

**Applicant**.....: Renata SA  
Address .....: Kreuzenstrasse 30, CH 4452 Itingen

**Manufacturer** .....: Same as applicant  
Address.....: Same as applicant

**Factory**.....: Same as applicant  
Address.....: Same as applicant

**Test object**.....: Primary Lithium Coin Cell  
**Model**.....: CR2477N

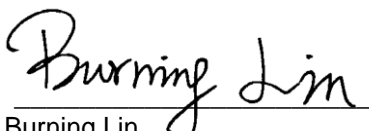
**Test specifications / Test standard**.....: ST/SG/AC.10/11/Rev.6/Section 38.3  
**Test procedure**.....: SGS-CSTC

**Test Report Form No.**.....: UN 38.3\_B  
**Test Report Form(s) Originator**.....: SGS-CSTC  
**Master TRF**.....: Dated 2017-02

**Purpose of examination**.....: Commission Test

**Summary of testing**.....: The sample(s) tested complies with the requirements of ST/SG/AC.10/11/Rev.6 Section 38.3 UNITED NATIONS "Recommendations on the transport of dangerous goods" Manual of test and Criteria ST/SG/AC.10/11/Rev.6 Section 38.3

**Remark:** None.

  
Burning Lin  
Project Reviewer  
Safety Laboratory

  
Gavin Zheng  
Project Engineer



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### 1. Function / Description:

Primary Lithium Coin Cell

### 2. General product information:

Model	CR2477N
Rated Voltage	3,0 V
Rated Capacity	950 mAh

### Test information:

Possible test case verdicts:

- |  |                      |
|--|----------------------|
| - test case does not apply to the test object: | N/A (Not Applicable) |
| - test object does meet the requirement:       | P (Pass)             |
| - test object does not meet the requirement:   | F (Fail)             |

The tests were done in the Electrical Safety Laboratory of SGS-CSTC in Shanghai.

Test item was received on 2017-03-06

Tests were performed from 2017-03-06 to 2017-05-16 .

Ambient temp.: 20 °C ± 5 °C

When determining the test conclusion, the Measurement Uncertainty of test has been considered.

### 3. Test result:

ST/SG/AC.10/11/Rev.5/Section 38.3/Amend.2			
Clause	Requirement + Test	Result - Remark	Verdict
38.3.4	Procedure		P
38.3.4.1	Test T.1: Altitude simulation		P
	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).		P
	Requirement: Cells and batteries Mass loss limit: ≤0,1%;		P
	Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.		P
	No leakage, no venting, no disassembly, no rupture and no fire.		P
38.3.4.2	Test T.2: Thermal test		P

	<p>Test procedure: Test cells and batteries are to be stored for at least six hours at a test temperature equal to <math>75 \pm 2</math> °C, followed by storage for at least six hours at a test temperature equal to <math>-40 \pm 2</math> °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated 10 times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (<math>20 \pm 5</math> °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.</p>		P
	<p>Requirement: Cells and batteries Mass loss limit: <math>\leq 0,1\%</math></p>		P
	<p>Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.</p>		P
	<p>No leakage, no venting, no disassembly, no rupture and no fire.</p>		P
	<p>Test T.3: Vibration</p>		P
38.3.4.3	<p>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 position of the cell. One of the directions of vibration must be perpendicular to the terminal face. The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of <math>1 g_n</math> is maintained until 18 Hz is reached. The amplitude is then maintained at 0,8 mm (1,6 mm total excursion) and the frequency increased until a peak acceleration of <math>8 g_n</math> occurs (approximately 50Hz). A peak acceleration of <math>8 g_n</math> is then maintained until the frequency is increased to 200 Hz</p>		P
	<p>Requirement: Cells and batteries Mass loss limit: <math>\leq 0,1\%</math></p>		P
	<p>Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.</p>		P
	<p>No leakage, no venting, no disassembly, no rupture and no fire.</p>		P
38.3.4	<p>Test T.4: Shock</p>		P

	<p>Test procedure:            Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be 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 or battery for a total of 18 shocks. However, large cells and large batteries shall be subjected to a half-sine or peak acceleration of 50 gn and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the positive direction followed by the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.</p>		P
	<p>Requirement:            Cells and batteries Mass loss limit: <math>\leq 0,1\%</math></p>		P
	<p>Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.</p>		P
	<p>No leakage, no venting, no disassembly, no rupture and no fire.</p>		P
38.3.4.5	<p>Test T.5: External short circuit</p>		P
38.3.4.5	<p>Test procedure:            The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches <math>57\pm 2</math> °C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0,1 ohm at <math>57\pm 4</math> °C. If this assessment is not Feasible, the exposure time shall be at least 6hours for small cells and small batteries, and 12 hours for large cells and large batteries. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to <math>57\pm 4</math> °C, The cell or battery must be observed for a further six hour for the test to be concluded, or in the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below the value.</p>		P
38.3.4.5	<p>Requirement:            Cell's or batteries' external temperature not exceed 170 °C.</p>		P
38.3.4.5	<p>No disassembly, no rupture and no fire within six hours.</p>		P

38.3.4.6	Test T.6: Impact / Crush		P
	Test procedure 1: Impact The sample cell or component cell is to be placed on a flat smooth surface.		N/A
	A 15.8 mm ± 0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample.		N/A
	A 9.1 kg ± 0.1 kg mass is to be 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 shall be oriented 90 degrees from the horizontal supporting surface.		N/A
	The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15,8 mm ± 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.		N/A
	Test procedure 2: Crush A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1,5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.		P
	(a) The applied force reaches 13 kN ± 0.78 kN; or		P
	(b) The voltage of the cell drops by at least 100 mV; or		N/A
	(c) The cell is deformed by 50% or more of its original thickness.		N/A
	Requirement: Cell's or batteries' external temperature not exceed 170 °C.		P
No disassembly, no rupture and no fire within six hours.		P	
38.3.4.7	Test T.7: Overcharge		N/A
	Test procedure: The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:		N/A
	(a) When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.		N/A
	(b) When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.		N/A

	Requirement: No disassembly, no rupture and no fire within seven days.		N/A
38.3.4.8	Test T.8: Force discharge		P
	Test procedure: Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.		P
	The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).		P
	Requirement: No disassembly, no rupture and no fire within seven days.		P

**T1 to T5 test data**

Sample No.	Mass prior to test		After Test T.1 Altitude simulation		After Test T.2 Thermal test		After Test T.3 Vibration		After Test T.4 Shock/		T.5 External short circuit /
	Mass (g)	OCV (V)	Mass loss (%)	Charge ratio (%)	Mass loss (%)	Charge ratio (%)	Mass loss (%)	Charge ratio (%)	Mass loss (%)	Charge ratio (%)	Temp (°C)
#1	8,303	3,26	0,01	100,00	0,00	99,69	0,00	100,00	0,00	100,00	60,2
#2	8,382	3,23	0,02	100,00	0,00	100,00	0,00	100,00	0,00	100,00	60,6
#3	8,317	3,24	0,00	100,00	0,00	100,00	0,00	100,00	0,00	100,00	60,9
#4	8,400	3,26	0,01	100,00	0,00	99,69	0,00	100,00	0,00	100,00	61,8
#5	8,496	3,26	0,01	100,00	0,00	99,69	0,00	97,89	0,00	100,00	61,8
#6	8,264	3,36	0,02	100,00	0,00	99,81	0,00	100,00	0,00	100,00	60,7
#7	8,221	3,25	0,02	100,00	0,00	100,00	0,00	100,00	0,00	100,00	61,9
#8	8,390	3,24	0,01	100,00	0,00	100,00	0,00	100,00	0,00	100,00	60,5
#9	8,352	3,20	0,01	100,00	0,00	100,00	0,00	100,00	0,00	100,00	61,7
#10	8,256	3,23	0,01	100,00	0,00	100,00	0,00	100,00	0,00	100,00	61,6
#11	8,248	--	0,00	--	0,00	--	0,00	--	0,00	--	59,9
#12	8,228	--	0,01	--	0,00	--	0,00	--	0,00	--	59,9
#13	8,297	--	0,01	--	0,00	--	0,00	--	0,00	--	58,4
#14	8,173	--	0,01	--	0,00	--	0,00	--	0,00	--	60,1
#15	8,293	--	0,01	--	0,00	--	0,00	--	0,00	--	58,7
#16	8,195	--	0,01	--	0,00	--	0,00	--	0,00	--	59,4
#17	8,508	--	0,01	--	0,00	--	0,00	--	0,00	--	59,8
#18	8,127	--	0,01	--	0,00	--	0,00	--	0,00	--	59,1
#19	8,397	--	0,02	--	0,00	--	0,00	--	0,00	--	59,9
#20	8,194	--	0,01	--	0,00	--	0,00	--	0,00	--	60,1

**T6 test data**

Sample No.	#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
Mass prior to test-OCV (V)	--	--	--	--	--	--	--	--	--	--
Maximum case temperature rise T, (°C)	--	--	--	--	--	--	--	--	--	--

**T8 test data**

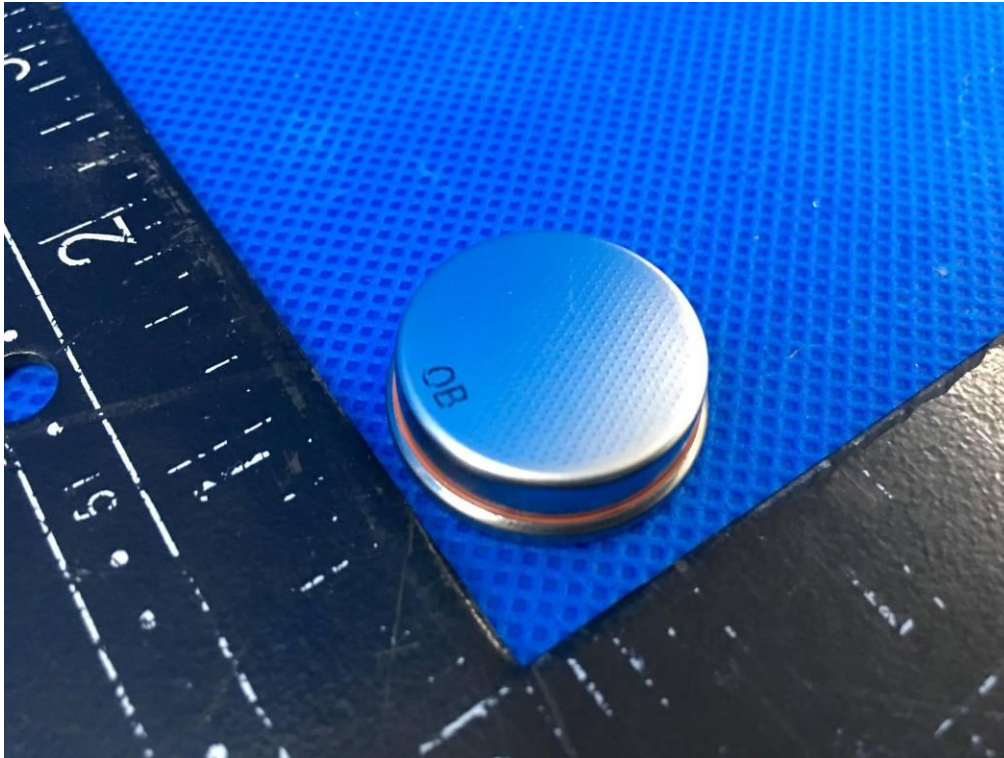
Sample No.	#31	#32	#33	#34	#35	#36	#37	#38	#39	#40
Mass prior to test-OCV (V)	--	--	--	--	--	--	--	--	--	--

**Samples remark:**

- #1-#10: In undischarged states, (T1-T5)
- #11-#20: In fully discharged states, (T1-T5)
- #21-#25: In undischarged states, (T6)
- #26-#30: In fully discharged states, (T6)
- #31-#40: In fully discharged states, (T8)



Attachment: Sample photos



-- End of Report --