Lithium Battery Statement

Requirements for Shipment of tempmate.®-S1

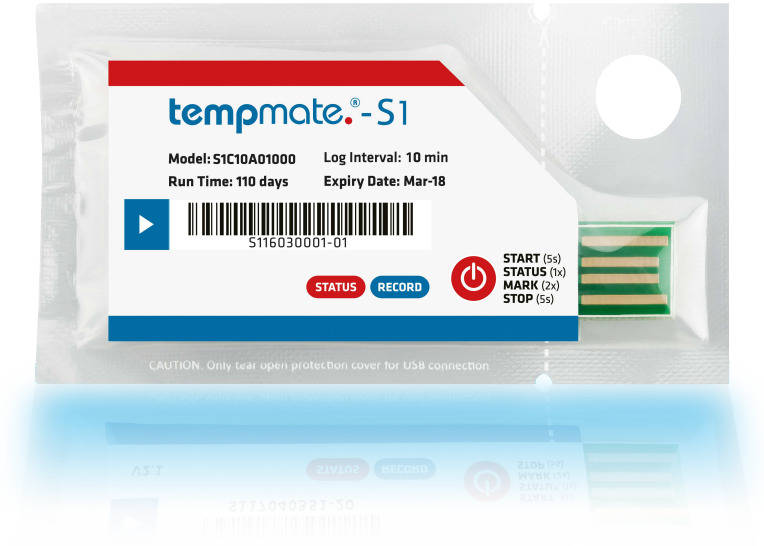
tempmate.®-S1 loggers are containing CR2450 lithium metal button cell batteries. These batteries meet the requirements of IATA GDR for 2020.

With changes to the IATA DGR for 2020, tempmate.®-S1 loggers are containing lithium metal button cells are no longer required to use the battery handling label based on Packing Instruction UN3091, 970 "Additional Requirements – Section II"

Your package does not need to be shipped as Dangerous Goods!

Please see IATA Dangerous Goods Regulation (DGR) packing instruction UN3091, 970 Section II for batteries in equipment.: http://www.iata.org/lithiumbatteries

"...However, button cell batteries installed in equipment (including circuit boards) need not be considered...."



> Shipping tempmate.®-S1 loggers, does not require handling label or safety document!<

Test Report issued under the responsibility of:
检测报告负责发行机构:

中国认可
检测
TESTING
CNAS L2065

检 测 报 告
TEST REPORT

SAMPLE INFORMATION:	Primary Coin Lithium Manganese Dioxide Battery, CR2450，3V，600mAh
样品信息：	锂-二氧化锰纽扣电池, 型号 CR2450，3V，600mAh
APPLICANT:	Changzhou Lithium Batteries Ltd.
申请单位：	常州锂霸电池有限公司
TYPE OF TEST:	Commercial Inspection and Testing Services
检测类别：	商业委托检测

苏州UL美华认证有限公司广州分公司
UL-CCIC Company Limited Guangzhou Branch

Applicant information 申请资料	
Name of samples 样品名称	Primary Coin Lithium Manganese Dioxide Battery 锂-二氧化锰纽扣电池
Type/ Model 型号规格	Model CR2450, 3V, 600mAh 型号 CR2450, 3V, 600mAh
Trade mark 商标	N/A
Applicant 申请单位	Changzhou Lithium Batteries Ltd. 常州锂霸电池有限公司
Applicant address 申请单位地址	No.35, Taihu West Road, New North District, Changzhou, Jiangsu, PRC 中国江苏省常州市新北区太湖西路35号
Manufacturer 制造商	Changzhou Lithium Batteries Ltd. 常州锂霸电池有限公司
Manufacturer address 制造商地址	No.35, Taihu West Road, New North District, Changzhou, Jiangsu, PRC 中国江苏省常州市新北区太湖西路35号
Appearance 样品外观颜色	Round Silvery Metallic casing 圆形银色金属外壳
Quantity of sample 样品数量	Total 40pcs
Sample identification 样品标识序号	Battery Cell: 1104226-1~1104226-10, 1104224-1~1104224-10, 923735-21 ~ 923735-30, 988424-11～~988424-20
Testing standard 参考标准	United Nations: Recommendations on the Transport of Dangerous Goods - Manual of Tests and Criteria, Fifth revised edition, Amendment 1 (2011) and Amendment 2 (2013), Section 38.3: Lithium Batteries (ST/SG/AC.10/11/Rev.5/Amend.1& Amend.2/Section 38.3) 联合国《关于危险品货物运输的建议书》试验和标准手册第五修订版修正1 (2011)和修正2(2013)，第38.3节：锂电池
Received date / 接样日期	2017-04-26, 2017-05-08, 2017-08-10
Completion date / 完成日期	2017-08-23
Remark/备注: Primary Coin Lithium Manganese Dioxide Battery, Model CR2450, 3V, 600mAh. 锂-二氧化锰纽扣电池,型号CR2450，3V，600mAh。	

Test Conclusion 测试结论					
No. 序号	Name of test 测试项目名称	Sample Condition 样品状态	Sample Number 样品编号	Conclusion 单项结论	Remarks 备注
T.1	Altitude simulation 高度模拟	Fully discharged state/ 完全放电	1104226-1 ~ 1104226-10	Pass 通过	--
		Undischarged state/未放电	1104224-1 ~ 1104224-10	Pass 通过	--
T.2	Thermal test 温度试验	Fully discharged state/ 完全放电	1104226-1 ~ 1104226-10	Pass 通过	--
		Undischarged state/未放电	1104224-1 ~ 1104224-10	Pass 通过	--
T.3	Vibration 振动	Fully discharged state/ 完全放电	1104226-1 ~ 1104226-10	Pass 通过	--
		Undischarged state/未放电	1104224-1 ~ 1104224-10	Pass 通过	--
T.4	Shock 冲击	Fully discharged state/ 完全放电	1104226-1 ~ 1104226-10	Pass 通过	--
		Undischarged state/未放电	1104224-1 ~ 1104224-10	Pass 通过	--
T.5	External Short-circuit 外部短路	Fully discharged state/ 完全放电	1104226-1 ~ 1104226-10	Pass 通过	--
		Undischarged state/未放电	1104224-1 ~ 1104224-10	Pass 通过	--
T.6	Impact 撞击	N/A 不适用	N/A 不适用	N/A 不适用	--

	Crush 挤压	Fully discharged state/ 完全放电	923735-21 ~ 923735-25	Pass 通过	Coin cell 钮扣电池
		Undischarged state/未放电	9923735-26 ~ 923735-30	Pass 通过	Coin cell 钮扣电池
T.7	Overcharge 过度充电	N/A 不适用	N/A 不适用	N/A 不适用	Primary Cell 不可充电池
		N/A 不适用	N/A 不适用	N/A 不适用	
T.8	Forced discharge 强制放电	Fully discharged state/ 完全放电	988424-11 ~ 988424-20	Pass 通过	--

Test Conclusion / 检验结论：

The Primary Coin Lithium Manganese Dioxide Battery, Model CR2450, 3V, 600mAh submitted by Changzhou Lithium Batteries Ltd. is tested according to Section 38.3 of the Fifth Revised Edition Amendment 1 and Amendment 2 of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.5/Amend.1/Section 38.3 and ST/SG/AC.10/11/Rev.5/Amend.2/Section 38.3). The test items are full items.

常州锂霸电池有限公司送检的锂-二氧化锰纽扣电池型号CR2450, 3V, 600mAh，依据《关于危险品货物运输的建议书》试验和标准手册第五修订版修正1和修正2第38.3节进行检测。试验为全项目。

The test results: Pass.

测试结果：通过。

Date of issue / 签发日期: 2017-09-29

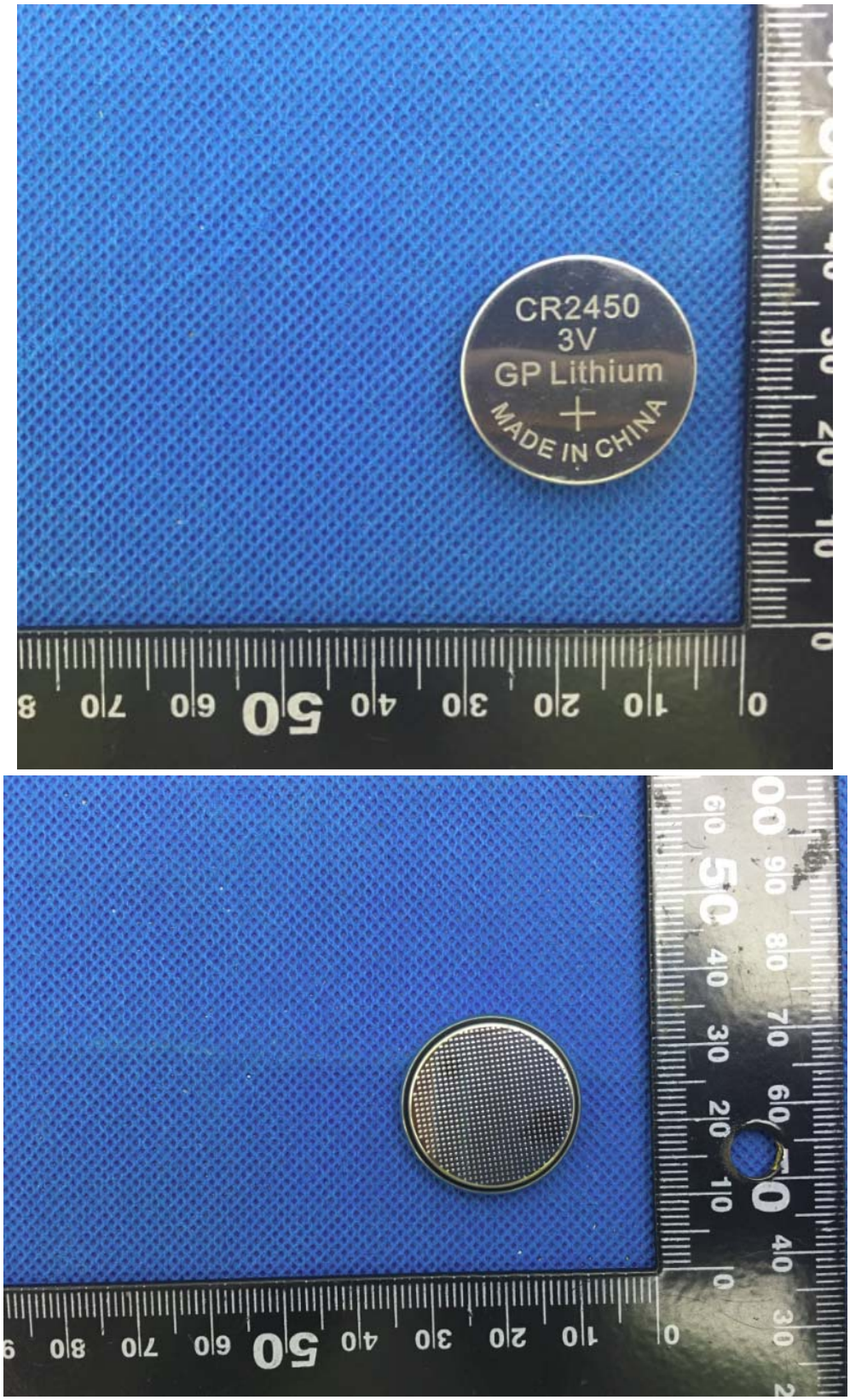
Approved by: 批准：彭军

Reviewed by: 审核：陈世明

Tested by: 检测：崔正浩

Photos of samples and markings
样品及标识照片

Primary Coin Lithium Manganese Dioxide Battery, Model CR2450, 3V, 600mAh锂-二氧化锰纽扣电池， 型号 CR2450, 3V, 600mAh



T.1 Altitude simulation
高度模拟

Test Method
测试方法

The samples were stored for 6 hours at an absolute pressure of 11.6 kPa (1.68 psi) and a temperature of 20 ± 5°C (68 ± 9°F). The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. 将测试样品放在温度为20±5°C，大气压力为不大于11.6kpa的环境中贮存不少于6个小时。对样品在测试前后进行称重，并记录电压。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1104226-1	(A)	6.435	6.436	0.000	-	-	-	(6), (7)
1104226-2	(A)	6.410	6.410	0.000	-	-	-	(6), (7)
1104226-3	(A)	6.445	6.444	0.016	-	-	-	(6), (7)
1104226-4	(A)	6.414	6.469	0.000	-	-	-	(6), (7)
1104226-5	(A)	6.414	6.415	0.000	-	-	-	(6), (7)
1104226-6	(A)	6.504	6.503	0.015	-	-	-	(6), (7)
1104226-7	(A)	6.508	6.509	0.000	-	-	-	(6), (7)
1104226-8	(A)	6.457	6.457	0.000	-	-	-	(6), (7)
1104226-9	(A)	6.331	6.444	0.000	-	-	-	(6), (7)
1104226-10	(A)	6.332	6.427	0.000	-	-	-	(6), (7)
1104224-1	(B)	6.276	6.277	0.000	3.344	3.270	97.787	(6), (7)
1104224-2	(B)	6.244	6.245	0.000	3.355	3.282	97.824	(6), (7)
1104224-3	(B)	6.336	6.336	0.000	3.339	3.281	98.263	(6), (7)
1104224-4	(B)	6.292	6.292	0.000	3.351	3.262	97.344	(6), (7)
1104224-5	(B)	6.337	6.337	0.000	3.339	3.256	97.514	(6), (7)
1104224-6	(B)	6.242	6.242	0.000	3.343	3.270	97.816	(6), (7)
1104224-7	(B)	6.270	6.270	0.000	3.357	3.279	97.676	(6), (7)
1104224-8	(B)	6.316	6.317	0.000	3.342	3.251	97.277	(6), (7)
1104224-9	(B)	6.330	6.331	0.000	3.346	3.210	95.935	(6), (7)

1104224-10	(B)	6.332	6.333	0.000	3.346	3.203	95.726	(6), (7)

Results/结果:
(1) Leakage/漏液.
(2) Venting/排气.
(3) Disassembly/解体.
(4) Rupture/破裂.
(5) Fire/着火.
(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.
(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90％.
Condition/状态:
(A) Fully discharged state/完全放电.
(B) Undischarged state/未放电.
(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.
(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.
(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.2 Thermal test
温度试验

Test Method
测试方法

The samples were subjected to temperature cycling consisting of the following. The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. 测试样品将进行如下温度循环测试。样品测试前后进行称重，并记录电压。

Samples In/样品进箱:	The chamber temperature was raised to 72 ± 2°C (162 ± 4°F) within 30 minutes and maintained at this temperature for **[**6**]** ~~**[12]**~~ hours. 烤箱温度在30分钟内上升到72 ± 2°C，并维持此温度 **[**6**]** ~~**[12]**~~小时。
	The chamber temperature was reduced to -40 ± 2°C (-40 ± 4°F) within 30 minutes and maintained at this temperature for **[**6**]** ~~**[12]**~~ hours. 烤箱温度在30分钟内降低到-40 ± 2°C，并维持此温度 **[**6**]** ~~**[12]**~~小时。
	Repeat the sequence for 9 additional cycles (total of 10 cycles). 重复此顺序测试额外9个循环（总共10个循环）。
Samples Out/样品出箱:	After the 10th cycle, store the batteries at ambient temperature 20 ± 5°C (68 ± 9°F) for 24 hours prior to examination. 在第10个循环后，于20 ± 5°C环境下储存24小时，然后检查其状态。

Note: The duration of exposure to the test temperature extremes was determined as below:
注：样品承受极端温度的持续时间按如下确定：

- Small cells and small batteries: 6 hours; 小电芯和小电池为6小时;
- Large cells and large batteries: 12 hours. 大电芯和大电池为12小时。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1104226-1	(A)	6.436	6.429	0.108	-	-	-	(6), (7)
1104226-2	(A)	6.410	6.405	0.078	-	-	-	(6), (7)
1104226-3	(A)	6.444	6.440	0.062	-	-	-	(6), (7)
1104226-4	(A)	6.469	6.464	0.077	-	-	-	(6), (7)
1104226-5	(A)	6.415	6.409	0.093	-	-	-	(6), (7)
1104226-6	(A)	6.503	6.500	0.046	-	-	-	(6), (7)
1104226-7	(A)	6.509	6.504	0.076	-	-	-	(6), (7)
1104226-8	(A)	6.457	6.452	0.077	-	-	-	(6), (7)
1104226-9	(A)	6.444	6.439	0.077	-	-	-	(6), (7)
1104226-10	(A)	6.427	6.423	0.062	-	-	-	(6), (7)
1104224-1	(B)	6.277	6.272	0.079	3.344	3.335	99.730	(6), (7)
1104224-2	(B)	6.245	6.242	0.048	3.355	3.352	99.910	(6), (7)
1104224-3	(B)	6.336	6.331	0.078	3.339	3.346	100.000	(6), (7)
1104224-4	(B)	6.292	6.288	0.063	3.351	3.350	99.970	(6), (7)
1104224-5	(B)	6.337	6.333	0.063	3.339	3.342	100.000	(6), (7)

1104224-6	(B)	6.242	6.240	0.032	3.343	3.350	100.000	(6), (7)
1104224-7	(B)	6.270	6.267	0.047	3.357	3.351	99.821	(6), (7)
1104224-8	(B)	6.317	6.312	0.079	3.342	3.351	100.000	(6), (7)
1104224-9	(B)	6.331	6.326	0.078	3.346	3.352	100.000	(6), (7)
1104224-10	(B)	6.333	6.328	0.078	3.346	3.353	100.000	(6), (7)

Results/结果:

(1) Leakage/漏液.

(2) Venting/排气.

(3) Disassembly/解体.

(4) Rupture/破裂.

(5) Fire/着火.

(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.

(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90%.

Condition/状态:

(A) Fully discharged state/完全放电.

(B) Undischarged state/未放电.

(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.

(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.

(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.3 Vibration
振动

Test Method
测试方法

The samples were subjected to vibration tests consisting of the following. The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. 测试样品将进行如下振动测试。

The samples were 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 was a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle was 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 was perpendicular to the terminal face. 电芯和电池牢固地安装在振动台上。振动以正弦波形式，以7Hz增加至200Hz，然后在减少回到7Hz为一个循环，一个循环持续15分钟的对数前移传送。以振动的其中一个方向必须是垂直样品极性，对每个电芯从三个互相垂直的方向上循环12次，每个方向3个小时。

The logarithmic frequency sweep was as follows/对数扫频如下:

[X] For cells and small batteries: From 7 Hz a peak acceleration of 1 g was maintained until 18 Hz is reached. The amplitude was then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 g occurred (approximately 50 Hz). A peak acceleration of 8 g was then maintained until the frequency was increase to 200 Hz. 对于小电芯和小电池：7赫兹开始保持1gn的最大加速度直到频率为18赫兹，然后将振幅保持在0.8毫米（总偏移1.6毫米）并增加频率直到最大加速度达到8gn（频率约为50赫兹），将最大加速度保持在8gn直到频率增加到200赫兹。

[ ] For large batteries: From 7 Hz a peak acceleration of 1 g was maintained until 18 Hz is reached. The amplitude was then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 g occurred (approximately 25 Hz). A peak acceleration of 2 g was then maintained until the frequency was increase to 200 Hz. 对大电芯和大电池：对于小电芯和小电池：7赫兹开始保持1gn的最大加速度直到频率为18赫兹，然后将振幅保持在0.8毫米（总偏移1.6毫米）并增加频率直到最大加速度达到2gn（频率约为25赫兹），将最大加速度保持在2gn直到频率增加到200赫兹。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1104226-1	(A)	6.429	6.429	0.000	-	-	-	(6), (7)
1104226-2	(A)	6.405	6.406	0.000	-	-	-	(6), (7)
1104226-3	(A)	6.440	6.440	0.000	-	-	-	(6), (7)
1104226-4	(A)	6.464	6.465	0.000	-	-	-	(6), (7)
1104226-5	(A)	6.409	6.409	0.000	-	-	-	(6), (7)
1104226-6	(A)	6.500	6.499	0.015	-	-	-	(6), (7)
1104226-7	(A)	6.504	6.503	0.015	-	-	-	(6), (7)

1104226-8	(A)	6.452	6.452	0.000	-	-	-	(6), (7)
1104226-9	(A)	6.439	6.439	0.000	-	-	-	(6), (7)
1104226-10	(A)	6.423	6.423	0.000	-	-	-	(6), (7)
1104224-1	(B)	6.272	6.263	0.143	3.335	3.301	98.981	(6), (7)
1104224-2	(B)	6.242	6.242	0.000	3.352	3.344	99.761	(6), (7)
1104224-3	(B)	6.331	6.331	0.000	3.346	3.345	99.970	(6), (7)
1104224-4	(B)	6.288	6.287	0.016	3.350	3.351	100.000	(6), (7)
1104224-5	(B)	6.333	6.332	0.016	3.342	3.343	100.000	(6), (7)
1104224-6	(B)	6.240	6.236	0.064	3.350	3.347	99.910	(6), (7)
1104224-7	(B)	6.267	6.267	0.000	3.351	3.351	100.000	(6), (7)
1104224-8	(B)	6.312	6.312	0.000	3.351	3.351	100.000	(6), (7)
1104224-9	(B)	6.326	6.327	0.000	3.352	3.353	100.000	(6), (7)
1104224-10	(B)	6.328	6.329	0.000	3.353	3.354	100.000	(6), (7)

Results/结果:
(1) Leakage/漏液.
(2) Venting/排气.
(3) Disassembly/解体.
(4) Rupture/破裂.
(5) Fire/着火.
(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.
(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90%.
Condition/状态:
(A) Fully discharged state/完全放电.
(B) Undischarged state/未放电.
(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.
(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.
(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.4 Shock
冲击

Test Method
测试方法

The samples were subjected to shock. The samples were weighed before and after the exposure. The cell/battery voltage was also determined before and after the test. The sample cell was secured to the testing machine by means of a rigid mount, which supports all mounting surfaces of the sample. Each sample was subjected to a half-sine shock as below: 样品将进行如下冲击测试。对样品在测试前后进行称重，并记录电压。以稳固的托架固定住每个电芯和电池样品的全部配件表面。每个样品将进行如下半正弦冲击测试：

[X] For small cells and small batteries: Peak acceleration of 150 g and pulse duration of 6 milliseconds. 小电芯和小电池：以峰值为150gn的半正弦的加速度撞击，脉冲持续6毫秒。

[ ] For large cells and large batteries: Peak acceleration of 50 g and pulse duration of 11 milliseconds. 大电芯和大电池：以峰值为50gn的半正弦的加速度撞击，脉冲持续11毫秒。

Each sample was subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell for a total of 18 shocks. 每个测试样品须在三个互相垂直的电池安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Weight Before Test in Grams 测试前质量（克）	Weight After Test In Grams 测试后质量（克）	Percentage of Weight Loss 质量损失百分比	Voltage Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Percent of residual Voltage 残余电压百分比	Results 结果
1104226-1	(A)	6.429	6.428	0.016	-	-	-	(6), (7)
1104226-2	(A)	6.406	6.405	0.016	-	-	-	(6), (7)
1104226-3	(A)	6.440	6.440	0.000	-	-	-	(6), (7)
1104226-4	(A)	6.465	6.465	0.000	-	-	-	(6), (7)
1104226-5	(A)	6.409	6.409	0.000	-	-	-	(6), (7)
1104226-6	(A)	6.499	6.499	0.000	-	-	-	(6), (7)
1104226-7	(A)	6.503	6.503	0.000	-	-	-	(6), (7)
1104226-8	(A)	6.452	6.451	0.015	-	-	-	(6), (7)
1104226-9	(A)	6.439	6.439	0.000	-	-	-	(6), (7)
1104226-10	(A)	6.423	6.423	0.000	-	-	-	(6), (7)
1104224-1	(B)	6.263	6.260	0.048	3.301	3.309	100.000	(6), (7)
1104224-2	(B)	6.242	6.242	0.000	3.344	3.350	100.000	(6), (7)
1104224-3	(B)	6.331	6.330	0.016	3.345	3.345	100.000	(6), (7)
1104224-4	(B)	6.287	6.287	0.000	3.351	3.351	100.000	(6), (7)

1104224-5	(B)	6.332	6.329	0.047	3.343	3.341	99.940	(6), (7)
1104224-6	(B)	6.236	6.235	0.016	3.347	3.347	100.000	(6), (7)
1104224-7	(B)	6.267	6.266	0.016	3.351	3.353	100.000	(6), (7)
1104224-8	(B)	6.312	6.312	0.000	3.351	3.347	99.881	(6), (7)
1104224-9	(B)	6.327	6.327	0.000	3.353	3.353	100.000	(6), (7)
1104224-10	(B)	6.329	6.328	0.016	3.354	3.354	100.000	(6), (7)

Results/结果:

(1) Leakage/漏液.

(2) Venting/排气.

(3) Disassembly/解体.

(4) Rupture/破裂.

(5) Fire/着火.

(6) No leakage, no venting, no disassembly, no rupture, no fire/无漏液，无排气，无解体，无破裂，无着火.

(7) The open circuit voltage of each cell after testing was greater than 90%/开路电压不低于试验前开路电压的90%.

Condition/状态:

(A) Fully discharged state/完全放电.

(B) Undischarged state/未放电.

(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.

(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.

(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.5 External short circuit
外部短路

Test Method
测试方法

The samples were temperature stabilized so that its external case temperature reached 55 ± 2°C and then the samples were subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 55 ± 2°C. This short circuit condition was continued for at least one hour after the cell or battery external case temperature returned to 55 ± 2°C. 保持试验环境温度稳定在55±2°C，以使电芯或电池样品外表温度达到55±2°C。将样品正负极用小于0.1欧姆的总电阻回路进行短路，样品的外表温度恢复到55±2°C之后保持短路状态1小时以上。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Voltage Before Test(V) 测试前电压（伏）	Maximum Temperature, °C 最高温度（摄氏度）	Results 结果
1104226-1	(A)	2.897	55.3	(4),(5)
1104226-2	(A)	2.930	55.4	(4),(5)
1104226-3	(A)	2.916	55.3	(4),(5)
1104226-4	(A)	0.189	55.1	(4),(5)
1104226-5	(A)	2.930	55.1	(4),(5)
1104226-6	(A)	0.045	57.0	(4),(5)
1104226-7	(A)	0.085	56.9	(4),(5)
1104226-8	(A)	2.910	56.8	(4),(5)
1104226-9	(A)	2.941	56.9	(4),(5)
1104226-10	(A)	0.105	56.9	(4),(5)
1104224-1	(B)	3.309	55.7	(4),(5)
1104224-2	(B)	3.350	56.8	(4),(5)
1104224-3	(B)	3.345	55.7	(4),(5)
1104224-4	(B)	3.351	55.9	(4),(5)
1104224-5	(B)	3.341	55.6	(4),(5)
1104224-6	(B)	3.347	57.0	(4),(5)
1104224-7	(B)	3.353	57.3	(4),(5)
1104224-8	(B)	3.347	57.6	(4),(5)
1104224-9	(B)	3.353	56.7	(4),(5)
1104224-10	(B)	3.354	57.6	(4),(5)

Results/结果:

(1) Disassembly/解体.

(2) Rupture/破裂.

(3) Fire/着火.

(4) No disassembly, no rupture, no fire/无解体，无破裂，无着火.

(5) The maximum temperature did not exceed 170°C/最高温度不超过170摄氏度.

Condition/状态:

(A) Fully discharged state/完全放电.

(B) Undischarged state/未放电.
(C) First cycle in fully charged state/第一个交替充电放电周期完全充电.
(D) After fifty cycles ending in fully charged state/第五十个交替充电放电周期完全充电.
(E) After twenty five cycles ending in fully charged state/第二十五个交替充电放电周期完全充电.

T.6 Impact / Crush
撞击 / 挤压

Test Method
测试方法

[] Impact (for cylindrical cells greater not less than 18 mm in diameter)/ 撞击（适用于直径不小于18毫米的圆柱形电池）

A test sample was placed on a flat surface. A 15.8 mm ± 0.1 mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar was placed across the center of the sample. A 9.1 kg ± 0.1 kg mass was dropped from a height of 61 ± 2.5 cm at the intersection of the bar and sample in a controlled manner, using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass was oriented 90 degrees from the horizontal supporting surface. 将试验样品放在一个平坦光滑的平面上。将一条316型不锈钢棒，其直径为15.8 mm ± 0.1 mm，长度为至少6 cm，或电芯的最长边长度（两者中较大者），放置在样品中心。将一质量为9.1 kg ± 0.1 kg的物体于61 ± 2.5 cm的高度, 无摩擦地从垂直滑轨落向样品。垂直滑轨与横向支承面互相垂直，保持90度。

The test sample was impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of a 15.8 mm ± 0.1 mm diameter curved surface lying across the center of the test sample. Separate samples were used for each test. 接受撞击的试样，纵轴应与平坦的表面平行并与横放在试样中心的直径15.8 mm ± 0.1 mm弯曲表面的纵轴垂直。每一个试样只经受一次撞击。

[x] Crush (for prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter)/挤压（适用于棱柱形、袋装、硬币/纽扣电池和直径小于18毫米的圆柱形电池）

A sample was crushed between two flat surfaces. The crushing was gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing was continued until the first of the three options below has reached/将样品放在两个平面之间挤压。挤压力度逐渐加大，在第一个接触点上的速度大约为1.5厘米/秒。挤压持续进行，直到出现以下三种情况之一：:

- The applied force reaches 13 kN ± 0.78 kN/施加的力达到13 kN ± 0.78 kN;
- The voltage of the cell drops by at least 100 mV; or/电池的电压下降至少100毫伏，或者
- The cell is deformed by 50% or more of its original thickness/电池变形达原始厚度的50%以上。

A prismatic or pouch cell was crushed by applying the force to the widest side. A button/coin cell was crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force was applied perpendicular to the longitudinal axis/棱柱形或袋装电池应从最宽的一面施压。纽扣/硬币形电池应从其平坦表面施压。圆柱形应从与纵轴垂直的方向施压。

The test sample was observed for a further 6 hours. Separate samples that have not previously been subjected to other tests were used for each test/测试样品进一步观察6小时。未进行过其他测试的样品用于此测试。

Test Result
测试结果

Sample No. 样品编号	Sample Condition 样品状态	Voltage Before Test(V) 测试前电压（伏）	Maximum Temperature, °C 最高温度（摄氏度）	Results 结果
923735-21	(A)	3.15	26.6	(3), (4)
923735-22	(A)	3.28	31.2	(3), (4)
923735-23	(A)	3.31	26.8	(3), (4)
923735-24	(A)	3.32	26.7	(3), (4)
923735-25	(A)	3.34	27.4	(3), (4)

923735-26	(B)	3.33	28.1	(3), (4)
923735-27	(B)	3.33	27.6	(3), (4)
923735-28	(B)	3.33	28.8	(3), (4)
923735-29	(B)	3.33	27.3	(3), (4)
923735-30	(B)	3.32	27.8	(3), (4)

Results/结果:

(1) Disassembly/解体.

(2) Fire/着火.

(3) No disassembly, no fire/无解体，无着火.

(4) The maximum temperature did not exceed 170°C/最高温度不超过170摄氏度.

Condition/状态:

(A) Undischarged/未放电.

(B) Fully discharged/完全放电.

(C) One half discharged/半放电.

T.8 Forced discharge
强制放电

Test Method
测试方法

Each cell was forced discharged at ambient temperature by connecting it in series with a 12 V DC power supply at an initial current equal to the maximum discharge current specified by the manufacturer. 在常温环境下，将单个电芯连接在12V的直流电源上进行强制放电，此直流电源提供给每个电芯初始电流为制造厂指定的最大放电电流。

The specified discharge current was obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell was forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in amperes). 指定的放电电流通过串联在测试电芯上的合适大小和功率的负载来获得，每个电芯的强制放电时间（小时）为额定容量除以初始电流（安培）。

Test Result
测试结果

Sample No. 样品编号	Condition 样品状态	Initial Discharge Current, mA 初始放电电流（毫安）	Voltage of Discharged Cell Before Test(V) 测试前电压（伏）	Voltage After Test(V) 测试后电压（伏）	Results 结果
988424-11	(A)	3	--	0.040	(3)
988424-12	(A)	3	--	0.227	(3)
988424-13	(A)	3	--	0.168	(3)
988424-14	(A)	3	--	0.051	(3)
988424-15	(A)	3	--	0.051	(3)
988424-16	(A)	3	--	0.841	(3)
988424-17	(A)	3	--	0.740	(3)
988424-18	(A)	3	--	0.097	(3)
988424-19	(A)	3	--	0.831	(3)
988424-20	(A)	3	--	0.259	(3)

Results/结果:
(1) Disassembly/解体.
(2) Fire/着火.
(3) No disassembly, no fire/无解体、无着火.
Condition/状态:
(A) Fully discharged state/完全放电.
(B) First cycle in fully discharged state/第一个交替充电放电周期完全放电.
(C) After fifty cycles ending in fully discharged state/第五十个交替充电放电周期完全放电.

注 意 事 项
Important

1. 未经本试验室书面同意，不得复制或部分地复制本报告。
   Nobody is allowed to photocopy or partly photocopy this test report without written permission of UL.

2. 本报告无批准人、审核人及检测人签名无效。
   The test report is invalid without the signatures of Approver, Reviewer and Tester.

3. 本报告涂改无效。
   The test report is invalid if altered.

4. 对检验报告若有异议，应于收到报告之日起十五天内向检验单位提出。
   Objections to the test report must be submitted to UL within 15 days.

5. 本报告中以点号代替小数点。
   Throughout this report a point is used as the decimal separator.

6. 本报告仅对送检样品负责。
   The test report is valid for the tested samples only.

7. 本报告并未授权许可申请单位使用UL任何UL的名称、商标、标识等。
   The test report does not grant applicant the use of UL name, trademark or label.

8. 任何情况下检测单位的赔偿责任都不会超过检测单位就本次检测所收取的检测费用。
   UL's liability under no circumstance will exceed the testing fee received from applicant for test conducted hereof this testing report.

检测单位：苏州UL美华认证有限公司广州分公司
Laboratory：UL-CCIC Company Limited Guangzhou Branch
地 址：中国 广东广州科学城南云二路8号品尧产业园电子大楼
Address: Electronic Building, Parage Electronic Industrial Park, No. 8 Nanyun Er Road, Guangzhou Science Park, Guangzhou, China
电 话(Tel)：+86-20-3213 1000
传 真(FAX)：+86-20-8348 6777
邮政编码(Post Code)：510663
Email: customerservice.cn@cn.ul.com
Web: www.ul.com

GP Batteries

Material Safety Data Sheet for Lithium coin cell

The batteries are exempt articles and are not subject to the OSHA Hazard Communication Standard Requirement. This sheet is only provided as technical information and is referred normal use of the product in question. Peak Power makes no warranty expressed or implied.

Section 1- Identification

Manufacturer's Name GPI International Ltd.	Emergency Telephone Number
Address (Number, Street, City State, and ZIP Code) 7/F, Building 16W, 16 Science Park West Avenue Hong Kong Science Park, New Territories, Hong Kong	Telephone Number for information 852-2484-3333
	Date of prepared and revision Jan 1, 2019
	Signature of Prepare (optional)

Section 2 – Hazards Identification

This contains lithium, organic solvent, and other combustible materials. For this reason, improper handling of the battery could lead to distortion, leakage*, overheating, explosion, or fire and cause human injury or equipment trouble. Please strictly observe safety instructions.
(*leakage is defined as an unintended escape of liquid from a battery)

Section 3 – Composition/Information On Ingredients

Hazardous Components:

Description:	CAS Number	Approximate % of total weight
Lithium or Lithium Alloy	7439-93-2	1 to 5
Manganese Dioxide	1313-13-9	15 to 40
Propylene Carbonate	108-32-7	2 to 6
1,2-Dimethoxyethane	110-71-4	1 to 5
Lithium Perchlorate	7791-03-9	0 to 1.5
Graphite	7782-42-5	1 to 4
SVHC Substances according to REACH (Article 33) 1,2-dimethoxyethane; ethylene glycol dimethyl ether (EGDME)[a]	110-71-4	>0.1

[a]Remark: According to REACH Regulation Article 7(2) for SVHC present in articles, there is no obligation to notify because the substance EGDME has been registered in ECHA and it is excluded exposure to humans or the environment inside the battery during normal or reasonably foreseeable conditions of use and disposal. GP Lithium metal battery complies with REACH Regulation.

*) Lithium content for each cell

Model	Li content(g)	Model	Li content(g)
CR927	0.009	CR2016	0.023
CR1025	0.010	CR2025	0.048
CR1216	0.0068	CR2032	0.065
CR1220	0.011	CR2430	0.090
CR1616	0.014	CR2450	0.162
CR1620	0.020	CR1/3N	0.06
CR1632	0.038	2CR1/3N	0.12

Section 4 – First Aid Measures

None unless internal materials exposure. If contents are leaked out, observe following instructions

Inhalation Fumes can cause respiratory irritation. Remove to fresh air and consult a physician.

Skin	Immediately flush skin with plenty of water. If itch or irritation by chemical burn persists, consult a physician.
Eyes	Immediately flush eye with plenty of water for at least 15 minutes. Consult a physician immediately
Ingestion	If swallowing a battery, consult a physician immediately. If contents come into mouth, immediately rinse by plenty of water and consult a physician.

Section 5 – Fire-Fighting Measures

Extinguishing Media	Extinguisher of alkaline metal fire is effective. Plenty of cold water is also effective to cool the surrounding area and control the spread fire. But hydrogen gas may be evolved by the reaction of water and lithium and it can form an explosive mixture. Therefore in the case that lots of lithium batteries are burning in a confined space, use a smothering agent.
Fire fighting procedure	Use self-contained breathing apparatus and full protective gear not to inhale harmful gas.

Section 6 – Accidental Release Measures

Steps to Be Taken in Case Material is Released or Spilled

Batteries that are leakage should be handled with rubber gloves.

Avoid direct contact with electrolyte.

Wear protective clothing and a positive pressure Self-Contained Breathing Apparatus (SCBA).

Section 7 – Handling and Storage

Safe handling and storage advice

Batteries should be handled and stored carefully to avoid short circuits.

Do not store in disorderly fashion, or allow metal objects to be mixed with stored batteries.

Never disassemble a battery.

Do not breathe cell vapors or touch internal material with bare hands.

The cells and batteries shall not be stored in high temperature ,the maximum temperature allowed is 60℃ for a short period during the shipment , Otherwise the cells maybe leakage and can result in shortened service life..

Section 8– Exposure Controls / Person Protection

Occupational Exposure Limits:	LTEP N.A.	STEP N.A.	
Respiratory Protection (Specify Type)	N.A.		
Ventilation	Local Exhausts N.A.	Special	N.A.
	Mechanical (General) N.A.	Other	N.A.
Protective Gloves	N.A.	Eye Protection	N.A.
Other Protective Clothing or Equipment	N.A.		
Work / Hygienic Practices	N.A.		

Section 9 - Physical / Chemical Properties

Boiling Point N.A.	Specific Gravity (H_2O=1) N.A.
Vapor Pressure (mm Hg) N.A.	Melting Point N.A.
Vapor Density (AIR=1) N.A.	Evaporation Rate (Butyl Acetate) N.A.
Solubility in Water N.A.	
Appearance and Odor Coin Shape, odorless	

Section 10 – Stability and Reactivity

Stability	Unstable		Conditions to Avoid
	Stable	X	

Incompatibility (Materials to Avoid)

Hazardous Decomposition or Byproducts

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

Section 11 – Toxicological Information

Route(s) of Entry Inhalation? N.A. Skin? N.A. Ingestion? N.A.

Health Hazard (Acute and Chronic) / Toxicological information

In case of electrolyte leakage, skin will be itchy when contaminated with electrolyte.

In contact with electrolyte can cause severe irritation and chemical burns.

Inhalation of electrolyte vapors may cause irritation of the upper respiratory tract and lungs.

Section 12 – Ecological Information

N.A.

Section 13 – Disposal Considerations

Dispose of batteries according to government regulations.

Section 14 – Transportation Information

UN Number: UN 3090						
UN Proper Shipping Name: Lithium metal batteries						
UN: The Transport of Dangerous Goods, Manual of Tests and Criteria 38.3 Lithium batteries						
Shipping	**Regulation**	**Packing**	**Limit of Aggregated**	**Transport**	**Environmental**	**Special**

mode/ Country		Group/Special Provision	Lithium Content	Hazard Class	Hazards	Precautions
USA	US DOT 49 CFR Section 173-185 Lithium batteries and cells		>1 g (cell)/2 g (battery)	Dangerous goods, Class 9	No marine pollutant	Lithium handling label needed
			<=1 g (cell)/2 g (battery)	Non-dangerous goods		
Air	ICAO/IATA DGR 60th edition 2019	- PI 968 Section IA	>1 g (cell)/2 g (battery)	Dangerous goods, Class 9	No marine pollutant	DG Label, CAO Label needed
		- PI 968 Section IB	<=0.3 g, 0.3-1 g (cell); <=0.3 g, 0.3-2 g (battery) (for that exceed allowance in Section II)	Dangerous goods, Class 9	No marine pollutant	Lithium handling label, DG label, CAO label needed
		- PI 968 Section II	<=0.3 g, 0.3-1 g (cell) <=0.3 g, 0.3-2 g (battery) (Only allow one package prepared per consignment)	Partially-regulated dangerous goods	No marine pollutant	Lithium handling label, CAO Label needed.
Sea	IMO/IMDG CODE 38-16	P903 SP188	>1 g (cell)/2 g (battery)	Dangerous goods, Class 9	No marine pollutant	Lithium handling label needed
			<=1 g (cell)/2 g (battery)	Non-dangerous goods	No marine pollutant	Lithium handling label needed
Road	ADR	P903, P903a, P903b	>1 g (cell)/2 g (battery)	Dangerous goods, Class 9	No marine pollutant	Lithium handling label needed
			<=1 g (cell)/2 g (battery)	Non-dangerous goods	No marine pollutant	Lithium handling label needed

a) In general, all batteries in all forms of transportation (ground, air, or ocean) must be packaged in a safe and responsible manner. Regulatory concerns from all agencies for safe packaging require that batteries be packaged in a manner that prevents short circuits and be contained in "strong outer packaging" that prevents spillage of contents. All original packaging for GP lithium coin cell (sometimes referred to as "Lithium metal battery") has been designed to be compliant with these regulatory concerns.

Primary (non-rechargeable) lithium metal batteries and cells, (UN 3090), are forbidden for transportation aboard passenger-carrying aircraft. Such batteries transported in accordance with Section IA, IB & II of Packing Instruction 968 must be labeled with the CARGO AIRCRAFT ONLY label.

b) International Maritime Organization (IMO) IMDG Code regulated these products as UN 3090, Lithium metal batteries, Class 9 dangerous goods with Special Provision 188 and 903 assigned.

c) All batteries by our company, including single cells with lithium content less than 1g or battery pack models with lithium

content less than 2g, conform to special regulation 188 and transport condition defined in IMDG Code. It can be transported as non-dangerous goods.

Transport of Lithium metal batteries contained in equipment or Lithium metal batteries packed with equipment have to follow the appropriate regulations for UN3091, PI970 or PI969 respectively.

Section 15 – Regulatory Information

Special requirement be according to the local regulatory.

Section 16 – Other Information

The data in this Material Safety Data Sheet relates only to the specific material designated herein. However, the data is provided without any warranty; expressed or implied, regarding its correctness or accuracy. It is the user's responsibility to assume liability on loss, injury, damage, or expense resulting from improper use of this product. We urge you to make this information available as appropriate in your organization and to any others with whom you arrange to handle this product.

Section 17 – Measures for fire extinction

In case of fire, it is permissible to use any class of extinguishing medium on these batteries or their packing material. Cool exterior of batteries if exposed to fire to prevent rupture.

Fire fighters should wear self-contained breathing apparatus.