| | | |
|---|---|---|
| | **Test Report issued under the responsibility of:**<br><br>**NCB TÜV SÜD PSB Pte Ltd.**<br>**15 International Business Park, TÜV SÜD@IBP**<br>**Singapore 609937**<br>**Singapore** | |

# TEST REPORT
# IEC 62619
# Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications

| | |
|---|---|
| **Report Number.....:** | 085-282460519-000 |
| **Date of issue.....:** | 2025-01-06 |
| **Total number of pages.....:** | 25 pages |
| **Name of Testing Laboratory preparing the Report.....:** | TÜV SÜD New Energy Testing (Guangdong) Co., Ltd. |
| **Applicant's name .....:** | AISWEI New Energy Technology (Yangzhong) Co., Ltd. |
| **Address .....:** | No.588 Gangxing Road, Economic Development Zone, 212200 Yangzhong, PEOPLE'S REPUBLIC OF CHINA |
| **Test specification:** | |
| **Standard .....:** | IEC 62619:2022 |
| **Test procedure .....:** | CB Scheme |
| **Non-standard test method .....:** | N/A |
| **TRF template used .....:** | IECEE OD-2020-F1:2022, Ed.1.5 |
| **Test Report Form No.....:** | IEC62619B |
| **Test Report Form(s) Originator ....:** | UL Solutions (Demko) |
| **Master TRF .....:** | Dated 2023-02-24 |



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 IECEE 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 NCB. 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 Li-ion Battery System |
| **Trademark(s)..... :** | Solplanet |
| **Manufacturer..... :** | Same as the applicant |
| **Model/Type reference..... :** | ASW5120-LB-G3 |
| **Ratings..... :** | 51.2Vd.c., 100Ah |

**Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):**

| | | | |
|---|---|---|---|
| ☒ | **CB Testing Laboratory:** | TÜV SÜD New Energy Testing (Guangdong) Co., Ltd. | |
| **Testing location/ address.....:** | | North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China | |
| **Tested by (name, function, signature).....:** | | Ava Deng (Project Handler) | Ava Deng |
| **Approved by (name, function, signature)...:** | | Liefeng Chen (Designated Reviewer) | Liefeng Chen |
| ☐ | **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 No. 1: Photo Documentation (9 pages)

**Summary of testing:**

**Tests performed (name of test, test clause and date test performed):**

In section 7 and section 8, tests of clause 7.2.3.3, 8.2.2, 8.2.3, 8.2.4 were performed with the battery ASW5120-LB-G3.

| Name of test, test clause | Date of test performed |
|---|---|
| - Cl. 7.2.3.3 Edge or corner drop test (cell or cell block, and battery system) | 2024-11-13 |
| - Cl. 8.2.2 Overcharge control of voltage (battery system) | 2024-10-29 |
| - Cl. 8.2.3 Overcharge control of current (battery system) | 2024-10-28 |
| - Cl. 8.2.4 Overheating control (battery system) | 2024-10-30 |

The samples comply with the above requirements of IEC 62619:2022 (Edition 2.0).

**Testing location: (CBTL, SPTL, CTF, Subcontractor)**

TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

Address: North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China

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

**Use of uncertainty of measurement for decisions on conformity (decision rule) :**

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

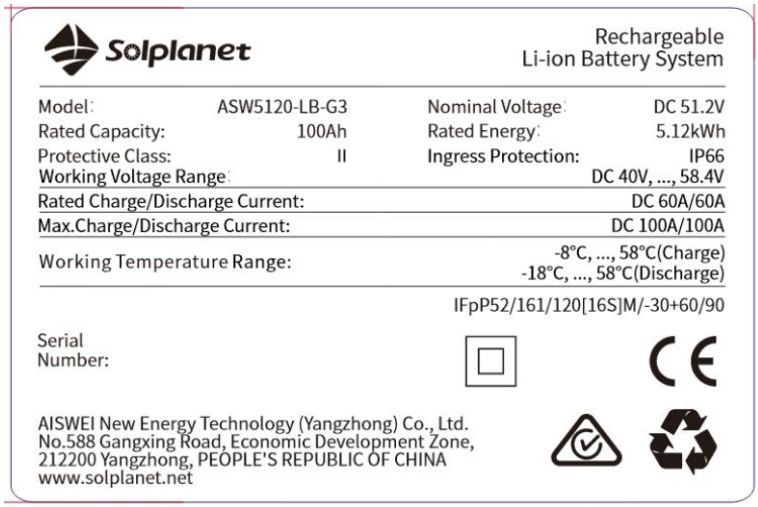
☐ Other: … (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

**Information on uncertainty of measurement:**
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.
IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

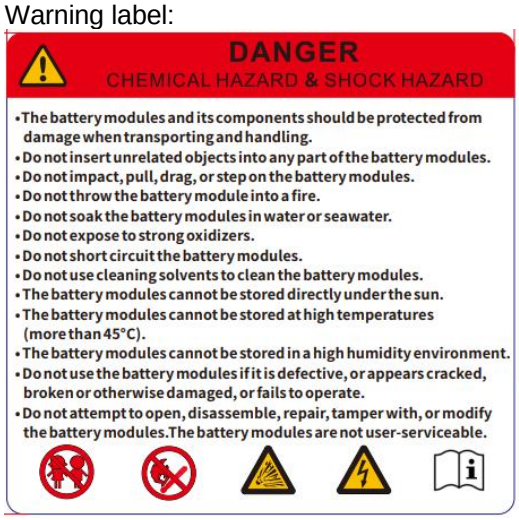
Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

**Copy of marking plate:**

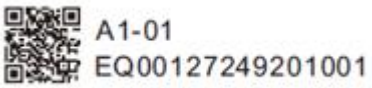
**The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.**




Warning label:




Serial code:




Remark:

1. “+”, “-” are marked near the terminals of the battery.
2. Manufacture code tab “EQ00127249201001” will be marked on the external surface of the battery, which can be used to trace the manufacture information of the battery. The 8th to 12th figures represent date of manufacture, 8th to 9th figures represent the year, the numbers “20” ~ “40“ represent 2020 ~ 2040, the 10th figure represent the month, 1 for Jan., 2 for Feb., ....., 9 for Sept., A for Oct., B for Nov., C for Dec., 11th to 12th figures represent the date, the numbers “01” ~ “31“ represent 1st to 31st date of a month. For example, “24920" means the manufacture day is September 20, 2024. This manufacture code is not the manufacture code of actual samples and just for example.

| | |
|---|---|
| **Test item particulars .....:** | Rechargeable Li-ion Battery System |
| **Classification of installation and use.....:** | Use in industrial applications |
| **Supply Connection .....:** | Supply by terminal |
| **.....:** | |
| **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..... :** | 2024-09-02, 2024-10-21 |
| **Date (s) of performance of tests ..... :** | 2024-09-14 to 2024-10-19, 2024-10-21 to 2024-11-18 |

**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).....:** | Factory 1. AISWEI New Energy Technology (Yangzhong) Co., Ltd.<br>No.588 Gangxing Road, Economic Development Zone, 212200 Yangzhong, PEOPLE'S REPUBLIC OF CHINA<br>Factory 2. Suzhou Hengge Energy Technology Co.,Ltd.<br>No.111 Caizi Road, Wujiang District, 215200 Suzhou City, Jiangsu Province, PEOPLE'S REPUBLIC OF CHINA |

**General product information and other remarks:**

1. The Rechargeable Li-ion Battery System is used in industrial applications, which consists of 16pcs approved cells (model no.: GSP50160119F) connected in 16S. The cell model No. GSP50160119F has been approved with IEC 62619:2022 certification.
Additionally, details information of the battery system is shown in following table:

| Product name | Rechargeable Li-ion Cell | Rechargeable Li-ion Battery System |
|---|---|---|
| Type/model | GSP50160119F | ASW5120-LB-G3 |
| Nominal voltage | 3.2Vd.c. | 51.2Vd.c. |
| Rated capacity | 100Ah | 100Ah |
| Charging voltage declared by manufacturer | 3.65V | 58.4V (3.65V/cell) |
| Upper limit charging voltage | 3.8V | 59.2V (3.7V/cell) |
| Recommended charging power / current by manufacturer | 50A | 60A |
| Maximum continuous charging current | 120A | 100A |
| Recommended discharging power / current by manufacturer | 50A | 60A |
| Maximum continuous discharging current | 200A | 100A |
| Discharging cut off voltage | 2.5V | 40V or any cell reaches 2.5V (0°C ≤ T ≤ 58°C), 36.8V or any cell reaches 2.3V (-18°C ≤ T < 0°C) |
| Lower limit discharging voltage | 2.0V | 32V or any cell reaches 2.0V |
| Standard temperature range for charging | -10°C to 60°C | -8°C to 58°C |
| Standard temperature range for discharging | -30°C to 60°C | -18°C to 58°C |
| Standard charging method by manufacturer | Charging the cell with 50A constant current until to 3.65V, then constant voltage 3.65V until charging current reduces to 5A. | Charge at constant current 60A until battery SOC reach 95%, then charge at constant current 30A until any cell voltage reach 3.65V. |
| Charging method for internal short-circuit test | Charged at constant current 120A till the voltage reaches 3.8V, then charged at constant voltage 3.8V till the current reduces to 0.05 *I*t A (5A). | - |
| Dimension | Max: T x W x H: 51.5mm x 160.7mm x 119.1mm | Width x Depth x Height: (630±5) mm * (185±5) mm * (320±5) mm |
| Weight | (1.92±0.1)kg | (46±1) kg |
| Configuration | - | 16S |

Remark:
The final evaluation of the battery must be conducted in the end device application for which the battery will be used.

| IEC 62619 | | | |
|---|---|---|---|
| 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 are safe under conditions of both intended use and reasonably foreseeable misuse… : | Clause 6, Clause 7, 8.1, and 8.2. See also table 5.1 for Critical components information | P |
| | Reduce the risk of injuries from moving parts | | P |
| **5.2** | **Insulation and wiring** | | P |
| | Voltage, current, altitude, and humidity requirements | | P |
| | Adequate clearances and creepage distances between connectors and live parts at different voltages or between live parts and non-current-carrying accessible parts | | P |
| | Protect from hazardous live parts, including during installation | | P |
| | The mechanical integrity of internal connections | | P |
| **5.3** | **Venting** | | P |
| | Pressure relief function | | P |
| | Encapsulation used to support cells within an outer casing | | P |
| **5.4** | **Temperature/voltage/current management** | | P |
| | The design prevents abnormal temperature-rise | | P |
| | Voltage, current, and temperature limits of the cells | | P |
| | Specifications and charging instructions for equipment manufacturers | | P |
| **5.5** | **Terminal contacts of the battery pack and/or battery system** | | P |
| | Polarity marking(s) | | P |
| | Polarity marking not provided for keyed external connector | | P |
| | Capability to carry the maximum anticipated current | | P |
| | External terminal contact surfaces | | P |
| | Terminal contacts are arranged to minimize the risk of short circuits | | P |
| **5.6** | **Assembly of cells, modules, or battery packs into battery systems** | | P |
| 5.6.1 | General | | P |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Independent control and protection method(s) | | P |
| | Recommendations of cell operating limits, mounting advice, storage conditions and other design recommendations by the cell manufacturer | | P |
| | Batteries designed for the selective discharge of a portion of their series connected cells | | N/A |
| | Protective circuit component(s) and consideration to the end-device application | | P |
| 5.6.2 | Battery system design | | P |
| | The voltage control function | | P |
| | Maximum charging/discharging current of the cell are not exceeded | | P |
| **5.7** | **Operating region of lithium cells and battery systems for safe use** | | P |
| | The cell operating region.....: | See page 6 | P |
| | Designation of battery system to comply with the cell operating region | | P |
| **5.8** | **System lock (or system lock function)** | | P |
| | Non-resettable function to stop battery operation | The battery system has a non-resettable protection when cell operating region (voltage, current, or temperature) is exceeded. It is not user resettable and not automatic reset. | P |
| | Manual with procedure for resetting of battery operation | The function of the battery system can be reset by the manufacturer after checking the status of cells/batteries. | P |
| | Emergency battery final discharge | | N/A |
| **5.9** | **Quality plan** | | P |
| | Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented.....: | ISO9001 certification was provided | P |
| | The process capabilities and the process controls | | P |

| | | | |
|---|---|---|---|
| **6** | **TYPE TEST CONDITIONS** | | P |
| **6.1** | **General** | | P |
| **6.2** | **Test items** | | P |
| | Cells or batteries that are not more than six months old (See Table 1 of IEC 62619) | | P |
| | Capacity confirmation of the cells or batteries | | P |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Default ambient temperature of test, 25 °C ± 5 °C | | P |

| | | | |
|---|---|---|---|
| **7** | **SPECIFIC REQUIREMENTS AND TESTS** | | P |
| **7.1** | **Charging procedure for test purposes** | | P |
| | The battery discharged to a specified final voltage prior to charging | | P |
| | The cells or batteries charged using the method specified by the manufacturer .....: | See page 6 | P |
| **7.2** | **Reasonably foreseeable misuse** | | P |
| 7.2.1 | External short-circuit test (cell or cell block) | | N/A |
| | Short circuit with total resistance of 30 mW± 10 mW at 25 °C ± 5 °C | | N/A |
| | Results: no fire, no explosion | See Table 7.2.1. | N/A |
| 7.2.2 | Impact test (cell or cell block) | | N/A |
| | Cylindrical cell, longitudinal axis impact | | N/A |
| | Prismatic cell, longitudinal axis and lateral axis impact | | N/A |
| | Results: no fire, no explosion. | | N/A |
| 7.2.3 | Drop test (cell or cell block, and battery system) | | P |
| 7.2.3.1 | General | | P |
| 7.2.3.2 | Whole drop test (cell or cell block, and battery system) | | N/A |
| | Description of the Test Unit.....: | | — |
| | Mass of the test unit (kg).....: | | — |
| | Height of drop (m).....: | | — |
| | Results: no fire, no explosion | | N/A |
| 7.2.3.3 | Edge and corner drop test (cell or cell block, and battery system) | | P |
| | Description of the Test Unit.....: | Battery: ASW5120-LB-G3 | — |
| | Mass of the test unit (kg).....: | Measured: Max. 45.2kg | — |
| | Height of drop (m).....: | 0.1m | — |
| | Results: no fire, no explosion | | P |
| 7.2.4 | Thermal abuse test (cell or cell block) | | N/A |
| | Results: no fire, no explosion | | N/A |
| 7.2.5 | Overcharge test (cell or cell block) | | N/A |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | For those battery systems that are provided with only a single protection for the charging voltage control | | — |
| | Results: no fire, no explosion ..... : | See Table 7.2.5. | N/A |
| 7.2.6 | Forced discharge test (cell or cell block) | | N/A |
| | Cells connected in series in the battery system..... : | | N/A |
| | Redundant or single protection for discharge voltage control provided in battery system ..... : | | N/A |
| | Target Voltage..... : | | N/A |
| | Maximum discharge current of the cell, Im..... : | | N/A |
| | Discharge current for forced discharge, 1.0 It..... : | | N/A |
| | Discharging time, t = (1 It / Im ) x 90 (min.)..... : | | N/A |
| | Results: no fire, no explosion ..... : | See Table 7.2.6. | N/A |
| **7.3** | **Considerations for internal short-circuit – Design evaluation** | | N/A |
| 7.3.1 | General | | N/A |
| 7.3.2 | Internal short-circuit test (cell) | | N/A |
| | Samples preparation procedure:<br>In accordance with Clause A.5 and A.6 of IEC 62133-2:2017 | | N/A |
| | Tested per 7.3.2 b) in an ambient temperature of 25 °C ± 5 °C. | | N/A |
| | The appearance of the short-circuit location recorded by photograph or other means..... : | See Attachment # __ | — |
| | The pressing was stopped<br>- When a voltage drop of 50 mV was detected; or | | N/A |
| | - The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached | | N/A |
| | Results: no fire ..... : | See Table 7.3.2. | N/A |
| 7.3.3 | Propagation test (battery system) | Clause 7.3.2 was tested in the cell report | N/A |
| | Method to create a thermal runaway in one cell ... : | See Annex B and C | N/A |
| | Results: No external fire from the battery system, no battery case rupture..... : | See results in Table 7.3.3 | N/A |

| | | | |
|---|---|---|---|
| **8** | **BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)** | | P |
| **8.1** | **General requirements** | | P |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Functional safety analysis for critical controls | Functional safety analysis has been done according to Annex H of IEC 60730-1:2013 +AMD1:2015+AMD2:2020 | P |
| | Conduct of a process hazard analysis for both the cell manufacturing process and the<br>battery system manufacturing process | | P |
| | Conduct of risk assessment and mitigation of the battery system | | P |
| **8.2** | **Battery management system (or battery management unit)** | | P |
| 8.2.1 | Requirements for the BMS | | P |
| | The safety integrity level (SIL) target of the BMS | | P |
| | The charge control evaluated by tests in clauses 8.2.2 to 8.2.4 | | P |
| 8.2.2 | Overcharge control of voltage (battery system) | | P |
| | The exceeded charging voltage applied to the whole battery system | | N/A |
| | The exceeded charging voltage applied to only a part of the battery system, such as the cell(s) .....: | | P |
| | Results: no fire, no explosion .....: | See Table 8.2.2. | P |
| | The BMS terminated the charging before exceeding the upper limit charging voltage | | P |
| 8.2.3 | Overcharge control of current (battery system) | | P |
| | Results: no fire, no explosion .....: | See Table 8.2.3 | P |
| | The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current | | P |
| 8.2.4 | Overheating control (battery system) | | P |
| | The cooling system, if provided, was disconnected | | N/A |
| | Elevated temperature for charging, 5 °C above maximum operating temperature.....: | 65°C | P |
| | Results: no fire, no explosion .....: | See Table ~~9.2.4~~ 8.2.4 | P |
| | The BMS detected the overheat temperature and terminated charging | | P |
| | The battery system operated as designed during test | | P |

| | | |
|---|---|---|
| **9** | **EMC** | N/A |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Battery system fulfil EMC requirements of the end-device application.....: | See Table 9<br>[ ] See attachment<br># ___for detail EMC report<br>[ X ] Intended for to be tested in the end use application<br>[*include specific application*] | N/A |
| **10** | **INFORMATION FOR SAFETY** | | P |
| | The cell manufacturer provides information about current, voltage and temperature limits of their products | | P |
| | The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users. | | N/A |
| **11** | **MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)** | | P |
| | The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual. | | P |
| | Cell or battery system has clear and durable markings | | P |
| | Cell designation | | N/A |
| | Battery designation | | P |
| | Battery structure formulation | | P |
| **12** | **PACKAGING AND TRANSPORT** | | P |
| | Refer to Annex D | | P |
| **ANNEX A** | **OPERATING REGION OF CELLS FOR SAFE USE** | | P |
| A.1 | General | | P |
| A.2 | Charging conditions for safe use | | P |
| A.3 | Consideration on charging voltage | | P |
| A.4 | Consideration on temperature | | P |
| A.5 | High temperature range | | N/A |
| A.6 | Low temperature range | | N/A |
| A.7 | Discharging conditions for safe use | | P |
| A.8 | Example of operating region | | P |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **ANNEX B** | **PROCEDURE OF 7.3.3 PROPAGATION TEST BY LASER IRRADIATION** | | N/A |
| **B.1** | **General** | | N/A |
| **B.2** | **Test conditions** | | N/A |
| B.2.1 | Cell test (preliminary test) | | N/A |
| | The cell fully charged according to the manufacturer recommended conditions.....: | | — |
| | Laser irradiation point on the cell.....: | | — |
| | Output power of laser irradiation.....: | | — |
| | Tested in an ambient temperature of 25 °C ± 5 °C | | N/A |
| | Repeat of cell test for 3 times | | N/A |
| B.2.2 | Battery system test (main test) | | N/A |
| | The battery system fully charged according to the manufacturer recommended conditions.....: | | — |
| | Target cell to be laser irradiated .....: | | — |
| | The irradiation point on the target cell same or similar as that on the cell test | | |
| | Output power of laser irradiation.....: | | — |
| | Tested in an ambient temperature of 25 °C ± 5 °C | | N/A |

| **ANNEX C** | **PROCEDURE OF 7.3.3 PROPAGATION TEST BY METHODS OTHER THAN LASER** | | N/A |
|---|---|---|---|
| C.1 | General | | N/A |
| C.2 | Test conditions: | | N/A |
| | – The battery fully charged according to the manufacturer recommended conditions.....: | | — |
| | – Target cell forced into thermal runaway .....: | | — |
| | – A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing.....: | | — |
| C.3 | Method used for initiating the thermal runaway.<br>1) Heater (Heater, Burner, Laser, Inductive heating<br>2) Overcharge<br>3) Nail penetration of the cell<br>4) Combination of above methods<br>5) Other methods .....: | | — |

| **ANNEX D** | **PACKAGING AND TRANSPORT** | P |
|---|---|---|

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The materials and pack design chosen in a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants | | P |
| | Regulations concerning international transport of secondary lithium batteries | | P |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| **5.1** | **TABLE: Critical components information** | | | | **P** |
|---|---|---|---|---|---|
| **Object / part No.** | **Manufacturer/ trademark** | **Type / model** | **Technical data** | **Standard** | **Mark(s) of conformity[1)]** |
| 1.Cell (16pcs) | Guangzhou Great Power Energy Storage Technology Co., Ltd | GSP50160119F | 3.2Vd.c., 100Ah | IEC 62619:2022 | Cert. No.: SG PSB-BT-04339, Report No.: 085-282360754-000 |
| 2. BMS | AISWEI New Energy Technology (Yangzhong) Co., Ltd. | 270-900630-00 (Software version: L610-90003-00, Hardware version: L270-900630-02) | Overcharge detection voltage for each cell: 3.7V, Overdischarge detection voltage for each cell: 2.4V (T≥0°C), 2.2V (T<0°C), Charge overcurrent detection current: 115A, Discharge overcurrent detection current: 115A, High temperature charging protection: 58°C, Low temperature charging protection: -8°C, High temperature discharging protection: 58°C, Low temperature discharging protection: -18°C. | - | - |
| - PCB material | SHENGYI TECHNOLOGY CO LTD | S1000H | V-0, 130°C | UL 746 | UL E109769 |
| - IC for MCU (U119) | GigaDevice Semiconductor Inc. | GD32F305VCT6 | Supply voltage: 2.6V to 3.6V, Topr: -40°C to 85°C | - | - |
| - IC for CAN (U107) | Shanghai Chipanalog Microelectronics Co., Ltd. | CA-IS3062W | Supply voltage: 4.5V to 5.5V, $T_{opr}$: -40°C to 125°C | DIN EN IEC 60747-17 (VDE 0884-17):2021-10 | VDE 40052786 |
| - IC for AFE (U115) | Texas Instruments | BQ7695204PFBR | Supply voltage: -0.3V to 85V, $T_{opr}$: -40°C to 85°C | - | - |
| - IC for ADC (U101) | Texas Instruments | INA228AIDGST | Supply voltage: -0.3V to 85V, $T_{opr}$: -40°C to 125°C | - | - |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

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|---|---|---|---|---|---|
| - IC for watchdog (U121) | SGMICRO | SGM823-TXN5G/TR | Supply voltage: -0.3V to 6V, $T_{opr}$: -40°C to 125°C | - | - |
| - IC for PWM controller (U119) | GigaDevice Semiconductor Inc. | GD32F305VCT6 | Supply voltage: 2.6V-3.6V, $T_{opr}$: -40°C to 85°C | - | - |
| - MOSFET for charge & discharge (U132-U135, U116, U100, U124, U122, 8pcs connected in parallel) | Innoscience | INV100FQ030A | $V_{DD}$: 100V, $V_{GD}$: 6V, $V_{DG}$: 100V, $I_D$: 100A ($T_A$=25°C), $T_J$: -40°C to 150°C | - | - |
| - Current sampling resistor (R163, R164, R191, R192, R200, R207, R292, R293, R310, R332, R333, R335) | C&B ELECTRONICS (SHENZHEN) CO., LTD. | SEWF2512F3L00P9 | 3mΩ±1%, 4W, $T_{opr}$: -65°C to 170°C | - | - |
| - PTC | THINKING ELECTRONIC INDUSTRIAL CO LTD | PPL11250MA2C8CKB | $V_{max}$: 380Vac, $I_h$: 123mA, $I_t$: 245mA, $I_{max}$: 2A, $T_{opr}$: -20°C to 85°C (V=$V_{max}$) | UL 1434 | UL E138827 |
| - Fuse for Secondary protection action execution switch (F100, F107-F109, 4pcs connected in parallel) | DONGGUAN TLC ELECTRONIC TECHNOLOGY CO LTD | WSFD4550-A | 80V, 45A, $T_{opr}$: -20°C to 65°C | UL 248-1 | UL E467707 |
| - Fuse for short-circuit protection (F102-F106, F110-F124, 20pcs connected in parallel) | SHENZHEN VICTORS INDUSTRIAL CO LTD | 12SF025 | 65V, 25A, $T_{opr}$: -55°C to 125°C | UL 248-1 | UL E357828 |
| - NTC (R320, R321, 2pcs) | THINKING ELECTRONIC | TSM1A153H3951RZ | $R_{25}$= 15kΩ±3%, $B_{25/50}$= 3950K±1%, $T_{opr}$: -40°C to 125°C | UL 1434 | UL E138827 |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| 3. LED board | AISWEI New Energy Technology (Yangzhong) Co., Ltd. | L270-900640-00 (Hardware version: V1.0) | Control LED switch | - | - |
| - PCB material | SHENGYI TECHNOLOGY CO LTD | S1000H | V-0, 130°C | UL 746 | UL E109769 |
| - LED light | Shenzhen Hongliang Optoelectronics Co.Ltd | H3433AVGB0FC02 | $V_{DD}$: 3.5V to 5.4V, $I_{DD}$: 0.5mA, $T_{opr}$: -40°C to 105°C | - | - |
| 4. NTC for cell (8pcs) | SEMITEC Corporation | 103KT1608T-1P | $R_{25}$= 10kΩ±1%, $B_{25/85}$= 3435K±1%, $T_{opr}$: -40°C to 125°C | - | - |
| 5. Connector for P- | Shenzhen GU Precision Industry Co., Ltd | R057MM05AK-08 | 1500V, 125A, -40°C to 125°C | UL 4128 | UL E527779 |
| 6. Connector for P+ | Shenzhen GU Precision Industry Co., Ltd | R057MM05BK-08 | 1500V, 125A, -40°C to 125°C | UL 4128 | UL E527779 |
| 7. Battery Switch | LANBOO INTELLIGENT Technology Co., Ltd. | LB16QC-P10F/E/S | 12V/24V, 0.2A, -40°C to 80°C | EN 60947-5-1:2017 | CE: M.2020.206.C6718 |
| 8. Cable gland for P- | Shenzhen GU Precision Industry Co., Ltd | P057C025AK-8 | 1500V, 125A, -40°C to 125°C | UL 4128 | UL E527779 |
| - Alternative | Shenzhen GU Precision Industry Co., Ltd | P057C025AK-13 | 1500V, 125A, -40°C to 125°C | UL 4128 | UL E527779 |
| 9. Cable gland for P+ | Shenzhen GU Precision Industry Co., Ltd | P057C025BK-8 | 1500V, 125A, -40°C to 125°C | UL 4128 | UL E527779 |
| - Alternative | Shenzhen GU Precision Industry Co., Ltd | P057C025AK-13 | 1500V, 125A, -40°C to 125°C | UL 4128 | UL E527779 |
| 10. Wiring for Connector (B+, B-) | LINOYA ELECTRONIC TECHNOLOGY CO LTD | 3512 | 4AWG, 600Vac, 200°C | UL 758 | UL E315619 |
| - Alternative | JIANGYIN WEICHENG SPECIAL CABLE CO LTD | 3512 | 4AWG, 600Vac, 200°C | UL 758 | UL E325197 |
| 11. Wiring for Connecting BMS and button | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIES CO LTD | 1332 | 20awg, 200°C, 300V | UL 758 | UL E237831 |
| - Alternative | HAIYAN ADS SPECIAL CABLE CO LTD | 1332 | 20awg, 200°C, 300V | UL 758 | UL E363968 |

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| 12. Wiring for Connecting LED board and BMS | KUNSHAN NEW ZHICHENG ELECTRONICS TECHNOLOGIES CO LTD | 1332 | 22awg, 200°C, 300V | UL 758 | UL E237831 |
| - Alternative | HAIYAN ADS SPECIAL CABLE CO LTD | 1332 | 22awg, 200°C, 300V | UL 758 | UL E363968 |
| 13. Wiring for Internal communication | Suzhou Fuertai Electronic Co Ltd | 2517 | 24awg, 105°C, 300V | UL 758 | UL E519190 |
| 14. Grounding Wire for System | LINOYA ELECTRONIC TECHNOLOGY CO LTD | 3512 | 10awg, 200°C, 600V | UL 758 | UL E315619 |
| - Alternative | JIANGYIN WEICHENG SPECIAL CABLE CO LTD | 3512 | 4AWG, 600Vac, 200°C | UL 758 | UL E325197 |
| 15. Fire extinguisher | HUBEI JIANDUN FIRE TECHNOLOGY CO.,LTD | QRR0.03G/S | -50°C to 100°C, 50g/$m^3$ | EU 2015/863 | EMTEK Report No.: EDG2402010056C00101R |
| 16. Case | Xing Ming Jiang Precision metal | STAINLESS IRON430 | Thickness: 1.2mm | - | - |

Supplementary information:

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

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 7.2.1 | TABLE: External short-circuit test (cell or cell block) | | | | N/A |
|---|---|---|---|---|---|
| **Sample No.** | **Ambient (at 25°C ± 5°C)** | **OCV at start of test (V dc)** | **Resistance of Circuit (mW)** | **Maximum Case Temperature Rise DT (°C)** | **Results** |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |

**Supplementary information:**

A – No fire or Explosion
B – Fire
C – Explosion
D – The test was completed after 6 h
E – The test was completed after the cell casing cooled to 20% of the maximum temperature rise
F – Other (Please explain):___

| 7.2.5 | TABLE: Overcharge test (cell or cell block) | | | | | N/A |
|---|---|---|---|---|---|---|
| **Sample No.** | **OCV at start of test (V dc)** | **OCV at end of test (V dc)** | **Measured Maximum Charging Current (A)** | **Measured Maximum Charging Voltage (V dc)** | **Max. Cell Case Temperature, (°C)** | **Results** |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |
| - | - | - | - | - | - | - |

**Supplementary information:**

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Test concluded when temperature reached a steady state condition
E – Test concluded when temperature returned to ambient
F – Other (Please explain): _____

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 7.2.6 | TABLE: Forced discharge test (cell or cell block) | | | | N/A |
|---|---|---|---|---|---|
| **Sample No.** | **OCV before applying reverse charge, (V dc)** | **Target Voltage (V dc)** | **Measured Reverse Charge Current It, (A)** | **Total Time for Reversed Charge Application (min)** | **Results** |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |

**Supplementary information:**

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Other (Please explain): ___

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 7.3.2 | TABLE: Internal short-circuit test (cell) | | | N/A |
|---|---|---|---|---|
| **Sample No.** | **OCV at start of test, (V dc)** | **Particle location [1)]** | **Maximum applied pressure, (N)** | **Results** |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |
| - | - | - | - | - |

**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.

**Results:**

A – No fire or explosion
B – Fire
C – Explosion
D – Test concluded when 50 mV voltage drop occurred prior to reaching force limit
E – Test concluded when 800/400 N pressure was reached and 50 mV voltage drop was not achieved
F – Test was concluded when fire or explosion occurred
G – Other (Please explain): __

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 7.3.3 | TABLE: Propagation test (battery system) | | | | N/A |
|---|---|---|---|---|---|
| **Sample No.** | **OCV of Battery System Before Test, (V dc)** | **OCV of Target Cell Before Test, (V dc)** | **Maximum Cell Case Temperature, (°C)** | **Maximum DUT Enclosure Temperature, (°C)** | **Results** |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |

| Method of cell failure [1)] | Location of target cell | Area for fire protection ($m^2$) |
|---|---|---|
| - | - | - |
| - | - | - |
| - | - | - |

**Supplementary information:**

**1)** Cell can be failed through laser exposure, applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method

**2)** If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.

Results:
A – No fire external to DUT enclosure or area for fire protection or no battery case rupture
B – Fire external to DUT enclosure or area for fire protection
C – Explosion
D – Battery case rupture
E – Other (Please explain): __

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 8.2.2 | TABLE: Overcharge control of voltage (battery system) | | | | P |
|---|---|---|---|---|---|
| **Sample No.** | **OCV at start of test for Cell/Cell Blocks, (V dc)** | **Maximum Charging Current, (A)** | **Max. Charging Voltage, (V dc)** | **Max. Voltage of Cell/Cell Blocks, (V dc)** | **Results** |
| Battery 1 | 2.530 | 100 | 58.807 | 3.681 | A, D, F |

| | **Charge Voltage Applied Battery System: 1)** | |
|---|---|---|
| | **Whole** | **Part** |
| | 66.88 | - |

**Supplementary information:**

1) The exceeded voltage can be applied to only a part of the system such as the cell(s) in the battery system per Figure 6 of IEC 62619, if it is difficult to do it in using the whole battery system.

Results:
A – No Fire or Explosion
B – Fire
C – Explosion
D – The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage
E – The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage
F – All function of battery system did operate as intended during the test.
G – All function of battery system did not operate as intended during the test.
H – Other (Please explain): ___

| 8.2.3 | TABLE: Overcharge control of current (battery system) | | | P |
|---|---|---|---|---|
| **Sample No.** | **OCV at start of test, (V dc)** | **Max. Charging Current, (A)** | **Max. Charging Voltage, (V dc)** | **Results** |
| Battery 1 | 47.801 | 144 | 49.694 | A, D, F |

**Supplementary information:**

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Overcurrent sensing function of BMU did operate and then charging stopped
E – Overcurrent sensing function of BMU did not operate and then charging stopped
F – All function of battery system did operate as intended during the test.
G – All function of battery system did not operate as intended during the test.
H – Other (Please explain): ____

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| **8.2.4** | **TABLE: Overheating control (battery system)** | | **P** |
|---|---|---|---|
| **Model No.** | **OCV at start (SOC 50%) of test, V dc** | **Maximum Charging Current, A** | **Measured Maximum Charging Voltage, V dc** |
| Battery 1 | 52.857 | 60 | 54.248 |
| **Maximum Specified Temperature of Battery System, °C** | | **Maximum Measured Cell Case Temperature, °C** | **Results** |
| 58 | | 55.5 | A, D, F |

**Supplementary information:**

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Temperature sensing function of BMU did operate and then charging stopped
E – Temperature sensing function of BMU did not operate and then charging stopped
F – All function of battery system did operate as intended during the test.
G – All function of battery system did not operate as intended during the test.
H – Other (Please explain): ____

| IEC 62619 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 9 | TABLE: EMC | | | | N/A |
|---|---|---|---|---|---|
| Standard used for EMC test: | | | | | |
| **Sample No.** | **EMC Test Item** | **Battery Condition** | **EMC Test Level/ Parameters** | **Compliance Criteria** | **Results** |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |
| - | - | - | - | - | - |

**Supplementary information:**

Battery Condition During EMC test

1 – In Operation Mode, [ ] Supplied at ____, [ ] Load at____

2 – In non-operation Mode, Battery state of charge (SOC) before test at around____

Compliance Criteria and Test Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Battery system did operate as intended during the test.
E - All function of battery system did operate as intended after the test.
F - All function of battery system did not operate as intended during the test, (Please explain): ____
G - Other (Please explain): ____

**--- End ---**