**TEST REPORT N°: AROU-19OC2044YTSHP**

# UN 38.3 TEST REPORT

| | | | | |
|---|---|---|---|---|
| Applicant: | **Energus Power Solutions** | | To: | - |
| Attn: | Robertas Beleckas | | Attn: | - |
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| This document includes: 20 pages | | | | |

| | | | |
|---|---|---|---|
| Manufacturer name: | Energus Power Solutions | | |
| Location: | Vilkpedes str.4, Vilnius, Lithuania | Sample No: | SH191024/014 |
|  | | Start date: | October 24, 2019 |
| | | Finish date: | December 5, 2019 |
| | | Standards used: (Date): | ST/SG/AC.10/11/Rev.6/ Amend 1/Section 38.3 |
| | | Clauses examined: | All clauses |
| | | Re-testing: | None |
| **Secondary Li-ion Battery / Li20pVTC6 / 3,6V 60Ah 216Wh** | | Remark / Note: | See Page 2 |
| CONCLUSION: | **The samples satisfy the clauses examined.** | | |

| | |
|---|---|
| Test done by.<br>Project Engineer<br><br>Gemma ZHOU | Approved by,<br>Technical Manager<br><br>Sam SHEN |

**TEST REPORT N°: AROU-19OC2044YTSHP**

## HISTORICAL OF SAMPLE RECEIVED

| LCIE CHINA RECORDED N° | DETAIL OF THE SAMPLE | SPECIAL REMARKS |
|---|---|---|
| SH191024/014 | Original samples | None |

COPY OF RATING PLATE:


## TEST PERFORMED / RESULTS

| CLAUSE | ITEM | CONCLUSION |
|---|---|---|
| ☒ 38.3.4.1 | Test T.1: Altitude simulation | PASS |
| ☒ 38.3.4.2 | Test T.2: Thermal test | PASS |
| ☒ 38.3.4.3 | Test T.3: Vibration | PASS |
| ☒ 38.3.4.4 | Test T.4: Shock | PASS |
| ☒ 38.3.4.5 | Test T.5: External short circuit | PASS |
| ☒ 38.3.4.6 | Test T.6: Impact / Crush: Impact test | PASS |
| ☐ 38.3.4.6 | Test T.6: Impact / Crush: Crush test | NA |
| ☐ 38.3.4.7 | Test T.7: Overcharge | NA |
| ☒ 38.3.4.8 | Test T.8: Forced discharge | PASS |
| Note: Tests were subcontracted to CQC Intime Testing Technology Co., Ltd. | | |

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## THE NUMBER AND CONDITION OF THE SAMPLES

| Table A | When testing primary cells and batteries under tests T.1 to T.5 the following shall be tested in the quantity indicated: |
|---|---|

| Number and condition | Login number |
|---|---|
| ☐ Ten cells in undischarged states; | None |
| ☐ Ten cells in fully discharged states; | None |
| ☐ Four small batteries in undischarged states; | None |
| ☐ Four small batteries in fully discharged states; | None |
| ☐ Four large batteries in undischarged states; and | None |
| ☐ Four large batteries in fully discharged states. | None |

| Table B | When testing rechargeable cells and batteries under tests T.1 to T.5 the following shall be tested in the quantity indicated: |
|---|---|

| Number and condition | Login number |
|---|---|
| ☐ Five cells at first cycle, in fully charged states; | None |
| ☐ Five cells after 25 cycles ending in fully charged states; | None |
| ☒ Four small batteries at first cycle, in fully charged states; | Q38N01~Q38N04 |
| ☒ Four small batteries after 25 cycles ending in fully charged states; | Q38N05~Q38N08 |
| ☐ Two large batteries at first cycle, in fully charged states; and | None |
| ☐ Two large batteries after 25 cycles ending in fully charged states. | None |

| Table C | When testing primary and rechargeable cells under test T.6, the following shall be tested in the quantity indicated: |
|---|---|

| Number and condition | Login number |
|---|---|
| ☐ For primary cells, five cells in undischarged states and five cells in fully discharged states; | None |
| ☐ For component cells of primary batteries, five cells in undischarged states and five cells in fully discharged states; | None |
| ☐ For rechargeable cells, five cells at first cycle at 50% of the design rated capacity; | None |
| ☐ For rechargeable cells, five cells after 25 cycles ending at 50% of the design rated capacity; and | None |
| ☒ For component cells of rechargeable batteries, five cells at first cycle at 50% of the design rated capacity; and | Q38N09~Q38N13 |
| ☒ For component cells of rechargeable batteries, five cells after 25 cycles ending at 50% of the design rated capacity. | Q38N14~Q38N18 |

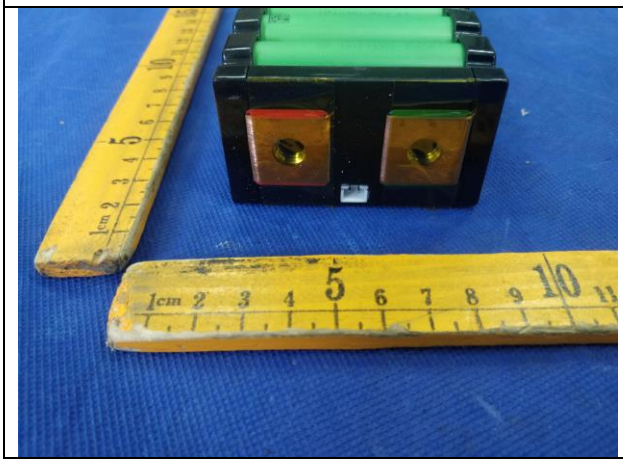
| Table D | When testing rechargeable batteries or rechargeable single cell batteries under test T.7, the following shall be tested in the quantity indicated: | |
|---|---|---|
| Number and condition | | Login number |
| ☐ | Four small batteries at first cycle, in fully charged states; | None |
| ☐ | Four small batteries after 25 cycles ending in fully charged states; | None |
| ☐ | Two large batteries at first cycle, in fully charged states; and | None |
| ☐ | Two large batteries after 25 cycles ending in fully charged states. | None |

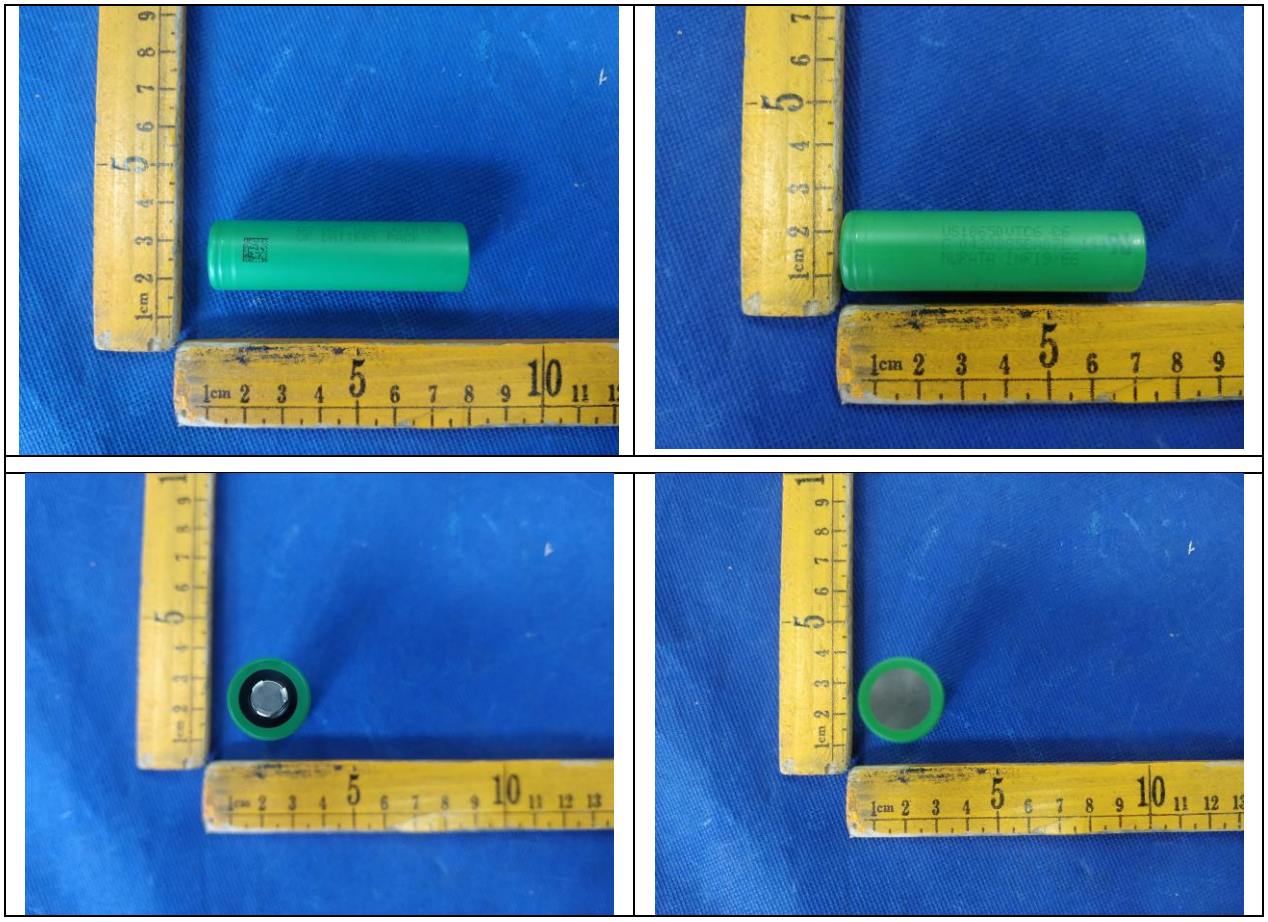
| Table E | When testing primary and rechargeable cells and component cells under test T.8, the following shall be tested in the quantity indicated: | |
|---|---|---|
| Number and condition | | Login number |
| ☐ | Ten primary cells in fully discharged states; | None |
| ☐ | Ten primary component cells in fully discharged states; | None |
| ☐ | Ten rechargeable cells, at first cycle in fully discharged states; | None |
| ☒ | Ten rechargeable component cells, at first cycle in fully discharged states; | Q38N19~Q38N28 |
| ☐ | Ten rechargeable cells after 25 cycles ending in fully discharged states; and | None |
| ☒ | Ten rechargeable component cells after 25 cycles ending in fully discharged states. | Q38N29~Q38N38 |

# PICTURE OF THE SAMPLE TESTED







**TEST REPORT N°: AROU-19OC2044YTSHP**

| Test item particulars | |
|---|---|
| Appearance: | Li-ion Battery |
| Type of appliance: | Lithium ion |
| Type / model: | Li20pVTC6 |
| Rated Voltage: | 3,6V |
| Rated capacity: | 60Ah |
| Rated energy: | 216Wh |
| Trademark: | - |
| Manufacturer: | Energus Power Solutions |
| Recommend charging method declared by the manufacturer: | 60A CC, 4.2V CV until 100mA cut off |
| Discharge current: | 200A |
| Specified final voltage: | 2,0V |
| Maximum charging voltage: | 4,2V |
| Maximum charging current: | 80A |
| Maximum discharge current of cell: | 30A |
| Cells number: | 20 |
| Permutation of cells: | Connection in parallel |
| Appearance of cell: | Cylindrical cell |
| Cell model: | INR19/66 |
| Capacity of cell: | 3000mAh |
| Manufacturer of cells: | - |
| Cell report for UN38.3 | - |
| Other information on battery: | - |

| Possible test case verdicts: | |
|---|---|
| - test object does meet the requirement : | P (Pass) |
| - test case does not apply to the test object : | NA (Not Applicable) |
| - test object does not meet the requirement : | F (Fail) |
| - test object does not demand | ND (Not Demanded) |
| General remarks: | |
| "(See remark #)" refers to a remark appended to the report.<br>Throughout this report a ☒ comma / ☐ point is used as the decimal separator. | |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **38.3.2.3** | **Mass loss** | | **P** |
| | Mass loss means a loss of mass that exceeds the values in Table 38.3.1 below<br>**Table 38.3.1: Mass loss limit**<br>Mass *M* of cell or battery: Mass loss limit<br>M < 1 g: 0.5%<br>1 g ≤ M ≤ 75 g: 0.2%<br>M > 75 g: 0.1% | | P |
| | In order to quantify the mass loss, the following procedure is provided:<br>$Mass\ loss\ (\%) = \frac{(M_1 - M_2)}{M_1} \times 100$ | | P |
| | Where $M_1$ is the mass before the test and $M_2$ is the mass after the test. When mass loss does not exceed the values in Table 38.3.1, it shall be considered as "no mass loss". | | P |
| **38.3.4** | **Procedure** | | **P** |
| | Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. | | P |
| | Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries. | | P |
| | Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries. | | NA |
| **38.3.4.1** | **Test T.1: Altitude simulation** | | **P** |
| 38.3.4.1.2 | Test procedure | | P |
| | 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). | See table 38.3.4.1 | P |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 38.3.4.1.3 | Requirement | | P |
| | Cells and batteries meet this requirement if there is 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. | No leakage, no venting, no disassembly, no rupture and no fire. | P |
| **38.3.4.2** | **Test T.2: Thermal test** | | P |
| 38.3.4.2.2 | Test procedure | | P |
| | 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 extremes should be at least 12 hours. | See table 38.3.4.2 | P |
| 38.3.4.2.3 | Requirement | | P |
| | Cells and batteries meet this requirement if there is 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. | No leakage, no venting, no disassembly, no rupture and no fire. | P |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **38.3.4.3** | **Test T.3: Vibration** | | P |
| 38.3.4.3.2 | Test procedure | | P |
| | 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. | See table 38.3.4.3 | P |
| | 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). | | P |
| | 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 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. | | P |
| | For large batteries: from 7 Hz to 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 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. | | NA |
| 38.3.4.3.3 | Requirement | | P |
| | Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire during the test and after the test and if the open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position 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. | No leakage, no venting, no disassembly, no rupture and no fire. | P |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **38.3.4.4** | **Test T.4: Shock** | | P |
| 38.3.4.4.2 | Test procedure | | P |
| | 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. | See table 38.3.4.4 | P |
| | Each cell or battery shall be subjected to a halfsine shock of peak acceleration of 150 $g_n$ and pulse duration of 6 milliseconds. Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 $g_n$ and pulse duration of 11 milliseconds. | | P |
| | 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 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations. | | P |
| | <table><tr><th>Battery</th><th>Minimum peak acceleration</th><th>Pulse duration</th></tr><tr><td>Small batteries</td><td>150 $g_n$ or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller</td><td>6 ms</td></tr><tr><td>Large batteries</td><td>50 $g_n$ or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller</td><td>11 ms</td></tr></table> * Mass is expressed in kilograms. | | P |
| | Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. | | P |
| 38.3.4.4.3 | Requirement | | P |
| | Cells and batteries meet this requirement if there is 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. | No leakage, no venting, no disassembly, no rupture and no fire. | P |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **38.3.4.5** | **Test T.5: External short circuit** | | P |
| 38.3.4.5.2 | Test procedure | | P |
| | 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 designation of the cell or battery and should be assessed and documented.<br>If this assessment is not 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. | See table 38.3.4.5 | P |
| | Then the cell or battery at 57 ± 4 °C shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm. | | P |
| | This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57 ± 4 °C, or in the case of the large batteries, has decreasted by half of the maximum temperature increase observed during the test and remains below that valve. | | P |
| | The short circuit and cooling down phases shall be conducted at least at ambient temperature. | | P |
| 38.3.4.5.3 | Requirement | | P |
| | 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 during the test and within six hours after the test. | No disassembly, no rupture and no fire, external temperature does not exceed 170 °C | P |
| **38.3.4.6** | **Test T.6: Impact / Crush** | | P |
| 38.3.4.6.2 | Test procedure – Impact (applicable to cylindrical cells not less than 18 mm in diameter) | | P |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The sample cell or component cell is to be placed on a flat smooth surface. 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. 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. | See table 38.3.4.6 | P |
| | 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. | | P |
| 38.3.4.6.3 | Test Procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18 mm in diameter) | | NA |
| | 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. | | NA |
| | (a) The applied force reaches 13 kN ± 0,78 kN; | | NA |
| | (b) The voltage of the cell drops by at least 100 mV; or | | NA |
| | (c) The cell is deformed by 50% or more of its original thickness. | | NA |
| | Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released. | | NA |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis. | | NA |
| | Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests. | | NA |
| 38.3.4 6.4 | Requirement | | P |
| | Cells and component cells meet this requirement if their external temperature does not exceed 170 °C and there is no disassembly and no fire during the test and within six hours after this test. | No disassembly and no fire, external temperature does not exceed 170 °C | P |
| **38.3.4.7** | **Test T.7: Overcharge** | | NA |
| 38.3.4.7.2 | Test procedure | | NA |
| | The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows: | No overcharge protection | NA |
| | (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. | | NA |
| | (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. | | NA |
| | Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours. | | NA |
| 38.3.4.7.3 | Requirement | | NA |
| | Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test. | | NA |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **38.3.4.8** | **Test T.8: Forced discharge** | | **P** |
| 38.3.4.8.2 | Test procedure | | P |
| | 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. | See table 38.3.4.8 | 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 |
| 38.3.4.8.3 | Requirement | | P |
| | Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test. | No disassembly and no fire | P |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 38.3.4.1 | Test T.1: Altitude simulation | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before test | | After test | | Mass loss, (%) | Residual OCV, (%) | Result / Event |
| | Mass, (g) | OCV, (V) | Mass, (g) | OCV, (V) | | | |
| Q38N01 | 1067,71 | 4,179 | 1067,41 | 4,176 | 0,028 | 99,93 | NL, NV, ND, NR, NF |
| Q38N02 | 1068,45 | 4,177 | 1068,13 | 4,174 | 0,030 | 99,93 | NL, NV, ND, NR, NF |
| Q38N03 | 1068,58 | 4,178 | 1068,34 | 4,174 | 0,022 | 99,90 | NL, NV, ND, NR, NF |
| Q38N04 | 1067,83 | 4,171 | 1067,53 | 4,168 | 0,028 | 99,93 | NL, NV, ND, NR, NF |
| Q38N05 | 1067,26 | 4,176 | 1066,99 | 4,174 | 0,025 | 99,95 | NL, NV, ND, NR, NF |
| Q38N06 | 1065,83 | 4,173 | 1065,53 | 4,170 | 0,028 | 99,93 | NL, NV, ND, NR, NF |
| Q38N07 | 1067,36 | 4,176 | 1067,17 | 4,174 | 0,018 | 99,95 | NL, NV, ND, NR, NF |
| Q38N08 | 1068,40 | 4,175 | 1068,12 | 4,173 | 0,026 | 99,95 | NL, NV, ND, NR, NF |
| **Supplementary information: Acceptance criteria**<br>NL: No Leakage; NV: No Venting; ND: No Disassembly; NR: No Rupture; NF: No Fire | | | | | | | |

| 38.3.4.2 | Test T.2: Thermal test | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before test | | After test | | Mass loss, (%) | Residual OCV, (%) | Result / Event |
| | Mass, (g) | OCV, (V) | Mass, (g) | OCV, (V) | | | |
| Q38N01 | 1067,41 | 4,176 | 1067,30 | 4,119 | 0,010 | 98,64 | NL, NV, ND, NR, NF |
| Q38N02 | 1068,13 | 4,174 | 1068,10 | 4,119 | 0,003 | 98,68 | NL, NV, ND, NR, NF |
| Q38N03 | 1068,34 | 4,174 | 1068,29 | 4,120 | 0,005 | 98,71 | NL, NV, ND, NR, NF |
| Q38N04 | 1067,53 | 4,168 | 1067,48 | 4,117 | 0,005 | 98,78 | NL, NV, ND, NR, NF |
| Q38N05 | 1066,99 | 4,174 | 1066,87 | 4,120 | 0,011 | 98,71 | NL, NV, ND, NR, NF |
| Q38N06 | 1065,53 | 4,170 | 1065,41 | 4,121 | 0,011 | 98,82 | NL, NV, ND, NR, NF |
| Q38N07 | 1067,17 | 4,174 | 1067,09 | 4,122 | 0,007 | 98,75 | NL, NV, ND, NR, NF |
| Q38N08 | 1068,12 | 4,173 | 1068,08 | 4,120 | 0,004 | 98,73 | NL, NV, ND, NR, NF |
| **Supplementary information: Acceptance criteria**<br>NL: No Leakage; NV: No Venting; ND: No Disassembly; NR: No Rupture; NF: No Fire | | | | | | | |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 38.3.4.3 | Test T.3: Vibration | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before test | | After test | | Mass loss, (%) | Residual OCV, (%) | Result / Event |
| | Mass, (g) | OCV, (V) | Mass, (g) | OCV, (V) | | | |
| Q38N01 | 1067,30 | 4,119 | 1067,29 | 4,119 | 0,001 | 100 | NL, NV, ND, NR, NF |
| Q38N02 | 1068,10 | 4,119 | 1068,02 | 4,119 | 0,007 | 100 | NL, NV, ND, NR, NF |
| Q38N03 | 1068,29 | 4,120 | 1068,13 | 4,120 | 0,015 | 100 | NL, NV, ND, NR, NF |
| Q38N04 | 1067,48 | 4,117 | 1067,45 | 4,117 | 0,003 | 100 | NL, NV, ND, NR, NF |
| Q38N05 | 1066,87 | 4,120 | 1066,73 | 4,119 | 0,013 | 99,98 | NL, NV, ND, NR, NF |
| Q38N06 | 1065,41 | 4,121 | 1065,36 | 4,120 | 0,005 | 99,98 | NL, NV, ND, NR, NF |
| Q38N07 | 1067,09 | 4,122 | 1067,05 | 4,121 | 0,004 | 9998 | NL, NV, ND, NR, NF |
| Q38N08 | 1068,08 | 4,120 | 1068,02 | 4,120 | 0,006 | 100 | NL, NV, ND, NR, NF |

**Supplementary information: Acceptance criteria**
NL: No Leakage; NV: No Venting; ND: No Disassembly; NR: No Rupture; NF: No Fire

| 38.3.4.4 | Test T.4: Shock | | | | | | P |
|---|---|---|---|---|---|---|---|
| Sample No. | Before test | | After test | | Mass loss, (%) | Residual OCV, (%) | Result / Event |
| | Mass, (g) | OCV, (V) | Mass, (g) | OCV, (V) | | | |
| Q38N01 | 1067,29 | 4,119 | 1067,12 | 4,119 | 0,016 | 100 | NL, NV, ND, NR, NF |
| Q38N02 | 1068,02 | 4,119 | 1067,95 | 4,119 | 0,007 | 100 | NL, NV, ND, NR, NF |
| Q38N03 | 1068,13 | 4,120 | 1068,09 | 4,119 | 0,004 | 99,98 | NL, NV, ND, NR, NF |
| Q38N04 | 1067,45 | 4,117 | 1067,36 | 4,116 | 0,008 | 99,98 | NL, NV, ND, NR, NF |
| Q38N05 | 1066,73 | 4,119 | 1066,61 | 4,119 | 0,011 | 100 | NL, NV, ND, NR, NF |
| Q38N06 | 1065,36 | 4,120 | 1065,23 | 4,120 | 0,012 | 100 | NL, NV, ND, NR, NF |
| Q38N07 | 1067,05 | 4,121 | 1066,94 | 4,121 | 0,010 | 100 | NL, NV, ND, NR, NF |
| Q38N08 | 1068,02 | 4,120 | 1067,89 | 4,120 | 0,012 | 100 | NL, NV, ND, NR, NF |

**Supplementary information: Acceptance criteria**
NL: No Leakage; NV: No Venting; ND: No Disassembly; NR: No Rupture; NF: No Fire

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 38.3.4.5 | Test T.5: External short circuit | | | | P |
|---|---|---|---|---|---|
| **Sample No.:** | **Ambient, (°C)** | **OCV at start of test, (V)** | **Resistance of circuit, (Ω)** | **Max. External Temperature, (°C)** | **Result / Event** |
| Q38N01 | 57,4 | 4,119 | - | 89,8 | Not exceed 170°C, ND, NR, NF |
| Q38N02 | 57,3 | 4,119 | - | 83,0 | Not exceed 170°C, ND, NR, NF |
| Q38N03 | 58,3 | 4,119 | - | 82,5 | Not exceed 170°C, ND, NR, NF |
| Q38N04 | 57,4 | 4,116 | - | 79,6 | Not exceed 170°C, ND, NR, NF |
| Q38N05 | 58,1 | 4,119 | - | 79,8 | Not exceed 170°C, ND, NR, NF |
| Q38N06 | 56,8 | 4,120 | - | 81,0 | Not exceed 170°C, ND, NR, NF |
| Q38N07 | 57,3 | 4,121 | - | 82,8 | Not exceed 170°C, ND, NR, NF |
| Q38N08 | 56,7 | 4,120 | - | 80,5 | Not exceed 170°C, ND, NR, NF |

**Supplementary information: Acceptance criteria**

Not exceed 170°C; ND: No Disassembly; NR: No Rupture; NF: No Fire

Note: The protective device of batteries was operated during the test.

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 38.3.4.6 | Test T.6: Impact (Cell) | | | P |
|---|---|---|---|---|
| **Sample No.:** | **Ambient, (°C)** | **Observed duration, (h)** | **Max. External Temperature, (°C)** | **Result / Event** |
| Q38N09 | 21,6 | 6 | 120,4 | Not exceed 170°C, ND, NR, NF |
| Q38N10 | 23,7 | 6 | 122,9 | Not exceed 170°C, ND, NR, NF |
| Q38N11 | 24,3 | 6 | 117,6 | Not exceed 170°C, ND, NR, NF |
| Q38N12 | 23,8 | 6 | 118,8 | Not exceed 170°C, ND, NR, NF |
| Q38N13 | 23,7 | 6 | 117,6 | Not exceed 170°C, ND, NR, NF |
| Q38N14 | 23,7 | 6 | 112,2 | Not exceed 170°C, ND, NR, NF |
| Q38N15 | 24,3 | 6 | 122,1 | Not exceed 170°C, ND, NR, NF |
| Q38N16 | 20,9 | 6 | 120,4 | Not exceed 170°C, ND, NR, NF |
| Q38N17 | 23,5 | 6 | 127,2 | Not exceed 170°C, ND, NR, NF |
| Q38N18 | 24,8 | 6 | 123,7 | Not exceed 170°C, ND, NR, NF |
| **Supplementary information: Acceptance criteria**<br>Not exceed 170°C; ND: No Disassembly; NR: No Rupture; NF: No Fire | | | | |

| 38.3.4.6 | Test T.6: Crush (Cell) | | | NA |
|---|---|---|---|---|
| **Sample No.:** | **Ambient, (°C)** | **OCV at start of test, (V)** | **Max. External Temperature, (°C)** | **Result / Event** |
| - | - | - | - | - |
| **Supplementary information: Acceptance criteria**<br>Not exceed 170°C; ND: No Disassembly; NR: No Rupture; NF: No Fire | | | | |

| UN 38.3 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 38.3.4.7 | Test T.7: Overcharge | | | | NA |
|---|---|---|---|---|---|
| **Sample No.:** | **Ambient, (°C)** | **Charge current, (A)** | **Max. voltage of the test, (V)** | **Test duration, (h)** | **Result / Event** |
| - | - | - | - | - | - |
| **Supplementary information: Acceptance criteria**<br>ND: No Disassembly; NF: No Fire | | | | | |

| 38.3.4.8 | Test T.8: Forced discharge | | P |
|---|---|---|---|
| **Sample No.:** | **Result / Event** | **Sample No.:** | **Result / Event** |
| Q38N19 | ND, NF | Q38N29 | ND, NF |
| Q38N20 | ND, NF | Q38N30 | ND, NF |
| Q38N21 | ND, NF | Q38N31 | ND, NF |
| Q38N22 | ND, NF | Q38N32 | ND, NF |
| Q38N23 | ND, NF | Q38N33 | ND, NF |
| Q38N24 | ND, NF | Q38N34 | ND, NF |
| Q38N25 | ND, NF | Q38N35 | ND, NF |
| Q38N26 | ND, NF | Q38N36 | ND, NF |
| Q38N27 | ND, NF | Q38N37 | ND, NF |
| Q38N28 | ND, NF | Q38N38 | ND, NF |
| **Supplementary information: Acceptance criteria**<br>ND: No Disassembly; NF: No Fire | | | |