



Test Report issued under the responsibility of:



**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. : SZES220700390601

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Name of Testing Laboratory preparing the Report : SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

Applicant's name..... : EcoFlow Inc.

Address..... : Plant A202, Founder Technology Industrial Park, Shiyan Sub-district, Bao'an District, Shenzhen, 518000, Guangdong, China

Test specification:

Standard : IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021

Test procedure : CB Scheme

Non-standard test method : N/A

TRF template used : IECEE OD-2020-F1:2021, Ed.1.4

Test Report Form No...... : IEC62133_2C

Test Report Form(s) Originator.... : DEKRA Certification B.V.

Master TRF..... : Dated 2022-07-01

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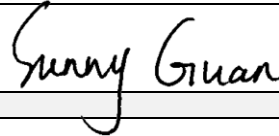
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General disclaimer:

The test results presented in this report relate only to the object tested.

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Test item description..... :	Rechargeable Li-ion Battery Pack	
Trade Mark(s)..... :		
Manufacturer..... :	Same as applicant	
Model/Type reference..... :	EFR610-NZ	
Ratings..... :	Rated Voltage: 25,6 V d.c., Rated Capacity: 20 Ah, 512 Wh	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch
Testing location/ address.....:		No.2, Jianghao Industrial Factory Area, No.430, Jihua Road, Bantian Street, Longgang District, Shenzhen, Guangdong, China
Tested by (name, function, signature).....:		Steven Xiao / Project Engineer 
Approved by (name, function, signature)....:		Sunny Guan / Report Reviewer 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	N/A
Testing location/ address.....:		
Tested by (name, function, signature).....:		
Approved by (name, function, signature)....:		
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	N/A
Testing location/ address.....:		
Tested by (name + signature)		
Witnessed by (name, function, signature)..:		
Approved by (name, function, signature)....:		
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	N/A
<input type="checkbox"/>	Testing procedure: CTF Stage 4:	N/A
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: 4 pages of Photos; Attachment 2: 3 pages of Information for safety; Attachment 3: 1 page of Packaging; Attachment 4: 1 page of Product specification.	
Summary of testing: The sample(s) tested complies with the requirements of IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021. Remark: Only battery was considered and tested according to standard in this report as the cell (model: C40) was certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021 by TÜV Rheinland (Japan) (CB Report No.: CN22ZPT4 001, Cert. No.: JPTUV-133350).	
Tests performed (name of test and test clause): <input checked="" type="checkbox"/> 5.2 Insulation resistance <input type="checkbox"/> 7.2.1 Continuous charging at constant voltage (cells) <input checked="" type="checkbox"/> 7.2.2 Case stress at high ambient temperature (battery) <input type="checkbox"/> 7.3.1 External short circuit (cell) <input checked="" type="checkbox"/> 7.3.2 External short circuit (battery) <input checked="" type="checkbox"/> 7.3.3 Free fall <input type="checkbox"/> 7.3.4 Thermal abuse (cells) <input type="checkbox"/> 7.3.5 Crush (cells) <input checked="" type="checkbox"/> 7.3.6 Over-charging of battery <input type="checkbox"/> 7.3.7 Forced discharge (cells) <input checked="" type="checkbox"/> 7.3.8 Mechanical tests (batteries) <input type="checkbox"/> 7.3.9 Design evaluation – Forced internal short circuit (cells) <input type="checkbox"/> Annex D Measurement of the internal AC resistance for coin cells	Testing location: SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch No.2, Jianghao Industrial Factory Area, No.430, Jihua Road, Bantian Street, Longgang District, Shenzhen, Guangdong, China
Summary of compliance with National Differences (List of countries addressed): EU Group difference, UK National difference <input checked="" type="checkbox"/> The product fulfils the requirements of EN 62133-2:2017/A1:2021, BS EN 62133 2:2017+A1:2021.	

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.

**Remark:**

Manufacture date is in the S/N number 'xxxxxxxxXXxxxx' (16 bits), The tenth to twelfth bits is the date code, tenth bit indicate the year, eleventh bits indicate the month, twelfth bit indicate the date, see below for detail:

Bits in S/N number	Range of variable	Content
tenth	A, B, C, D ...	Indicate the year, A means 2018, B means 2019, C means 2020, D means 2021, E means 2022 and so on
eleventh	1-9, A, B, C	Indicate the month, Jan. – Sep.: 1 - 9, Oct.: A, Nov.: B, Dec.: C
twelfth	1-9, A-H, J-N, P-X	Indicate the date, 1-9, A-H: 10-17, J-N: 18-22, P-X: 23-31

Test item particulars : --	
Classification of installation and use..... : --	
Supply Connection : --	
Recommend charging method declared by the manufacturer.....	CC/CV
Discharge current (0,2 It A).....	4 A
Specified final voltage.....	20 V (T>0°C), 16 V (T≤0°C)
Upper limit charging voltage per cell.....	3,65 V
Maximum charging current.....	20 A
Charging temperature upper limit.....	45 °C
Charging temperature lower limit	0 °C
Polymer cell electrolyte type.....	<input type="checkbox"/> gel polymer <input type="checkbox"/> solid polymer <input checked="" type="checkbox"/> 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.....	2022-07-08
Date (s) of performance of tests	2022-07-08 to 2022-07-14
General remarks:	
<p>"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.</p> <p>This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at http://www.sgs.com/en/Terms-and-Conditions.aspx and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at http://www.sgs.com/en/Terms-and-Conditions/Terms-e-Document.aspx. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.</p>	

Manufacturer's Declaration per sub-clause 4.2.5 of IEC62133_2C:

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
☒ Not applicable

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

Name and address of factory (ies)..... : Guang Zhou Seawitsin Electronics Co., Ltd.
 Nanyue Straight Street, No. 1 Luo Jia, Dalong,
 Panyu, Guangzhou, Guangdong, China

General product information and other remarks:

Product description:	Rechargeable Li-ion Battery Pack
Model of pack:	EFR610-NZ
Designation of pack:	8IFpR41/136
Rated voltage:	25,6 V
Rated capacity:	20 Ah
Maximum charge current:	20 A
Number of cells in battery pack:	8S1P
Model of cell:	C40
Designation of cell:	IFpR41/136
Rated voltage of cell:	3,2 V
Rated capacity of cell:	20 Ah
Maximum charge current of cell:	20 A

Remark:
 See Attachment 4 for more detailed product specification.

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		P
	Insulation resistance (MΩ) :	> 6,5 MΩ	—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate clearances and creepage distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		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	Cell: A pressure relief mechanism was used to relieve excessive internal pressure. Pack: Plastic frame secured by metal screws, aperture as the venting mechanism of battery.	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief	Plastic frame was used as encapsulation to wrap cells, will not cause the battery to overheat during normal operation nor inhibit pressure relief.	P
5.4	Temperature, voltage and current management		P
	Batteries are designed such that abnormal temperature rise conditions are prevented	Protection circuit was used.	P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer	Protection circuit was used.	P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
	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	See Attachment 4 for detail	P
5.5	Terminal contacts		P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		P
	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 circuits		P
5.6	Assembly of cells into batteries		P
5.6.1	General		P
	Each battery has 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		P
	This protection may be provided external to the battery such as within the charger or the end devices	The protection is within the battery	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 has protective circuitry that can maintain the cells within their operating regions	Single battery pack without separate case	N/A
	Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		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		P
	Protective circuit components are added as appropriate and consideration given to the end-device application		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
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
	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	8S1P The voltages of any one of the single cells does not exceed the upper limit of the charging voltage 3,65 V	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	8S1P Charging is stopped when 3,65 V is exceeded for any one of the single cells	P
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage are not counted as an overcharge protection		P
	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 are not discharged beyond the cell manufacturer's specified final voltage		P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry are incorporated into the battery management system		P
5.6.3	Mechanical protection for cells and components of batteries		P
	Mechanical protection for cells, cell connections and control circuits within the battery are provided to prevent damage as a result of intended use and reasonably foreseeable misuse		P
	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	Mechanical protection will be provided by the end product enclosure	P
	The battery case and compartments housing cells are designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For batteries intended for building into a portable end product, testing with the battery installed within the end product is considered when conducting mechanical tests	Evaluated in the end product	N/A
5.7	Quality plan		P
	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	Quality plan self-declaration was submitted.	P
5.8	Battery safety components		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	Not more than six months old Production date: Jun. 2022.	P
	The internal resistance of coin cells are measured in accordance with Annex D. Coin cells with internal resistance less than or equal to 3 Ω are tested in accordance with Table 1	Not coin cell	N/A
	Unless otherwise specified, tests are carried out in an ambient temperature of 20 °C \pm 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 over discharge protection		P
	When conducting the short-circuit test, consideration is 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		P
7	SPECIFIC REQUIREMENTS AND TESTS		P
7.1	Charging procedure for test purposes		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 \pm 5 °C, using the method declared by the manufacturer		P
	Prior to charging, the battery has been discharged at 20 °C \pm 5 °C at a constant current of 0,2 It A down to a specified final voltage		P
7.1.2	Second procedure		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		N/A
	After stabilization for 1 h to 4 h, at an ambient temperature of the highest test temperature and the lowest test temperature, respectively, 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 current to constant voltage charging method		N/A
7.2	Intended use		P
7.2.1	Continuous charging at constant voltage (cells)	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
	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		N/A
	Results: no fire, no explosion, no leakage..... :		N/A
7.2.2	Case stress at high ambient temperature (battery)		P
	Oven temperature (°C) : 70		—
	Results: no physical distortion of the battery case resulting in exposure of internal protective components and cells		P
7.3	Reasonably foreseeable misuse		P
7.3.1	External short-circuit (cell)	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
	The cells were tested until one of the following occurred:		N/A
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20 % of the maximum temperature rise		N/A
	Results: no fire, no explosion :		N/A
7.3.2	External short-circuit (battery)		P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or	Rapid decline in short circuit current, protective electronic circuit operated in normal and single fault conditions.	P
	- The case temperature declined by 20 % of the maximum temperature rise		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	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 is conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test		P
	A single fault applies to protective component parts such as MOSFET (metal oxide semiconductor field-effect transistor), fuse, thermostat or positive temperature coefficient (PTC) thermistor	Single fault applies to MOSFET (Q12, Q18) respectively	P
	Results: no fire, no explosion	(See appended table 7.3.2)	P
7.3.3	Free fall		P
	Results: no fire, no explosion		P
7.3.4	Thermal abuse (cells)	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
	Oven temperature (°C)		—
	Results: no fire, no explosion		N/A
7.3.5	Crush (cells)	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
	The crushing force was released upon:		N/A
	- The maximum force of 13 kN ± 0,78 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	Results: no fire, no explosion		N/A
7.3.6	Over-charging of battery		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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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)	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
	Discharge a single cell to the lower limit discharge voltage specified by the cell manufacturer		N/A
	The discharged cell is then subjected to a forced discharge at 1 It A to the negative value of the upper limit charging voltage		N/A
	- 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
	- 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		N/A
	Results: no fire, no explosion		N/A
7.3.8	Mechanical tests (batteries)		P
7.3.8.1	Vibration		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		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)	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
	The cells complied with national requirement for		—
	The pressing was stopped upon:		N/A
	- 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		N/A
	Results: no fire		N/A
8	INFORMATION FOR SAFETY		P
8.1	General		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Manufacturers of secondary cells provides information about current, voltage and temperature limits of their products	See Attachment 4 for detail.	P
	Manufacturers of batteries provides information regarding how to minimize and mitigate hazards to equipment manufacturers or end-users	See Attachment 2 for detail.	P
	Systems analyses are 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 is 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 cell or 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
	- In case of ingestion of a cell or battery, seek medical assistance promptly		N/A
9	MARKING		P
9.1	Cell marking	Only battery will be marked.	N/A
	Cells are 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 are marked as specified in IEC 61960, except for coin batteries	See marking plate for detail.	P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity	Not coin batteries	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Batteries are marked with an appropriate caution statement		P
	- Terminals have clear polarity marking on the external surface of the battery, or	Clear polarity was marked on PCB near terminal	P
	- Not be marked with polarity markings if the design of the external connector prevents reverse polarity connections		N/A
9.3	Caution for ingestion of small cells and batteries	Not small cells or batteries	N/A
	Coin cells and batteries identified as small batteries include a caution statement regarding the hazards of ingestion in accordance with 8.2		N/A
	Small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion is given on the immediate package		N/A
9.4	Other information		P
	The following information are marked on or supplied with the battery:		P
	- Storage and disposal instructions	Storage and disposal instructions were supplied with the battery. See Attachment 2 for detail.	P
	- Recommended charging instructions	Recommended charging instructions were supplied with the battery. See Attachment 4 for detail.	P
10	PACKAGING AND TRANSPORT		N/A
	Packaging for coin cells are not be small enough to fit within the limits of the ingestion gauge of Figure 3		N/A
ANNEX A	CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE		N/A
A.1	General	Cells were certified according to IEC 62133-2: 2017, IEC 62133-2: 2017/AMD1: 2021	N/A
A.2	Safety of lithium ion secondary battery		N/A
A.3	Consideration on charging voltage		N/A
A.3.1	General		N/A
A.3.2	Upper limit charging voltage		N/A
A.3.2.1	General		N/A
A.3.2.2	Explanation of safety viewpoint		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied		N/A
A.4	Consideration of temperature and charging current		N/A
A.4.1	General		N/A
A.4.2	Recommended temperature range		N/A
A.4.2.1	General		N/A
A.4.2.2	Safety consideration when a different recommended temperature range is applied		N/A
A.4.3	High temperature range		N/A
A.4.3.1	General		N/A
A.4.3.2	Explanation of safety viewpoint		N/A
A.4.3.3	Safety considerations when specifying charging conditions in the high temperature range		N/A
A.4.3.4	Safety considerations when specifying a new upper limit in the high temperature range		N/A
A.4.4	Low temperature range		N/A
A.4.4.1	General		N/A
A.4.4.2	Explanation of safety viewpoint		N/A
A.4.4.3	Safety considerations, when specifying charging conditions in the low temperature range		N/A
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range		N/A
A.4.5	Scope of the application of charging current		N/A
A.4.6	Consideration of discharge		N/A
A.4.6.1	General		N/A
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		N/A
A.4.6.3	Discharge current and temperature range		N/A
A.4.6.4	Scope of application of the discharging current		N/A
A.5	Sample preparation		N/A
A.5.1	General		N/A
A.5.2	Insertion procedure for nickel particle to generate internal short		N/A
A.5.3	Disassembly of charged cell		N/A
A.5.4	Shape of nickel particle		N/A
A.5.5	Insertion of nickel particle in cylindrical cell		N/A
A.5.5.1	Insertion of nickel particle in winding core		N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator		N/A
A.5.6	Insertion of nickel particle in prismatic cell		N/A
A.6	Experimental procedure of the forced internal short-circuit test		N/A
A.6.1	Material and tools for preparation of nickel particle		N/A
A.6.2	Example of a nickel particle preparation procedure		N/A
A.6.3	Positioning (or placement) of a nickel particle		N/A
A.6.4	Damaged separator precaution		N/A
A.6.5	Caution for rewinding separator and electrode		N/A
A.6.6	Insulation film for preventing short-circuit		N/A
A.6.7	Caution when disassembling a cell		N/A
A.6.8	Protective equipment for safety		N/A
A.6.9	Caution in the case of fire during disassembling		N/A
A.6.10	Caution for the disassembling process and pressing the electrode core		N/A
A.6.11	Recommended specifications for the pressing device		N/A
ANNEX B	RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS		P
ANNEX C	RECOMMENDATIONS TO THE END-USERS		N/A
ANNEX D	MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS		N/A
D.1	General		N/A
D.2	Method		N/A
	A sample size of three coin cells is required for this measurement		N/A
	Coin cells with an internal resistance greater than 3 Ω require no further testing	(See appended table D.2)	N/A
	Coin cells with an internal resistance less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1		N/A
ANNEX E	PACKAGING AND TRANSPORT		P
ANNEX F	COMPONENT STANDARDS REFERENCES		P

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: Continuous charging at constant voltage (cells)				N/A
Sample No.	Recommended charging voltage V _c (Vdc)	Recommended charging current I _{rec} (A)	OCV before test (Vdc)	Results	
--	--	--	--	--	
Supplementary information:					
--					

7.3.1	TABLE: External short circuit (cell)					N/A
Sample No.	Ambient (°C)	OCV at start of test (Vdc)	Resistance of circuit (mΩ)	Maximum case temperature rise ΔT (K)	Results	
Samples charged at charging temperature upper limit						
--	--	--	--	--	--	
Samples charged at charging temperature lower limit						
--	--	--	--	--	--	
Supplementary information:						
--						

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 (K)	Component single fault condition	Results
Pack: EFR610-NZ (M5)	20,1	26,692	87,8	--*	Normal	Pass
Pack: EFR610-NZ (M6)	20,1	26,699	86,1	--**	SC Q12 Pin (D-S)	Pass
Pack: EFR610-NZ (M7)	20,1	26,691	83,6	--**	SC Q12 Pin (D-S)	Pass
Pack: EFR610-NZ (M8)	20,1	26,694	82,8	--**	SC Q18 Pin (D-S)	Pass
Pack: EFR610-NZ (M9)	20,1	26,697	86,4	--**	SC Q18 Pin (D-S)	Pass
Supplementary information:						
- No fire or explosion						
- SC means short circuit						
--* Shut down immediately and test for 24 hours, no max. temperature was noted.						
--** Fuse (F5) opened and test for 24 hours, no max. temperature was noted.						

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.5	TABLE: Crush (cells)				N/A
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					
--	--	--	--	--	
Samples charged at charging temperature lower limit					
--	--	--	--	--	
Supplementary information:					
--					

7.3.6	TABLE: Over-charging of battery				P
Constant charging current (A) :			40,0		—
Supply voltage (Vdc) :			35,04		—
Sample No.	OCV before charging (Vdc)	Total charging time (minute)	Maximum outer case temperature (°C)	Results	
Pack: EFR610-NZ (M13)	22,085	172	44,8	Pass	
Pack: EFR610-NZ (M14)	22,079	172	45,6	Pass	
Pack: EFR610-NZ (M15)	22,074	172	43,8	Pass	
Pack: EFR610-NZ (M16)	22,082	172	43,5	Pass	
Pack: EFR610-NZ (M17)	22,083	172	44,3	Pass	
Supplementary information:					
- No fire or explosion					
- Ambient temperature was 24,6 °C.					

7.3.7	TABLE: Forced discharge (cells)				N/A
Sample No.	OCV before application of reverse charge (Vdc)	Measured reverse charge I _r (A)	Lower limit discharge voltage (Vdc)	Results	
--	--	--	--	--	
Supplementary information:					
--					

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

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	
Pack: EFR610-NZ (M18)	26,692	26,690	3378,80	3378,79	Pass	
Pack: EFR610-NZ (M19)	26,694	26,691	3376,23	3376,22	Pass	
Pack: EFR610-NZ (M20)	26,696	26,693	3379,59	3379,59	Pass	
Supplementary information: - No fire, no explosion, no rupture, no leakage or 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	
Pack: EFR610-NZ (M21)	26,693	26,691	3377,53	3377,52	Pass	
Pack: EFR610-NZ (M22)	26,698	26,694	3378,15	3378,15	Pass	
Pack: EFR610-NZ (M23)	26,699	26,695	3376,31	3376,31	Pass	
Supplementary information: - No fire, no explosion, no rupture, no leakage or venting						

7.3.9	TABLE: Forced internal short circuit (cells)					N/A
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						
--	--	--	--	--	--	
Samples charged at charging temperature lower limit						
--	--	--	--	--	--	
Supplementary information: --						

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: --					

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

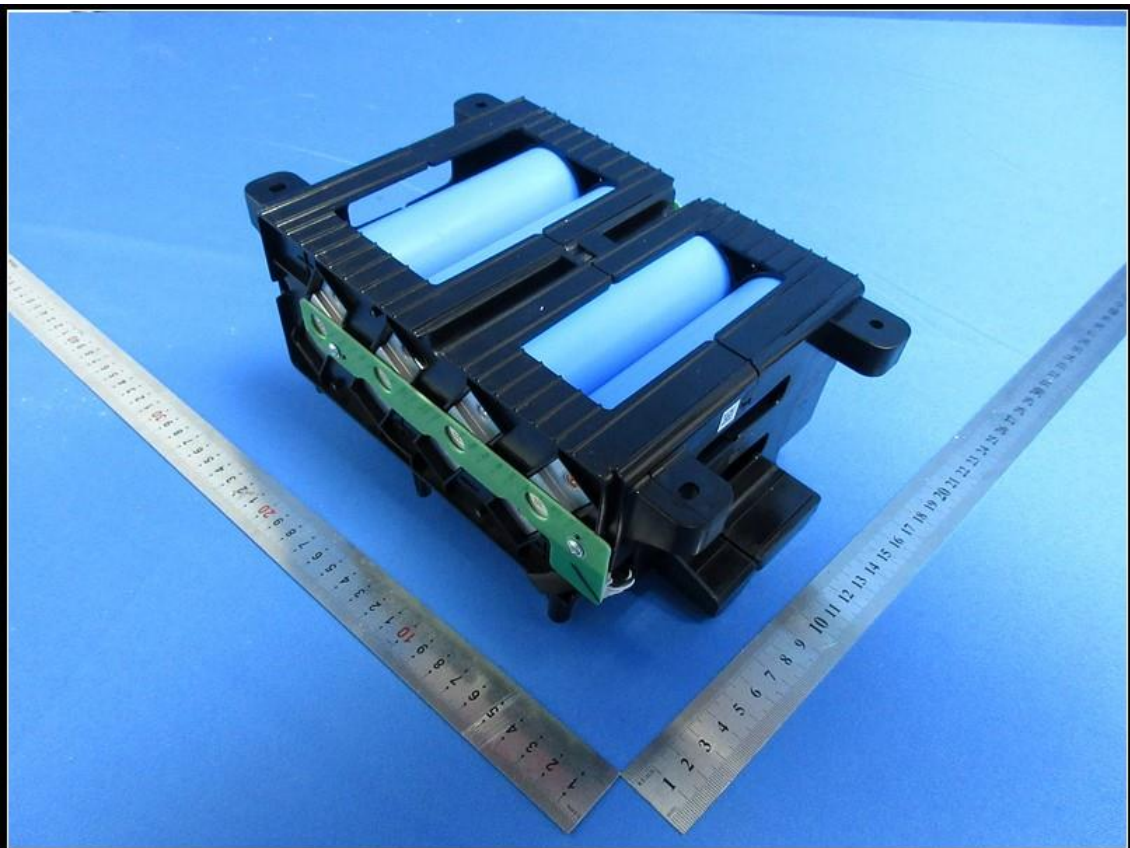
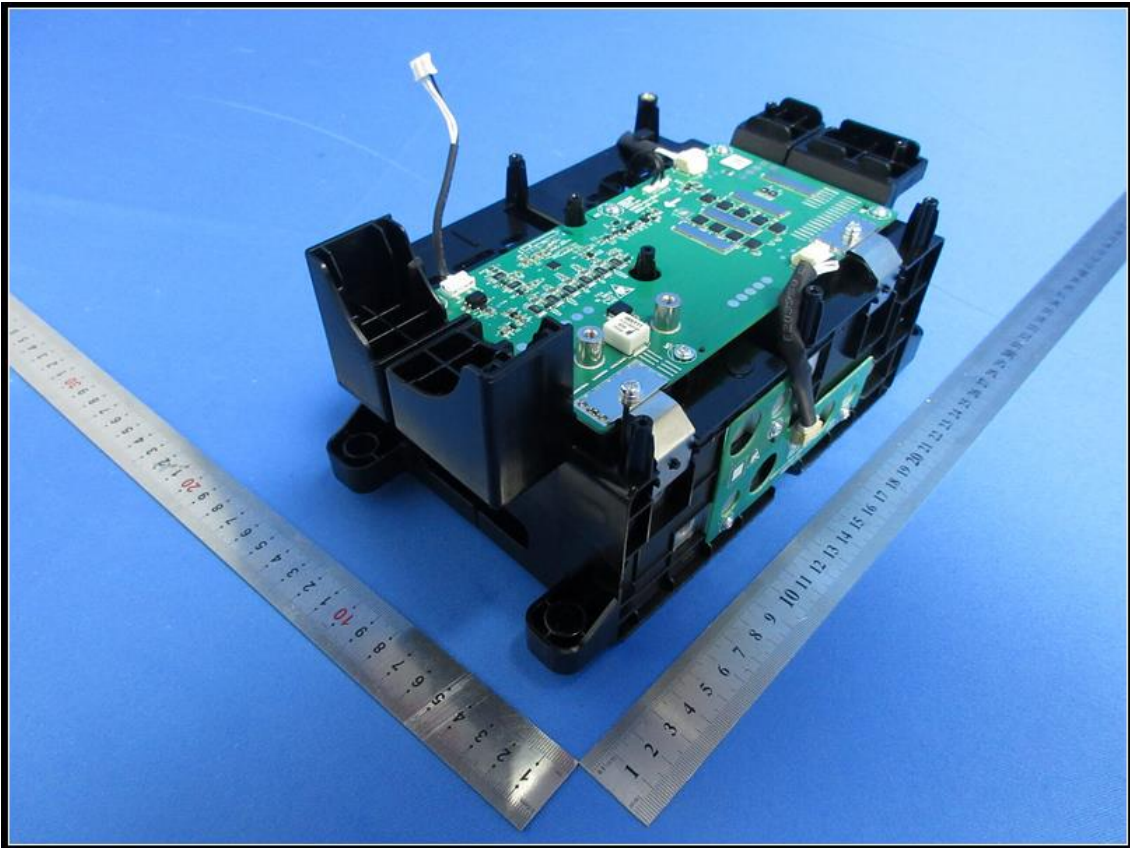
TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾
Cell	EVE POWER Co., Ltd.	C40	3,2 V, 20 Ah	IEC 62133-2: 2017 IEC 62133-2: 2017/AMD1: 2021 EN 62133-2: 2017+A1:2021	TÜV Rheinland (Japan) (Report No.: CN22ZPT4 001, Cert. No.: JPTUV-133350)
Plastic frame of cellblock	SILVER AGE ENGINEERING PLASTICS (DONGGUAN) CO LTD	PC2330	Material: PC, Min. thickness: 0,8 mm, V-0, 80°C	UL 94 UL 746C	UL (E225348)
Lead wire (signal)	DONGGUAN ZHONGZHENG WIRE & CABLE TECH CO LTD	10368	24 AWG, 105°C, 300 V, VW-1	UL 758	UL (E336285)
Alt.	Interchangeable	Interchangeable	Min. 24 AWG, 105°C, 300 V, VW-1	UL 758	UL
Heat-shrinkable tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	RSFR(CB)	125 °C, VW-1, 300 V	UL 224	UL (E203950)
Alt.	Interchangeable	Interchangeable	125 °C, VW-1, Min. 300 V	UL 224	UL
PCB	SHENZHEN TONGCHUANGX IN ELECTRONICS CO LTD	TCX	V-0, 130°C	UL 796	UL (E250336)
Alt.	Interchangeable	Interchangeable	V-0, Min. 130°C	UL 796	UL
NTC (RT1, RT2)	SHENZHENSHI KEMIN SENSOR CO LTD	MF58100K	Resistance at 25°C: 100 ± 1% KΩ, Tmoa: 250 °C	UL 1434 or UL 60730-1	UL (E356449)
Protect IC (U2)	O2Micro	OZ7708	V _{ov} : 3,3 to 4,575 V V _{uv} : 1,9 to 3,175 V Operating temperature range: -40 to 85 °C	--	--

IEC 62133-2					
Clause	Requirement + Test		Result - Remark		Verdict
RS (R46, R55)	RALEC	LR2512-23R001F4	1 mΩ, 3 W	--	--
Fuse (F5)	ADVANCED SURGETECH MATERIALS LTD	A121005-80	80 A, 75 Vdc	UL 248-1 UL 248-14	UL (E470032)
MOSFET (Q10, Q11, Q12, Q13, Q14, Q18, Q19, Q20, Q22)	China Resources Microelectronics (Chongqing) Limited	CRSM034N06L 2	Id: 80 A Vds: 60 V Tj: -55 to 150°C	--	--
Supplementary information: ¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

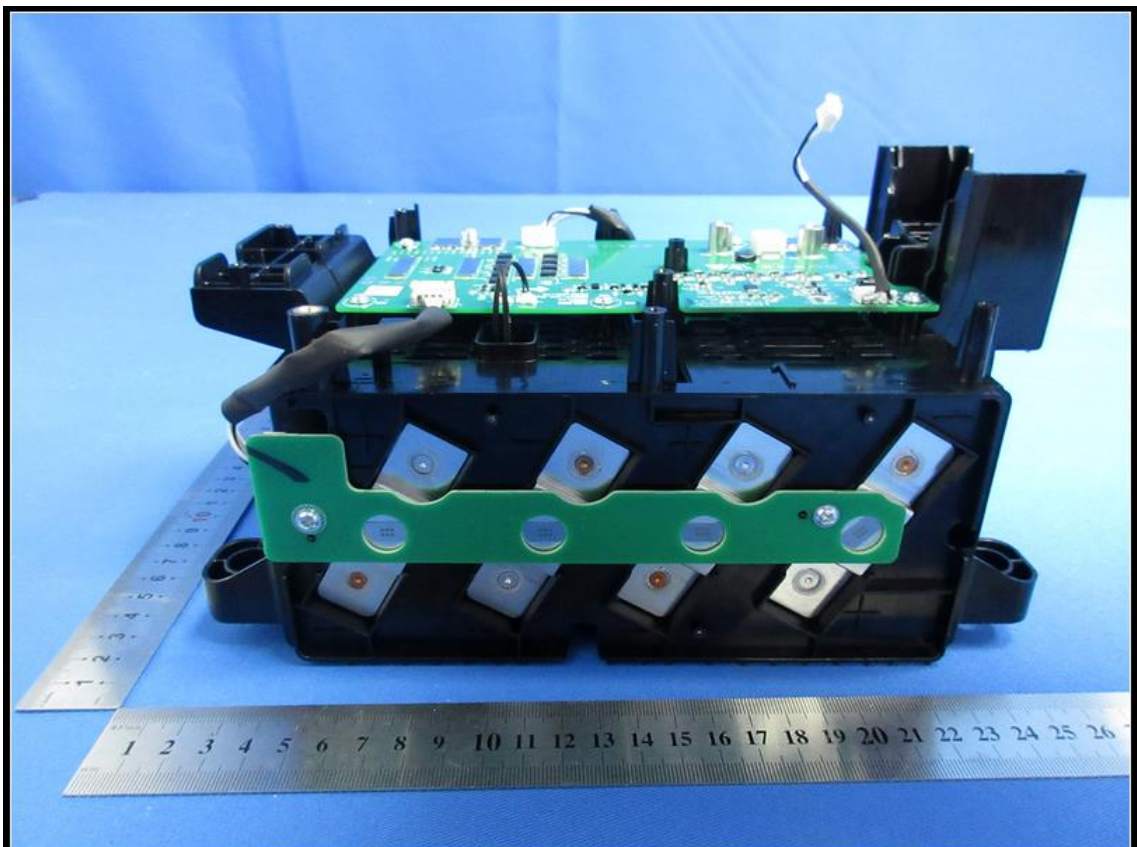
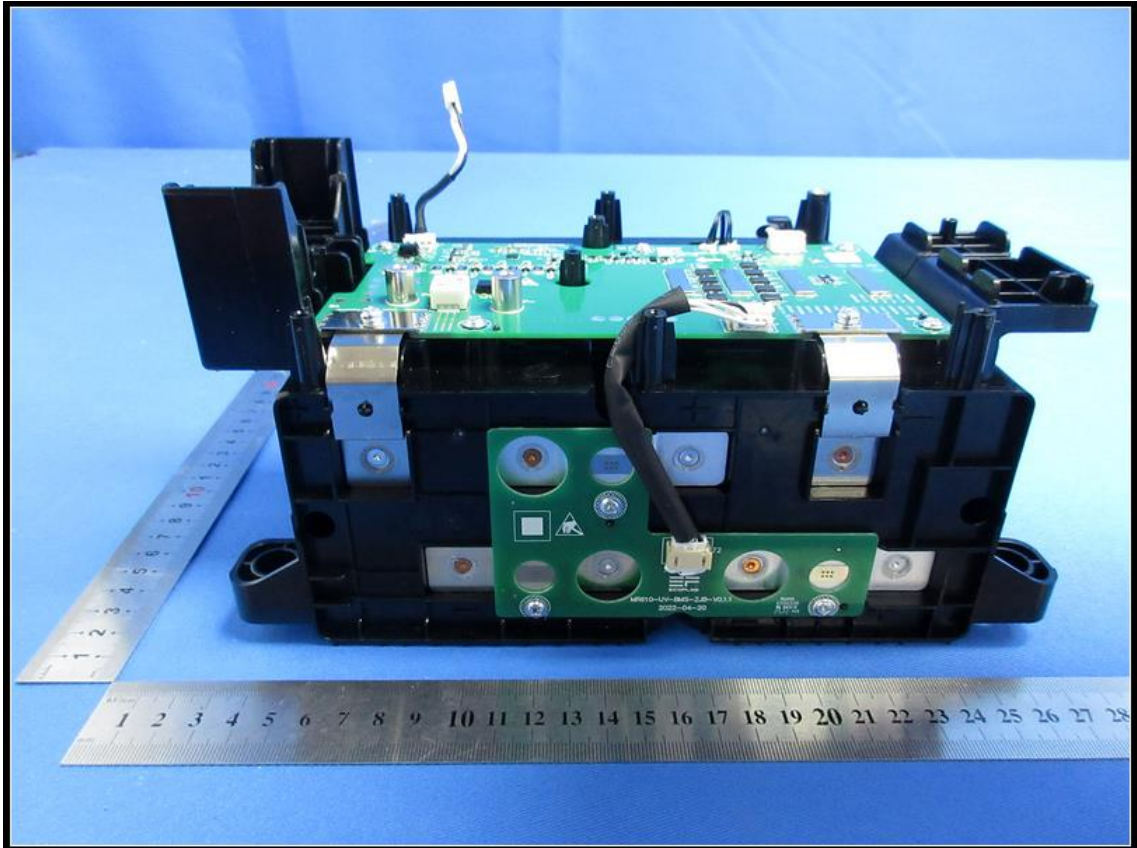
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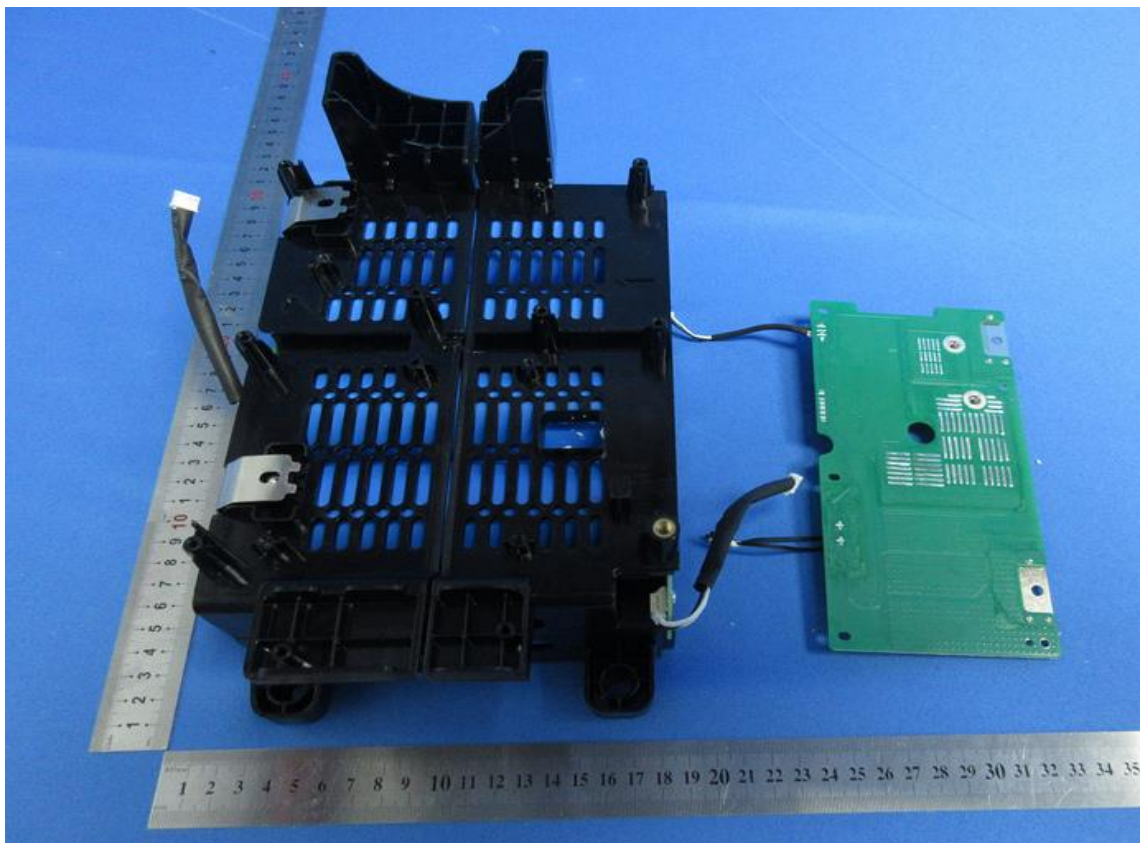
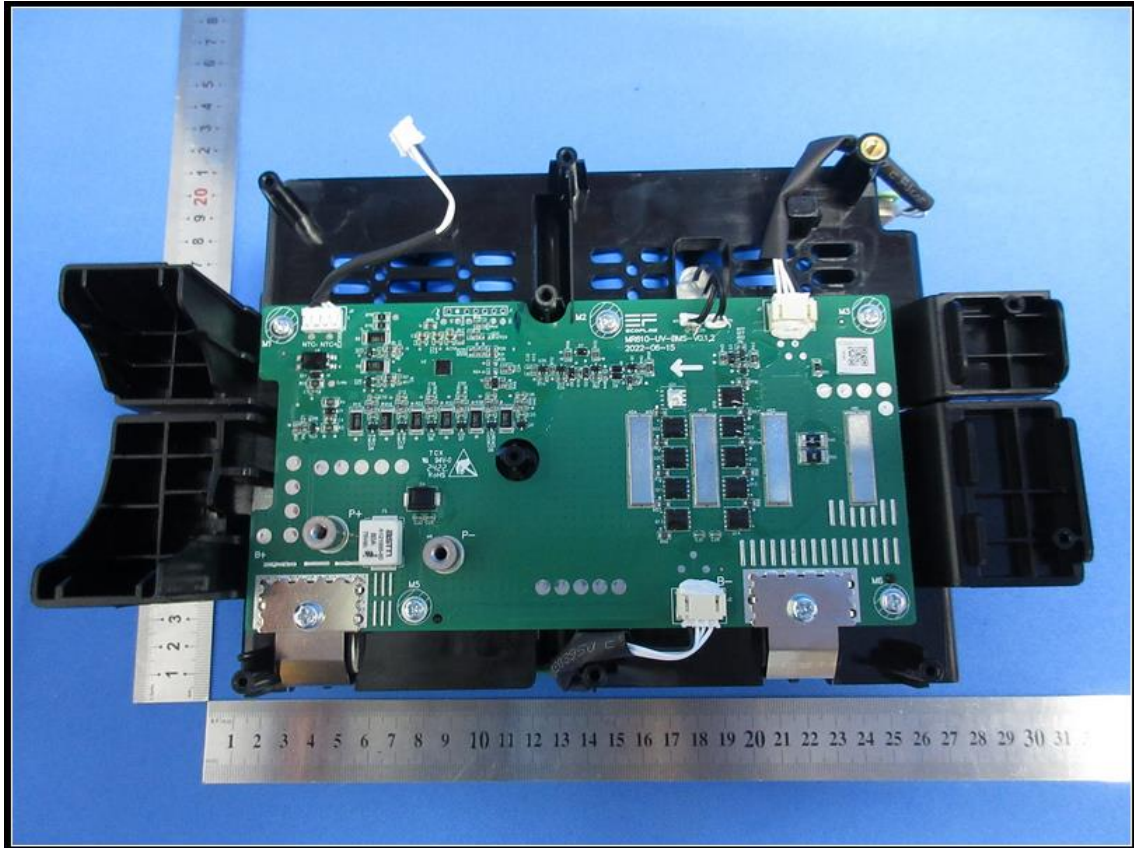
Attachment 1 Photo documentation

Whole unit



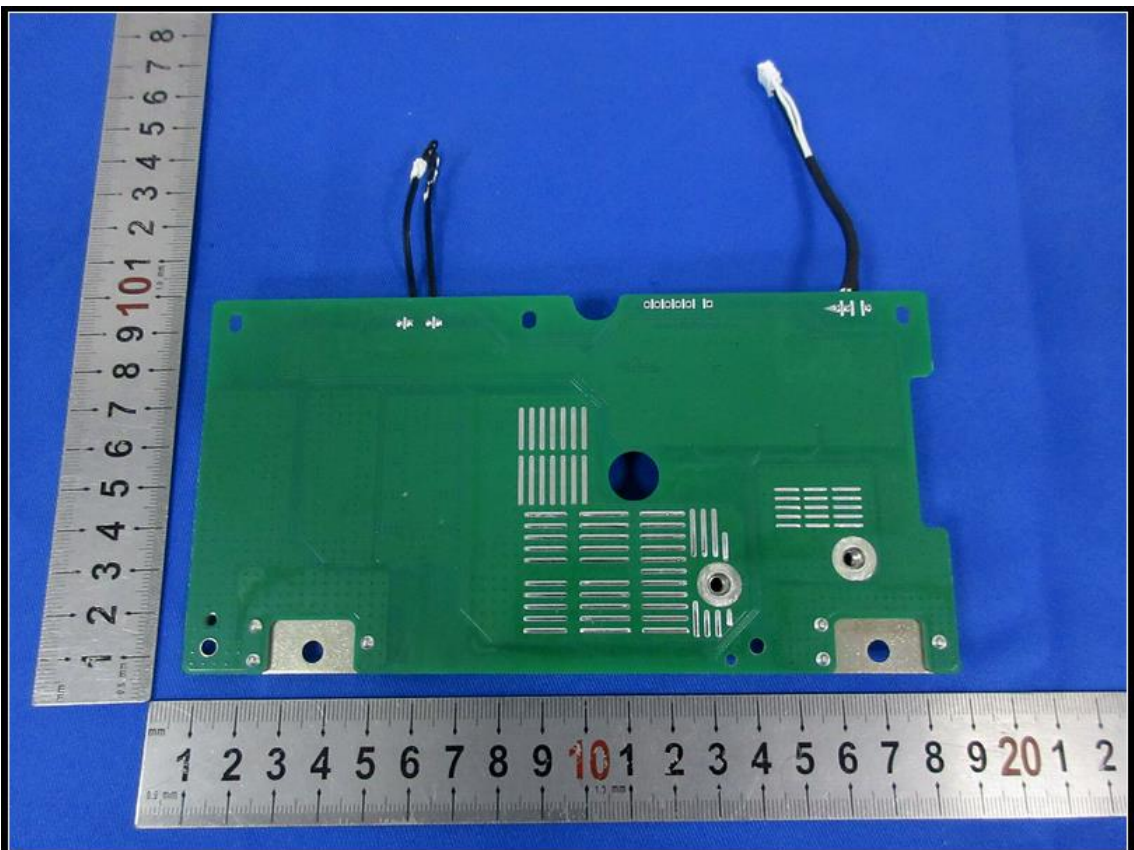
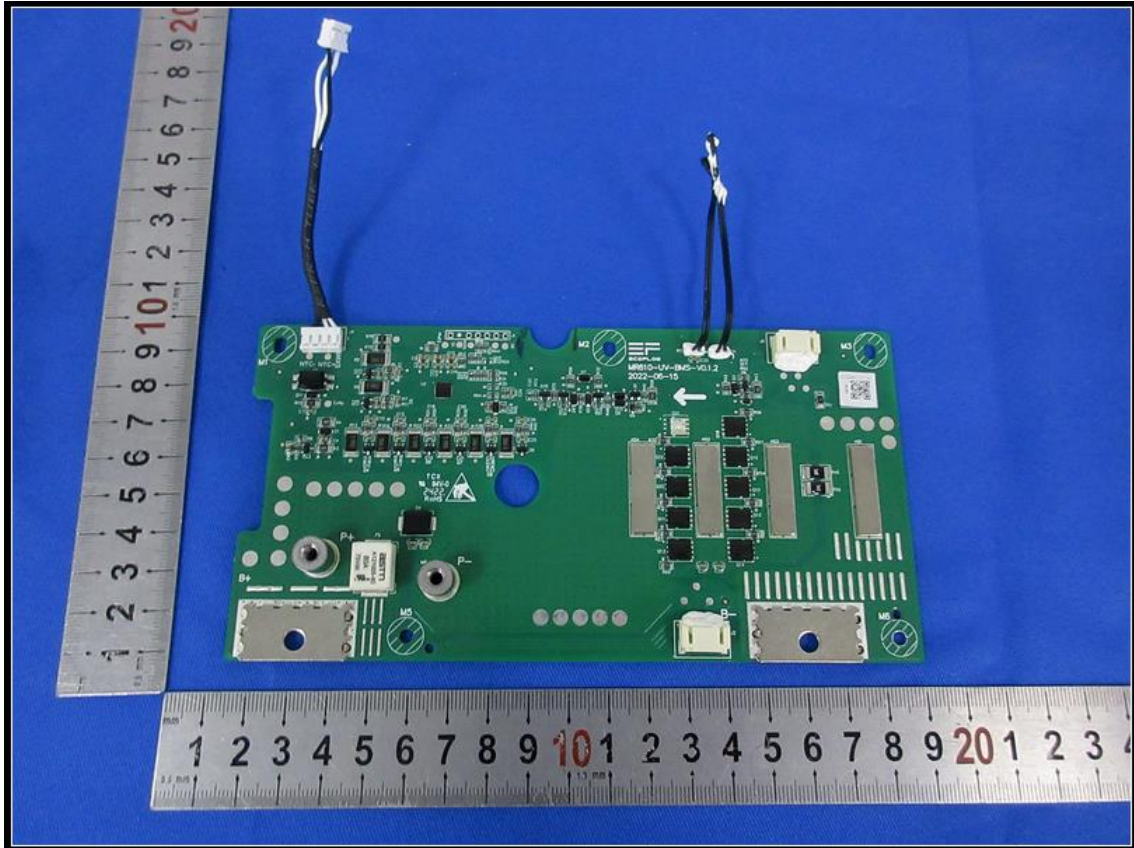
Attachment 1 Photo documentation



Attachment 1 Photo documentation

Attachment 1 Photo documentation

PCB



- - - End of Attachment 1 - - -

Attachment 2 Information for safety

6. Storage 贮存

6.1 Warehouse Management 仓库管理

①Seven meters heightened warehouse is not recommended to store Products. In case of the warehouse, Products should be placed not higher than two meters from floor

不推荐使用立体式仓库（高度在7米以上为立体仓库）储存锂离子电池；如果用立体仓库，则放置在地面2米高度以下的货位

②Batteries with safety deficiency and normal batteries should be separately stored with wall in-between or in different fire protection zone

安全缺陷电池和正常电池放开区域存储，单独隔墙或者不同防火分区

③Prevent electrical fire sources. Electrical tube, switch box and socket should be undamaged. 0.5 meters from floor standing air conditioner and dehumidifier should be free from inflammable materials. Use cold light source in warehouse. If spotlight is used, at least one meter therefrom should be free from other inflammable materials

管理电气火源，电气穿管不破损，开关箱、插座不破损；落地的空调、除湿机周围0.5米范围内无可燃物；仓库室内使用冷光源照明，如果用射灯在其周边至少1米无其他可燃物质

④Warehouse should be labelled with smoking ban and confirmed without cigarette butts. Smoking points should be reasonably designed with a fire-retardant wall separating warehouse. Wind at exist cannot blow cigarette butt near warehouse

仓库有禁烟标识，并确认仓库区域无烟头。吸烟点设计合理，和仓库有阻燃墙壁隔开，出口不会有风吹出烟头靠近仓库地面

⑤Warehouse should have mice protective measures, like plugging up holes and caves, timer-connected mouse expeller, floor baffler against mouse, sealing door slot with less than 10mm gap

仓库有防鼠措施，如堵住孔洞、设置有定时器联动的噪声驱鼠器，或门口设有挡鼠板或门缝有可以加密封后间隙不超过10mm

⑥Warehouse canopy must use fire retardant materials, prohibit inflammable materials like plastic or canvas

仓库雨棚只能用阻燃材料，禁止用可燃材料如塑料雨棚、帆布雨棚

⑦Warehouse should be equipped with fire detector, watch-keeper, and surveillance video kept for at least one month

仓库有火灾探测器，联动值班室，仓库整体头视频监控，视频保存至少1个月

⑧Keep a dry clean storage place with proper ventilation. Specifically, with a relative humidity of 5% RH~95%RH, if ambient temperature ranges between -30°C to 60°C, storage period lasts for seven days; if ambient temperature ranges between -20°C to 45°C, storage period lasts for six months

⑨Battery performance is vulnerable to chemical corrosion, strong acid, strong base, electrochemical corrosion, salt spray and radiation

化学腐蚀、强酸、强碱、电化学腐蚀、盐雾和射线都会影响电池性能

6.2 Fire extinguish device 配备灭火装

①Battery sites must be equipped with multiple varieties of battery fire extinguishers, including fire sand, blanket and powder extinguisher

现场配置多种多样的锂电池灭火装置，包括：消防沙、防火毯、干粉灭火器等

②Micro fire station is recommended to be deployed with firefighter uniform, helmet, fire protection mask, safety gloves, and at least one set of first aid kit including medical devices and drugs

建议在现场布置微型消防站，多套消防战斗服，头盔，防火面罩；高温手套，至少一套医疗急救箱，外用药品和器械

6.3 Smoke discharge 排烟

①Equip 24 hours fan with failure alert. Fan should coordinate with smoke detector or gas concentration detector

房间宜配置独立风机24小时运作有故障报警，或房间有独立风机且风机和烟雾报警器/或浓度报警器联动

②Fan portfolio includes axial flow fan on wall (effective distance less than 5 meters), fan with fixed air hose, mobile fan with flexible aluminum foil. Wall fan combined with mobile fan is recommended

建议灵活组合使用风机。包括：墙壁轴流风机（作用距离不超过5米），或固定风管的风机，或带伸缩铝箔管道的移动风机，鼓励见墙壁风机和移动风机组合排烟

6.4 Fire retardant buildings 建筑耐火

Warehouse and plant should use level two fire retardant buildings, like rock wool colour steel plate, plasterboard and iron rain-shed. Inflammable materials like foam and plastics are prohibited

电池的仓库和车间使用二级耐火建筑；不得使用易燃建筑材料如泡沫彩钢板、塑料雨棚，可使用阻燃的岩棉彩钢板、石膏板、铁皮雨棚

Attachment 2 Information for safety

6.5 Separate storage 单独存放

①Lithium batteries should not be stored with inflammable or toxic objects

锂离子电池不得和易燃或有毒等危险品一起存放

②Design various fire protection zones. Normal batteries and batteries with safety deficiencies should be stored desperately

要在不同防火分区，正常的锂离子电池和安全缺陷电池不要混放

The shipment module SOC is more than 30% and the module need be charged after 6 months during storage

模组出货SOC为不小于30%，超过六个月需要对模组进行补电

9.2 Recommending Usage 推荐使用事项

Please read the battery instructions and the label on its surface before use.

使用电池前，请仔细阅读使用说明书和电池表面标识。

Use the battery indoors under normal condition, temperature: $(20 \pm 5)^\circ\text{C}$, absolute humidity: $65 \pm 20\%$.

请在正常的室内环境中使用电池，温度： $(20 \pm 5)^\circ\text{C}$ ，相对湿度： $65 \pm 20\%$ 。

When in use, the battery shall be kept out of heat、high voltage and avoided children's touching. Do not drop the battery.

在使用过程中，应远离热源、高压，避免儿童玩弄电池，切勿摔打电池。

Use the compatible charger. Do not put the battery into the charger over 24hours.

本电池只能使用配套充电器充电，不要将电池放在充电器超过 24 小时。

Do not touch contacts together. Do not demolish or assembly the battery by yourself. Do not put the battery in the damp place to avoid danger.

切勿将电池正负极短路，切勿自己拆装电池，也勿让电池放在受潮处，以免发生危险。

When the battery was stored for a long period, put it well in its half capacity. Do not wrap it with conduct material to avoid the damage caused by the direct contact between the metal and battery. Keep the battery in dry places.

长期不用时，请将电池储存完好，让电池处于半荷电状态。请用不导电材料包裹电池，以避免金属直接接触电池，造成电池损坏，将电池保存阴凉干燥处。

Well disposed the disused battery. Do not put it into fire or water.

废弃电池请安全妥当处理，不要投入火中或水中

9.3 Prohibited Usage 严禁事项

Do not immerse in water

禁止投入水中

Do not heat

禁止加热

Do not attempt to crush, drop or penetrate the Pack

禁止尝试挤压、跌落、穿刺

Do not attempt to have any modification

禁止任何修改

Stop using the Pack with any colour change or mechanical damage detected during assembling, charging, normal operation and storage

在组装，充电，正常使用和存储中，如有变色或机械损伤，请不要继续使用

In case of leakage or smells, track to thermal source, remove source and clean with water

万一有漏液或气味，要从热源移除，并且用清水清洗干净

Do not put the Pack into a fire. Do not use it or leave it in a place near fire, heaters, or high temperature sources. The heat can melt Pack insulator, damage safety vent, result in overheat, explosion or fire

不要将电池丢入火中。不要在离火源，热源或高温源近的地方使用或放置。在这种情况下，电池中的绝缘保护可能融化，安全阀等结构可能会被损坏，这样可能会过热，爆炸或起火

Do not connect the Pack reversely connect positive (+) and negative (-) terminal

禁止反接电池正负极，在这种情况下，电池被异常充电可能会导致过热，爆炸或起火

Do not short circuit. Do not let the Pack terminals (+ and -) contact a wire or any metal (like a metal necklace or a hairpin). In such a case, the Pack is short circuited and generate excessive current, which may result in heat generation, explosion, or fire

禁止短接，禁止直接用导线或任何金属（比如金属项链或发卡）连接电池正负极。这种情况下，电池外短路引起过电流，有可能导致过热，爆炸或起火

Do not throw or drop the Pack. Strong impact may damage the protecting device, which may cause an abnormal chemical reaction during its charge and result in heat generation, explosion, or fire of the Pack

禁止抛扔或跌落电池，强的重力冲击可能破坏保护机构，可能引起异常化学反应导致发热，爆炸或起火

Do not drive a nail in, hit with a hammer, or stamp on the Pack. In such a case, the Pack may be deformed and short circuited, which may cause heat generation, explosion, or fire of the Pack

禁止针刺，砸锤或邮戳电池，这种情况下，电池可能变形和短路，从而导致过热，爆炸，起火

Attachment 2 Information for safety

Do not disassemble or alter the Pack. The Pack employs a safety mechanism and a protecting device in order to avoid any danger. If they are damaged, heat, explosion or fire may be caused

禁止拆解或更换电池，电池安置了安全机构和保护机构避免安全隐患，假如损坏，可能导致过热，爆炸或起火

Do not put the Pack in a microwave oven or a pressure cooker. Sudden heat may damage the sealing of the Pack and may cause heat generation, explosion, or fire of the Pack

禁止将电池放在微波炉或压力锅内，极速的热可能导致过热，爆炸或起火

Stop charging after reaching specified charge time even if capacity is not complete, otherwise, as the Pack might cause heat generation, explosion, or fire

规定时间内不能完成充电不要继续充电，否则可能导致过热，爆炸或起火

Do not use the Pack beyond specified conditions; otherwise, the Pack might cause heat generation, damage, or deterioration of its performance

禁止在超出规定条件下使用电池，否则可能导致过热，损坏，恶化电池电性能

9.4 Hazard Warning 危险警告

This battery cannot mix with disposal or twice- recycled batteries in use. Otherwise, for its abnormal charge and discharge, it will cause over-heated, distort, smoke or burning.

电池不可与其它类型的一次或二次电池混用，否则因为不正常的充、放电造成电池发热、冒烟、变形或燃烧。

Keep the battery out of children's reach and prevent them biting or swallowing the battery.

将电池远离孩童不能得到的地方，以避免孩童咬或吞咽电池，如果吞咽了电池，应迅速送医院处理。

Do not insert the battery onto the charger for a long time. If charging beyond the normal time, the battery is still in the charger, please stop charging. The abnormal charging will cause battery over-heated, distort, smoke or burning.

如果超过正常充电时间很长时间充电器仍在充电，应停止充电，不正常的充电有可能会使电池发热、冒烟变形或燃烧。

Do not put into microwave stove or any other pressure apparatus. Take the battery away from the cellular phone or the charger if it is instant heated or leak-out (or odors) and dispose it. The bad battery will cause over-heated, smoke or burning.

不可置于微波炉或其他压力容器，瞬间加热或结构漏液（或有异味），应让电池离开手机或充电器并弃用。使用不正常的电池会发热、冒烟、变形或燃烧

9.5 Precautions 注意事项

The battery shall be prevented to be exposed in effulgence so as not to cause over-heated, distort, smoke and weaken its performance and cycle life.

避免在强光曝晒环境下使用电池，以免发热、变形、冒烟。至少避免电池性能下降、降低寿命。

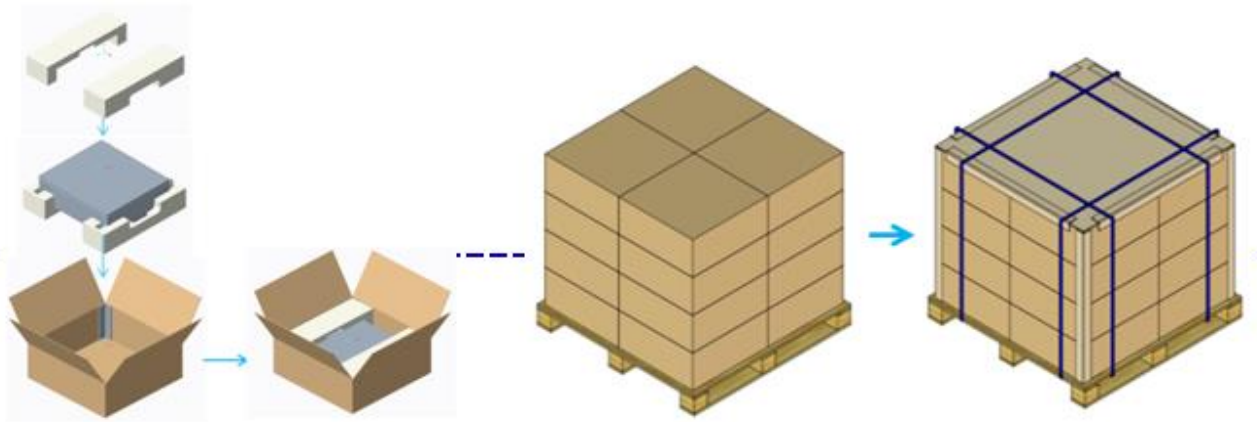
There is a protective circuit inside the battery to prevent contingency. Do not use the battery in the Electro static circumstances, (above 1000V), for it is easily destroyed the circuit board so that the battery does not work and causes over-heated, distort, smoke or burning.

电池中装有保护电路以避免各种意外情况发生。不要在产生静电的场所使用电池，因为静电（1000V 以上）容易损坏保护板，而导致电池工作不正常，发热、变形、冒烟或起火燃烧。

按照不同国家的废弃电池管理规则进行正确丢弃，合理回收废弃电池。

Dispose of batteries appropriately according to local regulations different from other countries.

- - - End of Attachment 2 - - -

Attachment 3 Packaging

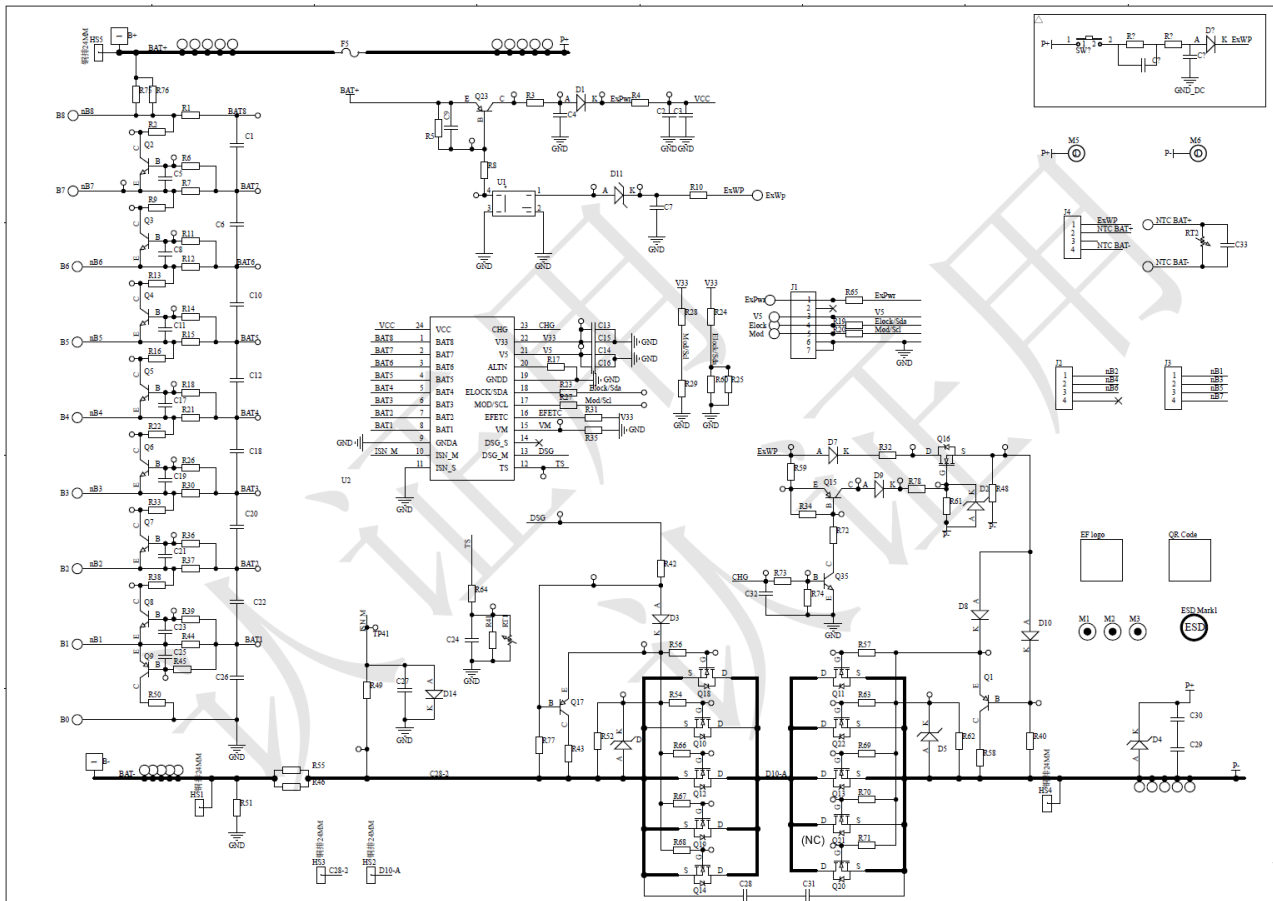
--- End of Attachment 3 ---

Attachment 4 Product specification

Specification of Pack

Item	Rating for battery
Rated Capacity	20 Ah
Nominal Voltage	25.6 V
Discharge Cut-off Voltage	20 V ($T > 0^{\circ}\text{C}$) 16 V ($T \leq 0^{\circ}\text{C}$)
Max. Charge Voltage	29.2 V
Max. Charge Current	20 A
Charge Operating Temperature	0-45 $^{\circ}\text{C}$

Circuit diagram



--- End of Attachment 4 ---