 ± 2 °C (73 ± 3.6 °F).	The component cell has passed UL1642 testing.	Р
4.3	External battery pack connectors		Р
4.3.1	An external battery pack connector shall be constructed to prevent inadvertent short circuiting of its terminals unless the pack meets the limited power source requirements of the Limited Power Source Test, Section 13. Examples of methods to prevent inadvertent short-circuiting include recessing the terminals, providing circuitry that prevents inadvertent short circuiting, providing covers over the terminals, use of keyed connectors, and the like	The recessing terminals provided	Ρ
4.3.2	Insulating material for external battery pack connectors, outside the enclosure, shall have a V-2 minimum flame rating unless the pack meets the limited power source requirements of the Limited Power Source Test, Section 13. External connectors forming part of the fire enclosure shall be V-1 minimum	See Critical Component Table, the external terminal is not intended to be used as part of the fire enclosure	P
4.4	Printed wiring boards		Р
4.4.1	Printed wiring boards mounting battery circuit components shall be rated V-1 minimum	See Critical Component Table	Р

PERFORMANCE

General

5



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Clause	Requirement + Test	Result - Remark	Verdict
5.1	Batteries are to be tested as described in Sections <i>9</i> through 24. Section 12, Forced-Discharge Test, is applicable only to cells intended to be used in multicell series applications, such as battery packs. The Battery Enclosure Tests, Sections 18 — 21 (including the 250 N Steady Force, Mold Stress Relief, and Drop Impact Tests) are intended only for batteries that have a plastic outer enclosure.	Arrange the test as requirements in Cell and Battery Pack.	Р
5.2	In most cases cells and/or batteries shall not explode or catch fire as a result of the tests in this standard. For the Shock Test, Section 16, Vibration Test, Section 17, 250 N Steady Force Test, Section 19, Mold Stress Relief Test, Section 20, Drop Impact Test, Section 21, and the Temperature Cycling Test, Section 24 the samples shall also not vent or leak. For these tests unacceptable leakage is deemed to have occurred when the resulting mass loss exceeds the values shown in Table 5.1, Venting and Leakage Mass Loss Criteria.	See testing records in appended tables. Also see the testing records in UL1642 report in 17021048.001 Attachment 1.	Ρ
5.3	Deleted August 12, 2008		N/A
5.4	Certain end product devices require that the power output of a battery be limited. The Limited Power Source Test described in Section 13 is to be used to determine whether a cell or battery is suitable in such applications where fire hazards may otherwise exist.	Not declared as Limited Power Source by the manufacturer.	N/A
6	Samples		Р
6.1	Unless otherwise indicated, fresh cells or batteries in the fully charged state are to be used for the tests described in Sections 9 — 24. The test program and number of samples to be used in each test is shown in Tables 6.1 and 6.2, for component cell testing and battery pack testing, respectively.	Arrange the test as requirement. New sample is used for each testing.	P
6.2	When a battery pack is tested in accordance with Table 6.2, the component cells comprising that battery pack shall also be tested in accordance with Table 6.1 if they have not already been.	The fresh component cell has passed UL1642 testing.	Р
6.3	All batteries shall be fully charged in accordance with the manufacturer's specifications prior to testing except for the samples to be subjected to the Abnormal Charge and Abusive Overcharge Tests, which shall be discharged to the manufacturer specil1ed voltage and end points prior to testing.	Arrange the test as requirement.	Ρ
7	Important test considerations		Р
7.1	As some batteries explode in the tests described in Sections 9 — 24, it is important that personnel be protected from the flying fragments, explosive force, sudden release of heat, chemical bums, and noise results from such explosions. The test area is to be well ventilated to protect personnel from possible harmful fumes or gases	Arrange the test as requirement.	Ρ



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Clause	Requirement + Test	Result - Remark	Verdict
L	1	I	
7.2	The temperatures on the surface of the battery casings shall be monitored during the tests described in Sections 9, 10, 11, 14, and 15. All personnel involved in the testing of batteries are to be instructed never to approach a battery until the surface temperature returns to ambient temperature.	Arrange the test as requirement.	Р
7.3	The tests described in Section 22, Projectile Test, shall be conducted in a separate room or room equipped with an adequate safety barrier separating the test area from the observer.	Lithium Battery Pack testing in UL2054, the cell has passed projectile test during UL1642 evaluation, the battery pack not applied to Projectile Test here.	N/A
8	Temperature measurements		Р
8.1	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.	Arrange the test as requirement.	P
8.2	The temperature measurements on the batteries are to be made with the measuring junction of the thermocouple held tightly against the outer casing of the battery.	Arrange the test as requirement.	Р
ELECTR	ICAL TESTS		
9	Short-Circuit Test		Р
9.1	Cells shall comply with 9.1 — 9.6.		N/A
9.2	Each fully charged test sample component cell, in turn, is to be short-circuited by connecting the positive and negative terminals of the battery with a circuit load having a maximum resistance load of 0.1 ohm. The battery is to discharge until a fire or explosion is obtained, or until it is completely discharged and the battery case temperature has peaked or reached a steady state condition.	Battery Pack testing in UL2054, no testing for Cell in this report. UL1642 testing has been done and being passed for the Cell used in this Battery Pack.	N/A
9.3	Tests are to be conducted at $20 \pm 5^{\circ} C$ (68 $\pm 9^{\circ} F$), and at 55 $\pm 2^{\circ} C$ (131 $\pm 3.6^{\circ} F$). The component cells are to reach equilibrium at 20 $\pm 5^{\circ} C$ (68 $\pm 9^{\circ} F$) or $55\pm 2^{\circ} C$		N/A
	$(131 \pm 3.6 F)$ as applicable, before the terminals ar e connected.		
9.4	 (131 ±3.6F) as applicable, before the terminals ar e connected. A component cell is to be tested individually unless the cell 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 component cells to be covered for each configuration as specified by the manufacturer. 		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
0.0	The samples shall not explode or catch fire. The		N/A

9.6	temperature of the exterior cell or battery casing shall not exceed 150° (302°).		N/A
9.7	Battery packs shall comply with 9.8 — 9.12.		Р
9.8	Each fully charged test sample battery pack, in turn, is to be short-circuited by connecting the positive and negative terminals of the battery with a circuit load having a maximum resistance load of 80 ±20 m ohm. The battery is to discharge until a fire or explosion is obtained, or until it is completely discharged, or until the battery case temperature has peaked or reached a steady state condition.	Arrange the test as requirement.	Ρ
9.9	Tests are to be conducted at 20 ± 5 °C (68 ±9 °F) and at 55 ± 5 °C (131 ±9 °F). The batteries are to reach equilibrium at 20 ± 5 °C (68 ±9 °F) or 55 ± 5 °C (131 ±9 °F), as applicable, before the terminals are connected.	Arrange the test as requirement.	Р
9.10	Battery pack constructions are to be subjected to a single fault across any protective device in the load circuit of the battery under test. The protective devices faulted shall be documented. When protective devices actuate during the test, the protective devices shall be reset and the test shall be repeated with the battery pack connected to the maximum load that does not cause the protective devices to open.	Arrange the test as requirement. MOSFET on Protective circuit board is Short- circuited; PTC is operated during the test.	Ρ
9.11	One of the above five test sample battery packs, tested at $20 \pm 5^{\circ}$ (68 $\pm 9^{\circ}$) shall be evaluated with the following additional conditions in place. The terminals are to be subjected to a short circuit condition with a minimum length of 16 AWG (1.3 mm2) bare copper wire. The test is to be conducted on a tissue paper covered soft wood surface and the sample battery pack and bare conductor is to be covered with a single layer of cheesecloth.	Arrange the test as requirement.	Ρ
9.12	The samples shall not explode or catch fire and the tests shall not result in chemical leaks caused by cracking, rupturing or bursting of the internal cell jacket. The temperature of the battery pack casing shall not exceed 150° (302°). For battery pack samples tested in accordance with 9.11, the cheesecloth and tissue paper shall not catch fire.	No explosion, no fire, no chemical leakage, not exceed 150°C at enclosure. No fire. See appended table for details.	Р
10	Abnormal Charging Test		Р
10.1	Primary batteries (for example: cells, single cell batter comply with $10.2 - 10.5$	ies, or battery packs) shall	N/A
10.2	Batteries discharged to the manufacturer's rated capacity are to be used for this test. The batteries are to be tested in an ambient temperature of 20 ± 5 °C (68 ± 9 °F).	Not Primary cell or Battery Pack. Secondary cell inside Battery Pack.	N/A



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Clause	Requirement + Test	Result - Remark	Verdict
10.3	Each test sample battery is to be subjected to a charging current of three times the current I, specified 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: $t_c = \frac{2.5C}{3(l_c)}, \text{ in which}$		N/A
	 <i>t_c</i> is the charging time in hour <i>C</i> is the capacity of the cell/batteiy in ampere-hours, and <i>I_c</i> is the maximum charging current, in amperes, specified by the manufacturer. The minimum charging time is to be 7 hours. 		
10.4	When a protective device that has been investigated for the purpose, actuates 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. A protective device that has not been investigated for the purpose shall be short-circuited.		N/A
10.5	The samples shall not explode or catch fire. For battery pack samples, tests shall not result in chemical leaks caused by cracking, rupturing or bursting of the battery casing.		N/A
10.6	Secondary cells shall comply with 10.7— 10.9.		N/A
10.7	The cells are to be tested in an ambient temperature of 20 ± 5 °C (68 ± 9 °F). Each battery shall be discharged at a constant current of 0.2 C/1 hour, to a manufacturer specified discharge endpoint voltage.	Battery Pack has been tested in UL2054 in this report. Cell inside Battery Pack has been tested and being passed according to	N/A
		UL1642.	
10.8	The cells are to be charged with a constant maximum specified charger output voltage and a current limit of three times the maximum current lc, specified by the manufacturer. Charging duration is the time required to reach the manufacturer's specified end-of-charge condition plus seven additional hours.		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
10.9	A cell is to be tested without the assistance of protective devices, unless such protective devices are either integral to the cell constructions or have been investigated for the purpose. A re-settable protective device that actuates during the test shall be allowed to reset and the test shall be resumed, cycling as often as necessary to complete the test. When a protective device operates during the test (whether re-settable or not) the test is repeated with the same charging time, but with the cell connected to the maximum load that does not cause the protective devices to operate. A protective device that is not integral to the cell and that has not been		N/A
10.0.1	investigated for the purpose is to be short-circuited		P
10.9.1			
10.10	Secondary battery packs shall comply with 10.11 — 1	0.13.	Г
10.11	The batteries are to be tested in an ambient temperature of $20 \pm 5^{\circ} (68 \pm 9^{\circ})$. The room ambient temperature, Tamb, shall be recorded. A thermocouple is to be attached to each test sample battery. Each battery shall be discharged at a constant current of 0.2C1 hour, to a manufacturer specified discharge endpoint voltage.	Arrange the test as requirement.	Р
10.12	Each of the test sample batteries are to be subjected to the following overcharge conditions, in sequential order. a) The battery is to be charged with a constant maximum specified charger output voltage and a	Arrange the test as requirement. Continuous charging current with 3 x 1.6A(Max charging current specified	Р

10.12	to the following overcharge conditions, in sequential order. a) The battery is to be charged with a constant maximum specified charger output voltage and a current limit of three times the maximum current l,, specified by the manufacturer. Charging duration is the time required to reach the manufacturer's specified end-of-charge condition plus seven additional hours. The maximum temperature measured on the exterior cell or battery casing, Tmax, shall be recorded. b) The charge condition in accordance with a) shall be conducted with each single component fault that is likely to occur in the charging circuit and which would result in overcharging of the battery. Protective components which are faulted are to be documented.	requirement. Continuous charging current with 3 x 1.6A(Max charging current specified by manufacturer); Max 14.6Vdc(Max charging voltage specified by manufacturer); MOSFET on Protective circuit board is Short- circuited; PTC is used but not operated during the test; but the thermal-link (94°C, 250V/10A) operated.	
10.13	The samples shall not explode or catch fire. For battery pack samples, tests shall not result in chemical leaks caused by cracking, rupturing or bursting of the internal cell jacket.	No explosion, no fire, no chemical leak. See appended table for detail.	Р
11	Abusive Overcharge Test		Р
11.1	The batteries are to be tested in an ambient temperature of $20 \pm 5^{\circ}$ (68 $\pm 9^{\circ}$ F).	Arrange the test as requirement.	Р



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Clause	Requirement + Test	Result - Remark	Verdict
11.2	Sample batteries are to be subjected to a constant charging current at 10 times the C5 amp rate, using a supply voltage sufficient to maintain the 10 times C5 amp rate throughout the duration of the test. A thermocouple is to be attached to each test battery. For battery packs, the temperature is to be measured on the battery pack casing. The test is to continue until the cell or battery explodes, vents, or the temperature of the outer casing reaches steady state conditions or returns to ambient.	Arrange the test as UL requirement (10 C5 (3.2A) CC mode charged until the battery voltage reached 30V, then 30V CV until the temperature of the outer casing reached steady state conditions). Also testing in 5 C5 (1.6A) CC mode charged until the battery voltage reached 30V, then 30V CV until the temperature of the outer casing reached steady state conditions).	Ρ
11.3	During the tests, batteries supplied with protective devices shall be subjected to a single component fault using any single fault condition which is likely to occur in the charging circuit and which would result in overcharging of the battery.	Arrange the test as requirement. See above. MOSFET on Protective circuit board is Short- circuited; PTC is used but not operated during the test; but the thermal-link (94°C, 250V/10A) operated.	P
11.4	The samples shall not explode of catch life.	See appended table for detail.	F
11.5	At least one of the five samples shall be subjected to the test outlined in 11.2 and 11.3 with a constant current charge 5 times the C5 rate with a supply voltage sufficient to maintain that rate throughout the duration of the test.	No explosion, no fire. See appended table for detail.	P
12	Forced-Discharged Test		Р
12.1	This test is intended for cells that are to be used in multicell applications, such as battery packs. The batteries are to be tested in an ambient temperature of $20 \pm 5^{\circ} C$ (68 $\pm 9^{\circ} F$).	Arrange the test as requirement.	Р
12.2	For multi-cell series configurations without parallel strings a completely 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 total number of cells in the pack less one.		P



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Clause	Requirement + Test	Result - Remark	Verdict

12.3	For multi-cell series configurations with parallel strings, a completely discharged parallel string 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 parallel string is to equal the total number of cells in the pack less the number of cells in the discharged parallel string.		N/A
12.4	Each of the five battery packs shall be prepared as described in 12.2 or 12.3, as applicable.	Arrange the test as requirement.	Р
12.5	Once the completely discharged cells (or string of cells) are connected in series with the specified number of fully charged cells, the resultant battery pack is to be short circuited.	Arrange the test as requirement.	Р
12.6	The positive and negative terminals of the sample are to be connected with a copper wire with a maximum resistance load of 0.1 ohms. 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 volts (closed circuit condition) and the battery case temperature has returned to ± 10 °C (± 18 °F) of ambient temperature.	Arrange the test as requirement.	Р
12.7	During the tests, batteries supplied with protective devices shall be subjected to a single component fault using any single fault condition which is likely to occur in the discharge circuit and which would result in excessive discharge of the battery.	Arrange the test as requirement.	Р
12.8	The samples shall not explode or catch fire.	No explosion, no fire. See appended table for detail.	Р
13	Limited Power Source Test	(Not applied for)	N/A
13.1	The batteries are to be tested in an ambient temperature of 20 ± 5 °C (68 ± 9 °F).		N/A
13.2	A limited power source battery shall comply with one of the following: a) The output is inherently limited in compliance with Table 13.1; b) An impedance limits the output in compliance with Table 13.1. If a positive temperature coefficient device is used, it shall pass the applicable tests specified in Annex J of IEG 60730-1; c) An overcurrent protective device is used and the output is limited in compliance with Table 13.2; d) A regulating network limits the output in compliance with Table 13.1, both under normal operating conditions and after any single fault in the regulating network limits the output in compliance with Table 13.1 under normal operating conditions, and an overcurrent protective device limits the output in compliance with Table 13.2 after any single fault in the regulating network (open circuit or short circuit).		N/A



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Clause	Requirement + Test	Result - Remark	Verdict
13.3	Where an overcurrent protective device is used, it shall be a fuse or a non-adjustable, nonautoreset, electromechanical device		N/A
13.4	Batteries shall be fully charged when conducting the measurements for Uoc and according to Tables 13.1 and 13.2.		N/A
13.5	The load referenced in items 2) and 3) of Tables 13.1 and 13.2 shall include the threshold (I) and (S) load values indicated in Tables <i>13.1</i> and 13.2 as well as a load adjusted to develop maximum current and power transfer respectively. Single faults in a regulating network are applied under all four of these load conditions.		N/A
13.6	Batteries that meet the requirements are eligible to include the Marking "LPS" to indicate that they are considered to be a limited power source. Batteries that do not meet these requirements, regardless of terminal design, are restricted to applications where a limited power source is not required.		N/A
13A	Battery Pack Component Temperature Test Section 13A added effective November 11, 2011	See below	Р
13A.1	A battery pack with enclosure shall be subjected to a normal temperature test under both input (charging) and output (discharging) conditions.		Р
13A.2	For the output loading temperature test, a fully charged battery pack shall be subjected to a constant resistive loading across the output terminals of the pack with the output load current set to just below the operating limit of the discharging protection circuit. Temperatures are monitored until thermal stabilization or until the pack is at its specified endpoint voltage, whichever comes first.	Fully charged battery pack discharged with 4800mA. The testing current is below to PTC triple current so PTC was not operated.	Ρ
13A.3	The input loading temperature test shall be conducted on a fully discharged battery pack, discharged at a constant current of 0.2C/1 hour to a manufacturer specified discharge endpoint voltage.	Discharge with 10A to endpoint voltage 9.2V. The testing current is below to PTC triple current so PTC was not operated.	Р
13A.4	For the input loading temperature test, a fully discharged sample shall be subjected to a CCCV charging method with the maximum charging voltage not to exceed the manufacturer's recommended maximum charging voltage limits. During the test, the charging current shall not exceed three times the maximum charge current or the operating limit of the charging protection circuit, whichever is less, during the test	CC=4800mA, CV=14.6V	Ρ
13A.5	Temperatures are considered to be stabilized when three successive readings taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than 15 minutes, indicate no further increase.		Р



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Clause

13A.6

13A.7

Requirement + Test	Result - Remark	Verdict
Protective devices within the pack shall not operated during the test.	The testing current is below to PTC triple current so PTC was not operated.	Ρ
Temperatures are monitored on surfaces of components using thermocouples. Thermocouples are to consist of 30 AWG wires. Larger size wires may be used, but they shall not exceed 24 AWG and shall not be large enough to result in a heat sink		Ρ

	may be used, but they shall not exceed 24 AWG and shall not be large enough to result in a heat sink condition on the part under test.		
13A.8	During the normal temperature test, temperature measurement T shall not exceed (Tmax + Tamb –Tma)	See appended table	Р
13B	Battery Pack Surface Temperature Test	See below	Р
	Section 13B added effective November 11, 2011		
13B.1	A battery pack with enclosure shall be subjected to a normal temperature test under both input (charging) and output (discharging) conditions.		Р
13B.2	For the output loading temperature test, a fully charged battery pack shall be subjected to a constant resistive loading across the output terminals of the pack with the output load current set to just below the operating limit of the discharging protection circuit.	Fully charged battery pack discharged with 4800mA. The testing current is below to PTC triple current so PTC was not operated.	Ρ
13B.3	The input loading temperature test shall be conducted on a fully discharged battery pack, discharged at a constant current of 0.2C/1 hour to a manufacturer specified discharge endpoint voltage.	Discharge with 10A to endpoint voltage 9.2V	Ρ
13B.4	For the input loading temperature test, a fully discharged sample shall be subjected to a CCCV charging method with the maximum charging voltage not to exceed the manufacturer's recommended maximum charging voltage limits. During the test, the charging current shall not exceed three times the maximum charge current or the operating limit of the charging protection circuit, whichever is less, during the test	CC=4800mA, CV=14.6V	Ρ
13B.5	Temperatures are considered to be stabilized when three successive readings taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than 15 minutes, indicate no further increase.		Ρ
13B.6	Protective devices within the pack shall not operated during the test.		Р
13B.7	Temperatures are monitored on surfaces of components using thermocouples. Thermocouples are to consist of 30 AWG wires. Larger size wires may be used, but they shall not exceed 24 AWG and shall not be large enough to result in a heat sink condition on the part under test.		Р



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Clause	Requirement + Test	Result - Remark	Verdict
13B.8	During the normal temperature test, temperature measurement T shall not exceed (Tmax + Tamb – Tma)	See appended table	Р
MECHA	NICAL TESTS	•	
14	Crush Test		N/A
14.1	The batteries are to be tested in an ambient	Battery Pack was tested in UL2054 in this report.	N/A
	temperature of 20 ± 5 °C (68 ± 9 °F).	Lithium cell has been tested according to UL1642 and being passed.	
14.2	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram with a 32 mm (1.25 inch) diameter piston. The crushing is to be continued until a pressure reading of 17.2 MPa (2500 psig) is reached on the hydraulic ram, resulting in an applied force of 13 kN (3000 pounds). Once the maximum pressure has been obtained it is to be released.		N/A
14.3	A cylindrical or prismatic battery is to be crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus. A prismatic battery is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the crushing force. Each sample battery is to be subjected to a crushing force in only one direction. Separate samples are to be used for each test.		N/A
14.4	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.		N/A
14.5	The samples shall not explode or catch fire.		N/A
15	Impact Test		N/A
15.1	The batteries are to be tested in an ambient temperature of 20 ± 5 °C (68 ± 9 °F).	Battery Pack was tested in UL2054 in this report. Lithium cell has been tested according to UL1642 and	N/A
15.2	A test sample battery is to be placed on a flat surface. A 15.8 mm (518 inch) diameter bar is to be placed across the center of the sample. A 9.1 \pm 0.46 kg (20 \pm 1 pound) weight is to be dropped from a height of 610 \pm 25 mm (24 \pm 1 inch) onto the sample.	being passed.	N/A
15.3	A cylindrical or prismatic battery is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of a 15.8 mm (5/8 inch) diameter curved surface lying across the center of the test sample. A prismatic battery is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the impact. Each sample battery is to be subjected to only a single impact. Separate samples are to be used for each test.		N/A



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Clause	Requirement + Test	Result - Remark	Verdict	
15.4	A coin or button battery is to be impacted with the fiat surface of the test sample parallel to the flat surface and the 15.8 mm (518 inch) diameter curved surface lying across its center.		N/A	
15.5	The samples shall not explode or catch fire.		N/A	
16	Shock Test		N/A	
16.1	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 milliseconds 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°C (68 \pm 9°F).	Battery Pack was tested in UL2054 in this report. Lithium cell has been tested according to UL1642 and being passed.	N/A	
16.2	The samples shall not explode or catch fire.		N/A	
16.3	The sample shall be examined 6 hours after testing and shall not vent or leak as described in 5.2.		N/A	
17	Vibration Test		N/A	
17.1	The batteries are to be tested in an ambient temperature of 20 ± 5 °C (68 ± 9 °F).	Battery Pack was tested in UL2054 in this report. Lithium cell has been tested according to UL1642 and being passed.	N/A	
17.2	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].		N/A	
17.3	The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz and return in not less than 90 nor more than 100 minutes. 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.		N/A	
17.4	The samples shall not explode or catch fire.		N/A	
17.5	The sample shall be examined 6 hours after testing and shall not vent or leak as described in 5.2.		N/A	
BATTER	Y ENCLOSURE TESTS			
18	General		۲ 	
18.1	The batteries are to be tested in an ambient temperature of 20 $\pm 5^{\circ}$ (68 $\pm 9^{\circ}$ F).	Arrange the test as requirement.	P	



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Clause	Requirement + Test Result - Remark	Verdict
19.0	Batteries with outer plastic enclosures shall be Arrange the test as	Р

18.2	subjected to the tests described in Sections 19, 20,	requirement.	
	and 21.	See the tests below for detail.	
19	250 N Steady Force Test		Р
19.1	The batteries are to be tested in an ambient temperature of $20 \pm 5^{\circ}$ (68 $\pm 9^{\circ}$ F).	Arrange the test as requirement.	Р
19.2	External enclosures of the battery pack are to be subjected to a steady force of 250 ± 10 N (56 ± 2 pounds force) for a period of 5 seconds, applied in turn to the top, bottom and sides of the battery pack enclosure by means of a suitable test tool providing contact over a circular plane surface 30 mm (1.2 inches) in diameter.	Arrange the test as requirement.	Р
19.3	The samples shall not explode or catch fire. In addition, the outer battery enclosure shall not crack to the extent that the cells or any protective devices are exposed.	No explosion, no fire, and no crack.	Р
19.4	The sample shall be examined 6 hours after testing and shall not vent or leak as described in 5.2.	Verified, no vent or leakage.	Р
20	Mold Stress Relief Test		Р
20.1	Each of three samples are to be placed in a full-draft circulating-air oven maintained at a uniform temperature of 70° (1 58°F). The samples are to remain in the oven for 7 hours.	Arrange the test as requirement. 70°C is maintained in the oven.	Р
20.2	Deleted effective November 11, 2011	Arrange the test as requirement.	Р
20.3	After careful removal from the oven and after returning to room temperature following the conditioning described in 20.3, the samples shall show no evidence of mechanical damage that would result in damage to cells or protective circuitry. In addition, the battery enclosures shall not crack, warp, or melt to the extent that the cells or any protective devices are exposed. Openings in the enclosure created as a result of the conditioning shall meet the criteria of 4.1.5	No explosion, no fire, no vent or leakage, no crack.	Р
21	Drop Impact Test		Р
21.1	The batteries are to be tested in an ambient temperature of $20 \pm 5^{\circ}$ (68 $\pm 9^{\circ}$ F), 0°C.	Arrange the test as requirement.	Р
21.2	Each of three samples is to be dropped from a height of 1 m (3.28 ft) so it strikes a concrete surface in the position that is most likely to produce the adverse results in 21.3. Each sample is to be dropped ,three times.	Arrange the test as requirement.	Р
21.3	The samples shall not explode or catch fire.	No explosion, no fire.	P
21.4	The sample shall be examined 6 hours after testing and shall not vent or leak as described in 5.2, and the integrity of the protective devices shall be maintained.	Verified. Tested at 2 samples at 25℃; 1 sample at 0℃.	Р



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Clause	Requirement + Test	Result - Remark	Verdict
21.5	The outer battery enclosure shall not crack to the extent that cells or any protective devices are exposed.	Verified, no cell or protective device is explosive to operator.	Р
FIRE EXP	OSURE TESTS		
22	Projectile Test	(Not applied for)	N/A
22.1	When subjected to the test described in 22.2 — 22.5 no part of an exploding cell or battery shall create a hole in the wire screen cage or penetrate the wire screen cage such that some or all of the cell or battery protrudes through the screen cage.	The battery pack was tested in UL2054 in this report.	N/A
22.2	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 inch (25.4 mm) and a wire diameter of 0.43 mm (0.017 inch).		N/A
22.3	The screen is to be mounted 38 mm (1-1/2 inch) above a 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.		N/A
22.4	An eight-sided covered wire cage, 610 mm (2 feet) across and 305 mm (1 foot) high, made from metal screening is to be placed over the test sample. See Figure 22.1. The metal screening is to be constructed from 0.25 mm (0.010 inch) diameter aluminum wire with 16— 18 wires per inch (25.4 mm> in each direction.		N/A
22.5	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.		N/A
ENVIRON	MENTAL TESTS		
23	Heating Test		N/A
23.1	The sample shall not explode or catch fire when subjected to the test described in 23.2 — 23.4.	The Battery Pack is tested in UL2054 in this report. The cell is tested and passed according to UL1642, see report: 17021048.001 Attachment 1.	N/A
23.2	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).		N/A
23.3	The temperature of the oven is to be raised at a rate of $5 \pm 2^{\circ}$ (9 $\pm 3.6^{\circ}$ F) per minute to a temperature of 130 $\pm 2^{\circ}$ (266 $\pm 3.6^{\circ}$ F) and remain at that temperature for 10 minutes.		N/A
23.4	The sample shall return to room temperature (20 $\pm 5^{\circ}$ C) and then be examined.		N/A



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Clause	Requirement + Test
Olduse	ricquirement + rest

Result - Remark Verdict

24	Temperature Cycling Test		N/A
24.1	 The batteries are to be placed in a test chamber and subjected to the following cycles: a) Raising the chamber-temperature to 70±3℃ (158 ±5♥) within 30 minutes and maintaining this temperature for 4 hours. b) Reducing the chamber temperature to 20 ±3℃ (68 ±5♥) within 30 minutes and maintaining this temperature for 2 hours. c) Reducing the chamber temperature to minus 40 ±3℃ (minus 40 ±5♥) within 30 minutes and maintaining this temperature for 2 hours. d) Raising the chamber temperature to 20 ±3℃ (68 ±5♥) 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 prior to examination 	The Battery Pack is tested in UL2054 in this report. The cell is tested and passed according to UL1642, see report: 17021048.001 Attachment 1.	N/A
24.2	The samples shall not explode or catch fire. In addition, the samples shall not vent or leak as described in 5.2.		N/A
MARKING			
25	General		Р
25.1	A battery shall be legibly and permanently marked with: a) The manufacturers name, trade name, or trademark or other descriptive marking by which the organization responsible for the product may be identified; b) A distinctive ('catalog" or "model") number or the equivalent; c) The electrical rating; and d) The date or other dating period of manufacture not exceeding any three consecutive months.	See marking plate.	Ρ
25.2	When a manufacturer produces the battery at more than one factory, each battery shall have a distinctive marking to identify it as the product of a particular factory.	See marking plate and manufacturer's specification.	Р
25.3	 A battery or the smallest unit package or instructions provided with each battery shall include the following statements or equivalent: a) An attention word, such as "Caution," 'Warning," or "Danger." b) A brief description of possible hazards associated with mishandling of the battery, such as burn hazard, fire hazard, explosion hazard. c) A list of actions to take to avoid possible hazards, such as do not crush, disassemble, dispose of in fire, or similar actions. 	Information for safety mentioned in manufacturer's specification.	Ρ



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Clause	Requirement + Test	Result - Remark	Verdict
		·	•
25.3.1	A lithium ion battery pack shall be marked with the following or equivalent: "CAUTION: Risk of Fire and Burns. Do Not Open, Crush, Heat Above (manufacturer's specified maximum temperature) or Incinerate. Follow Manufacturer's Instructions" This wording or equivalent shall also be included in the instructions packaged with the battery pack	See marking label.	Ρ
25.4	The manufacturer's specified charging instructions shall be included.	See manufacturer's specification.	Р
25.5	A cell or battery that is less than 32 mm (1.25 inches) in diameter by 3.8 mm (0.15 in) thick shall include the following marking or equivalent on the smallest unit package or instructions provided with each cell or battery: "Caution — Never put batteries in mouth. If swallowed, contact your physician or local poison control center."		N/A
25.6	Batteries which meet the requirements of the Limited Power Source Test, Paragraph 13.4, may include the Marking 'LPS."		N/A



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UL60950-1 and CSA C22.2 No. 60950-1-07+A1:2011			
Clause	Requirement + Test	Result - Remark	Verdict

UL 60950-1, 2nd Edition, (Information Technology Equipment - Safety - Part 1: General Requirements); CSA C22.2 No. 60950-1-07, 2nd Edition (Information Technology Equipment - Safety - Part 1: General Requirements)				
IEC 60950	0-1:2006, 2nd Edition Requirement			
1	GENERAL		Р	
1.5	Components		Р	
1.5.1	General		Р	
	Comply with IEC 60950 or relevant component standard		Р	
1.5.2	Evaluation and testing of components	Components certified to IEC harmonized standard and checked for correct application. Components not certified are used in accordance with their ratings and they comply with applicable parts of UL 60950- 1 and the relevant component Standard. Components, for which no relevant IEC-Standard exists, have been tested under the conditions occurring in the equipment, using applicable parts of UL 60950-1.	Ρ	
1.5.3	Thermal controls	Certificated component is used.	Ρ	
1.5.4	Transformers	Only battery pack.	N/A	
1.5.5	Interconnecting cables		N/A	
1.5.6	Capacitors in primary circuits	:	N/A	
1.5.7	Double insulation or reinforced insulation bridged by components		N/A	
1.5.7.1	General		N/A	
1.5.7.2	Bridging capacitors		N/A	
1.5.7.3	Bridging resistors		N/A	
1.5.7.4	Accessible parts		N/A	
1.5.8	Components in equipment for IT power systems		N/A	
1.6	Power interface		N/A	
1.6.1	AC power distribution systems	Build in battery pack.	N/A	



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Clause	Requirement + Test	Result - Remark	Verdict

1.6.2	Input current		N/A
1.6.3	Voltage limit of hand-held equipment		N/A
1.6.4	Neutral conductor		N/A
1.7	Marking and instructions		Р
1.7.1	Power rating	Rating marking readily visible to OPERATOR.	Р
	Rated voltage(s) or voltage range(s) (V):	13.2V.	Р
	Symbol for nature of supply, for d.c. only	Optional.	N/A
	Rated frequency or rated frequency range (Hz):		N/A
	Rated current (mA or A):	1600mA for charge, 1600mA for discharge.	N/A
	Manufacturer's name or trademark or identification mark	Refer to the Model information at the beginning of this Test Report.	Р
	Type/model or type reference:	Refer to the Model information at the beginning of this Test Report.	Р
	Symbol for Class II equipment only		N/A
	Other symbols:		Р
	Certification marks	cTUVus.	Р
1.7.2	Safety instructions	Safety instructions in English. Other languages will be provided when submitted for national approval.	Р
1.7.3	Short duty cycles	The equipment is intended for continuous operation.	N/A
1.7.4	Supply voltage adjustment		N/A
1.7.5	Power outlets on the equipment:		N/A
1.7.6	Fuse identification		N/A
1.7.7	Wiring terminals		N/A
1.7.7.1	Protective earthing and bonding terminals		N/A
1.7.7.2	Terminal for a.c. mains supply conductors		N/A
1.7.7.3	Terminals for d.c. mains supply conductors		N/A



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UL60950-1 and CSA C22.2 No. 60950-1-07+A1:2011			
Clause	Requirement + Test	Result - Remark	Verdict

1.7.8	Controls and indicators		N/A
1.7.8.1	Identification, location and marking		N/A
1.7.8.2	Colours:		N/A
1.7.8.3	Symbols according to IEC 60417		N/A
1.7.8.4	Markings using figures:	Figures are not used for indicating different positions of controls.	N/A
1.7.9	Isolation of multiple power sources:	There is only one connection to power source.	N/A
1.7.10	IT power distribution systems -	Not intended for use on IT power systems.	N/A
1.7.11	Thermostats and other regulating devices	No thermostats or similar regulating devices.	N/A
1.7.12	Language	Reviewed only English markings/instructions.	-
1.7.13	Durability		N/A
1.7.14	Removable parts		N/A
1.7.15	Replaceable batteries	No batteries.	N/A
	Language		-
1.7.16	Operator access with a tool	No operator access areas require the use of a tool.	N/A
1.7.17	Equipment for restricted access locations:	Equipment not intended for installation in a RESTRICTED ACCESS LOCATION.	N/A
2	PROTECTION FROM HAZARDS	1	Р
2.1	Protection from electric shock and energy hazards		Р
2.1.1	Protection in operator access areas	Only has access to bare parts of SELV circuits.	Р
2.1.1.1	Access to energized parts	Operator can gain access only to SELV (output connector).	Р
	Test by inspection		N/A
	Test with test finger		N/A
	Test with test pin		N/A
	Test with test probe	No TNV presents.	N/A



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2.1.1.2	Battery compartments:		N/A
2.1.1.3	Access to ELV wiring	No internal wiring at ELV.	N/A
	Working voltage (V); minimum distance (mm) through insulation		-
2.1.1.4	Access to hazardous voltage circuit wiring	No internal wiring accessible to the user.	N/A
2.1.1.5	Energy hazards:	Used as build in battery pack.	N/A
2.1.1.6	Manual controls		N/A
2.1.1.7	Discharge of capacitors in equipment		N/A
	Time-constant (s); measured voltage (V)		-
2.1.2	Protection in service access areas		N/A
2.1.3	Protection in restricted access locations	Not intend for RESTRICTED ACCESS LOCATION.	N/A
2.2	SELV circuits		Р
2.2.1	General requirements	SELV levels are maintained after single fault condition.	Р
2.2.2	Voltages under normal conditions (V):	All accessible voltages are less than 42.4 V peak or 60 V dc and are classified as SELV.	Р
2.2.3	Voltages under fault conditions (V)		Р
2.2.3.1	Separation by double insulation or reinforced insulation (method 1)		N/A
2.2.3.2	Separation by earthed screen (method 2)		N/A
2.2.3.3	Protection by earthing of the SELV circuit (method 3)		N/A
2.2.4	Connection of SELV circuits to other circuits:	SELV CIRCUITS are only connected to other SELV CIRCUITS or LIMITED CURRENT CIRCUITS.	Р
2.3	TNV circuits		N/A
2.3.1	Limits	No TNV presents.	N/A
	Type of TNV circuits		-
2.3.2	Separation from other circuits and from accessible parts		N/A
	Insulation employed		-



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Clause	Requirement + Test	Result - Remark	Verdict

2.3.3	Separation from hazardous voltages		N/A
	Insulation employed		-
2.3.4	Connection of TNV circuits to other circuits		N/A
	Insulation employed		-
2.3.5	Test for operating voltages generated externally		N/A
2.4	Limited current circuits		N/A
2.4.1	General requirements		N/A
2.4.2	Limit values		N/A
	Frequency (Hz)		-
	Measured current (mA)		-
	Measured voltage (V)		-
	Measured capacitance (mF)		-
2.4.3	Connection of limited current circuits to other circuits		N/A
2.5	Limited power sources		N/A
	Inherently limited output	Used as build in battery pack. Not marked with LPS.	N/A
	Impedance limited output		N/A
	Overcurrent protective device limited output		N/A
	Regulating network limited output under normal operating and single fault condition		N/A
	Regulating network limited output under normal operating conditions and overcurrent protective device limited output under single fault condition		N/A
	Output voltage (V), output current (A), apparent power (VA):		-
	Current rating of overcurrent protective device (A) :		-
2.6	Provisions for earthing and bonding		N/A
2.6.1	Protective earthing	Used as build in battery pack.	N/A
2.6.2	Functional earthing		N/A
L	1	(1



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UL60950-1 and CSA C22.2 No. 60950-1-07+A1:2011			
Clause	Requirement + Test	Result - Remark	Verdict

2.6.3	Protective earthing and protective bonding conductors	N/A
2.6.3.1	General	N/A
2.6.3.2	Size of protective earthing conductors	N/A
	Rated current (A), cross-sectional area (mm2), AWG	-
2.6.3.3	Size of protective bonding conductors	N/A
	Rated current (A), cross-sectional area (mm2), AWG	-
2.6.3.4	Resistance (Ohm) of earthing conductors and their terminations, test current (A)	N/A
2.6.3.5	Colour of insulation:	N/A
2.6.4	Terminals	N/A
2.6.4.1	General	N/A
2.6.4.2	Protective earthing and bonding terminals	N/A
	Rated current (A), type and nominal thread diameter (mm)	-
2.6.4.3	Separation of the protective earthing conductor from protective bonding conductors	N/A
2.6.5	Integrity of protective earthing	N/A
2.6.5.1	Interconnection of equipment	N/A
2.6.5.2	Components in protective earthing conductors and protective bonding conductors	N/A
2.6.5.3	Disconnection of protective earth	N/A
2.6.5.4	Parts that can be removed by an operator	N/A
2.6.5.5	Parts removed during servicing	N/A
2.6.5.6	Corrosion resistance	N/A
2.6.5.7	Screws for protective bonding	N/A
2.6.5.8	Reliance on telecommunication network or cable distribution system	 N/A



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2.7	Overcurrent and earth fault protection in primary	/ circuits	N/A
2.7.1	Basic requirements	No primary circuit.	N/A
	Instructions when protection relies on building installation		N/A
2.7.2	Faults not covered in 5.3		N/A
2.7.3	Short-circuit backup protection		N/A
2.7.4	Number and location of protective devices		N/A
2.7.5	Protection by several devices		N/A
2.7.6	Warning to service personnel		N/A
2.8	Safety interlocks		N/A
2.8.1	General principles	There is no safety interlock used.	N/A
2.8.2	Protection requirements		N/A
2.8.3	Inadvertent reactivation		N/A
2.8.4	Fail-safe operation		N/A
2.8.5	Moving parts		N/A
2.8.6	Overriding		N/A
2.8.7	Switches and relays		N/A
2.8.7.1	Contact gaps (mm)		N/A
2.8.7.2	Overload test		N/A
2.8.7.3	Endurance test		N/A
2.8.7.4	Electric strength test		N/A
2.8.8	Mechanical actuators		N/A
2.9	Electrical insulation		Р
2.9.1	Properties of insulating materials	Natural rubber, materials containing asbestos and hygroscopic materials are not used as insulation.	Р
2.9.2	Humidity conditioning		N/A
	Humidity (%)		-



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	Temperature (°C):		-
2.9.3	Grade of insulation	Unit supplied by SELV and no hazardous voltage generated within unit, only Functional Insulation Required.	Р
2.10	Clearances, creepage distances and distances the	nrough insulation	Р
2.10.1	General	Pollution degree 2 applicable.	Р
2.10.2	Determination of working voltage	Pollution Degree 2 applicable. Unit supplied by SELV and	Р
		no	
		nazardous voltage generated	
		Insulation Required	
		For Functional Insulation, see	
		5.3.4.	
2.10.3	Clearances		N/A
2.10.3.1	General		N/A
2.10.3.2	Clearances in primary circuit		N/A
2.10.3.3	Clearances in secondary circuits		N/A
2.10.3.4	Measurement of transient voltage levels		N/A
2.10.4	Creepage distances		N/A
	CTI tests:		-
2.10.5	Solid insulation		N/A
2.10.5.1	Minimum distance through insulation		N/A
2.10.5.2	Thin sheet material		N/A
	Number of layers (pcs):		-
	Electric strength test:		-
2.10.5.3	Printed boards		N/A
	Distance through insulation		N/A



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	Electric strength test for thin sheet insulating material		-
	Number of layers (pcs):		N/A
2.10.5.4	Wound components		N/A
	Number of layers (pcs):		N/A
	Two wires in contact inside wound component; angle between 45¡ã and 90¡ã:		N/A
2.10.6	Coated printed boards		N/A
2.10.6.1	General		N/A
2.10.6.2	Sample preparation and preliminary inspection		N/A
2.10.6.3	Thermal cycling		N/A
2.10.6.4	Thermal ageing (°C):		N/A
2.10.6.5	Electric strength test:		-
2.10.6.6	Abrasion resistance test		N/A
	Electric strength test		-
2.10.7	Enclosed and sealed parts:		N/A
	Temperature T1=T2 = Tma - Tamb +10K (℃):		N/A
2.10.8	Spacings filled by insulating compound:		N/A
	Electric strength test		-
2.10.9	Component external terminations		N/A
2.10.10	Insulation with varying dimensions		N/A
3	WIRING, CONNECTIONS AND SUPPLY		Р
3.1	General		Р
3.1.1	Current rating and overcurrent protection	All internal wires and INTERCONNECTING CABLES possess adequate cross-sectional areas for their intended application and all internal wirings are adequately insulated.	Р



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3.1.2	Protection against mechanical damage	The wires are routed away from sharp edges and parts that could damage insulation.	Р
3.1.3	Securing of internal wiring	Internal wiring routed, supported, clamped or secured in a manner that excessive strain on wire and on terminal connections, loosening of terminal connections and damage of conductor insulation are unlikely.	Ρ
3.1.4	Insulation of conductors	The insulation of the individual conductors is suitable for the application and the working voltage.	Р
3.1.5	Beads and ceramic insulators		N/A
3.1.6	Screws for electrical contact pressure		N/A
3.1.7	Insulating materials in electrical connections		N/A
3.1.8	Self-tapping and spaced thread screws		N/A
3.1.9	Termination of conductors		N/A
	10 N pull test		N/A
3.1.10	Sleeving on wiring		N/A
3.2	Connection to an a.c. mains supply or a d.c. mai	ns supply	N/A
3.2.1	Means of connection	Used as build in battery pack.	N/A
3.2.1.1	Connection to an a.c. mains supply		N/A
3.2.1.2	Connection to a d.c. mains supply		N/A
3.2.2	Multiple supply connections		N/A
3.2.3	Permanently connected equipment		N/A
	Number of conductors, diameter (mm) of cable and conduits		-
3.2.4	Appliance inlets		N/A
3.2.5	Power supply cords		N/A
3.2.5.1	AC power supply cords		N/A
	Туре		-
		-	



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	Rated current (A), cross-sectional area (mm2), AWG		-
3.2.5.2	DC power supply cords		N/A
3.2.6	Cord anchorages and strain relief		N/A
	Mass of equipment (kg), pull (N)		-
	Longitudinal displacement (mm):		-
3.2.7	Protection against mechanical damage		N/A
3.2.8	Cord guards		N/A
	D (mm); test mass (g)		-
	Radius of curvature of cord (mm):		-
3.2.9	Supply wiring space		N/A
3.3	Wiring terminals for connection of external conductors		N/A
3.3.1	Wiring terminals	No wiring terminals.	N/A
3.3.2	Connection of non-detachable power supply cords		N/A
3.3.3	Screw terminals		N/A
3.3.4	Conductor sizes to be connected		N/A
	Rated current (A), cord/cable type, cross-sectional area (mm2)		-
3.3.5	Wiring terminal sizes		N/A
	Rated current (A), type and nominal thread diameter (mm)		-
3.3.6	Wiring terminals design		N/A
3.3.7	Grouping of wiring terminals		N/A
3.3.8	Stranded wire		N/A
3.4	Disconnection from the mains supply	1	N/A
3.4.1	General requirement	Used as build in battery pack.	N/A
3.4.2	Disconnect devices		N/A
I			



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3.4.3	Permanently connected equipment		N/A
3.4.4	Parts which remain energized		N/A
3.4.5	Switches in flexible cords		N/A
3.4.6	Single-phase equipment and d.c. equipment		N/A
3.4.7	Three-phase equipment		N/A
3.4.8	Switches as disconnect devices		N/A
3.4.9	Plugs as disconnect devices		N/A
3.4.10	Interconnected equipment	Not interconnected equipment.	N/A
3.4.11	Multiple power sources		N/A
3.5	Interconnection of equipment		Р
3.5.1	General requirements	Interconnection circuits of SELV through the DC output connectors.	Р
3.5.2	Types of interconnection circuits:	Interconnection circuits are SELV CIRCUITS and LIMITED CURRENT CIRCUIT.	Р
3.5.3	ELV circuits as interconnection circuits	No ELV circuit.	N/A
4	PHYSICAL REQUIREMENTS		Р
4.1	Stability		N/A
	Angle of 10¡ã	Used as build in battery pack.	N/A
	Test: force (N):		N/A
4.2	Mechanical strength	I	Р
4.2.1	General	After tests, the sample is continuing to comply with relevant requirements.	Р
4.2.2	Steady force test, 10 N		N/A
4.2.3	Steady force test, 30 N		N/A
4.2.4	Steady force test, 250 N	No hazards as a result of the 250 N test.	Р
4.2.5	Impact test		N/A
	Fall test		N/A
L			



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	Swing test		N/A
4.2.6	Drop test	No hazards as a result of the drop test.	Р
4.2.7	Stress relief test	Used as build in battery pack.	Р
4.2.8	Cathode ray tubes		N/A
	Picture tube separately certified		N/A
4.2.9	High pressure lamps		N/A
4.2.10	Wall or ceiling mounted equipment; force (N):	Equipment is not intended for wall or ceiling mounted.	N/A
4.3	Design and construction		Р
4.3.1	Edges and corners	All edges and corners judged to be sufficiently well rounded so as not to constitute a hazard.	Р
4.3.2	Handles and manual controls; force (N):		N/A
4.3.3	Adjustable controls	The equipment does not have any operator accessible adjustable controls.	N/A
4.3.4	Securing of parts	Design is to withstand usual mechanical stress.	Р
4.3.5	Connection of plugs and sockets		N/A
4.3.6	Direct plug-in equipment		N/A
	Dimensions (mm) of mains plug for direct plug-in:		N/A
	Torque and pull test of mains plug for direct plug- in; torque (Nm); pull (N)		N/A
4.3.7	Heating elements in earthed equipment	No heating elements.	N/A
4.3.8	Batteries	For battery Pack: Over charging test is passed; Reversed not likely External Short-Circuit test since the specified terminal. For Excessive discharging is done and being passed. For cell, UL1642 is tested; see appended tables in attachment 1.	Ρ
4.3.9	Oil and grease	The insulation of the internal wiring is not exposed to oil, grease, etc.	N/A



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4.3.10	Dust, powders, liquids and gases	The equipment does not produce dust or employ powders, liquids or gases.	N/A
4.3.11	Containers for liquids or gases	The equipment does not contain liquids.	N/A
4.3.12	Flammable liquids:	The equipment does not use any flammable liquids.	N/A
	Quantity of liquid (I):		N/A
	Flash point ($^{\circ}C$):		N/A
4.3.13	Radiation; type of radiation	The equipment does not generate ionizing radiation or contain flammable liquids or gases.	N/A
4.3.13.1	General		N/A
4.3.13.2	Ionizing radiation		N/A
	Measured radiation (pA/kg)		-
	Measured high-voltage (kV)		-
	Measured focus voltage (kV):		-
	CRT markings:		-
4.3.13.3	Effect of ultraviolet (UV) radiation on materials		N/A
	Part, property, retention after test, flammability classification		N/A
4.3.13.4	Human exposure to ultraviolet (UV) radiation:		N/A
4.3.13.5	Laser (including LEDs)		N/A
	Laser class:		-
4.3.13.6	Other types		N/A
4.4	Protection against hazardous moving parts	•	N/A
4.4.1	General	No hazardous moving parts.	N/A
4.4.2	Protection in operator access areas		N/A
4.4.3	Protection in restricted access locations		N/A
4.4.4	Protection in service access areas		N/A



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4.5	Thermal requirements		Р
4.5.1	Maximum temperatures	The equipment and its component parts did not attain excessive temperatures during normal operation, see appended table for testing in UL2054 and UL1642 for Battery Pack and Cell respectively.	Ρ
	Normal load condition per Annex L	See above.	Р
4.5.2	Resistance to abnormal heat		N/A
4.6	Openings in enclosures		N/A
4.6.1	Top and side openings	Used as build in battery pack.	N/A
	Dimensions (mm):		-
4.6.2	Bottoms of fire enclosures		N/A
	Construction of the bottom:		-
4.6.3	Doors or covers in fire enclosures		N/A
4.6.4	Openings in transportable equipment		N/A
4.6.5	Adhesives for constructional purposes		N/A
	Conditioning temperature (°C)/time (weeks):		-
4.7	Resistance to fire		Р
4.7.1	Reducing the risk of ignition and spread of flame	Method 1: Selection and application of components and materials that minimize the possibility of ignition and spread of flame.	Р
	Method 1, selection and application of components wiring and materials	Selection and application of components, wiring and materials, which reduce the possibility of ignition and spread of flame by the use of FIRE ENCLOSURE.	Ρ
	Method 2, application of all of simulated fault condition tests		N/A
4.7.2	Conditions for a fire enclosure	Used as build in battery pack.	N/A
4.7.2.1	Parts requiring a fire enclosure	Used as build in battery	N/A



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		pack.	
4.7.2.2	Parts not requiring a fire enclosure		N/A
4.7.3	Materials		Р
4.7.3.1	General	The propagation of fire is minimized through satisfying the requirement of constructions and materials.	Р
4.7.3.2	Materials for fire enclosures		N/A
4.7.3.3	Materials for components and other parts outside fire enclosures	Connectors are made of materials of Class V-2 minimum.	Р
4.7.3.4	Materials for components and other parts inside fire enclosures	All internal materials are rated V-2 or better. Internal wiring is UL Recognized, marked VW-1 or FT-1.	Ρ
4.7.3.5	Materials for air filter assemblies	The equipment does not have any air filters.	N/A
4.7.3.6	Materials used in high-voltage components	No high-voltage components.	N/A
5	ELECTRICAL REQUIREMENTS AND SIMULATE	D ABNORMAL CONDITIONS	N/A
5.1	Touch current and protective conductor current		N/A
5.1.1	General	Used as build in battery pack.	N/A
5.1.2	Equipment under test (EUT)		N/A
5.1.3	Test circuit		N/A
5.1.4	Application of measuring instrument		N/A
5.1.5	Test procedure		N/A
5.1.6	Test measurements		N/A
	Test voltage (V)		-
	Measured touch current (mA):		-
	Max. allowed touch current (mA):		-
	Measured protective conductor current (mA):		-
	Max. allowed protective conductor current (mA):		-
5.1.7	Equipment with touch current exceeding 3.5 mA:		N/A
5.1.8	Touch currents to and from telecommunication networks and cable distribution systems and from	No TNV presents.	N/A



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	telecommunication networks		
5.1.8.1	Limitation of the touch current to a telecommunication network and a cable distribution system		N/A
	Test voltage (V)		-
	Measured touch current (mA)		-
	Max. allowed touch current (mA)		-
5.1.8.2	Summation of touch currents from telecommunication networks		N/A
5.2	Electric strength		N/A
5.2.1	General	Used as build in battery pack.	N/A
5.2.2	Test procedure		N/A
5.3	Abnormal operating and fault conditions		Р
5.3.1	Protection against overload and abnormal operation	See Table 5.3 for details.	Р
5.3.2	Motors		N/A
5.3.3	Transformers		N/A
5.3.4	Functional insulation:	Functional insulation complies with the requirements (a), (b), or (c).	Р
5.3.5	Electromechanical components	The equipment does not have any electromechanical components in the secondary.	N/A
5.3.6	Simulation of faults		Р
5.3.7	Unattended equipment		N/A
5.3.8	Compliance criteria for abnormal operating and fault conditions	No fire, emission of molten metal or deformation was noted during the tests. Electric Strength tests performed after abnormal and fault tests.	Р
6	CONNECTION TO TELECOMMUNICATION NETW	ORKS	N/A
6.1	Protection of telecommunication network service persons, and users of other equipment connected to the network, from hazards in the equipment		N/A
6.1.1	Protection from hazardous voltages		N/A
6.1.2	Separation of the telecommunication network from e	arth	N/A



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6.1.2.1	Requirements	N/A
	Test voltage (V)	-
	Current in the test circuit (mA)	-
6.1.2.2	Exclusions	N/A
6.2	Protection of equipment users from overvoltages on telecommunication networks	N/A
6.2.1	Separation requirements	N/A
6.2.2	Electric strength test procedure	N/A
6.2.2.1	Impulse test	N/A
6.2.2.2	Steady-state test	N/A
6.2.2.3	Compliance criteria	N/A
6.3	Protection of the telecommunication wiring system from overheating	N/A
	Max. output current (A)	-
	Current limiting method	-
7	CONNECTION TO CABLE DISTRIBUTION SYSTEMS	N/A
7.1	Protection of cable distribution system service persons, and users of other equipment connected to the system, from hazardous voltages in the equipment	N/A
7.2	Protection of equipment users from overvoltages on the cable distribution system	N/A
7.3	Insulation between primary circuits and cable distribution systems	N/A
7.3.1	General	N/A
7.3.2	Voltage surge test	N/A
7.3.3	Impulse test	N/A
A	Annex A, TESTS FOR RESISTANCE TO HEAT AND FIRE	N/A
A.1	Flammability test for fire enclosures of movable equipment having a total mass exceeding 18 kg, and of stationary equipment (see 4.7.3.2)	N/A
A.1.1	Samples:	-
	Wall thickness (mm)	-
A.1.2	Conditioning of samples; temperature (°C):	N/A



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A.1.3	Mounting of samples	N/A
A.1.4	Test flame	N/A
A.1.5	Test procedure	N/A
A.1.6	Compliance criteria	N/A
	Sample 1 burning time (s)	-
	Sample 2 burning time (s)	-
	Sample 3 burning time (s)	-
A.2	Flammability test for fire enclosures of movable equipment having a total mass not exceeding 18 kg, and for material and components located inside fire enclosures (see 4.7.3.2 and 4.7.3.4)	N/A
A.2.1	Samples, material	-
	Wall thickness (mm)	-
A.2.2	Conditioning of samples	N/A
A.2.3	Mounting of samples	N/A
A.2.4	Test flame	N/A
A.2.5	Test procedure	N/A
A.2.6	Compliance criteria	N/A
	Sample 1 burning time (s)	-
	Sample 2 burning time (s)	-
	Sample 3 burning time (s)	-
A.2.7	Alternative test acc. to IEC 60695-2-2, cl. 4, 8	N/A
	Sample 1 burning time (s)	-
	Sample 2 burning time (s)	-
	Sample 3 burning time (s)	-
A.3	Hot flaming oil test (see 4.6.2)	N/A
A.3.1	Mounting of samples	N/A
A.3.2	Test procedure	N/A



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A.3.3	Compliance criterion	N/A
В	Annex B, MOTOR TESTS UNDER ABNORMAL CONDITIONS(see 4.7.2.2 and 5.3.2)	N/A
B.1	General requirements	N/A
	Position	-
	Manufacturer	-
	Туре	-
	Rated values	-
B.2	Test conditions	N/A
B.3	Maximum temperatures	N/A
B.4	Running overload test	N/A
B.5	Locked-rotor overload test	N/A
	Test duration (days)	-
	Electric strength test: test voltage (V)	-
B.6	Running overload test for d.c. motors in secondary circuits	N/A
B.7	Locked-rotor overload test for d.c. motors in secondary circuits	N/A
B.7.1	Test procedure	N/A
B.7.2	Alternative test procedure; test time (h)	N/A
B.7.3	Electric strength test	N/A
B.8	Test for motors with capacitors	N/A
B.9	Test for three-phase motors	N/A
B.10	Test for series motors	N/A
	Operating voltage (V)	-
с	Annex C, TRANSFORMERS (see 1.5.4 and 5.3.3)	N/A
	Position Used as build in battery pack.	-
	Manufacturer	-



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	Туре		-
	Rated values:		-
	Method of protection:		-
C.1	Overload test		N/A
C.2	Insulation		N/A
	Protection from displacement of windings		N/A
D	Annex D, MEASURING INSTRUMENTS FOR TOU	CH-CURRENT TESTS	N/A
D.1	Measuring instrument	Used as build in battery pack.	N/A
D.2	Alternative measuring instrument		N/A
E	Annex E, TEMPERATURE RISE OF A WINDING		N/A
F	Annex F, MEASUREMENT OF CLEARANCES AN (see 2.10)	D CREEPAGE DISTANCES	N/A
G	Annex G, ALTERNATIVE METHOD FOR DETERN CLEARANCES	IINING MINIMUM	N/A
G.1	Summary of the procedure for determining minimum clearances		N/A
G.2	Determination of mains transient voltage (V)		N/A
G.2.1	AC mains supply		N/A
G.2.2	DC mains supply		N/A
G.3	Determination of telecommunication network transient voltage (V) :		N/A
G.4	Determination of required withstand voltage (V):		N/A
G.5	Measurement of transient levels (V)		N/A
G.6	Determination of minimum clearances:		N/A
Н	ANNEX H, IONIZING RADIATION (see 4.3.13)		N/A
J	Annex J, TABLE OF ELECTROCHEMICAL POTE	NTIALS (see 2.6.5.6)	N/A
	Metal used:		-
к	ANNEX K, THERMAL CONTROLS (see 1.5.3 and	5.3.7)	N/A
K.1	Making and breaking capacity		N/A



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K.2	Thermostat reliability; operating voltage (V):	N/A
К.З	Thermostat endurance test; operating voltage (V).:	N/A
K.4	Temperature limiter endurance; operating voltage (V)	N/A
K.5	Thermal cut-out reliability	N/A
K.6	Stability of operation	N/A
L	Annex L, NORMAL LOAD CONDITIONS FOR SOME TYPES OF ELECTRICAL BUSINESS EQUIPMENT (see 1.2.2.1 and 4.5.1)	Р
L.1	Typewriters	N/A
L.2	Adding machines and cash registers	N/A
L.3	Erasers	N/A
L.4	Pencil sharpeners	N/A
L.5	Duplicators and copy machines	N/A
L.6	Motor-operated files	N/A
L.7	Other business equipment	Р
М	Annex M, CRITERIA FOR TELEPHONE RINGING SIGNALS (see 2.3.1)	N/A
M.1	Introduction	N/A
M.2	Method A	N/A
M.3	Method B	N/A
M.3.1	Ringing signal	N/A
M.3.1.1	Frequency (Hz)	-
M.3.1.2	Voltage (V)	-
M.3.1.3	Cadence; time (s), voltage (V)	-
M.3.1.4	Single fault current (mA)	-
M.3.2	Tripping device and monitoring voltage	N/A
M.3.2.1	Conditions for use of a tripping device or a monitoring voltage	N/A
M.3.2.2	Tripping device	N/A



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M.3.2.3	Monitoring voltage (V)		N/A
N	Annex N, IMPULSE TEST GENERATORS (see 2. clause G.5)	10.3.4, 6.2.2.1, 7.3.2 and	N/A
N.1	ITU-T impulse test generators		N/A
N.2	IEC 60065 impulse test generator		N/A
Р	Annex P, NORMATIVE REFERENCES		Р
Q	Annex Q, BIBLIOGRAPHY		Р
R	Annex R, EXAMPLES OF REQUIREMENTS FOR PROGRAMMES	QUALITY CONTROL	N/A
R.1	Minimum separation distances for unpopulated coated printed boards (see 2.10.6)		N/A
R.2	Reduced clearances (see 2.10.3)		N/A
S	Annex S, PROCEDURE FOR IMPULSE TESTING	(see 6.2.2.3)	N/A
S.1	Test equipment		N/A
S.2	Test procedure		N/A
S.3	Examples of waveforms during impulse testing		N/A
т	Annex T, GUIDANCE ON PROTECTION AGAINST 1.1.2)	INGRESS OF WATER (see	N/A
	:		-
U	Annex U, INSULATED WINDING WIRES FOR US INSULATION (see 2.10.5.4)	E WITHOUT INTERLEAVED	N/A
			-
	USA / Canada - Differences to IEC 60950-1:200	06, 2nd Edition	
1.1	Equipment able to be installed in accordance with the National Electrical Code ANSI/NFPA 70 and the Canadian Electrical Code, Part1, and when applicable, the National Electrical Safety Code, IEEE C2.		Ρ
1.1.1	Equipment able to be installed in accordance with ANSI/NFPA 75 and NEC Art. 645 unless intended for use outside of computer room and provided with such instructions.		Р
1.1.2	Equipment in wire-line communication facilities serving high-voltage electric power stations operating at greater than 1kV are excluded.		N/A
1.1.2	Special requirements apply to equipment intended for use outdoors.	Not for outdoor use.	N/A



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UL60950-1 and CSA C22.2 No. 60950-1-07+A1:2011

Clause	Requirement + Test	Result - Remark	Verdict

1.4.14	For Pluggable Equipment Type A, the protection in the installation is assumed to be 20 A.		N/A
1.5.1	All IEC standards for components identified in Annex P.1 replaced by the relevant requirements of CSA and UL component standards in Annex P.1.		Ρ
1.5.1	All IEC standards for components identified in Annex P.2 alternatively satisfied by the relevant requirements of CSA and UL component standards in Annex P.2.		Р
1.5.5	Interconnecting cables acceptable for the application regarding voltage, current, temperature, flammability, mechanical serviceability and the like.	Interconnecting cables comply with the relevant requirements of this standard.	Р
1.5.5	For other than limited power and TNV circuits, the type of output circuit identified for output connector.		N/A
1.5.5	External cable assemblies that exceed 3.05 m in length to be types specified in the NEC and CEC.		N/A
1.5.5	Detachable external interconnecting cables 3.05 m or less in length and provided with equipment marked to identify the responsible organization and the designation for the cable.		N/A
1.5.5	Building wiring and cable for use in ducts, plenums and other air handling space subject to special requirements and excluded from scope.		N/A
1.5.5	Telephone line and extension cords and the like comply with UL 1863 and CSA C22.2 No. 233.	No telephone line provided.	N/A
1.6.1.2	Equipment intended for connection to a d.c. power (mains) distribution system is subject to special circuit classification requirements (e.g., TNV-2)		N/A
1.6.1.2	Earthing of d.c. powered equipment provided.		N/A
1.7	Lamp replacement information indicated on lampholder in operator access area.	No lamp.	N/A
1.7.1	Special marking format for equipment intended for use on a supply system with an earthed neutral and more than one phase conductor.		N/A
1.7.1	Equipment voltage rating not higher than rating of the plug except under special conditions.		N/A
1.7.6	Special fuse replacement marking for operator accessible fuses.		N/A
1.7.7	Identification of terminal connection of the equipment earthing conductor.		N/A
1.7.7	Connectors and field wiring terminals for external Class 2 or Class 3 circuits provided with marking indicating minimum Class of wiring to be used.		N/A



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Clause	Requirement + Test	Result - Remark	Verdict	

1.7.7	Marking located adjacent to terminals and visible during wiring.		N/A
2.1.1	Screw shell of Edison-base lampholder tied to the neutral conductor.		N/A
2.1.1.1	Bare TNV conductive parts in the interior of equipment normally protected against contact by a cover intended for occasional removal are exempt provided instructions include directions for disconnection of TNV prior to removal of the cover.	No TNV present.	N/A
2.3.1.b	Other telecommunication signaling systems (e.g., message waiting) than described in 2.3.1(b) are subject to M.4.		N/A
2.3.1.b	For TNV-2 and TNV-3 circuits with other than ringing signals and with voltages exceeding 42.4 Vp or 60 V d.c., the maximum current limit through a 2000 Ohm or greater resistor with loads disconnected is 7.1 mA peak or 30 mA d.c. under normal conditions.	Unit is Build in battery pack.	N/A
2.3.1.b	Limits for measurements across 5000 ohm resistor in the event of a single fault are replaced after 200 ms with the limits of M.3.1.4.	Unit is Build in battery pack.	N/A
2.3.2	Enamel coating on signal transformer winding wire allowed as an alternative to Basic insulation in specific telecommunication applications when subjected to special construction requirements and routine testing.		N/A
2.3.2	In the event of a single fault, the limits of 2.2.3 apply to SELV circuits and accessible conductive parts.		N/A
2.5	Overcurrent protection device required for Class 2 and Class 3 limiting in accordance with the NEC, or for a Limited Power Source, not interchangeable with devices of higher ratings if operator replaceable.		N/A
2.6	Equipment having receptacles for output a.c. power connectors generated from an internal separately derived source have the earthed (grounded) circuit conductor suitably bonded to earth.	Unit is Build in battery pack.	N/A
2.6.3.3	For Pluggable Equipment Type A, if neither a) or b) are applicable, the current rating of the circuit is taken as 20 A.		N/A
2.6.3.4	Capacity of connection between earthing terminal and parts required to be earthed subject to special conditions based on the current rating of the circuit.		N/A
2.6.3.4	Protective bonding conductors and their terminals of non-standard constructions (e.g. PWB traces) evaluated to limited short-circuit test of CSA C22.2 No.0.4.		N/A



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UL60950-1 and CSA C22.2 No. 60950-1-07+A1:2011			
Clause	Requirement + Test	Result - Remark	Verdict

2.6.4.1	Field wiring terminals for earthing conductors suitable for wire sizes (gauge) used in US and Canada.		N/A
2.7.1	Data for selection of special external branch circuit overcurrent devices marked on the equipment.		N/A
2.7.1	Standard supply outlets protected by overcurrent device in accordance with the NEC, and CEC, Part 1.	Unit is Build in battery pack.	N/A
2.7.1	Overcurrent protection for individual transformers that distribute power to other units over branch circuit wiring.		N/A
2.7.1	Additional requirements for overcurrent protection apply to equipment provided with panelboards.		N/A
2.7.1	Non-motor-operated equipment requiring special overcurrent protective device marked with device rating.		N/A
2.10.5.4	Multi-layer winding wire subject to UL component wire requirements in addition to 2.10.5.4 and Annex U.		N/A
3.1.1	Permissible combinations of internal wiring/external cable sizes for overcurrent and short circuit protection.		N/A
3.1.1	All interconnecting cables protected against overcurrent and short circuit.		N/A
3.2	Wiring methods permit connection of equipment to primary power supply in accordance with the NEC and CEC, Part 1.	Unit is Build in battery pack.	N/A
3.2.1	Permitted use for flexible cords and plugs.	Unit is Build in battery pack.	N/A
3.2.1	Flexible cords provided with attachment plug rated 125% of equipment current rating.	Unit is Build in battery pack.	N/A
3.2.1	Any Class II equipment provided with 15 or 20 A standard supply outlets, Edison-base lampholders or single pole disconnect device provided with a polarized type attachment plug.	No standard power outlets are provided.	N/A
3.2.1.2	Equipment intended for connection to DC mains supply power systems complies with special wiring requirements (e.g., no permanent connection to supply by flexible cord).		N/A
3.2.1.2	Equipment with one pole of the DC mains supply connected to both the equipment mains input terminal and the main protective earthing terminal provided with special instructions and construction provisions for earthing		N/A
3.2.1.2	Equipment with means for connecting supply to earthing electrode conductor has no switches or protective devices between supply connection and earthing electrode connection.		N/A



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3.2.1.2	Special markings and instructions for equipment with provisions to connect earthed conductor of a DC supply circuit to earthing conductor at the equipment.	Unit is Build in battery pack.	N/A
3.2.1.2	Special markings and instructions for equipment with earthed conductor of a DC supply circuit connected to the earthing conductor at the equipment.		N/A
3.2.1.2	Terminals and leads provided for permanent connection of DC powered equipment to supply marked to indicate polarity if reverse polarity may result in a hazard.		N/A
3.2.3	Permanently connected equipment has provision for connecting and securing a field wiring system (i.e. conduit, or leads etc.) per the NEC and CEC, Part 1.	Not Permanently connected equipment.	N/A
3.2.3	Permanently connected equipment may have terminals or leads not smaller than No. 18 AWG (0.82 mm2) and not less than 152 mm in length for connection of field installed wiring.		N/A
3.2.3	If supply wires exceed 60 $^\circ C$, marking indicates use of 75 $^\circ C$ or 90 $^\circ C$ wiring for supply connection as appropriate.		N/A
3.2.3	Equipment compatible with suitable trade sizes of conduits and cables.		N/A
3.2.5	Length of power supply cord limited to between 1.5 and 4.5 m unless shorter length used when intended for a special installation.		N/A
3.2.5	Conductors in power supply cords sized according to NEC and CEC, Part I.		N/A
3.2.5	Power supply cords and cord sets incorporate flexible cords suitable for the particular application.		N/A
3.2.6	Strain relief provided for non-detachable interconnecting cables not supplied by a limited power source.	Unit is Build in battery pack.	N/A
3.2.9	Adequate wire bending space and volume of field wiring compartment required to properly make the field connections.		N/A
3.2.9	Equipment intended solely for installation in Restricted Access Locations using low voltage d.c. systems may not need provision for connecting and securing a field wiring system. A method of securing wiring or instructions provided to ensure the wiring is protected from abuse.		N/A
3.3	Field wiring terminals provided for interconnection of units for other then LPS or Class 2 circuits also comply with 3.3.	Unit is Build in battery pack.	N/A
3.3	Interconnection of units by LPS or Class 2 conductors may have field wiring connectors other		N/A



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	than those specified in 3.3 if wiring is reliably separated.		
3.3.1	Terminals for the connection of neutral conductor identified by a distinctive white marking or other equally effective means.		N/A
3.3.3	Wire binding screw terminal permitted for connection of No. 10 AWG (5.3 mm2) or smaller conductor if provided with upturned lugs, cupped washer or equivalent retention.		N/A
3.3.4	Terminals accept wire sizes (gauge) used in the U.S. and Canada.		N/A
3.3.4	Terminals accept current-carrying conductors rated 125% of the equipment current rating.		N/A
3.3.6	Field wiring terminals marked to indicate the material(s) of the conductor appropriate for the terminals used.		N/A
3.3.6	Connection of an aluminum conductor not permitted to terminal for equipment earthing conductor.		N/A
3.3.6	Field wiring connections made through the use of suitable pressure connectors (including set screw type), solder lugs or splices to flexible leads.		N/A
3.4.2	Separate motor control device(s) required for cord- connected equipment rated more than 12 A, or with motor rated more than 1/3 hp or more than 120 V.	No motor control device(s).	N/A
3.4.8	Vertically mounted disconnect devices oriented so up position of handle is "on".		N/A
3.4.11	For computer-room applications, equipment with battery systems capable of supplying 750 VA for 5 min require battery disconnect means.	Unit is Build in battery pack.	N/A
4.2.8.1	Special opening restrictions for enclosures around CRTs with face dimension of 160 mm or more.		N/A
4.2.9	Compartment housing high-pressure lamp marked to indicate risk of explosion.		N/A
4.3.2	Loading test for equipment with handle(s) used to support more than 9 kg tested at four times the weight of the unit.	No any handles and manual controls.	N/A
4.3.6	In addition to the IEC requirements, Direct Plug-in Equipment complies with UL 1310 or CSA 223 mechanical assembly requirements.	Unit is Build in battery pack.	N/A
4.3.12	The maximum quantity of flammable liquid stored in equipment complies with ANSI/NFPA 30(Table NAE.6).	The equipment does not use any flammable liquids.	N/A
4.3.12	Equipment using replenishable liquids marked to indicate type of liquid to be used.		N/A
4.3.13.2	Equipment that produces x-radiation and does not comply with 4.3.12 under all conditions of servicing		N/A



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	marked to indicate the presence of radiation where readily visible.		
4.3.13.5	Requirements contained in the applicable national codes and regulations apply to lasers (21 CFR 1040 and REDR C1370).		N/A
4.7	Automated information storage equipment intended to contain more than 0.76 m3 of combustible media requires provision for automatic sprinklers or a gaseous agent extinguishing system.		N/A
4.7.3.1	Equipment for use in environmental air space other than ducts or plenums provided with metal enclosure or with non-metallic enclosure having adequate fire-resistance and low smoke producing characteristics. Low smoke-producing characteristics evaluated according to UL 2043. Equipment for installation in space used for environmental air as described in Sec. 300-22(c) of the NEC provided with instructions indicating suitability for installation in such locations.		N/A
4.7.3.1	Flame spread rating for external surface of combustible material with exposed area greater than 0.93 m2 or a single dimension greater than 1.8 m; 50 or less for computer room applications or 200 or less for other applications.		N/A
4.7.3.4	Wire marked "VW-1" or "FT-1" considered equivalent.	Internal wiring is UL Recognized, marked VW-1 or FT-1.	Р
5.1.8.2	Special earthing provisions and instructions for equipment with high touch current due to telecommunication network connections.		N/A
5.1.8.3	Touch current due to ringing voltage for equipment containing telecommunication network leads.		N/A
5.3.6	Overloading of SELV connectors and printed wiring board receptacles accessible to the operator.		N/A
5.3.6	Tests interrupted by opening of a component repeated two additional times.	Considered.	Pass
5.3.8.1	Test interrupted by opening of wire or trace subject to certain conditions.		N/A
6	Specialized instructions provided for telephones that may be connected to a telecommunications network.	Unit is Build in battery pack.	N/A
6	Marking identifying function of telecommunication type connectors not used for connection to a telecommunication network.	Unit is Build in battery pack.	N/A
6.2.1	Special requirements for enameled wiring used as electrical separation provided between parts connected to telecommunication network and telecommunication circuitry intentionally isolated		N/A



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	from network.		
6.2.1	Digital line termination equipment (e.g., NCTE) subject to separation requirements.		N/A
6.3	Equipment remotely powered over telecommunication wiring systems provided with specialized markings adjacent to the connection.		N/A
6.3	Overcurrent protection incorporated into equipment to provide power over telecommunication wiring system not interchangeable with devices of higher ratings if operator replaceable.		N/A
6.4	Additional requirements for equipment intended for connection to a telecommunication network using cable subject to overvoltage from power line failures (Fig. 6C).		N/A
6.4	Where 26 AWG line cord required by Fig. 6C, either the cord is provided with the equipment or described in the safety instructions.		N/A
6.5	Acoustic pressure from an ear piece less than 136 dBA for short duration disturbances, and less than 125 dBA for handsets, 118 dBA for headsets, and 121 dBA for insert earphones, for long duration disturbances.		N/A
7	Equipment associated with the cable distribution system may need to be subjected to applicable parts of Chapter 8 of the NEC.	Unit is Build in battery pack.	N/A
н	Ionizing radiation measurements made under single fault conditions in accordance with the requirements of the Code of Federal Regulations 21 CFR 1020 and the Canadian Radiation Emitting Devices Act, REDR C1370.	Unit is Build in battery pack.	N/A
M.2	Continuous ringing signals evaluated to Method A subjected to special accessibility considerations.		N/A
M.4	Special requirements for message waiting and similar telecommunications signals.		N/A
NAC	Equipment intended for use with a generic secondary protector marked with suitable instructions.		N/A
NAC	Equipment intended for use with a specific primary or secondary protector marked with suitable instructions.	Unit is Build in battery pack.	N/A
NAF	Household/Home Office Document Shredders		N/A
NAF.1.7	Markings and instructions alert the user to key safety considerations related to use of shredders, including not intended to be used by children, avoid touching document feed opening, avoid clothes and hair entanglement, and avoid aerosol products.	Unit is Build in battery pack.	N/A



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Clause	Requirement + Test	Result - Remark	Verdict				
NAF.2.8.3	Safety interlock cannot be inadvertently activated		N/A				

NAI .2.0.0	by the articulated accessibility probe (figure NAF.1).	
NAF.3.4	Provided with an isolating switch complying with 3.4.2, including 3 mm contact gap, with appropriate markings associated with the switch.	N/A
NAF.4.4	Hazardous moving parts are not accessible to the user, as determined using the articulated accessibility probe (figure NAF.1) and the accessibility probe/wedge (figures NAF.2/NAF.3).	N/A



Critical Components

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
Plastic cover	FORMOSA	ANC120	Min.V-0, Min.95C	UL 94, UL746C	UL(E162823)
PCB material	Kingboard and Various	KB6160A	Min.130C, Min.94V-1	UL 94, UL746C	UL(E123995)
Insulated material under PCB	TOYO FIBRE and various		Min.90C, Min.94V-1	UL 94, UL746C	UL(E55656)
Insulated sheet	E I Dupont	T410	RTI:220, Min.94V-1	UL 94	UL(E34739)
MOSFET	Altha and OMEGA and Various	A0D403	$V_{DS}(V) = -30V$ $I_D = -85A$ $(V_{GS} = -20V)$ $R_{DS(ON)} < 6m\Omega$ $(V_{GS} = -20V)$ $R_{DS(ON)} < 7.6m\Omega$ $(V_{GS} = -10V)$		Tested within equipment.
Internal Wires	Dong Guan Sheng Pai Electric Wire Cable Co.,Ltd and Various	Min.26AWG	Maximum 200 deg C, 600 Vdc, VW-1.	UL758	UL(E347603)
Cell	GlobTek, Inc.	SR703880F	3.3V, 1600mAh	UL1642	See test report attachment 1 of 17021048 001
Anode	Shanghai Shanshan Tech Co., Ltd.	MCP	Tap Density: ≥1.32g/cm3, Surface Area:		
			1.0~1.6 m2/g		
			D90≤25.0um		
Alternative	ChangSha HaiRong Electronic Materials Co., Ltd.	PRC30	Tap Density: ≥0.9g/cm3, Surface Area: ≤2.5 m2/g D10= 5~9um D50= 13~17um D90≤34.0um		



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Cathode	Formasa Energy & Material Technology Co.,	SFCM30050	TAP Density:1.2~1.5g/ cm ³ ,		
	Ltd.		D ₅₀ : 2~6um,		
			Surface area:6~9m²/g		
Alternative	Advanced Lithium Electrochemistry(China	M121	TAP Density:0.8~1.2g/ cm ³ ,		
	ShangHai)Co.,Ltd		D ₅₀ : 2~6um,		
			Surface area:11~15m ² /g		
Electrolyte	Guangzhou Tinci Materials Technology Co., Ltd.	TCE808	EC/DMC/EMC/Li PF6		
Alternative	Beijing institute of chemical reagents	BLE8153	EC/DMC/EMC/Li PF6		
Separator	UBE Industries Co., Ltd	UP3074	PP、PE; Size: 20µm, 140C max		
Alternative	SHENZHEN SENIOR TECHNOLOGY MATERIAL Co., Ltd.	SD2	PP、PE; Size: 20µm		
Thermal link	NEC SCHOTT	SF91E	Min.250V Min.10A, T:94C	UL1434	UL(E71747)
PTC	Shenzhen Jinke Special Materials Co.,Ltd	JK-P730	Max.20Vdc, 85C, lh: 7.3A, lt:14.1A, lmax: 100A, lsc:100A	UL1434	UL(E217453)
Label material	Shen Zhen Shi Guan Bao and Various	SMI	Min.60C	UL 969	UL(MH30106)



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4.3.8	TABLE:	Batteries	(UL60950-1 R	12.11 and	CAN/CS	A-C22.2 No	o. 60950-1∙		Р
The tests of 4.3.8 are applicable only when appropriate battery data is not available									
Is it possible to install the battery in a reverse polarity position? No possible for reversed charged from outside, the specified structure Positive/Negative/NTC terminal is designed.									Ρ
	Non-re	echargeabl	e batteries			Rechargea	ble batterie	es	
	Disch	arging	Un- intentional	Cha	rging	Disch	arging	Reve char	rsed ging
	Meas. current	Manuf. Specs.	charging	Meas. current	Manuf. Specs.	Meas.	Manuf. Specs.	Meas. current	Manuf. Specs.
Max. current during normal condition	N/A	N/A	N/A	1.6A	1.6A	1.6A	1.6A		
Max. current during fault condition	N/A	N/A	N/A	*4.8A	*4.8A	*10A	*10A		
Notes: *Sin	igle fault is	on Short-o	circuited of MC	SFET of p	orotective	circuit. PTC	is not ope	erated.	
Test results	s:								Verdict
- Chemical	leaks					No leaks.			Р
- Explosion	of the bat	tery				No exlposi	on.		Р
- Emission	of flame o	r expulsion	of molten met	tal		No emissio	on of flame		Р
- Electric st	trength tes	ts of equip	ment after com	pletion of	tests				N/A
Supplemen	ntary inforn	nation: UL2	2054 testing co	vers these	e testing a	and measur	ement.		



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4.3.8	TABLE: Batteries (UL60950-1 1 07+A1:2011)	R12.11 and CAN/CSA-C22.2 No. 60950-1-	Ρ
Battery cate	gory:	Lithium	
Manufacture	er:	See coverpage	
Type / mode	el :	See coverpage	
Voltage	:	13.2V	
Capacity	:	1600mAh	
Tested and	Certified by (incl. Ref. No.):	Sampling test for Cell in UL1642(17021048 001 Attachment1)	
Circuit prote	ction diagram:	sine sine	
MARKINGS Remark: Co	AND INSTRUCTIONS (1.7.12, 1 rrect subclause reference for IEC	.7.15) 60950-1:2005/A1 is 1.7.2.1, 1.7.13.	
Location of r	replaceable battery		
Language(s))	: English	
Close to the battery		Warning comments on label, see marking label atta	ached.
In the servic instructions	ing	Sufficient safety concern listing in User Manual.	
In the operation	ting instructions	: Sufficient safety concern listing in User Manual.	

5.3	TABLE: Fault condition tests (UL60950-1 R12.11 and CAN/CSA-C22.2 No. 60950-1-07+A1:2011)							
	Ambient temperature (°C): 25°C							
	Power source for I output rating	EUT: Manı	ufacturer, n	nodel/type		See E	quipment list.	
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	F CI	Fuse Observation urrent (A)		
Battery Pack	MOSFET S-C	13.2	7 hours			1.6A	Normal working, no haza	rd.
Battery Pack	Overcharge	13.2	7 hours			4.8A max	Refering to UL2054 report. Mat charging current:4.8A and 3.2A(CC mode). thermal link operated and no hazard.	
Battery Pack	External S-C	13.2	7 hours		1	4.7A max	Output current raised until PTC tripple current (14.7A) is reached. No hazard.	
Supplement	ary information:							



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UL 2054 appended tables:

9	TABLE: Sh	TABLE: Short-Circuit Test								
Ambient ten	Ambient temperature: 22.0°C									
Sampl	e No.	006	007	008	009	010				
Tmax	‹(℃)	24.6	25.1	24.9	27.0	25.6				
Failure Mode		Short-Circuited	Short-Circuited	Short-Circuited	Short-Circuited	Short- Circuited				
Faulted Protective Device		MOSFET	MOSFET	MOSFET	MOSFET	MOSFET				
Ambient ten	nperature: 5	5℃								
Sampl	e No.	001	002	003	004	005				
Tmax	‹(℃)	55.7	54.8	56.1 56.1		55.1				
Failure Mode		Short-Circuited	Short-Circuited	Short-Circuited	Short-Circuited	Short- Circuited				
Faulted Protective Device MOSFET MOSFET MOSFET					MOSFET					
Supplementary information:										
Tmax was recorded on the centre of the outside case;										

The MOSFET on protective circuit was short-circuited during the test. The PTC operated and broke up the charging, as soon as the short-circuited current reached the tripled current (14.3A) of PTC. The other thermal link is not operated.

10	TABLE: Ab	onormal Charging	ormal Charging Test						
Ambient ten	Ambient temperature: 23°C								
Sample No.		011	011 012		014	015			
lo	ld <u>0.32</u> A								
Ue <u>9.2</u> V									
lo	•		A						
U	с			<u>14.6</u> V					
Tm	ax	33.5	29.0	27.6	28.3	29.1			
Failure	Mode	Short-Circuited	Short-Circuited	Short-Circuited	Short-Circuited	Short- Circuited			
Faulted Prote	ective Device	MOSFET	MOSFET	MOSFET	MOSFET	MOSFET			

Supplementary information:

Tmax was recorded on the centre of the outside case;

The MOSFET on protective circuit was short-circuited during the test. The PTC was not operated, and the thermal link is not operated. No fire, explosive or leakage during the test.



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11	TABLE: Ab	TABLE: Abusive Overcharge Test				Р	
Ambient ten	Ambient temperature: 24.2°C						
Sampl	Sample No. 056 057 058 059				060		
lc		<u>3.2</u> A	<u>3.2</u> A	<u>3.2</u> A	<u>3.2</u> A	<u>1.6</u> A	
Tmax of Cell		94.5	78.0	90.0	83.2	67.5	
Tmax of Battery Case							
Failure Mode		Short-Circuited	Short-Circuited	Short-Circuited	Short- Circuited	Short- Circuited	
Faulted Protective Device		MOSFET	MOSFET	MOSFET	MOSFET	MOSFET	

Supplementary information:

Tmax was recorded on the centre of the outside case;

The MOSFET on protective circuit was short-circuited during the test. The PTC was not operated, and the thermal link is operated when the temperature on the cell reached the limited temperature. No fire, explosive or leakage during the test.

12	TABLE: Forced-Discharge Test					Р	
Ambient terr	Ambient temperature: 24.0°C						
Sampl	Sample No. 1 2 3 4 5					5	
Tmax Cell		48.6	64.4	43.5	44.7	58.6	
Failure Mode		Short-Circuited	Short-Circuited	Short-Circuited	Short-Circuited	Short- Circuited	
Faulted Protective Device		MOSFET	MOSFET	MOSFET	MOSFET	MOSFET	

Supplementary information:

Tmax was recorded on the centre of the outside case;

The MOSFET on protective circuit was short-circuited during the test. The PTC was not operated, and the thermal link is not operated. No fire, explosive or leakage during the test.

13A/13B	TABLE: Ba Temperatu	ittery Pack Component Temperatur	Р	
Ambient terr	nperature: 2	3 °C		
13A: Battery	Pack Com	ponent Temperature Test		
Sample No.			Limited T	
Testing Process		Charging	Discharging	
PCB		45.3	61.0	130
Cell body		43.9 52.7		70
Internal wire		45.4 36.0		75



13B: Battery Pack Surface Temperature Test					
Sample No.	Sample No. 2 Limited T				
Testing Process	Charging	Discharging			
Surface 33.9 37.7 95					

Supplementary information:

Output load temperature test: fully charged battery discharge with 10A to endpoint voltage 9.2V.

Input load temperature test: fully discharged battery charge with 4800mA to end off current, without triple PTC.

19	TABLE: 250 N Steady Force Test				Р
Ambient temperature: 21 °C					
Sample No. 032 033 034				034	
Mass before test (g)		274.60	269.43	27	72.58
Mass after test (g)		274.58	274.58 269.42 272.56		72.56
Supplementary information:					

20	TABLE: Mold Stress Relief Test				Р	
Ambient temperature: 21 °C						
Samp	Sample No. 027 028 031				031	
Mass before test (g)		275.06	270.37	27	73.49	
Mass after test (g)		274.67	270.02	273.12		
Supplementary information:						

The whole battery with plastic enclosure tested by 70°C, 7hours

21	TABLE: Drop Impact Test				
Ambient temperature: 23°C					
Sample No. 035 039 043				043	
Mass before test (g)		268.02	271.59	273.54	
Mass after test (g) 26		268.03	271.60	273.55	
Supplementary information:					

--End of Report--