Ref. Certif. No.

JPTUV-125461

IEC SYSTEM FOR MUTUAL RECOGNITION OF TEST CERTIFICATES FOR ELECTRICAL EQUIPMENT (IECEE) CB SCHEME

# CB TEST CERTIFICATE

| | |
|---|---|
| Product | Rechargeable LiFePO4 Battery |
| Name and address of the applicant | Techno-Innov<br>42 impasse de la Combe du Bois,<br>01150 Blyes, France |
| Name and address of the manufacturer | Spard New Energy Co., Ltd<br>One of the workshops at No.10,<br>Yuyi Road, South China modern traditional chinese medicine City, Nanlang Town, Zhongshan City, Guangdong, P.R. China |
| Name and address of the factory | Spard New Energy Co., Ltd<br>One of the workshops at No.10,<br>Yuyi Road, South China modern traditional chinese medicine City, Nanlang Town, Zhongshan City, Guangdong, P.R. China |
| Ratings and principal characteristics | 12.8V, 6400mAh, 81.92Wh |
| Trademark (if any) | |
| Customer's Testing Facility (CTF) Stage used | N/A |
| Model / Type Ref. | YT26650F |
| Additional information (if necessary may also be reported on page 2) | |
| A sample of the product was tested and found to be in conformity with | IEC 62133-2:2017<br>See Test Report for National Differences |
| As shown in the Test Report Ref. No. which forms part of this Certificate | CN21H9KD 001 |

This CB Test Certificate is issued by the National Certification Body

TÜVRheinland®

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Date: 2021-07-27

Signature: A. Chen

10/0861 CB 06/20v9rk

Test Report issued under the responsibility of:

TÜVRheinland®

# TEST REPORT
# IEC 62133-2
# Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems

| | |
|---|---|
| **Report Number. ..... :** | **CN21H9KD 001** |
| **Date of issue ..... :** | 2021-07-26 |
| **Total number of pages ..... :** | 24 pages |
| **Name of Testing Laboratory preparing the Report ..... :** | **Guangzhou MCM Certification & Testing Co., Ltd.** |
| **Applicant's name ..... :** | **Techno-Innov** |
| **Address ..... :** | 42 impasse de la Combe du Bois, 01150 Blyes, France |
| **Test specification:** | |
| **Standard ..... :** | IEC 62133-2: 2017 |
| **Test procedure ..... :** | CB Scheme |
| **Non-standard test method ..... :** | N/A |
| **Test Report Form No. ..... :** | IEC62133_2A |
| **Test Report Form(s) Originator .... :** | DEKRA |
| **Master TRF ..... :** | Dated 2017-08-10 |



If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

**This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.**

**General disclaimer:**

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

| | |
|---|---|
| **Test item description** ..... : | Rechargeable LiFePO4 Battery |
| **Trade Mark** ..... : | N/A |
| **Manufacturer**..... : | **Spard New Energy Co., Ltd**<br>One of the workshops at No.10, Yuyi Road, South China modern traditional chinese medicine City, Nanlang Town, Zhongshan City, Guangdong, P.R. China |
| **Model/Type reference** ..... : | YT26650F |
| **Ratings** ..... : | 12.8V, 6400mAh, 81.92Wh |

| | | | |
|---|---|---|---|
| **Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):** | | | |
| ☒ | **CB Testing Laboratory:** | Guangzhou MCM Certification & Testing Co., Ltd. | |
| **Testing location/ address** ..... : | | 1 F No.13, Zhong San Section, Shi Guang Road, Zhong Cun Street, Panyu District, Guangzhou, Guangdong China | |
| **Tested by (name, function, signature)** ..... : | | Xishan Cen (Engineer) | Xishan Cen |
| **Approved by (name, function, signature)**.. : | | Liang Hongcheng (Reviewer) | Liangrongcheng |
| ☐ | **Testing procedure: CTF Stage 1:** | | |
| **Testing location/ address** ..... : | | | |
| **Tested by (name, function, signature)** ..... : | | | |
| **Approved by (name, function, signature)**.. : | | | |
| ☐ | **Testing procedure: CTF Stage 2:** | | |
| **Testing location/ address** ..... : | | | |
| **Tested by (name + signature)** ..... : | | | |
| **Witnessed by (name, function, signature)**. : | | | |
| **Approved by (name, function, signature)**.. : | | | |
| ☐ | **Testing procedure: CTF Stage 3:** | | |
| ☐ | **Testing procedure: CTF Stage 4:** | | |
| **Testing location/ address** ..... : | | | |
| **Tested by (name, function, signature)** ..... : | | | |
| **Witnessed by (name, function, signature)**. : | | | |
| **Approved by (name, function, signature)**.. : | | | |
| **Supervised by (name, function, signature)** : | | | |

**List of Attachments (including a total number of pages in each attachment):**

- Attachment 1: National differences (3 pages)
- Attachment 2: Photo Documentation (3 pages)

**Summary of testing:**

| **Tests performed (name of test and test clause):** | **Testing location:** |
|---|---|
| cl.5.6.2 Design recommendation;<br>cl.7.1 Charging procedure for test purposes (for Cells and Batteries);<br>cl.7.2.1 Continuous charging at constant voltage (cells);<br>cl.7.2.2 Moulded case stress at high ambient temperature (Batteries);<br>cl.7.3.1 External short circuit (cells);<br>cl.7.3.2 External short circuit (batteries);<br>cl.7.3.3 Free fall (cells and batteries);<br>cl.7.3.4 Thermal abuse (cells);<br>cl.7.3.5 Crush (cells);<br>cl.7.3.6 Over-charging of battery;<br>cl.7.3.7 Forced discharge (cells);<br>cl.7.3.8 Mechanical tests (batteries);<br>cl. 7.3.9 Design evaluation – Forced internal short-circuit (cells);<br><br>Tests are made with the number of cells and batteries specified in IEC 62133-2: 2017 Table 1. | **Guangzhou MCM Certification & Testing Co., Ltd.**<br>1 F No.13, Zhong San Section, Shi Guang Road, Zhong Cun Street, Panyu District, Guangzhou, Guangdong China |

**Summary of compliance with National Differences (List of countries addressed):**

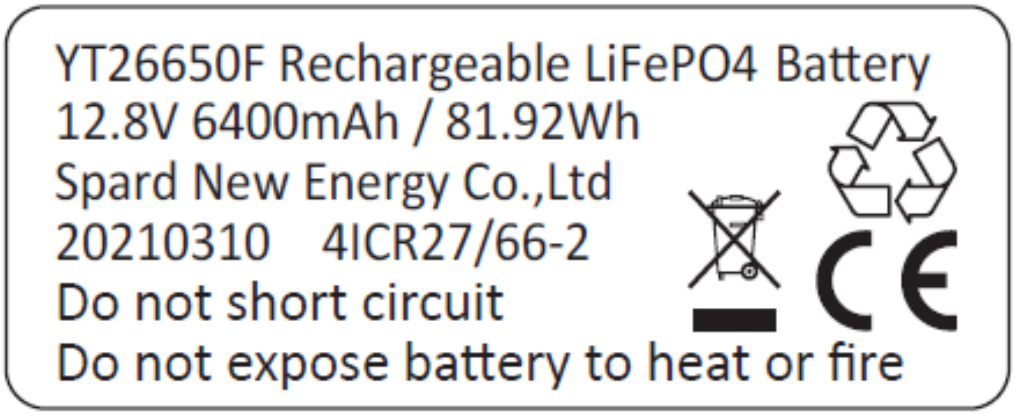
KR

KR=Republic of Korea

☒ **The product fulfils the requirements of <u>EN 62133-2: 2017</u>**

**Copy of marking plate:**

**The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.**



| | |
|---|---|
| **Test item particulars.....:** | |
| **Classification of installation and use.....:** | To be defined in final product |
| **Supply Connection.....:** | Customized connector |
| **Recommend charging method declared by the manufacturer.....:** | Charging the battery with 1280mA constant current until 14.6V, then constant voltage until charge current reduces to 64mA at ambient 20°C±5°C. |
| **Discharge current (0,2 It A) .....:** | 1280mA |
| **Specified final voltage.....:** | 10.0V |
| **Upper limit charging voltage per cell.....:** | 3.65V |
| **Maximum charging current.....:** | 3200mA |
| **Charging temperature upper limit.....:** | 45°C |
| **Charging temperature lower limit.....:** | 0°C |
| **Polymer cell electrolyte type.....:** | ☐ gel polymer ☐ solid polymer ☒ N/A |
| **Possible test case verdicts:** | |
| **- test case does not apply to the test object.....:** | N/A |
| **- test object does meet the requirement.....:** | P (Pass) |
| **- test object does not meet the requirement.....:** | F (Fail) |
| **Testing.....:** | |
| **Date of receipt of test item .....:** | 2021-06-07 |
| **Date (s) of performance of tests.....:** | 2021-06-07 to 2021-06-18 |

**General remarks:**

"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

**Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**

**Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:**

| | |
|---|---|
| The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... : | ☐ **Yes**<br>☒ **Not applicable** |

**When differences exist; they shall be identified in the General product information section.**

**Name and address of factory (ies) ..... :** Same as manufacturer

**General product information and other remarks:**

This battery is constructed with eight lithium-ion cells (4S2P) without overcharge, over-discharge, over current or short-circuits proof circuit. The manufacturer declares the protective circuit will be installed in end product.

The main features of the cell are shown as below (clause 7.1.1):

| Model | Rated capacity | Nominal voltage | Nominal Charge Current | Nominal Discharge Current | Maximum Charge Current | Maximum Discharge Current | Maximum Charge Voltage | Cut-off Voltage |
|---|---|---|---|---|---|---|---|---|
| YT26650F (Cell) | 3200mAh | 3.2V | 640mA | 640mA | 3200mA | 3200mA | 3.65V | 2.5V |

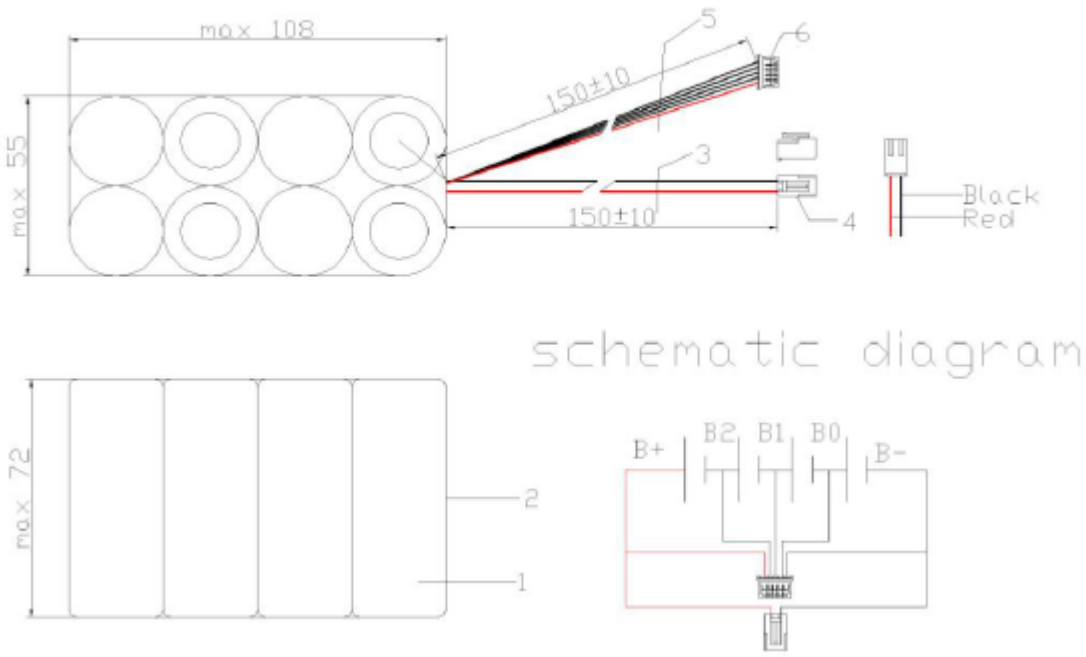
The main features of the cell are shown as below (clause 7.1.2):

| Model | Upper limit charge voltage | Taper-off current | Lower charge temperature | Upper charge temperature |
|---|---|---|---|---|
| YT26650F (Cell) | 3.65V | 160mA | 0°C | 55°C |

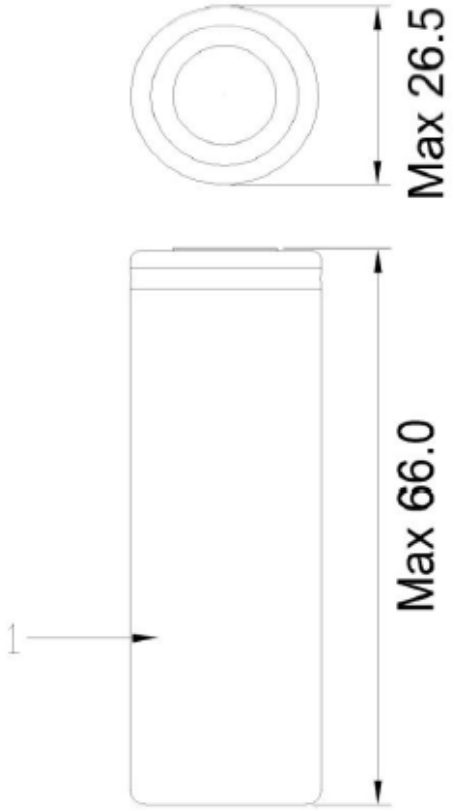
The main features of the battery pack are shown as below (clause 7.1.1):

| Model | Rated capacity | Nominal voltage | Nominal Charge Current | Nominal Discharge Current | Maximum Charge Current | Maximum Discharge Current | Maximum Charge Voltage | Cut-off Voltage |
|---|---|---|---|---|---|---|---|---|
| YT26650F | 6400mAh | 12.8V | 1280mA | 1280mA | 3200mA | 6000mA | 14.6V | 10.0V |

Construction Unit(mm):




Battery pack




Cell

Circuit diagram:

None protective circuit exists for the battery.

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **4** | **PARAMETER MEASUREMENT TOLERANCES** | | P |
| | Parameter measurement tolerances | | P |
| **5** | **GENERAL SAFETY CONSIDERATIONS** | | P |
| **5.1** | **General** | | P |
| | Cells and batteries so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse | | P |
| **5.2** | **Insulation and wiring** | | P |
| | The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ | No metal case exists. | N/A |
| | Insulation resistance (MΩ) ..... : | | — |
| | Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements | Complied. | P |
| | Orientation of wiring maintains adequate clearance and creepage distances between conductors | Complied. | P |
| | Mechanical integrity of internal connections accommodates reasonably foreseeable misuse | Complied. | P |
| **5.3** | **Venting** | | P |
| | Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition | Explosion-proof safety valve for venting exists. | P |
| | Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief | | N/A |
| **5.4** | **Temperature, voltage and current management** | | P |
| | Batteries are designed such that abnormal temperature rise conditions are prevented | | N/A |
| | Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer | | N/A |
| | Batteries are provided with specifications and charging instructions for equipment manufacturers so that specified chargers are designed to maintain charging within the temperature, voltage and current limits specified | The charging limits specified in the specification. | P |
| **5.5** | **Terminal contacts** | Complied. | P |
| | The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance | | P |
| | Terminal contacts are arranged to minimize the risk of short-circuit | | P |
| **5.6** | **Assembly of cells into batteries** | | P |
| **5.6.1** | General | | N/A |
| | Each battery have an independent control and protection for current, voltage, temperature and any other parameter required for safety and to maintain the cells within their operating region | None protective circuit exists for the battery. | N/A |
| | This protection may be provided external to the battery such as within the charger or the end devices | | N/A |
| | If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation | | N/A |
| | If there is more than one battery housed in a single battery case, each battery have protective circuitry that can maintain the cells within their operating regions | | N/A |
| | Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly | Current, voltage and temperature limits specified by cell manufacturer. | P |
| | Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer | | N/A |
| | Protective circuit components added as appropriate and consideration given to the end-device application | To be evaluated in final system. | N/A |
| | The manufacturer of the battery provide a safety analysis of the battery safety circuitry with a test report including a fault analysis of the protection circuit under both charging and discharging conditions confirming the compliance | | N/A |
| 5.6.2 | Design recommendation | | P |
| | For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2 | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks | Battery charging voltage: 3.65V/cell, not exceed 3.65V as cell specified in Clause 7.1.2, Table 2. | P |
| | For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that charging is stopped when the upper limit of the charging voltage is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks | | N/A |
| | For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an overcharge protection | | N/A |
| | For batteries consisting of series-connected cells or cell blocks, cells have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer | | P |
| | It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage | Final voltage of battery: 2.5V/cell, not exceed the final voltage specified by cell manufacturer. | P |
| | For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system | | N/A |
| 5.6.3 | Mechanical protection for cells and components of batteries | | P |
| | Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse | | N/A |
| | The mechanical protection can be provided by the battery case or it can be provided by the end product enclosure for those batteries intended for building into an end product | Build-in batteries, mechanical protection for cells should be provided by end product. | N/A |
| | The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer | To be evaluated in final system. | N/A |
| | For batteries intended for building into a portable end product, testing with the battery installed within the end product considered when conducting mechanical tests | | N/A |
| **5.7** | **Quality plan** | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery | Complied.<br>ISO 9001: 2015 certificate provide. | P |
| **5.8** | **Battery safety components** | | P |
| | According annex F | See TABLE: Critical components information. | P |

| | | | |
|---|---|---|---|
| **6** | **TYPE TEST AND SAMPLE SIZE** | | P |
| | Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old | | P |
| | Coin cells with resistance ≤ 3 Ω (measured according annex D) are tested according table 1 | Not coin cells. | N/A |
| | Unless otherwise specified, tests are carried out in an ambient temperature of 20 °C ± 5 °C | | P |
| | The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and overdischarge protection | | N/A |
| | When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test | See clause 7.3.2. | N/A |

| | | | |
|---|---|---|---|
| **7** | **SPECIFIC REQUIREMENTS AND TESTS** | | P |
| **7.1** | **Charging procedure for test purposes** | Complied. | P |
| 7.1.1 | First procedure | | P |
| | This charging procedure applies to subclauses other than those specified in 7.1.2 | | P |
| | Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of 20 °C ± 5 °C, using the method declared by the manufacturer | See page 5. | P |
| | Prior to charging, the battery have been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage | See page 5. | P |
| 7.1.2 | Second procedure | | P |
| | This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9 | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method | Charge temperature specified by manufacturer: 0-55°C.<br>60°C used for upper limit test temperature.<br>-5°C used for lower limit test temperature. | P |
| **7.2** | **Intended use** | | P |
| 7.2.1 | Continuous charging at constant voltage (cells) | Tested complied. | P |
| | Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer | Charging for 7days with 0.64A and 3.65V. | P |
| | Results: No fire. No explosion. No leakage.....: | (See appended table 7.2.1) | P |
| 7.2.2 | Case stress at high ambient temperature (battery) | Tested as client requested. | P |
| | Oven temperature (°C).....: | 70°C | — |
| | Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells | No physical distortion of the battery casing resulting in exposure if internal components. | P |
| **7.3** | **Reasonably foreseeable misuse** | | P |
| 7.3.1 | External short-circuit (cell) | Tested complied. | P |
| | The cells were tested until one of the following occurred: | | P |
| | - 24 hours elapsed; or | | N/A |
| | - The case temperature declined by 20 % of the maximum temperature rise | | P |
| | Results: No fire. No explosion.....: | (See appended table 7.3.1) | P |
| 7.3.2 | External short-circuit (battery) | Tested complied. | P |
| | The batteries were tested until one of the following occurred: | | P |
| | - 24 hours elapsed; or | | N/A |
| | - The case temperature declined by 20 % of the maximum temperature rise | | P |
| | In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition | | N/A |
| | A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test | | N/A |
| | A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Results: No fire. No explosion..... : | (See appended table 7.3.2) | P |
| 7.3.3 | Free fall | Tested complied. | P |
| | Results: No fire. No explosion | No fire. No explosion. | P |
| 7.3.4 | Thermal abuse (cells) | Tested complied. | P |
| | Oven temperature (°C) ..... : | 130°C | — |
| | Results: No fire. No explosion | No fire. No explosion. | P |
| 7.3.5 | Crush (cells) | Tested complied. | P |
| | The crushing force was released upon: | | P |
| | - The maximum force of 13 kN ± 0,78 kN has been applied; or | | P |
| | - An abrupt voltage drop of one-third of the original voltage has been obtained | | N/A |
| | Results: No fire. No explosion..... : | (See appended table 7.3.5) | P |
| 7.3.6 | Over-charging of battery | Tested complied. | P |
| | The supply voltage which is: | | P |
| | - 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or | | N/A |
| | - 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and | 17.52V applied. | P |
| | - Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached | | P |
| | Test was continued until the temperature of the outer casing: | | P |
| | - Reached steady state conditions (less than 10 °C change in 30-minute period); or | | N/A |
| | - Returned to ambient | | P |
| | Results: No fire. No explosion..... : | (See appended table 7.3.6) | P |
| 7.3.7 | Forced discharge (cells) | Tested complied. | P |
| | If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration | | N/A |
| | If the discharge voltage does not reach the negative value of upper limit charging voltage within the testing duration, the test is terminated at the end of the testing duration | | P |
| | Results: No fire. No explosion..... : | (See appended table 7.3.7) | P |
| 7.3.8 | Mechanical tests (batteries) | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 7.3.8.1 | Vibration | Tested complied. | P |
| | Results: No fire, no explosion, no rupture, no leakage or venting. ..... : | (See appended table 7.3.8.1) | P |
| 7.3.8.2 | Mechanical shock | Tested complied. | P |
| | Results: No leakage, no venting, no rupture, no explosion and no fire ..... : | (See appended table 7.3.8.2) | P |
| 7.3.9 | Design evaluation – Forced internal short-circuit (cells) | Tested complied. | P |
| | The cells complied with national requirement for ..... : | France, Japan, Republic of Korea and Switzerland. | — |
| | The pressing was stopped upon: | | P |
| | - A voltage drop of 50 mV has been detected; or | | N/A |
| | - The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached | Cylindrical cell, 800 N. | P |
| | Results: No fire ..... : | (See appended table 7.3.9) | P |
| **8** | **INFORMATION FOR SAFETY** | | P |
| **8.1** | **General** | | P |
| | Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products | Information for safety mentioned in manufacturer's specifications. | P |
| | Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards | Information for safety mentioned in manufacturer's specifications. | P |
| | Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product | | N/A |
| | As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user | | N/A |
| | Do not allow children to replace batteries without adult supervision | | N/A |
| **8.2** | **Small cell and battery safety information** | Not small battery. | N/A |
| | The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them: | | N/A |
| | - Keep small cells and batteries which are considered swallowable out of the reach of children | | N/A |
| | - Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - In case of ingestion of a cell or battery, seek medical assistance promptly | | N/A |
| **9** | **MARKING** | | P |
| **9.1** | **Cell marking** | The final product is battery. | N/A |
| | Cells marked as specified in IEC 61960, except coin cells | | N/A |
| | Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity | | N/A |
| | By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked | | N/A |
| **9.2** | **Battery marking** | | P |
| | Batteries marked as specified in IEC 61960, except for coin batteries | See marking plate on page 4. | P |
| | Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement | | P |
| | Terminals have clear polarity marking on the external surface of the battery | | N/A |
| | Batteries with keyed external connectors designed for connection to specific end products need not be marked with polarity markings if the design of the external connector prevents reverse polarity connections | Special designed connector used. Also the connector construction designed wrong polarity insert prevented. | P |
| **9.3** | **Caution for ingestion of small cells and batteries** | Not small battery. | N/A |
| | Coin cells and batteries identified as small batteries according to 8.2 include a caution statement regarding the hazards of ingestion in accordance with 8.2 | | N/A |
| | When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package | | N/A |
| **9.4** | **Other information** | | P |
| | Storage and disposal instructions | Information for storage and disposal instructions mentioned in manufacturer's specifications. | P |
| | Recommended charging instructions | Information for recommended charging instructions mentioned in manufacturer's specifications. | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **10** | **PACKAGING AND TRANSPORT** | | P |
| | Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3 | Not coin cells. | N/A |
| | The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants | | P |
| **ANNEX A** | **CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE** | | P |
| **A.1** | **General** | | P |
| **A.2** | **Safety of lithium ion secondary battery** | Complied. | P |
| **A.3** | **Consideration on charging voltage** | Complied. | P |
| A.3.1 | General | | P |
| A.3.2 | Upper limit charging voltage | 3.65V | P |
| A.3.2.1 | General | | P |
| A.3.2.2 | Explanation of safety viewpoint | | N/A |
| A.3.2.3 | Safety requirements, when different upper limit charging voltage is applied | 3.65V applied. | N/A |
| **A.4** | **Consideration of temperature and charging current** | | P |
| A.4.1 | General | | P |
| A.4.2 | Recommended temperature range | See A.4.2.2. | P |
| A.4.2.1 | General | | P |
| A.4.2.2 | Safety consideration when a different recommended temperature range is applied | Charging temperature declared by client is: 0-55°C. | P |
| A.4.3 | High temperature range | | P |
| A.4.3.1 | General | | P |
| A.4.3.2 | Explanation of safety viewpoint | | P |
| A.4.3.3 | Safety considerations when specifying charging conditions in the high temperature range | | P |
| A.4.3.4 | Safety considerations when specifying a new upper limit in the high temperature range | 60°C applied. | P |
| A.4.4 | Low temperature range | | P |
| A.4.4.1 | General | | P |
| A.4.4.2 | Explanation of safety viewpoint | | P |
| A.4.4.3 | Safety considerations, when specifying charging conditions in the low temperature range | | P |
| A.4.4.4 | Safety considerations when specifying a new lower limit in the low temperature range | -5°C applied. | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| A.4.5 | Scope of the application of charging current | | P |
| A.4.6 | Consideration of discharge | | P |
| A.4.6.1 | General | | P |
| A.4.6.2 | Final discharge voltage and explanation of safety viewpoint | 2.5V specified by cell manufacturer. | P |
| A.4.6.3 | Discharge current and temperature range | | P |
| A.4.6.4 | Scope of application of the discharging current | | P |
| **A.5** | **Sample preparation** | | P |
| A.5.1 | General | | P |
| A.5.2 | Insertion procedure for nickel particle to generate internal short | | P |
| A.5.3 | Disassembly of charged cell | | P |
| A.5.4 | Shape of nickel particle | | P |
| A.5.5 | Insertion of nickel particle in cylindrical cell | | P |
| A.5.5.1 | Insertion of nickel particle in winding core | | P |
| A.5.5.2 | Marking the position of the nickel particle on both ends of the winding core of the separator | | P |
| A.5.6 | Insertion of nickel particle in prismatic cell | | N/A |
| **A.6** | **Experimental procedure of the forced internal short-circuit test** | | P |
| A.6.1 | Material and tools for preparation of nickel particle | | P |
| A.6.2 | Example of a nickel particle preparation procedure | | P |
| A.6.3 | Positioning (or placement) of a nickel particle | | P |
| A.6.4 | Damaged separator precaution | | P |
| A.6.5 | Caution for rewinding separator and electrode | | P |
| A.6.6 | Insulation film for preventing short-circuit | | P |
| A.6.7 | Caution when disassembling a cell | | P |
| A.6.8 | Protective equipment for safety | | P |
| A.6.9 | Caution in the case of fire during disassembling | | P |
| A.6.10 | Caution for the disassembling process and pressing the electrode core | | P |
| A.6.11 | Recommended specifications for the pressing device | | P |
| **ANNEX B** | **RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS** | | N/A |
| **ANNEX C** | **RECOMMENDATIONS TO THE END-USERS** | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **ANNEX D** | **MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS** | | N/A |
| **D.1** | **General** | Not coin cells. | N/A |
| **D.2** | **Method** | | N/A |
| | A sample size of three coin cells is required for this measurement..... : | (See appended table D.2) | N/A |
| | Coin cells with an internal resistance of less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1 | | N/A |
| | Coin cells with an internal resistance greater than 3 Ω require no further testing | | N/A |
| **ANNEX E** | **PACKAGING AND TRANSPORT** | | N/A |
| **ANNEX F** | **COMPONENT STANDARDS REFERENCES** | | N/A |

| | TABLE: Critical components information | | | | P |
|---|---|---|---|---|---|
| **Object/part no.** | **Manufacturer/ trademark** | **Type/model** | **Technical data** | **Standard** | **Mark(s) of conformity [1)]** |
| Cell | Spard New Energy Co., Ltd | YT26650F(Cell) | 3.2V, 3200mAh | IEC 62133-2: 2017 | Tested with appliance |
| -Electrolyte | Jiujiang Tianci Materials Technology Co., Ltd | 180919487 | Composition: $LiPF_6$, Conductivity: 10.3±0.5 mS/cm | -- | -- |
| -Separator | Ran Xu, Shenzhen Electronics Co.,Ltd. | 60mm*20μm | Material: PP, 20μm*60.1mm , Shutdown temperature: 135-140°C | -- | -- |
| -Negative electrode | Shanshan, Shanghai Tech Co., Ltd | FSNC-1-140628 | Graphite, Capacity: 340.1 mAh/g, Tap Density: 1.10±0.1 g/cm3<br>D10: 3-10<br>D50: 10-25<br>D90: 25-40 | -- | -- |
| -Positive electrode | Heter Electronics Group Co., Ltd | XCL-CPQG-201406-20-01 | $LiFePO_4$, Capacity: 138.5 mAh/g(1C), Tap Density≥1.2 g/cm3<br>D10: 3-10<br>D50: 10-20<br>D90: 20-35 | -- | -- |
| Connector 1 | ZHEJIANG LIANHE ELECTRONIC CO LTD | VH-2P | -25~85°C, 2pins | UL 1977 | UL E364711 |
| Connector 2 | ZHEJIANG LIANHE ELECTRONIC CO LTD | PH-5P | -25~85°C, 5pins | UL 1977 | UL E364711 |
| Lead wire 1 | DONGGUAN DANYANG ELECTRONIC WIRE CO LTD | 1007 | 18AWG, 80°C, 300Vac | UL 758 | UL E332522 |
| Lead wire 2 | SHENZHEN RUNQI WIRE CO LTD | 1007 | 24AWG, 80°C, 300Vac | UL 758 | UL E495994 |

**Supplementary information:**

[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.

| 7.2.1 | TABLE: Continuous charging at constant voltage (cells) | | | P |
|---|---|---|---|---|
| **Sample no.** | **Recommended charging voltage Vc (Vdc)** | **Recommended charging current $I_{rec}$ (A)** | **OCV before test (Vdc)** | **Results** |
| Cell #1 | 3.65 | 0.64 | 3.52 | P |
| Cell #2 | 3.65 | 0.64 | 3.54 | P |
| Cell #3 | 3.65 | 0.64 | 3.54 | P |
| Cell #4 | 3.65 | 0.64 | 3.53 | P |
| Cell #5 | 3.65 | 0.64 | 3.54 | P |
| **Supplementary information:**<br>- No fire or explosion<br>- No leakage | | | | |

| 7.3.1 | TABLE: External short-circuit (cell) | | | | P |
|---|---|---|---|---|---|
| **Sample no.** | **Ambient T (°C)** | **OCV before test (Vdc)** | **Resistance of circuit (mΩ)** | **Maximum case temperature ~~rise ΔT~~ °C** | **Results** |
| **Samples charged at charging temperature upper limit (60°C)** | | | | | |
| Cell #6 | 55.7 | 3.44 | 85.9 | 76.5 | P |
| Cell #7 | 55.7 | 3.43 | 82.3 | 72.5 | P |
| Cell #8 | 55.7 | 3.44 | 86.6 | 82.2 | P |
| Cell #9 | 55.7 | 3.43 | 84.1 | 81.8 | P |
| Cell #10 | 55.7 | 3.43 | 80.8 | 80.6 | P |
| **Samples charged at charging temperature lower limit (-5°C)** | | | | | |
| Cell #11 | 56.3 | 3.34 | 87.5 | 77.0 | P |
| Cell #12 | 56.3 | 3.34 | 85.2 | 81.6 | P |
| Cell #13 | 56.3 | 3.35 | 81.9 | 81.8 | P |
| Cell #14 | 56.3 | 3.36 | 84.3 | 84.6 | P |
| Cell #15 | 56.3 | 3.34 | 88.2 | 78.8 | P |
| **Supplementary information:**<br>- No fire or explosion | | | | | |

| 7.3.2 | TABLE: External short-circuit (battery) | | | | | P |
|---|---|---|---|---|---|---|
| **Sample no.** | **Ambient T (°C)** | **OCV before test (Vdc)** | **Resistance of circuit (mΩ)** | **Maximum case temperature ~~rise ΔT~~ (°C)** | **Component single fault condition** | **Results** |
| Battery #4 | 22.6 | 13.43 | 86.8 | 78.8 | -- | P |
| Battery #5 | 22.6 | 13.42 | 84.1 | 78.8 | -- | P |
| Battery #6 | 22.6 | 13.43 | 82.9 | 74.1 | -- | P |
| Battery #7 | 22.6 | 13.41 | 85.3 | 76.6 | -- | P |
| Battery #8 | 22.6 | 13.41 | 80.8 | 81.2 | -- | P |
| **Supplementary information:**<br>- No fire or explosion<br>- No leakage<br>Note: S-C: short-circuit | | | | | | |

| 7.3.5 | TABLE: Crush (cells) | | | P |
|---|---|---|---|---|
| **Sample no.** | **OCV before test (Vdc)** | **OCV at removal of crushing force (Vdc)** | **Maximum force applied to the cell during crush (kN)** | **Results** |
| **Samples charged at charging temperature upper limit (60°C)** | | | | |
| C29# | 3.43 | 3.43 | 13.16 | P |
| C30# | 3.45 | 3.44 | 13.09 | P |
| C31# | 3.44 | 3.44 | 13.22 | P |
| C32# | 3.44 | 3.44 | 13.25 | P |
| C33# | 3.44 | 3.43 | 13.15 | P |
| **Samples charged at charging temperature lower limit (-5°C)** | | | | |
| C34# | 3.33 | 3.33 | 13.11 | P |
| C35# | 3.34 | 3.34 | 13.18 | P |
| C36# | 3.34 | 3.33 | 13.16 | P |
| C37# | 3.35 | 3.34 | 13.24 | P |
| C38# | 3.34 | 3.34 | 13.20 | P |
| **Supplementary information:**<br>- No fire or explosion | | | | |

| 7.3.6 | TABLE: Over-charging of battery | | | | P |
|---|---|---|---|---|---|
| Constant charging current (A) .....: | | 12.8 | | | — |
| Supply voltage (Vdc) .....: | | 17.52 | | | — |
| **Sample no.** | **OCV before charging (Vdc)** | **Total charging time (minute)** | **Maximum outer case temperature (°C)** | **Results** | |
| Battery #12 | 12.21 | 120 | 47.3 | P | |
| Battery #13 | 12.28 | 120 | 54.1 | P | |
| Battery #14 | 12.23 | 120 | 48.9 | P | |
| Battery #15 | 12.30 | 120 | 51.6 | P | |
| Battery #16 | 12.25 | 120 | 49.4 | P | |
| **Supplementary information:**<br>- No fire or explosion | | | | | |

| 7.3.7 | TABLE: Forced discharge (cells) | | | P |
|---|---|---|---|---|
| **Sample no.** | **OCV before application of reverse charge (Vdc)** | **Measured reverse charge $I_t$ (A)** | **Lower limit discharge voltage (Vdc)** | **Results** |
| C39# | 3.09 | 3.2 | 2.5 | P |
| C40# | 3.10 | 3.2 | 2.5 | P |
| C41# | 3.09 | 3.2 | 2.5 | P |
| C42# | 3.12 | 3.2 | 2.5 | P |
| C43# | 3.12 | 3.2 | 2.5 | P |
| **Supplementary information:**<br>- No fire or explosion | | | | |

| 7.3.8.1 | TABLE: Vibration | | | | P |
|---|---|---|---|---|---|
| **Sample no.** | **OCV before test (Vdc)** | **OCV after test (Vdc)** | **Mass before test (g)** | **Mass after test (g)** | **Results** |
| Battery #17 | 13.43 | 13.42 | 697.45 | 697.42 | P |
| Battery #18 | 13.42 | 13.42 | 698.07 | 698.04 | P |
| Battery #19 | 13.43 | 13.43 | 697.73 | 697.71 | P |
| **Supplementary information:**<br>- No fire or explosion<br>- No rupture<br>- No leakage<br>- No venting | | | | | |

| 7.3.8.2 | TABLE: Mechanical shock | | | | P |
|---|---|---|---|---|---|
| **Sample no.** | **OCV before test (Vdc)** | **OCV after test (Vdc)** | **Mass before test (g)** | **Mass after test (g)** | **Results** |
| Battery #20 | 13.42 | 13.42 | 697.38 | 697.38 | P |
| Battery #21 | 13.43 | 13.43 | 698.25 | 698.25 | P |
| Battery #22 | 13.42 | 13.42 | 697.81 | 697.81 | P |

**Supplementary information:**

- No fire or explosion
- No rupture
- No leakage
- No venting

| 7.3.9 | TABLE: Forced internal short circuit (cells) | | | | P |
|---|---|---|---|---|---|
| **Sample no.** | **Chamber ambient T (°C)** | **OCV before test (Vdc)** | **Particle location [1)]** | **Maximum applied pressure (N)** | **Results** |
| **Samples charged at charging temperature upper limit (60°C)** | | | | | |
| C44# | 60 | 3.43 | 1 | 800 | P |
| C45# | 60 | 3.42 | 1 | 800 | P |
| C46# | 60 | 3.43 | 1 | 800 | P |
| C47# | 60 | 3.43 | 1 | 800 | P |
| C48# | 60 | 3.43 | 1 | 800 | P |
| **Samples charged at charging temperature lower limit (-5°C)** | | | | | |
| C49# | -5 | 3.33 | 1 | 800 | P |
| C50# | -5 | 3.34 | 1 | 800 | P |
| C51# | -5 | 3.34 | 1 | 800 | P |
| C52# | -5 | 3.33 | 1 | 800 | P |
| C53# | -5 | 3.33 | 1 | 800 | P |

**Supplementary information:**

[1)] Identify one of the following:

1: Nickel particle inserted between positive and negative (active material) coated area.

2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

- No fire

| D.2 | TABLE: Internal AC resistance for coin cells | | | N/A |
|---|---|---|---|---|
| **Sample no.** | **Ambient T (°C)** | **Store time (h)** | **Resistance Rac (Ω)** | **Results [1)]** |
| | | | | |
| | | | | |
| | | | | |

**Supplementary information:**

[1)] Coin cells with internal resistance less than or equal to 3 Ω, see test result on corresponding tables

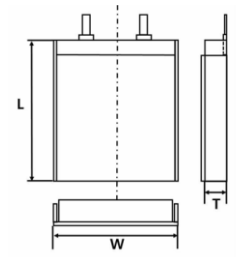
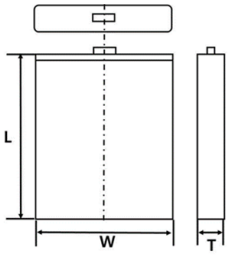
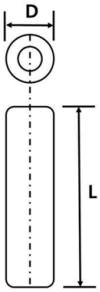
**-- End of Report --**

Attachment 1 Report No.: CN21H9KD 001

| IEC62133_2A ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **ATTACHMENT TO TEST REPORT**<br>**IEC 62133-2**<br>**(Republic of Korea) NATIONAL DIFFERENCES**<br>(Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems) | | | |
| **Differences according to** ..... : | National standard KC62133-2(2020-07) | | |
| **TRF template used: ..... :** | IECEE OD-2020-F3, Ed. 1.1 | | |
| **Attachment Form No**. ..... :<br>**Attachment Originator .....** :<br>**Master Attachment**..... : | KR_ND_IEC62133_2A<br>KTR<br>Dated 2020-09-25 | | |
|  | | | |
| | **National Differences** | | |
| **7.3.6** | **Over-charging of battery** | | P |
| *(Revision)* | ***[Add the bolded text]***<br><br>b) Test<br>The test shall be carried out in an ambient temperature of 20 °C ± 5 °C. Each test battery shall be discharged at a constant current of 0,2 It A, to a final discharge voltage specified by the manufacturer. Sample batteries shall then be charged at a constant current of 2,0 It A, using a supply voltage which is:<br>• 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or<br>• 1,2 times the upper limit charging voltage presented in Table A.1 per cell for series connected multi-cell batteries, and<br>• sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached.<br>**• In case the charging voltage specified by the manufacturer is higher than the overcharge test voltage, the maximum charging voltage specified by manufacturer should be applied with 2.0 ItA,**<br>**(e.g., quick charging power bank, etc.)** | (See appended table 7.3.6) | P |

| IEC62133_2A ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | ***[Replace to the following statement]***<br>c) Acceptance criteria<br>Overcharging exceeding to the limits specified by the manufacturer should not result in fire or explosion. | No fire. No explosion. | P |
| **Annex G** | **Definition for shape and materials of outer case for cell** | | P |
| *(Addition)* | G.1 General<br>Annex G provides definitions for shape and materials of outer case for cell<br><br>G.2 Shape of outer case for cell<br>G 2.1 Cylindrical cell<br>Cell with a cylindrical shape in which the overall height is equal to or greater than diameter.<br><br>G 2.2 Prismatic cell<br>Cell having the shape of a parallelepiped whose faces are rectangular<br><br>G.3 Materials of outer case for cell<br>G.3.1 Soft case<br>Non-metallic outer case or container for cell<br><br>G.3.2 Hard case<br>Metallic outer case or container for cell. | (Shape of outer cases)<br>☒ Cylindrical<br>☐ Prismatic<br><br>(Materials of outer cases)<br>☒ Hard<br>☐ Soft | — |
| **Annex H** | **Calculation method of the volumetric energy density for cell** | | P |
| *(Addition)* | Annex H provide a calculation method of the volumetric energy density for cell in use of smart phone, tablet, notebook.<br><br>H.1 General<br>Unless otherwise stated in the Annex E, the dimensions for calculation are based on these for cell before shipment and the volumetric energy density shall be calculated with a maximum values specified by manufacturer. If the specification for cell can't be provided a dimension for calculation, the manufacturer's other documentation shall be provided to demonstrate compliance for its calculation. | 281.3Wh / L | — |

Attachment 1 Report No.: CN21H9KD 001

| IEC62133_2A ATTACHMENT | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | H.2 Calculation Method<br>  <br><br>L : Length (max.) of cell (including terrace)<br>W : Width (max.) of cell<br>T : Thickness (max.) when shipping charge<br>(For reference, Please<br>Exclude the dimension of any tape that<br>Is attached to cell)<br>$Volumetric\ energy\ density\ (Wh/L) = \frac{Nominal\ voltage\ (V) \times Rated\ capacity\ (Ah)}{Length\ (L) \times Width\ (W)\ \times Thickness\ (T)}$<br>[H.1 – Prismatic cell using soft case]<br>  <br><br>L : Length (max.) of cell<br>W : Width (max.) of cell<br>T : Thickness when shipping charge<br>(For reference, Please<br>Exclude the dimension of any tape that<br>Is attached to cell)<br>$Volumetric\ energy\ density\ (Wh/L) = \frac{Nominal\ voltage\ (V) \times Rated\ capacity\ (Ah)}{Length\ (L) \times Width\ (W)\ \times Thickness\ (T)}$<br>[H.2 – Prismatic cell using hard case]<br>  <br><br>D : Diameter (max.) of cell<br>L : Length (max.) of cell<br>(According to shape of cell at shipping,<br>The dimension of tube for cell may be included<br>In overall dimension of cell )<br>$Volumetric\ energy\ density\ (Wh/L) = \frac{Nominal\ voltage\ (V) \times Rated\ capacity\ (Ah)}{3.14159\ \times \frac{Diameter\ (D)^2}{4} \times Length(L)}$<br>[H.3 – Cylindrical cell using hard case] | | — |

# Attachment 2 Photo Documentation



Product: Rechargeable $LiFePO_4$ Battery

Type Designation: YT26650F

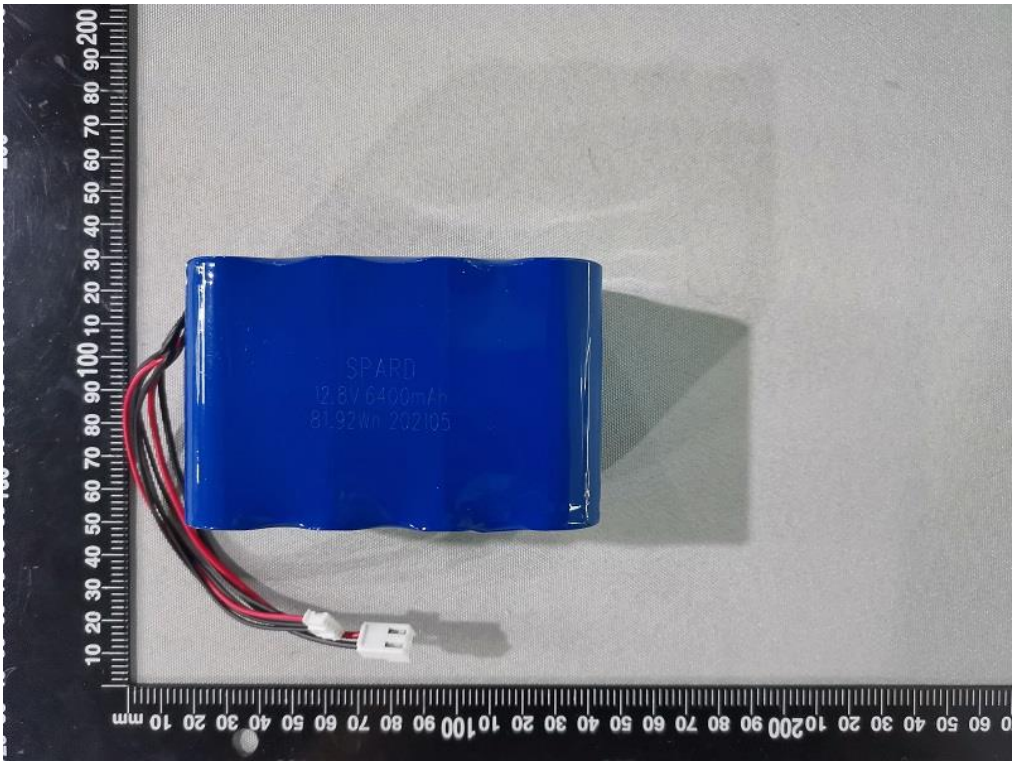



Figure 1 Front view of battery

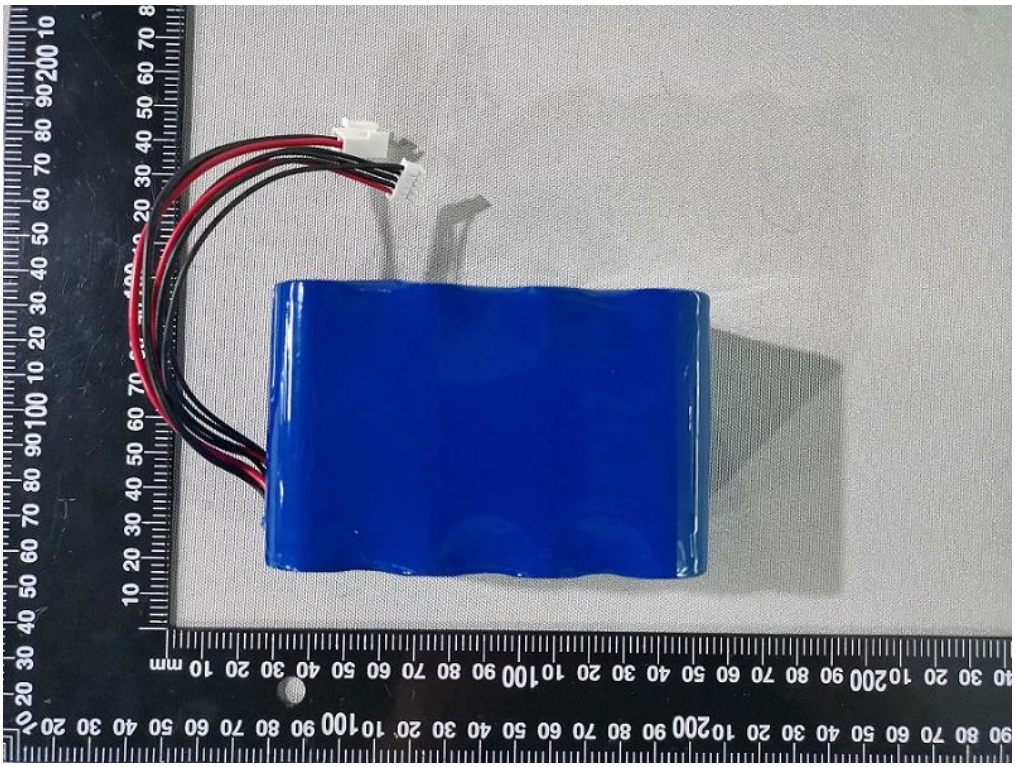


Figure 2 Back view of battery

Product: Rechargeable $LiFePO_4$ Battery

Type Designation: YT26650F

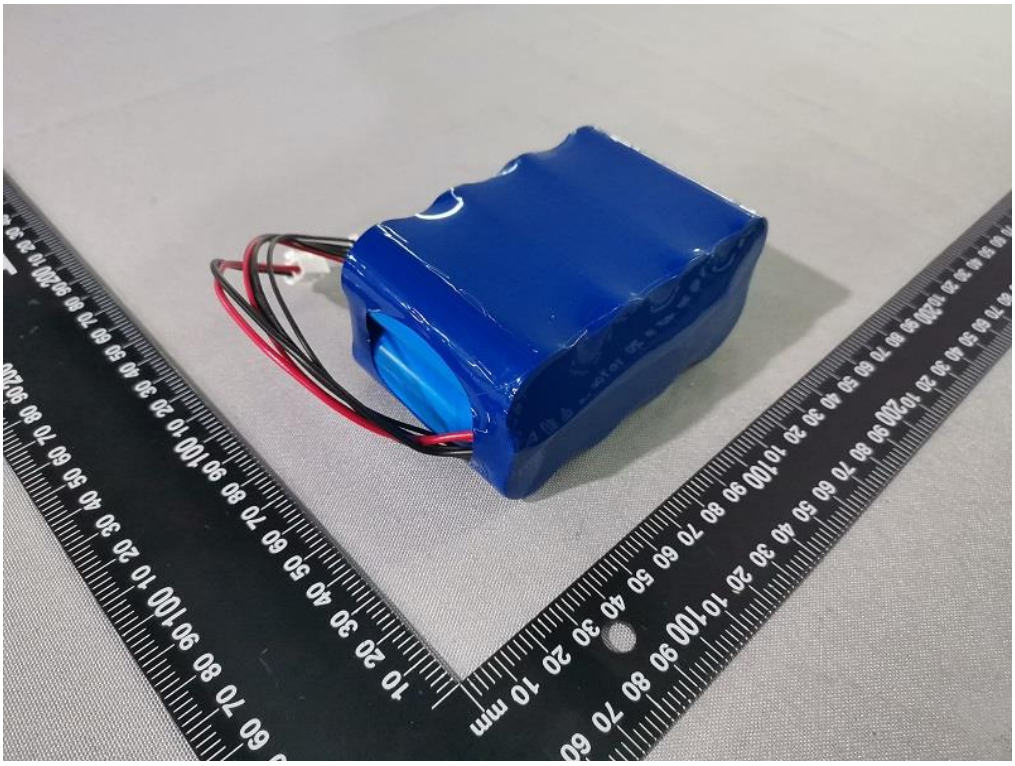


Figure 3 Side view of battery

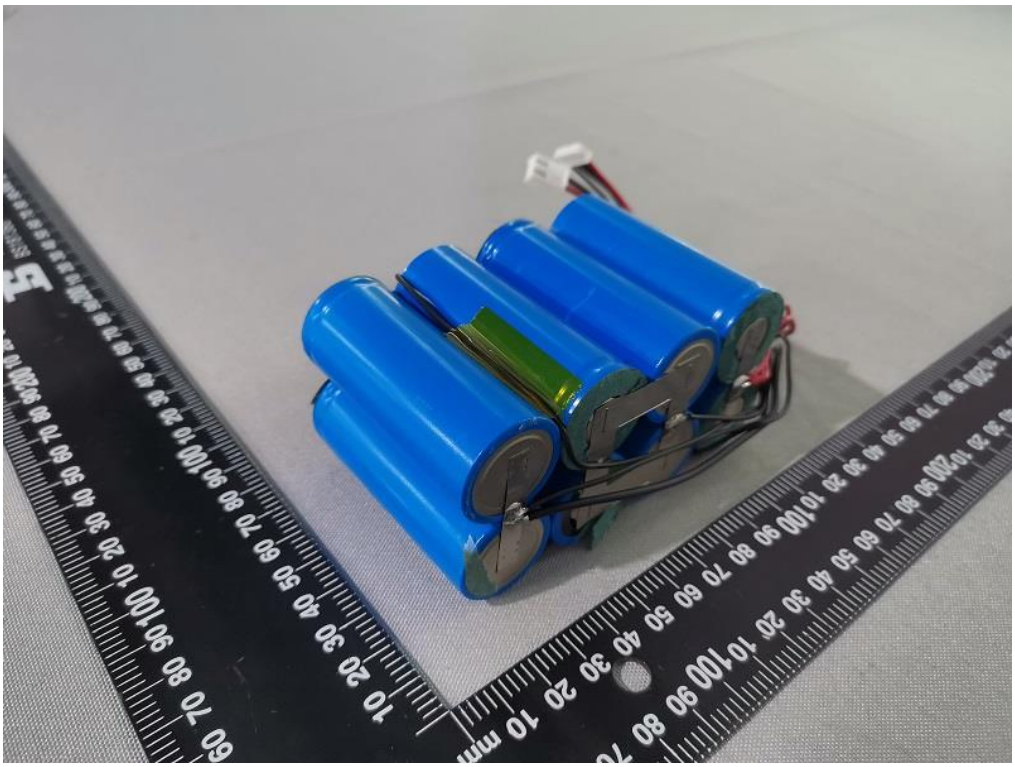


Figure 4 Inside view of battery

Product: Rechargeable $LiFePO_4$ Battery

Type Designation: YT26650F

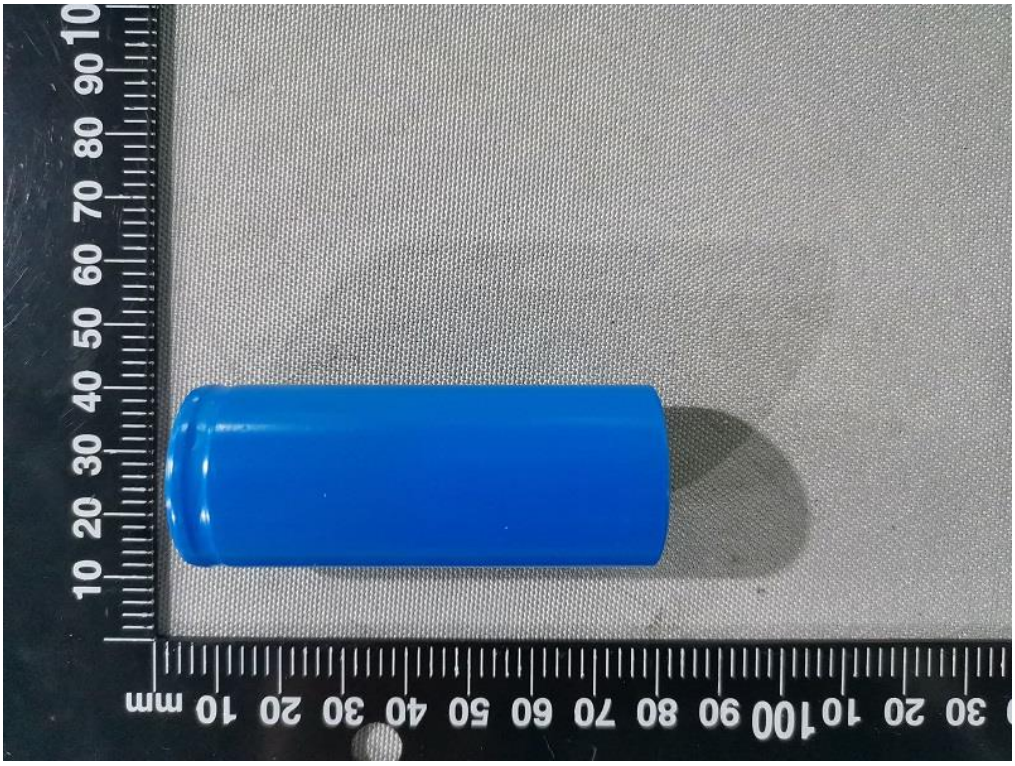


Figure 5 Front view of component cell

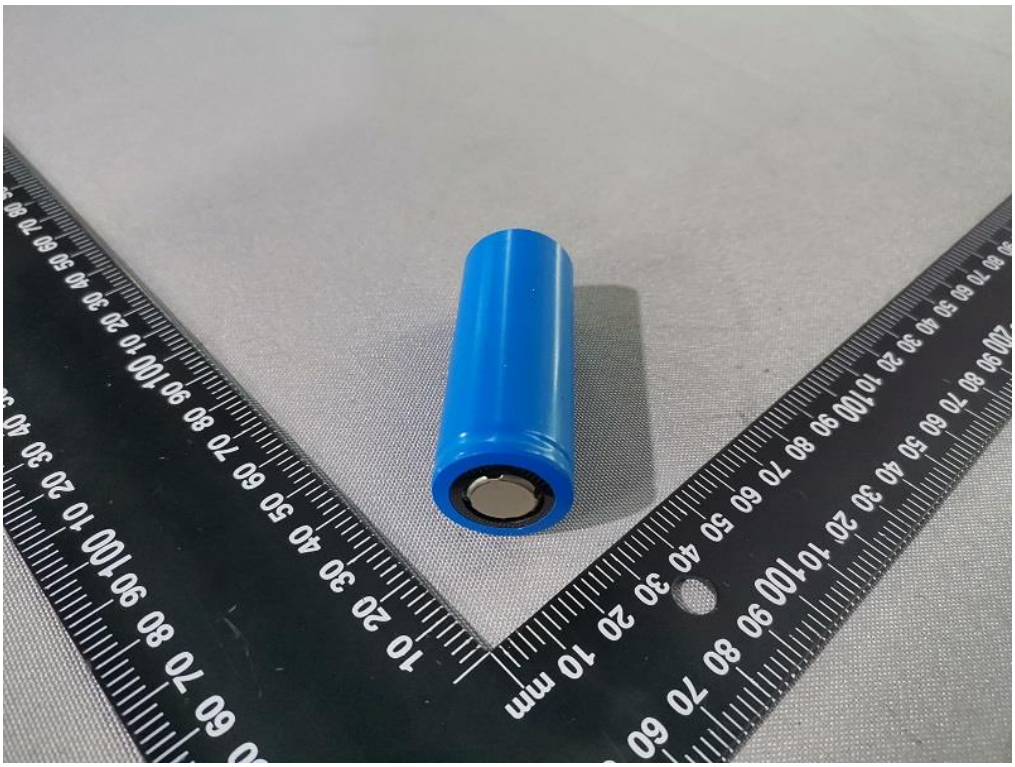


Figure 6 Side view of component cell