Product Safety Data Sheet (PSDS)

The battery products referenced in this PSDS document are consumer products. Batteries are considered "articles" under the Global Harmonized System and are exempted from the GHS labeling and SDS classification criteria. This PSDS document is provided as service in response to requests for information on battery use, safety and regulatory compliance.

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: DURACELL LITHIUM MANGANESE DIOXIDE BATTERIES AND CELLS
Product Identification: Lithium Manganese Dioxide Cells –
Duracell Designations:
CR-V3; DL1/3N; DL123(DL123A; DL2/3A); DL223 (DL223A); DLCR2; PL123; DL245; PX28L; DL1604

Product Use: Energy Source
PSDS Date of Preparation: April 20, 2009 **Reaffirmed:** 4/08/2011; 6/10/11; 7/7/2011; **Updated**: August 15, 2013
Document ID: Lithium Batteries-NA

Company Identification

US Office
Duracell, a P&G business
Berkshire Corporate Park
14 Research Drive
Bethel, CT USA 06401
(203) 796-4000

Canadian Office
Duracell, a P&G business
4711 Yonge Street
Toronto, Ontario
Canada M2N 6K8
(416) 730-4711

SECTION 2: HAZARDS IDENTIFICATION

Physical Appearance: Small cylindrical batteries

EMERGENCY OVERVIEW

CAUTION: Battery can explode or leak if heated, disassembled, shorted, recharged, exposed to fire or high temperature or inserted incorrectly. Keep in original package until ready to use. Do not carry batteries loose in your pocket or purse. Keep batteries away from children. If swallowed, consult a physician at once. For information on treatment, call the NATIONAL BUTTON BATTERY INGESTION HOTLINE collect, day or night, at (202) 625-3333. Under certain misuse conditions and by abusively opening the battery, exposed lithium can react with water or moisture in the air causing potential thermal burns or fire.

Potential Health Effects:

The chemicals and metals in this product are contained in a sealed can. Exposure to the contents will not occur unless the battery leaks, is exposed to high temperatures or is mechanically, physically, or electrically abused.

Eye Contact: Contact with battery contents may cause irritation.

Skin Contact: Contact with battery contents may cause irritation.

Inhalation: Inhalation of vapors or fumes released due to heat or a large number of leaking batteries may cause respiratory and eye irritation.

Ingestion: Swallowing is not anticipated for larger batteries due to battery size. Smaller batteries may be swallowed. If battery is swallowed, seek immediate medical advice. Batteries lodged in the esophagus should be removed

immediately since leakage, caustic burns and perforation can occur as soon as two hours after ingestion. Irritation to the internal/external mouth areas, may occur following exposure to a leaking battery. Do not give ipecac.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS Number	Amount
Manganese Dioxide	1313-13-9	15-45%
1,2-Dimethoxyethane	110-71-4	5-10%
Propylene Carbonate	108-32-7	1-10%
Lithium	7439-93-2	1-5%
Lithium Trifluoromethane Sulfonate	33454-82-9	0-5%
Carbon Black	1333-86-4	0-5%
Ethylene Carbonate	96-49-1	0-5%
Graphite	7782-42-5	0-5%

SECTION 4: FIRST AID MEASURES

Eye Contact: If battery is leaking and material contacts the eye, flush thoroughly with copious amounts of running water for 30 minutes. Seek immediate medical attention.

Skin Contact: If battery is leaking and material contacts the skin, remove any contaminated clothing and flush exposed skin with copious amounts of running water for at least 15 minutes. If irritation, injury or pain persists, seek medical attention.

Inhaled: If battery is leaking, contents may be irritating to respiratory passages. Move to fresh air. If irritation persists, seek medical attention.

Swallowed: If battery is swallowed seek immediate medical advice. Batteries lodged in the esophagus should be removed immediately since leakage, caustic burns and perforation can occur as soon as two hours after ingestion. If mouth area irritation or burning has occurred, rinse the mouth and surrounding area with tepid water for at least 15 minutes. Do not give ipecac.

Note to Physician: Published reports recommend removal from the esophagus be done endoscopically (under direct visualization). Batteries beyond the esophagus need not be retrieved unless there are signs of injury to the GI tract or a large diameter battery fails to pass the pylorus. If asymptomatic, follow-up x-rays are necessary only to confirm the passage of larger batteries. Confirmation by stool inspection is preferable under most circumstances. For information on treatment, telephone (202) 625-3333 collect, day or night. Potential leakage of dimethoxyethane, propylene carbonate and lithium trifluoromethane sulfonate. Dimethoxyethane rapidly evaporates. Do not give ipecac.

SECTION 5: FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Batteries may burst and release hazardous decomposition products when exposed to a fire situation.

Extinguishing Media: Use dry chemical, alcohol foam, water or carbon dioxide as appropriate for the surrounding fire. For incipient fires, carbon dioxide extinguishers are more effective than water.

Special Fire Fighting Procedures: Firefighters should wear positive pressure self-contained breathing apparatus and full protective clothing. Fight fire from a distance or protected area. Cool fire exposed batteries to prevent rupture. Use caution when handling fire-exposed containers (batteries may explode in heat of fire).

Hazardous Combustion Products: Thermal degradation may produce hazardous fumes of lithium and manganese; hydrofluoric acid, oxides of carbon and sulfur and other toxic by-products.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Notify safety personnel of large spills. Irritating vapors and flammable may be released from leaking or ruptured batteries. Eliminate all ignition sources. Evacuate the area and allow the vapors to dissipate. Clean-up personnel should wear appropriate protective clothing to avoid eye and skin contact and inhalation of vapors or fumes. Increase ventilation. Carefully collect batteries and place in an appropriate container for disposal. Remove spilled liquid with absorbent and contain for disposal.

SECTION 7: HANDLING AND STORAGE

Avoid mechanical or electrical abuse. DO NOT short circuit or install incorrectly. Batteries may explode, pyrolize or vent if disassembled, crushed, recharged or exposed to high temperatures. Install batteries in accordance with equipment instructions. Replace all batteries in equipment at the same time. Do not carry batteries loose in a pocket or bag.

Storage: Store batteries in a dry place at normal room temperature.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

The following occupational exposure limits are provided for informational purposes. No exposure to the battery components should occur during normal consumer use.

Chemical Name	Exposure Limits
Manganese Dioxide	5 mg/m3 Ceiling OSHA PEL 0.2 mg/m3 TWA ACGIH TLV
1,2-Dimethoxyethane	None Established
Propylene Carbonate	2 mg/m3 Ceiling ACGIH TLV
Lithium	None Established
Lithium Trifluoromethane Sulfonate	None Established
Carbon Black	3.5 mg/m3 TWA OSHA PEL/ACGIH TLV
Ethylene Carbonate	None Established
Graphite (natural-non-fibrous)	15 mppcf TWA OSHA PEL 2 mg/m3 TWA (respirable dust) ACGIH TLV
Graphite (synthetic non-fibrous)	5 mg/m3 TWA (respirable dust), 15 mg/m3 TWA (total dust) OSHA PEL 2 mg/m3 TWA (respirable dust) ACGIH TLV

Ventilation: No special ventilation is needed for normal use.

Respiratory Protection: None required for normal use.

Skin Protection: None required for normal use. Use butyl rubber gloves when handling leaking batteries.

Eye Protection: None required for normal use. Wear safety goggles when handling leaking batteries.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Small cylindrical batteries. Contents dark in color.

Specific Gravity: Not applicable
Water Solubility: Insoluble
Vapor Pressure: Not applicable
Vapor Density: Not applicable
Boiling Point: Not applicable
Melting Point: Not applicable
Flash Point: 29°F (-2°C) (1,2-Dimethoxyethane)
Autoignition Point: Not applicable

SECTION 10: STABILITY AND REACTIVITY

Stability: This product is stable.

Incompatibility/Conditions to Avoid: Contents are incompatible with strong oxidizing agents. Do not heat, crush, disassemble, short circuit or recharge.

Hazardous Decomposition Products: Thermal decomposition may produce hazardous fumes of lithium and manganese; hydrofluoric acid, oxides of carbon and sulfur and other toxic by-products.

Hazardous Polymerization: Will not occur

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Toxicity Data:
Manganese Dioxide: LD50 oral rat >3478 mg/kg
1,2-Dimethoxyethane: LDLo oral rat 1000 mg/kg, LCLo inhalation rat 63 g/m3/6 hr
Propylene Carbonate: LD50 oral rat 29100 uL/kg; LD50 dermal rabbit >20 mL/kg; LC50 inhalation rat >5 g/m3
Ethylene Carbonate: LD50 oral rat 10,000 mg/kg; LD50 dermal rabbit >3000 mg/kg
Lithium Trifluoromethane Sulfonate: LD50 oral rat 1250-1500 mg/kg

Chronic Effects: The chemicals in this product are contained in a sealed can and exposure does not occur during normal handling and use. No chronic effects would be expected from handling a leaking battery.

Target Organs: Skin, eyes and respiratory system.

Carcinogenicity: Carbon Black is classified by IARC as Possibly Carcinogenic to Humans (Group 2B). None of the other components of this product are listed as carcinogens by ACGIH, IARC, NTP or OSHA.

SECTION 12: ECOLOGICAL INFORMATION

No ecotoxicity data is available. This product is not expected to present an environmental hazard.

SECTION 13: DISPOSAL INFORMATION

Disposal should be in accordance with Federal, state/provincial and local regulations. Large quantities of open batteries should be treated as hazardous waste. Do not incinerate except for disposal in a controlled incinerator.

Some communities offer recycling or collection of batteries – contact your local government for disposal practices in your area.

SECTION 14: TRANSPORT INFORMATION

Emergency Phone Number:

CHEMTREC 24-Hour Emergency Response Hotline
+703-527-3887 (United States of America)

DURACELL lithium metal batteries are produced and delivered in accordance to IATA 54th Edition Regulations. Persons who prepare or offer lithium batteries for transport are required by regulation to be trained and certified. The information provided below is for informational purposes only.

DURACELL Primary Lithium Metal Batteries
UN3090 Primary lithium batteries **UN3091** Primary lithium batteries with or in equipment
UN 38.3: DURACELL certifies that all of its lithium batteries meet the requirements of the UN Manual of Tests and Criteria, Part III subsection 38.3. If you assemble these batteries into larger battery packs, it is recommended that you perform the UN Tests to ensure the requirements are met prior to shipment.
US DOT: Special Provision 29, 188, 189, 190, A54, A55, A100, A101, A103, A104
Air Transport (IATA/ICAO): Packing Instruction 968-970
Marine/Water Transport (IMDG): Special Provision 188, 230, 310, 957
ADR: Special Provisions: 188, 230, 310, 957

DOT - Except for personal use, the shipment of lithium batteries aboard passenger aircraft is not allowed. Airline passengers may have non-rechargeable lithium batteries for their equipment and a reasonable amount of spare non-rechargeable lithium batteries for their equipment in their carry-on luggage – **NOT** in their checked baggage. For more information, air travelers should consult the US Department of Transportation (DOT) Safety Travel web site at http://safetravel.dot.gov.

Shipping packages containing non-rechargeable lithium batteries must be labeled, regardless of size or number of batteries, with the following statement: "PRIMARY LITHIUM BATTERIES – FORBIDDEN FOR TRANSPORT ABOARD PASSENGER AIRCRAFT."

Effective January 1, 2013, new ICAO/IATA regulations for air shipments require a reduced package size quantity and the use of new labels. For more information visit the IATA website:
http://www.iata.org/whatwedo/cargo/dgr/Pages/lithium-batteries.aspx

The transportation of lithium metal batteries is regulated as UN3090 by ICAO, IATA, IMO and US DOT. DURACELL lithium manganese dioxide batteries cells and batteries are not subject to the other provisions of the Dangerous Goods regulations as long as they are packaged and marked in accordance with the ICAO regulations. The gram weight of lithium metal in Duracell lithium manganese dioxide batteries and cells is:

Catalog Number	Total Lithium Content	Type
DL 1/3N	.06 g	Cell
DL 123	.55 g	Cell
DL 223	1.1 g	Battery
PL 123	.55 g	Cell
PX 28 L	.12 g	Battery
CR-V3	1.4 g	Battery
DL CR2	.26 g	Cell
DL 245	1.1 g	Battery
DL1604	0.9g	Battery

SECTION 15: REGULATORY INFORMATION

United States

OSHA Status: While the finished product(s) is considered an article and not covered by the OSHA Hazard Communication Standard, 29 CFR 1910.1200, this PSDS contains valuable information critical to the safe handling and proper use of the product".

EPA TSCA Status: All intentionally-added components of this product are listed on the US TSCA Inventory.

SARA 313/302/304/311/312 chemicals: Manganese compounds 15-45%

California: This product has been evaluated and does not require warning labeling under California Proposition 65.

State Right-to-Know and CERCLA:
The following ingredients present in the finished product are listed on state right-to-know lists or state worker exposure lists

Ingredient	CAS #	Level	CERCLA RQ	State IL	MA	NJ	PA	RI
Manganese Dioxide	1313-13-9	15-45%	None	Y	Y	N	Y	Y
1,2-Dimethoxyethane	110-71-4	5-10%	None	Y	Y	Y	Y	N
Propylene Carbonate	108-32-7	1-10%	None	Y	Y	Y	Y	Y
Lithium	7439-93-2	1-5%	None	Y	Y	Y	Y	Y
Carbon Black	1333-86-4	0-5%	None	Y	Y	Y	Y	Y
Lithium Trifluoromethane Sulfonate	33454-82-9	0-5%	None	N	N	N	N	N
Ethylene Carbonate	96-49-1	0-5%	None	Y	Y	N	Y	Y
Graphite	7782-42-5 7440-44-0	0-5%	None	Y	Y	N	Y	Y

Canada All intentionally-added components of this product are listed on the Canadian DSL. This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and this PSDS contains all information required by the Controlled Products Regulations.

SECTION 16: OTHER INFORMATION

P&G Hazard Rating: Health: 0 Fire: 0 Reactivity: 0

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Data supplied is for use only in connection with occupational safety and health.

DISCLAIMER: This PSDS is intended to provide a brief summary of our knowledge and guidance regarding the use of this material. The information contained here has been compiled from sources considered by the P&G Company and its affiliates to be dependable and is accurate to the best of the Company's knowledge. It is not meant to be an all-inclusive document on worldwide hazard communication regulations.

This information is offered in good faith. Each user of this material needs to evaluate the conditions of use and design the appropriate protective mechanisms to prevent employee exposures, property damage or release to the

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Document Number: EA-0073, Revison 1

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Certificate of Compliance

Company Name	Physio-Control Inc
Company Address	11811 Willows Road NE
Company City, State, Country, Postal Code	Redmond, WA 98052
Contact Name	Tim McGaff
Contact Email	tim.mcgaff@physio-control.com
Contact Phone Number	425-867-4047
Product Name(s)	LPCR2
Product Part Number(s)	3314533-XXX
Nominal Voltage (V)	12
Rated Capacity (mAh)	4650
Product Type	Battery Pack, Primary, Small
Test Standard	UN38.3, UN Manual of Tests and Criteria, 6th Revised Edition, Effective December 2015
Overall Test Result	**COMPLIANT**

Component Test Results

Altitude (T.1)	Compliant
Thermal (T.2)	Compliant
Vibration (T.3)	Compliant
Shock (T.4)	Compliant
External Short Circuit (T.5)	Compliant

**Note: Tests T.6 (Impact/Crush) and T.8 (Forced Discharge) are applicable to cell-level testing only.*
**Note: Test T.7 (Overcharge) is applicable to secondary battery pack-level testing only.*

Release Approved By	
Name	Cynthia Millsaps
Date	1/9/2017

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Document Number: EA-0073, Revison 1

Test Standard: UN38.3, UN Manual of Tests and Criteria, 6th Revised Edition, Effective December 2015

UN 38.3 Report - Small, Primary, Battery Packs

PROJECT NUMBER	**EA1982Battery**
DATE OF REPORT	**1/9/2017**
STATUS	**Compliant**
DATE SAMPLES RECEIVED	**1/15/2015**

Contact Name	Tim McGaff
Contact Email	tim.mcgaff@physio-control.com
Contact Phone Number	425-867-4047
Company Name	Physio-Control Inc
Company Address	11811 Willows Road NE
Company City, State, Country, Postal Code	Redmond, WA 98052
Product Name(s)	LPCR2
Product Part Number(s)	3314533-XXX

Chemistry	LiMnO2
Nominal Voltage (V)	12.000
Rated Capacity (mAh)	4650
Maximum Specified Discharge Current (mA)	3000
End of Discharge Voltage (V)	7.000

Nominal Mass of Battery (grams)	283
Mass Loss Critical Threshold (Lookup)	0.001
Small or Large Battery (Lookup)	Small
Mass Precision (Calculated Digits)	3

Sample Numbering Legend	F	Fresh (as received)
	D	Discharged
	S	(Spare)

V-Check Criteria

Post Test Voltage ≥ 90% Pre-Test Voltage

M-Check Criteria

Mass (M) of cell or	Mass loss limit
M<1g	0.5%
1g≤M≤75g	0.2%
M>75g	0.1%

Laboratory Address: Energy Assurance, LLC
5202 Belle Wood Court, Suite 106
Buford, GA 30518-5853 USA

http://www.energy-assurance.com

Report Summary Comments

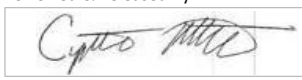
Samples tested demonstrated compliance to the referenced standard.

General notes regarding this report: Test results relate only to the items tested. Energy Assurance reserves the right to use approved parter laboratories in the delivery of services. This is denoted below by a "Y" in the OS field of each test section below. This report shall not be reproduced except in full without the approval of Energy Assurance, LLC.

Revision History

Rev	Date	Comments
1	1/9/2017	Initial issue

Reviewed & Released By:



Name Cynthia Millsaps
Date 1/9/2017

Product Photo:

Altitude Simulation (T.1)

Test Procedure: *Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5° C).*

Date (Test Start)	1/16/2015	OS	N
Date (Test Finish)	1/17/2015	Tech	NM
Test Ambient (°C)	22.8		
Model Tested	3314533-XXX	Rated Capacity (mAh)	4650

Test Step Notes (T.1): None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure: Leakage	Venting	Dis-Assy	Rupture	Fire	Comments
F1	12.92	283.970	12.91	283.950	Pass	Pass	N	N	N	N	N	None
F2	12.91	284.200	12.91	284.180	Pass	Pass	N	N	N	N	N	None
F3	12.92	282.920	12.91	282.890	Pass	Pass	N	N	N	N	N	None
F4	12.92	282.680	12.91	282.670	Pass	Pass	N	N	N	N	N	None
D1		283.410		283.350	No Data	Pass	N	N	N	N	N	None
D2		283.650		283.620	No Data	Pass	N	N	N	N	N	None
D3		283.250		283.250	No Data	Pass	N	N	N	N	N	None
D4		284.630		284.630	No Data	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	Ohaus AV313CU (0-300g), S/N 8031501103
Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 15
Timer	Accurite Timer, S/N 2312
Vacuum Gauge	Wika 0-30IN-HG, S/N PG-02

Thermal Test (T.2) --- Note: Battery size is Small

Test Procedure: *Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2° C, followed by storage for at least six hours at a test temperature equal to - 40 ± 2° C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5° C). For large cells and batteries, the duration of exposure to the test temperature should be at least 12 hours.*

Date (Test Start)	1/20/2015	OS	N
Date (Test Finish)	1/27/2015	Tech	NM/CT
Model Tested	3314533-XXX	Rated Capacity (mAh)	4650

Test Step Notes (T.2): None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure: Leakage	Venting	Dis-Assy	Rupture	Fire	Comments
F1	12.91	283.950	12.92	283.829	Pass	Pass	N	N	N	N	N	None
F2	12.91	284.180	12.94	284.078	Pass	Pass	N	N	N	N	N	None
F3	12.91	282.890	12.92	282.720	Pass	Pass	N	N	N	N	N	None
F4	12.91	282.670	12.92	282.545	Pass	Pass	N	N	N	N	N	None
D1		283.350		283.230	No Data	Pass	N	N	N	N	N	None
D2		283.620		283.505	No Data	Pass	N	N	N	N	N	None
D3		283.250		283.129	No Data	Pass	N	N	N	N	N	None
D4		284.630		284.487	No Data	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	Ohaus AV313CU (0-300g), S/N 8031501103
Temperature Chamber	Test Equity 1007H, S/N 61593

Vibration (T.3) --- Note: Battery size is Small

Test Procedure:

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).

For cells and small batteries: from 7 Hz a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency is increased until a peak acceleration of 8 g_n occurs (approximately 50 Hz). A peak acceleration of 8 g_n is then maintained until the frequency is increased to 200 Hz.

For large batteries: from 7 Hz a peak acceleration of 1 g_n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency is increased until a peak acceleration of 2 g_n occurs (approximately 25 Hz). A peak acceleration of 2 g_n is then maintained until the frequency is increased to 200 Hz.

Date (Test Start)	1/27/2015	OS	N
Date (Test Finish)	1/29/2015	Tech	CT/JC
Test Ambient(°C)	20.1		
Model Tested	3314533-XXX	Rated Capacity (mAh)	4650

Test Step Notes (T.3): None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure: Leakage	Venting	Dis-Assy	Rupture	Fire	Comments
F1	12.92	283.829	12.97	283.861	Pass	Pass	N	N	N	N	N	None
F2	12.94	284.078	12.98	284.086	Pass	Pass	N	N	N	N	N	None
F3	12.92	282.720	12.97	282.729	Pass	Pass	N	N	N	N	N	None
F4	12.92	282.545	12.98	282.559	Pass	Pass	N	N	N	N	N	None
D1		283.230		283.249	No Data	Pass	N	N	N	N	N	None
D2		283.505		283.528	No Data	Pass	N	N	N	N	N	None
D3		283.129		283.139	No Data	Pass	N	N	N	N	N	None
D4		284.487		284.503	No Data	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	Ohaus AV313CU (0-300g), S/N 8031501103
Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 13
Vibration Controller	Vibration Research VR9500, S/N 950C75B4
ICP Accelerometer	PCB Piezotronics 352C03 (10mV/G), S/N LW136337

Shock (T.4) --- Note: Battery size is Small

Test Procedure:

Cells and batteries are firmly secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

Each cell shall be subjected to a half-sine shock of peak acceleration of 150 g_n and a pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 g_n and a pulse duration of 11 milliseconds.

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 millisecondsfor small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

Small batteries: 150 g_n or result of formula, whichever is smaller

$$Acceleration\ (g_n) = \sqrt{\left(\frac{100850}{mass\ in\ kg}\right)}$$

Large batteries: 50 g_n or result of formula, whichever is smaller

$$Acceleration\ (g_n) = \sqrt{\left(\frac{30000}{mass\ in\ kg}\right)}$$

Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

NOTE: IEC Standard 60086-2-27 (Fourth Edition 2008-02): Environmental testing-Part 2-27: Tests - Ea and guidance: Shock provides guidance on tolerance for acceleration and pulse duration.

Date (Test Start)	1/30/2015	OS	N	Calculated Required Peak Acceleration (g_n)	
Date (Test Finish)	1/30/2015	Tech	CT	150	
Test Ambient (°C)	23.0			Calculated Required Pulse Width (ms)	
Model Tested	3314533-XXX	Rated Capacity (mAh)	4650	6	

Test Step Notes (T.4): None

	Pre-Test Voltage (Vdc)	Pre-Test Mass (g)	Post-Test Voltage (Vdc)	Post-Test Mass (g)	V-Ck	M-Ck	Observations (Y/N) - Presence is a failure: Leakage	Venting	Dis-Assy	Rupture	Fire	Comments
F1	12.97	283.861	12.91	283.839	Pass	Pass	N	N	N	N	N	None
F2	12.98	284.086	12.92	284.083	Pass	Pass	N	N	N	N	N	None
F3	12.97	282.729	12.92	282.728	Pass	Pass	N	N	N	N	N	None
F4	12.98	282.559	12.91	282.560	Pass	Pass	N	N	N	N	N	None
D1		283.249		283.244	No Data	Pass	N	N	N	N	N	None
D2		283.528		283.517	No Data	Pass	N	N	N	N	N	None
D3		283.139		283.143	No Data	Pass	N	N	N	N	N	None
D4		284.503		284.495	No Data	Pass	N	N	N	N	N	None
S1					No Data	No Data						Spare1
S2					No Data	No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Scale	Ohaus AV313CU (0-300g), S/N 8031501103
Ambient Temp Gauge	Digital Temperature-Humidity Meter, S/N 13
Signal Conditioner	PCB Piezotronics 4-Channel 482A22, S/N 772
ICP Shock Sensor	PCB Piezotronics 350A14, S/N 40088
Oscillloscope	Atten ADS 1102CAL, S/N ADS00003110272

External Short Circuit (T.5)

Test Procedure:

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57 ± 4 °C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is no t feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57 ± 4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has retur ned to 57 ± 4 °C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

Date (Test Start)	1/31/2015	OS	N
Date (Test Finish)	1/31/2015	Tech	RA/CT
Chamber Ambient Temp at Start of Test (°C)	55.6		
Model Tested	3314533-XXX	Rated Capacity (mAh)	4650

Test Step Notes (T.5): None

Observations (Y/N) - Presence is a failure.
**For Dis-Assy, Rupture, & Fire, observation period is test completion + 6 hours.*

	MaxTemp °c	T>170°C	Dis-Assy	Rupture	Fire	Short-Circuit System Ch#	mΩ	Comments
F1	55.9	Pass	N	N	N	BB-1	71	None
F2	56.3	Pass	N	N	N	BB-2	64	None
F3	56.6	Pass	N	N	N	BB-3	89	None
F4	55.6	Pass	N	N	N	BB-4	92	None
D1	58.1	Pass	N	N	N	BB-1	71	None
D2	57.5	Pass	N	N	N	BB-2	64	None
D3	58.2	Pass	N	N	N	BB-3	89	None
D4	58.4	Pass	N	N	N	BB-4	92	None
S1		No Data						Spare1
S2		No Data						Spare2

Measurement Equipment Information (Calibration details available upon request)

DMM	HP34401A, S/N MY45004881
Datalogger	HP34970A, S/N MY44028320
Short Circuit System	Short-Circuit Test Apparatus, HOTBOX2-BB

< For short-circuit resistance verification