

UNITED NATIONS**ST/SG/AC.10/27Add.2****Test Report**

Model: 501220P—0.296 Wh

Manufacturers: Oceansun

Cell Type: Lithium Ion Polymer Cell

Item	Authorized	Date
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Part I: Cell Configuration and Test Summary

1 **Cell Configuration:**

2 **Test Summary:**

3 **Conclusion:**

Oceansun 501220 Lithium Ion Polymer Cell passed ST/SG/AC.10/27/Add.2 all item test.

Model	501220	Dimension	5.0×12.0×20.0mm (T×W×L)
Rated Capacity	0.296 Wh	Endpoint Voltage	3.0V
Shape	Prismatic	Maximum discharge current	60mA
Mass	1.35g (Approx.)	Packing Material	Al Foil

NO.	Test Item	Test Result	Pass or Failure	Remark
1	Test1: Altitude simulation	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass	Tests 1 to 5 must be conducted in sequence on the same cell or battery.
2	Test2: Thermal Test	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass	
3	Test3: Vibration	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass	
4	Test4: Shock	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass	
5	Test5: External short circuit	External temperature does not exceed 170°C, no disassembly, no fire.	Pass	
6	Test6: Impact	External temperature does not exceed 170°C, no disassembly, and no fire within six hours.	Pass	
7	Test8: Forced Discharge	No disassembly and no fire within seven days of the test.	Pass	
8	Test9: Drop test	No leakage, no venting, no disassembly, no rupture and no fire.	Pass	

Remark: 1. Mass loss (%)=(M1-M2)/M1*100% (Where M₁ is the mass before the test and M₂ is the mass after the test.)

2. When mass loss does not exceed the value in Table: Mass loss limit, it shall be considered as "no mass loss".

Table: Mass loss limit

Mass M of cell or battery	Mass loss limit
$M < 1.0g$	0.5 %
$1.0 g < M < 5.0g$	0.2 %
$M \geq 5.0 g$	0.1 %

Part II: All Item Detail Testing Data and Result**Test 1: Altitude Simulation**

1.1 Purpose

This test simulates air transport under low-pressure conditions.

1.2 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 ($20 \pm 5^\circ\text{C}$).

1.3 Detail Testing

Data Table: Altitude simulation Testing Detail Data Environment Temperature: 25°C

Group	Cell code	Mass M of Test Cell (g)			OCV (V)			Criteria	Result (Pass or Fail)
		M1 (before test)	M2 (after test)	Mass Loss (%)	OCV1 (before test)	OCV2 (after test)	OCV2/OCV1		
Group A (fully charged)	1-0	1.345	1.345	0.00%	4.180	4.118	98.52%	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire. And the OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.	Pass
	1-1	1.348	1.348	0.00%	4.186	4.115	98.30%		Pass
	1-2	1.349	1.348	0.07%	4.184	4.118	98.42%		Pass
	1-3	1.352	1.351	0.07%	4.183	4.113	98.33%		Pass
	1-4	1.351	1.351	0.00%	4.180	4.112	98.37%		Pass
	1-5	1.350	1.349	0.07%	4.182	4.119	98.49%		Pass
	1-6	1.346	1.346	0.07%	4.188	4.116	98.28%		Pass
	1-7	1.345	1.345	0.07%	4.193	4.119	98.24%		Pass
	1-8	1.345	1.344	0.07%	4.185	4.114	98.30%		Pass
	1-9	1.348	1.348	0.00%	4.195	4.183	99.71%		Pass

Group B (fully discharged)	2-0	1.348	1.348	0.00%	3.274	3.267	N.A	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass
	2-1	1.351	1.351	0.00%	3.241	3.236	N.A		Pass
	2-2	1.356	1.355	0.06%	3.253	3.249	N.A		Pass
	2-3	1.347	1.347	0.00%	3.280	3.272	N.A		Pass
	2-4	1.348	1.348	0.00%	3.253	3.254	N.A		Pass
	2-5	1.349	1.348	0.07%	3.310	3.309	N.A		Pass
	2-6	1.345	1.345	0.00%	3.295	3.294	N.A		Pass
	2-7	1.348	1.348	0.00%	3.321	3.313	N.A		Pass
	2-8	1.351	1.351	0.00%	3.277	3.260	N.A		Pass
	2-9	1.350	1.350	0.00%	3.232	3.220	N.A		Pass

1.4 Requirement

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

1.5 Conclusion:

Oceansun 501220 cell passed altitude simulation test.

Test 2: Thermal Test

2.1 Purpose

This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.

2.2 Test procedure

Test cells and batteries are to be stored for at least six hours at a test temperature equal to $75 \pm 2 \text{ }^\circ\text{C}$, followed by storage for at least six hours at a test temperature equal to $-40 \pm 2 \text{ }^\circ\text{C}$. 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 ($20 \pm 5 \text{ }^\circ\text{C}$).

2.3 Detail Testing Data

Table: Thermal test Detail Data

Environment Temperature: $25 \text{ }^\circ\text{C}$

Group	Cell code	Mass M of Test Cell (g)			OCV (V)			Criteria	Result (Pass or Fail)
		M1 (before test)	M2 (after test)	Mass Loss (%)	OCV1 (before test)	OCV2 (after test)	OCV2/OCV1		
Group A (fully charged)	1-0	1.342	1.341	0.07%	4.184	4.114	98.33%	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire. And the OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.	Pass
	1-1	1.348	1.348	0.00%	4.183	4.111	98.28%		Pass
	1-2	1.348	1.347	0.06%	4.183	4.111	98.28%		Pass
	1-3	1.349	1.347	0.15%	4.183	4.112	98.30%		Pass
	1-4	1.354	1.354	0.00%	4.180	4.117	98.49%		Pass
	1-5	1.349	1.349	0.00%	4.186	4.114	98.28%		Pass
	1-6	1.347	1.347	0.00%	4.191	4.117	98.23%		Pass
	1-7	1.346	1.346	0.00%	4.183	4.112	98.30%		Pass
	1-8	1.352	1.352	0.00%	4.179	4.111	98.37%		Pass
	1-9	1.354	1.354	0.00%	4.181	4.112	98.35%		Pass

Group B (fully discharged)	2-0	1.353	1.352	0.06%	3.322	3.321	N.A	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass
	2-1	1.356	1.356	0.00%	3.307	3.306	N.A		Pass
	2-2	1.351	1.351	0.00%	3.333	3.325	N.A		Pass
	2-3	1.354	1.354	0.00%	3.289	3.272	N.A		Pass
	2-4	1.356	1.355	0.06%	3.244	3.232	N.A		Pass
	2-5	1.352	1.352	0.00%	3.280	3.273	N.A		Pass
	2-6	1.353	1.353	0.00%	3.247	3.242	N.A		Pass
	2-7	1.347	1.347	0.00%	3.259	3.255	N.A		Pass
	2-8	1.353	1.352	0.06%	3.286	3.278	N.A		Pass
	2-9	1.353	1.353	0.00%	3.259	3.258	N.A		Pass

2.4 Requirement

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

2.5 Conclusion:

Oceansun 501220 cell passed thermal test.

Test 3: Vibration Test

3.1 Purpose

This test simulates vibration during transport.

3.2 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 is as follows: 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 (1.6mm total excursion) and the frequency 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.

3.3 Detail Testing Data Table:

Vibration test Detail Data Environment Temperature: 25°C

Group	Cell code	Mass M of Test Cell (g)			OCV (V)			Criteria	Result (Pass or Fail)
		M1 (before test)	M2 (after test)	Mass Loss (%)	OCV1 (before test)	OCV2 (after test)	OCV2/OCV1		
Group A (fully charged)	1-0	1.354	1.353	0.06%	4.179	4.110	98.35%	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire. And the OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.	Pass
	1-1	1.353	1.352	0.06%	4.178	4.107	98.30%		Pass
	1-2	1.354	1.354	0.00%	4.178	4.107	98.30%		Pass
	1-3	1.346	1.346	0.00%	4.178	4.108	98.32%		Pass
	1-4	1.350	1.350	0.00%	4.175	4.113	98.51%		Pass
	1-5	1.349	1.348	0.07%	4.181	4.110	98.30%		Pass
	1-6	1.348	1.348	0.00%	4.179	4.113	98.42%		Pass
	1-7	1.354	1.353	0.06%	4.178	4.108	98.32%		Pass
	1-8	1.351	1.351	0.00%	4.175	4.107	98.37%		Pass
	1-9	1.351	1.351	0.00%	4.176	4.108	98.37%		Pass

Group B (fully discharged)	2-0	1.347	1.346	0.07%	3.295	3.278	N.A	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass
	2-1	1.352	1.351	0.07%	3.250	3.238	N.A		Pass
	2-2	1.353	1.353	0.00%	3.286	3.279	N.A		Pass
	2-3	1.354	1.353	0.07%	3.253	3.248	N.A		Pass
	2-4	1.354	1.354	0.00%	3.265	3.261	N.A		Pass
	2-5	1.350	1.349	0.07%	3.292	3.284	N.A		Pass
	2-6	1.349	1.348	0.07%	3.265	3.261	N.A		Pass
	2-7	1.345	1.345	0.00%	3.322	3.321	N.A		Pass
	2-8	1.354	1.353	0.07%	3.307	3.306	N.A		Pass
	2-9	1.351	1.351	0.00%	3.333	3.325	N.A		Pass

3.4 Requirement

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

3.5 Conclusion

Oceansun 501220 cell passed vibration test.

Test 4: Shock Test

4.1 Purpose

This test simulates possible impacts during transport.

4.2 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 g_n 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.

4.3 Detail Testing Data Table: Shock test Detail Data

Environment Temperature: 25°C

Group	Cell code	Mass M of Test Cell (g)			OCV (V)			Criteria	Result (Pass or Fail)
		M1 (before test)	M2 (after test)	Mass Loss (%)	OCV1 (before test)	OCV2 (after test)	OCV2/OCV1		
Group A (fully charged)	1-0	1.347	1.346	0.07%	4.175	4.113	98.51%	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire. And the OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.	Pass
	1-1	1.352	1.351	0.06%	4.181	4.110	98.30%		Pass
	1-2	1.353	1.353	0.00%	4.179	4.113	98.42%		Pass
	1-3	1.354	1.353	0.06%	4.178	4.108	98.32%		Pass
	1-4	1.354	1.354	0.00%	4.175	4.107	98.37%		Pass
	1-5	1.350	1.349	0.06%	4.177	4.114	98.49%		Pass
	1-6	1.349	1.348	0.07%	4.183	4.111	98.28%		Pass
	1-7	1.355	1.355	0.00%	4.188	4.114	98.23%		Pass
	1-8	1.354	1.353	0.07%	4.180	4.109	98.30%		Pass
	1-9	1.351	1.351	0.00%	4.190	4.178	99.71%		Pass

Group B (fully discharged)	2-0	1.348	1.348	0.00%	3.419	3.277	N.A	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	Pass
	2-1	1.349	1.348	0.06%	3.390	3.278	N.A		Pass
	2-2	1.352	1.352	0.00%	3.408	3.271	N.A		Pass
	2-3	1.348	1.348	0.00%	3.408	3.254	N.A		Pass
	2-4	1.349	1.348	0.07%	3.423	3.269	N.A		Pass
	2-5	1.353	1.353	0.00%	3.414	3.278	N.A		Pass
	2-6	1.356	1.355	0.06%	3.410	3.266	N.A		Pass
	2-7	1.350	1.351	-0.06%	3.436	3.302	N.A		Pass
	2-8	1.354	1.354	0.00%	3.428	3.290	N.A		Pass
	2-9	1.351	1.351	0.00%	3.443	3.313	N.A		Pass

4.4 Requirement

Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

4.5 Conclusion

Oceansun 501220 cell passed shock test.

Test 5: External Short Circuit

5.1 Purpose

This test simulates an external short circuit.

5.2 Test procedure

The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches $55 \pm 2^\circ\text{C}$ 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 $55 \pm 2^\circ\text{C}$. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to $55 \pm 2^\circ\text{C}$. The cell or battery must be observed for a further six hours for the test to be concluded.

5.3 Requirement

Cells and batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of this test.

5.4 Detail Testing Data Table: External Short Circuit Test Data

Environment Temperature: 25°C

Group	Cell Barcode	External Highest Temperature($^\circ\text{C}$)	Criteria	Result (Pass or Fail)
Group A (fully charged)	1-0	86.9	Cells external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of this test.	Pass
	1-1	93.9		Pass
	1-2	91.8		Pass
	1-3	88.5		Pass
	1-4	87.4		Pass
	1-5	86.1		Pass
	1-6	91.9		Pass
	1-7	88.6		Pass
	1-8	87.5		Pass
	1-9	86.2		Pass
Group B (fully discharged)	2-0	53.8	Cells external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire within six hours of this test.	Pass
	2-1	52.5		Pass
	2-2	61.2		Pass
	2-3	60.6		Pass
	2-4	56.3		Pass
	2-5	64.6		Pass
	2-6	61.3		Pass
	2-7	60.7		Pass
	2-8	56.4		Pass
	2-9	64.7		Pass

5.5 Conclusion

Oceansun 501220 cell passed external short circuit test.

Test6: Impact test

6.1 Purpose

This test simulates an impact.

6.2 Test procedure

The test sample cell or component cell is to be placed on a flat surface. A 15.8 mm diameter bar is to be placed across the center of the sample. A 9.1 kg mass is to be dropped from a height of 61 ± 2.5 cm onto the sample.

A cylindrical or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm diameter curved surface lying across the center of the test sample. A prismatic cell 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 is to be subjected to only a single impact. Separate samples are to be used for each impact.

6.3 Detail Testing Data Table: Impact Test Data Environment Temperature: 25°C

Group	Cell Barcode	External Highest Temperature(°C)	Direction	Criteria	Result (Pass or Fail)
Group A: (Half charge, at first cycle)	3-0	86.3	Longitudinal	Cells external temperature does not exceed 170°C and there is no disassembly and no fire within six hours of this test.	Pass
	3-1	87.1	Longitudinal		Pass
	3-2	94.1	Longitudinal		Pass
	3-3	92.0	Longitudinal		Pass
	3-4	88.7	Longitudinal		Pass
	3-5	87.5	Rotated 90 degrees		Pass
	3-6	88.3	Rotated 90 degrees		Pass
	3-7	91.2	Rotated 90 degrees		Pass
	3-8	97.6	Rotated 90 degrees		Pass
	3-9	98.4	Rotated 90 degrees		Pass
Group B: (In fully discharged status, after 50 cycles ending.)	4-0	67.3	Longitudinal	Cells external temperature does not exceed 170°C and there is no disassembly and no fire within six hours of this test.	Pass
	4-1	67.4	Longitudinal		Pass
	4-2	54.0	Longitudinal		Pass
	4-3	52.7	Longitudinal		Pass
	4-4	61.4	Longitudinal		Pass
	4-5	60.8	Rotated 90 degrees		Pass
	4-6	56.5	Rotated 90 degrees		Pass
	4-7	67.4	Rotated 90 degrees		Pass
	4-8	56.7	Rotated 90 degrees		Pass
	4-9	71.3	Rotated 90 degrees		Pass

6.4 Requirement

Cells and component cells meet this requirement if their external temperature does not exceed 170°C and there is no disassembly and no fire within six hours of this test.

6.5 Conclusion

Oceansun 501220 cell passed impact test.

Test7: Forced Discharge

7.1 Purpose

This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.

7.2 Test procedure Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

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).

7.3 Test Result Table: Forced Discharge Test Result Environment Temperature: 25°C

Group	Cell Barcode	Criteria	Result
Group A: (At first cycle, in fully discharged states)	5-0	There is no disassembly and no fire within seven days of the test.	Pass
	5-1		Pass
	5-2		Pass
	5-3		Pass
	5-4		Pass
	5-5		Pass
	5-6		Pass
	5-7		Pass
	5-8		Pass
	5-9		Pass
Group B: (After 50 cycles ending, in fully discharged states)	6-0	There is no disassembly and no fire within seven days of the test.	Pass
	6-1		Pass
	6-2		Pass
	6-3		Pass
	6-4		Pass
	6-5		Pass
	6-6		Pass
	6-7		Pass
	6-8		Pass
	6-9		Pass

7.4 Requirement

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire within seven days of the test.

7.5 Conclusion

Oceansun 501220 cell passed Forced Discharge test.

Test 8: Drop Test

8.1 Purpose

This test simulates possible Drop during transport.

8.2 Test procedure

Each cell shall be in the 20 ± 5 °C under the conditions, from 120 cm in height dropped to 18~20 mm thick cement board, from the X, Y, Z plus or minus six directions, each direction, fell 1 times.

8.3 Test Result Table: Drop Test Result Environment Temperature: 25°C

Group	Cell Barcode	Criteria	Result	
Group A: (At first cycle, in fully discharged states)	7-0	There is no leakage, no venting, no disassembly, no rupture and no fire.	Pass	
	7-1		Pass	
	7-2		Pass	
	7-3		Pass	
	7-4		Pass	
	7-5		Pass	
	7-6		Pass	
	7-7		Pass	
	7-8		Pass	
	7-9		Pass	
				Pass

8.4 Requirement

Primary or rechargeable cells meet this requirement if there is no leakage, no venting, no disassembly, no fire, no damage for cell and carton.

8.5 Conclusion

Oceansun 501220 cell passed Drop test.