



Test Report issued under the responsibility of:



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..... : TSZ23110179-P02-R01

Date of issue : 2023-12-27

Total number of pages : 26

Name of Testing Laboratory
preparing the Report : Shenzhen Tiansu Calibration and Testing Co., Ltd.

Applicant's name : SHENZHEN HIMAX ELECTRONICS CO.,LTD
Address : Floor 501, Building B, Nantong Avenue No.5, Tongle
Community, Baolong Street, Longgang, SHENZHEN
GUANGDONG SHENG 518000, 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

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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 :	Lithium-ion Battery Pack	
Trademark(s)	N/A	
Manufacturer	Same as applicant	
Model/Type reference	LAF12120, LAF12120BT	
Ratings	12.8V, 120Ah, 1536Wh	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	CB Testing Laboratory:	Shenzhen Tiansu Calibration and Testing Co., Ltd.
Testing location/ address :		Building 4, No.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China.
Tested by (name, function, signature) :		Davis Ding /Project Handler 
Approved by (name, function, signature) ... :		Eason zhou /Reviewer 
☐	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): Enclosures (14 pages)	
Summary of testing:	
Tests performed (name of test, test clause and date test performed): Testing for Cell: IFR32135-15Ah 7.2.1 External short-circuit test Test period: 2023-12-03 7.2.2 Impact test Test period: 2023-11-16 7.2.3 Drop test Test period: 2023-11-22 7.2.4 Thermal abuse test Test period: 2023-11-17 7.2.5 Overcharge test Test period: 2023-11-23 7.2.6 Forced discharge test Test period: 2023-11-19 7.3.2 Internal short-circuit test Test period: 2023-11-29 Testing for battery Pack: LAF12120 7.2.3 Drop test Test period: 2023-11-22 8.2.2 Overcharge control of voltage Test period: 2023-11-23 8.2.3 Overcharge control of current Test period: 2023-11-23 8.2.4 Overheating control Test period: 2023-11-24 to 2023-11-25	Testing location: (CBTL, SPTL, CTF, Subcontractor) CBTL Shenzhen Tiansu Calibration and Testing Co., Ltd. Building 4, No.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China.
Summary of compliance with National Differences (List of countries addressed): EU group *, United Kingdom (Per customer's request shown separately) *=No National or Group Differences declared. ☒ The product fulfils the requirements of EN IEC 62619: 2022 ☒ The product fulfils the requirements of BS EN IEC 62619: 2022	

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.

Lithium-ion Battery Pack
 LAF12120 IFpR34/141/[8P4S]M/-10+40/90
 +(Red) -(Black)
 12.8V, 120Ah, 1536Wh
 B0BCA00H
 SHENZHEN HIMAX ELECTRONICS CO.,LTD
 Recommended charge: 24A charge to 14.6V CC-CV
 Charge limited voltage: 14.6V
 Caution:
 Risk of fire and burns, follow manufacturer's instructions, disposal
 of batteries should follow local regulations.

Lithium-ion Battery Pack
 LAF12120BT IFpR34/141/[8P4S]M/-10+40/90
 +(Red) -(Black)
 12.8V, 120Ah, 1536Wh
 B0BCA00H
 SHENZHEN HIMAX ELECTRONICS CO.,LTD
 Recommended charge: 24A charge to 14.6V CC-CV
 Charge limited voltage: 14.6V
 Caution:
 Risk of fire and burns, follow manufacturer's instructions, disposal
 of batteries should follow local regulations.

Remark:

A	B	C	D	E	F	G	H	J	0
1	2	3	4	5	6	7	8	9	0

1. The date code "B0BCA00H" represents the date of production. The first four digits represent the year, the middle two digits represent the month, and the last two digits represent the day. The letter ABCDEFGHJ is used to represent 123456789 in word segmentation, and 0 is still represented by 0, As shown in the above table.

Such as B0BCA00H represents October 8th, 2023.

2. Battery model LAF12120 does not have Bluetooth communication, battery model LAF12120BT has Bluetooth communication, other than that, everything else is completely consistent.

Test item particulars..... : --	
Classification of installation and use..... : --	
Supply Connection : DC connector	
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 : 2023-11-08	
Date (s) of performance of tests : 2023-11-16 to 2023-11-29	
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 IEC60335-1:	
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) : Same as applicant	

General product information and other remarks:

The battery of model LAF12120 and LAF12120BT is composed of composed of thirty-two lithium-ion cells (4S8P), and equipped with overcharge, overdischarge, overcurrent, and short circuit protection circuits.

- Battery (Model: LAF12120) has been evaluated to comply with ST/SG/AC.10/11/Rev.7/Section 38.3, test report No.: TSZ23110179-P03-R01 issued on 2023-12-06, issued by Shenzhen Tiansu Calibration and Testing Co., Ltd.

- Battery (Model: LAF12120BT) has been evaluated to comply with ST/SG/AC.10/11/Rev.7/Section 38.3, test report No.: TSZ23110179-P08-R01 issued on 2023-12-06, issued by Shenzhen Tiansu Calibration and Testing Co., Ltd.

- Type reference IFP34/141/[8P4S]M/-10+40/90 is IEC 62620:2014 designation which is identical Model LAF12120 and LAF12120BT except for model designation.

- Detailed information of the cell, as following:

Product name:	Lithium-ion Cell	Cell model:	IFR32135-15Ah
Nominal Voltage	3.2V	Normal Charge Current	3A
Rated Capacity	15Ah	Maximum Charge Current	14A
Energy	48Wh	Normal Discharge Current	3A
Maximum Charge Voltage	3.65V	Maximum Discharge Current	14A
Discharge Cut-Off Voltage	2.0V	End of charging current	0.75A
Charging Temperature Range	0°C to 55°C	Discharging Temperature Range	-30°C to 60°C

- Detailed information of the battery system, as following:

Product name:	Lithium-ion Battery Pack	Battery model:	LAF12120
Nominal Voltage	12.8V	Normal Charge Current	24A
Rated Capacity	120Ah	Maximum Charge Current	100A
Energy	1536Wh	Normal Discharge Current	24A
Maximum Charge Voltage	14.6V	Maximum Discharge Current	100A
Discharge Cut-Off Voltage	10V	End of charging current	6A
Charging Temperature Range	0°C to 50°C	Discharging Temperature Range	-10°C to 60°C

Product name:	Lithium-ion Battery Pack	Battery model:	LAF12120BT
Nominal Voltage	12.8V	Normal Charge Current	24A
Rated Capacity	120Ah	Maximum Charge Current	100A
Energy	1536Wh	Normal Discharge Current	24A
Maximum Charge Voltage	14.6V	Maximum Discharge Current	100A
Discharge Cut-Off Voltage	10V	End of charging current	6A
Charging Temperature Range	0°C to 50°C	Discharging Temperature Range	-10°C to 60°C

Remark:

1. Battery model LAF12120 does not have Bluetooth communication, battery model LAF12120BT has Bluetooth communication, other than that, everything else is completely consistent.
2. This report is based on battery model LAF12120 for testing.

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		N/A
5.2	Insulation and wiring		P
	Voltage, current, altitude, and humidity requirements	See table 5.1 for Critical components information.	P
	Adequate clearances and creepage distances between connectors and live parts at different voltages or between live parts and non-current-carrying accessible parts		N/A
	Protect from hazardous live parts, including during installation		N/A
	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	Charging instructions included in the product specification.	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		N/A
	Capability to carry the maximum anticipated current	Connector complied with the requirements. See table 5.1 for Critical components information.	P
	External terminal contact surfaces		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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..... :	Refers to page 7.	P
	Designation of battery system to comply with the cell operating region	Refers to page 7.	P
5.8	System lock (or system lock function)		P
	Non-resettable function to stop battery operation	Provided in the BMS software security mechanism.	P
	Manual with procedure for resetting of battery operation		P
	Emergency battery final discharge		N/A
5.9	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented :	ISO 9001 certificate 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

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Clause	Requirement + Test	Result - Remark	Verdict

	Default ambient temperature of test, 25 °C ± 5 °C		P
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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	10.0V	P
	The cells or batteries charged using the method specified by the manufacturer..... :	24A CC charge to 14.6V, then 14.6V CV charge till charge current decline to 6A.	P
7.2	Reasonably foreseeable misuse		P
7.2.1	External short-circuit test (cell or cell block)		P
	Short circuit with total resistance of 30 mΩ ± 10 mΩ at 25 °C ± 5 °C		P
	Results: no fire, no explosion	(See appended table 7.2.1)	P
7.2.2	Impact test (cell or cell block)		P
	Cylindrical cell, longitudinal axis impact	Cylindrical cell.	P
	Prismatic cell, longitudinal axis and lateral axis impact		N/A
	Results: no fire, no explosion.		P
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)		P
	Description of the Test Unit..... :	Cell	—
	Mass of the test unit (kg)..... :	C07#: 0.266, C08#: 0.263, C09#: 0.268.	—
	Height of drop (m)..... :	1	—
	Results: no fire, no explosion		P
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)		P
	Description of the Test Unit..... :	Battery system	—
	Mass of the test unit (kg)..... :	11.430	—
	Height of drop (m)..... :	0.1	—
	Results: no fire, no explosion		P
7.2.4	Thermal abuse test (cell or cell block)		P
	Results: no fire, no explosion		P

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.5	Overcharge test (cell or cell block)		P
	For those battery systems that are provided with only a single protection for the charging voltage control		—
	Results: no fire, no explosion	(See appended table 7.2.5)	P
7.2.6	Forced discharge test (cell or cell block)		P
	Cells connected in series in the battery system	Cell only.	N/A
	Redundant or single protection for discharge voltage control provided in battery system	Cell only.	N/A
	Target Voltage	-3.65V	P
	Maximum discharge current of the cell, I_m	14A	P
	Discharge current for forced discharge, 1.0 I_t	14A	P
	Discharging time, $t = (1 I_t / I_m) \times 90$ (min.)	97min	P
	Results: no fire, no explosion	(See appended table 7.2.6)	P
7.3	Considerations for internal short-circuit – Design evaluation		P
7.3.1	General		P
7.3.2	Internal short-circuit test (cell)		P
	Samples preparation procedure: In accordance with Clause A.5 and A.6 of IEC 62133-2:2017		P
	Tested per 7.3.2 b) in an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$.		P
	The appearance of the short-circuit location recorded by photograph or other means	See Enclosures ID 07.	—
	The pressing was stopped - 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	800N for cylindrical cells.	P
	Results: no fire	(See appended table 7.3.2)	P
7.3.3	Propagation test (battery system)		N/A
	Method to create a thermal runaway in one cell ...		N/A
	Results: No external fire from the battery system, no battery case rupture		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		P
8.1	General requirements		P
	Functional safety analysis for critical controls	Analysis for functional safety according to Annex H of IEC 60730-1:2020.	P
	Conduct of a process hazard analysis for both the cell manufacturing process and the battery system manufacturing process	Hazard analysis	P
	Conduct of risk assessment and mitigation of the battery system	FEMA provided	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	Annex H of IEC 60730-1 :2020, Class B.	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		P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s)..... :		N/A
	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..... :	55°C	P
	Results: no fire, no explosion..... :	See Table 8.2.4.	P
	The BMS detected the overheat temperature and terminated charging		P
	The battery system operated as designed during test		P

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Clause	Requirement + Test	Result - Remark	Verdict

9	EMC		N/A
	Battery system fulfil EMC requirements of the end-device application :	Intended for to be tested in the end use 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.		P

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.	See Page 5, Copy of marking plate for more information.	P
	Cell or battery system has clear and durable markings		P
	Cell designation		N/A
	Battery designation	IFpR34/141/[8P4S]M/-10+40/90	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. 1) Heater (Heater, Burner, Laser, Inductive heating 2) Overcharge 3) Nail penetration of the cell 4) Combination of above methods 5) Other methods		—

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX D	PACKAGING AND TRANSPORT		P
	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⁾	
Enclosure	CHI MEI CORPORATION	PA-765(+)	Material: ABS, Dimension: 522mm *240mm*218mm, Minimum thickness: 2.5mm, RTI Electric: 130°C, RTI Impact: 120°C, RTI Strength: 130°C	UL 94 UL 746	UL E56070	
Epoxy resin board	JINGMEN GORUN TECHNOLOGY CO LTD	HF70	V-0, 80°C, Minimum thickness: 0.1mm	UL 94 UL 746	UL E305163	
Epoxy resin board (Alternative)	Interchangeable	Interchangeable	V-0, 80°C, Minimum thickness: 0.1mm	UL 94 UL 746	UL	
Power Terminals M8	XinFeng xinhonlin Packing Co., LTD	12V200L	Material: Copper; Size: φ20(23)mm*L31mm	IEC 62619: 2022	Tested with appliance	
Pole cap	ELECTROLUBE LTD	ER2218	Flammability: V-0, Material: Plastic	UL 94	UL E100107	
Pole cap (Alternative)	Interchangeable	Interchangeable	Flammability: V-0, Material: Plastic	UL 94	UL	
Internal power wires	Dongguan Yue Zhen Wire & Cable Co Ltd	3135	Minimum: 8AWG, minimum: 300V, minimum: 80°C, marked: VW-1	UL 758	UL E354338	
Internal power wires (Alternative)	Interchangeable	Interchangeable	Minimum: 8AWG, minimum: 300V, minimum: 80°C, marked: VW-1	UL 758	UL	
Internal wires	SHENZHEN JIAHUIDA ELECTRONICS CO LTD	1332	Minimum: 22AWG, minimum: 300V, minimum: 80°C, marked: VW-1	UL 758	UL E361915	
Internal wires (Alternative)	Interchangeable	Interchangeable	Minimum: 22AWG, minimum: 300V, minimum: 80°C, marked: VW-1	UL 758	UL	

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
Insulation Sleeving	SHENZHEN YITONGDA PYROCONDENSATION MATERIAL CO LTD	DLK-1	Rating: 600V, Temperature: 125°C, VW-1	UL 224	UL E239589
Insulation Sleeving (Alternative)	Interchangeable	Interchangeable	Rating: 600V, Temperature: 125°C, VW-1	UL 224	UL
Heating Film	Huizhou Hongtian Electronic Materials Co. , Ltd.	JRM-100W	Material: Silica gel, dimension: 380x105x0.3mm, power: 14.6V50W, Gross power: 14.6V100W	UL 94	UL E528123
Cell					
Cell	Hefei Gotion High tech Power Energy Co.,Ltd.	IFR32135-15Ah	3.2Vdc, 14.5Ah, 46.4Wh	IEC 62619: 2022	Tested with appliance
- Case	--	--	Al foil	--	--
- Positive electrode	--	GX003	Positive material: LiFePO4, coated on Al film	--	--
- Negative electrode	--	HD-10	Negative material C coated on Cu film	--	--
- Separator	Hefei Xingyuan New Energy Materials Co. Ltd.	SH312W13	Material: PE + Boehmite, Dimensions: (9+3μ), m*124.5mm (Width * Thickness)	--	--
- Electrolyte			LiFP6 dissolved in organic solvent (EC+EMC+PC+EC+VC)	--	--
- Insulation film			The minimum thickness: 0.075mm	UL 94 Ed.6	UL
- Vent or pressure release mechanism			1.5Mpa	--	--
PCB (BMS)					
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB-6160	130°C, V-0°C	UL 94 UL 796	UL E123995

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
Protect IC (MCU1)	Tai wan Nuvoton Technology Corporation	NANO100SD3B N	V _{DD} : 1.8V to 3.6V, T _{LXT} : -40°C to 85°C	IEC 62619: 2022	Tested with appliance
Protect IC (AU1, AU2)	TEXAS INSTRUMENTS	bq76920	V _{BAT} : -0.3V to 36V, T _{STG} : -65°C to 150°C	IEC 62619: 2022	Tested with appliance
IC (VU6)	HOLTEK	HT7533-1	V _{IN} : 30V, V _{OUT} : 3.201V to 3.399V, I _{OUT} : 100mA	IEC 62619: 2022	Tested with appliance
MOSFET of Charge (PMC2 to PMC4, PMC6 to PMC17, PMC19)	NCE power Semiconductor CO.,LTD.	NCEP018N85LL	V _{DS} : 85V, V _{GS} : ±20V, I _D : 320A, T _J : -55°C to 175°C	IEC 62619: 2022	Tested with appliance
MOSFET of Discharge (PMD2 to PMD4, PMD6 to PMD17, PMD19)	NCE power Semiconductor CO.,LTD.	NCEP018N85LL	V _{DS} : 85V, V _{GS} : ±20V, I _D : 180A, T _J : -55°C to 150°C	IEC 62619: 2022	Tested with appliance
Resister (RN1 to RN20)	Jiangsu Juyongchang Electronics Technology Co.,Ltd	ARD	Rated power: 3W, Operating temperature range: -55°C to 170°C	IEC 62619: 2022	Tested with appliance
MOSFET (HM1, HM2)	China Resources Microelectronics (Chongqing) Limited	CRSS052N08N	V _{DS} : 85V, I _D : 480A, T _J : -50°C to 150°C	IEC 62619: 2022	Tested with appliance
Temperature Protector (HPTC1)	YANGZHOU BAOHU ELECTRONIC TECHNOLOGY CO LTD	BH05-BB5D	Protect temperature: 60°C, Release temperature: 45°C	UL 60730	UL E500324
PCB (Bluetooth communication for Battery model: LAF12120BT)					
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB-6160	130°C, V-0°C	UL 94 UL 796	UL E123995
PCB (Alternative)	Interchangeable	Interchangeable	130°C, V-0°C	UL 94 UL 796	UL
Bluetooth module IC (U2)	Telink Semiconductor	TLSR8251F512 ET32	Temperature Range: -40°C to 85°C, VDD: 1.8V to 3.6V	IEC 62619: 2022	Tested with appliance

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

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)					P
Sample No.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (mΩ)	Maximum Case Temperature Rise ΔT (°C)	Results	
C01#	22.5	3.363	29	106.4	A, E	
C02#	22.5	3.362	27	102.9	A, E	
C03#	22.5	3.363	25	108.2	A, E	
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)					P
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
C13#	2.636	3.337	14	4.015	37.5	A, E
C14#	2.621	3.344	14	4.015	40.2	A, E
C15#	2.657	3.337	14	4.015	37.7	A, E
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): ____ Remark: Maximum charge voltage of the cell is 3.65V. The customer requires to use the maximum charge voltage of 110% for the test as the tightening test condition						

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.6	TABLE: Forced discharge test (cell or cell block)				P
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
C16#	2.744	-3.65	14	97	A
C17#	2.802	-3.65	14	97	A
C18#	2.695	-3.65	14	97	A
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D – Other (Please explain): ____					

7.3.2	TABLE: Internal short-circuit test (cell)				P
Sample No.	OCV at start of test, (V dc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results	
C19#	3.363	1	800	A, E	
C20#	3.364	1	800	A, E	
C21#	3.363	1	800	A, E	
C22#	3.363	1*	800	A, E	
C23#	3.363	1*	800	A, E	
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 location 2 exists. 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 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	
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Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m²)		
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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	
B01#	Min. 2.646	100	14.680	3.646	A, D, F	
			Charge Voltage Applied Battery System: 1)			
			Whole		Part	
			16.06		--	
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	
B01#	11.514	120	12.689	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	
B01#	13.219	24	13.554	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	
50		52.1	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): _____				

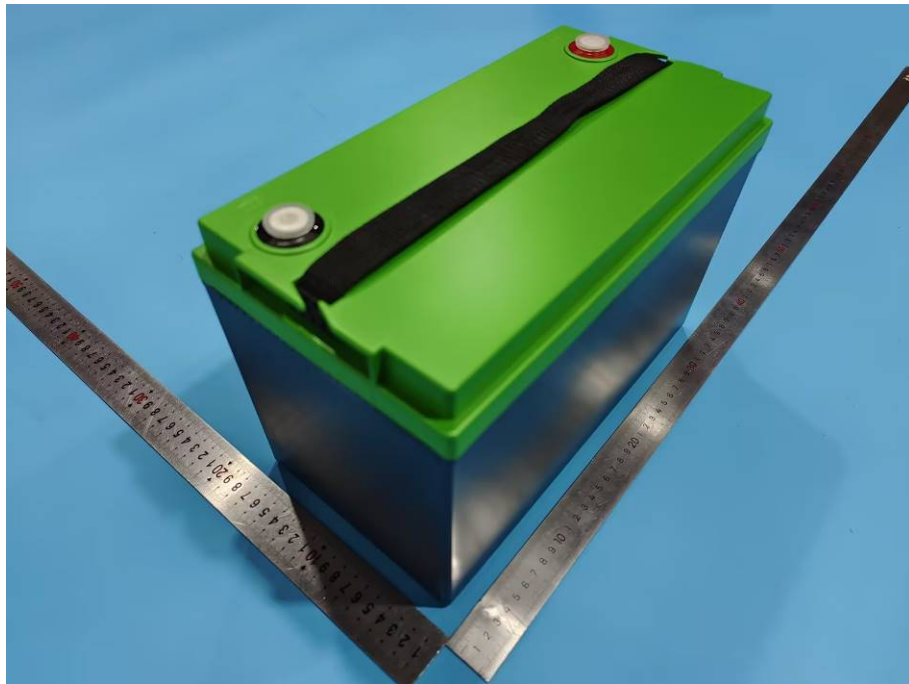
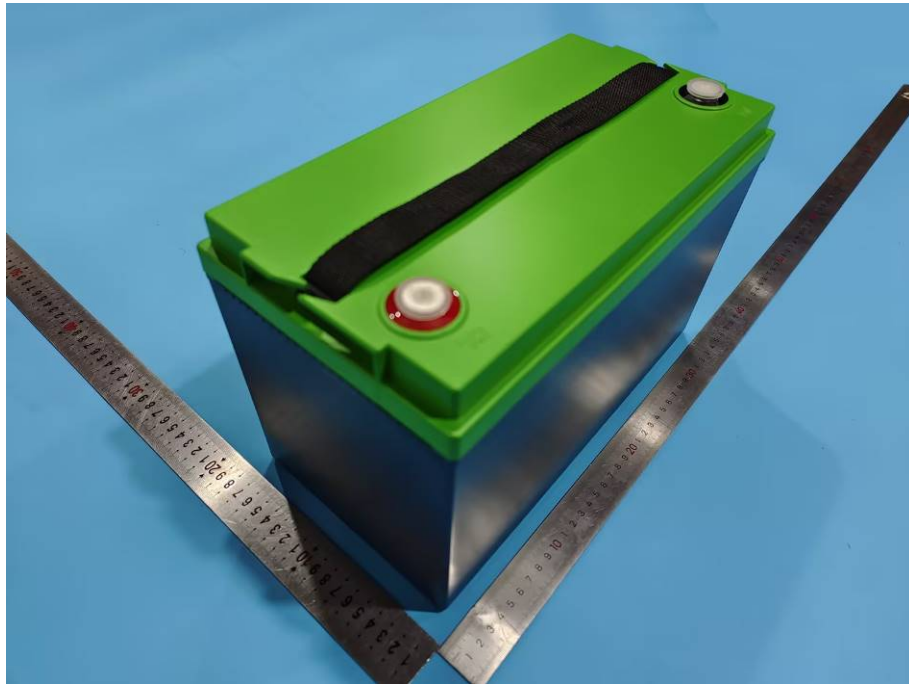
IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

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

ENCLOSURES

Supplement ID	Description
01-01 to 01-02	Overall view of Lithium-ion Battery Pack, model: LAF12120 and LAF12120BT
02-01 to 02-02	Internal view of Lithium-ion Battery Pack, model: LAF12120BT
03-01 to 03-02	Internal view of Lithium-ion Battery Pack, model: LAF12120
04	Overall view of Lithium-ion Battery Pack PCB, model: LAF12120 and LAF12120BT
05	Lithium-ion battery with Bluetooth PCB, model: LAF12120BT
06	Overall view of Lithium-ion Cell, model: IFR32135-15Ah
07	Internal short circuit location, model: IFR32135-15Ah
08	Assembly Lithium-ion Cell, model: IFR32135-15Ah
09	Assembly Lithium-ion Battery Pack, model: LAF12120 and LAF12120BT
10	Package of Lithium-ion Battery pack, model: LAF12120 and LAF12120BT

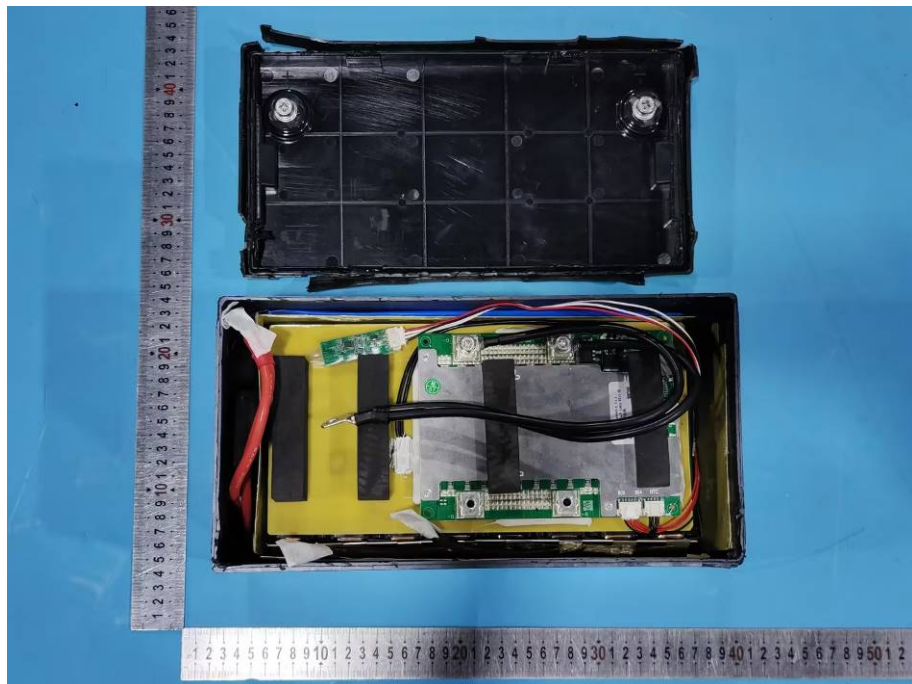
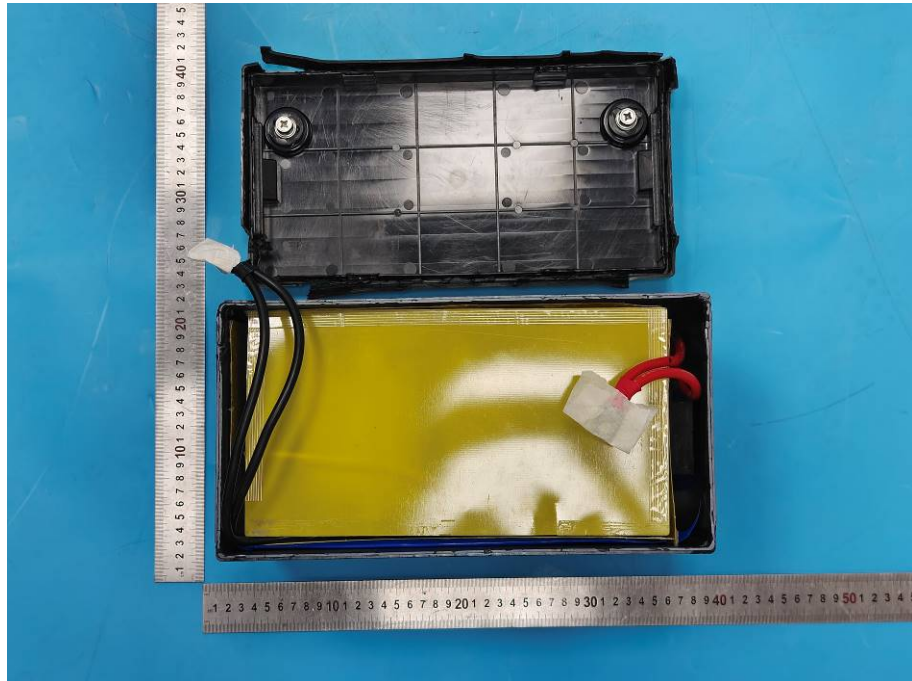
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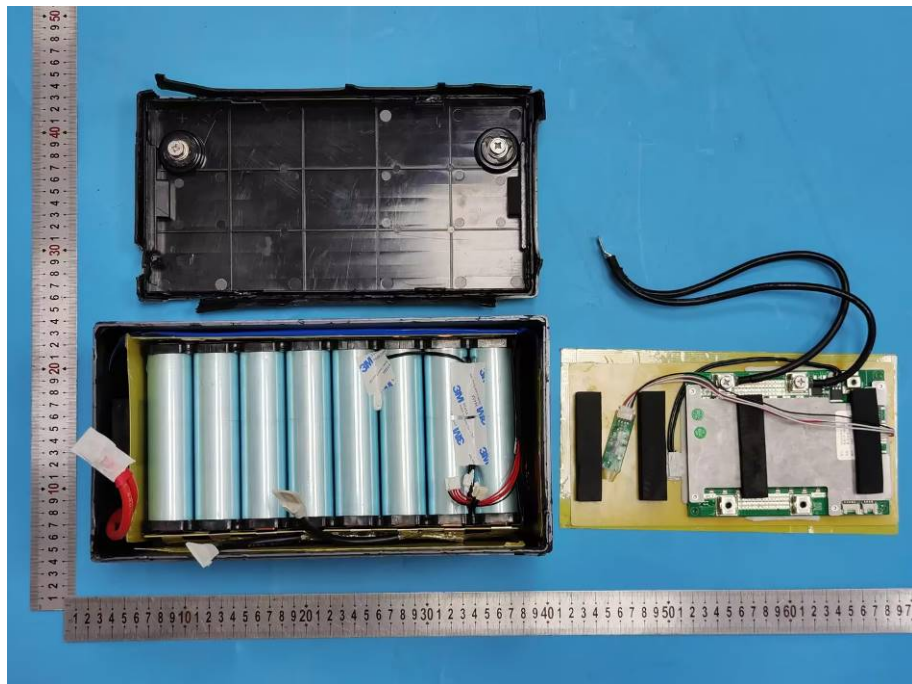
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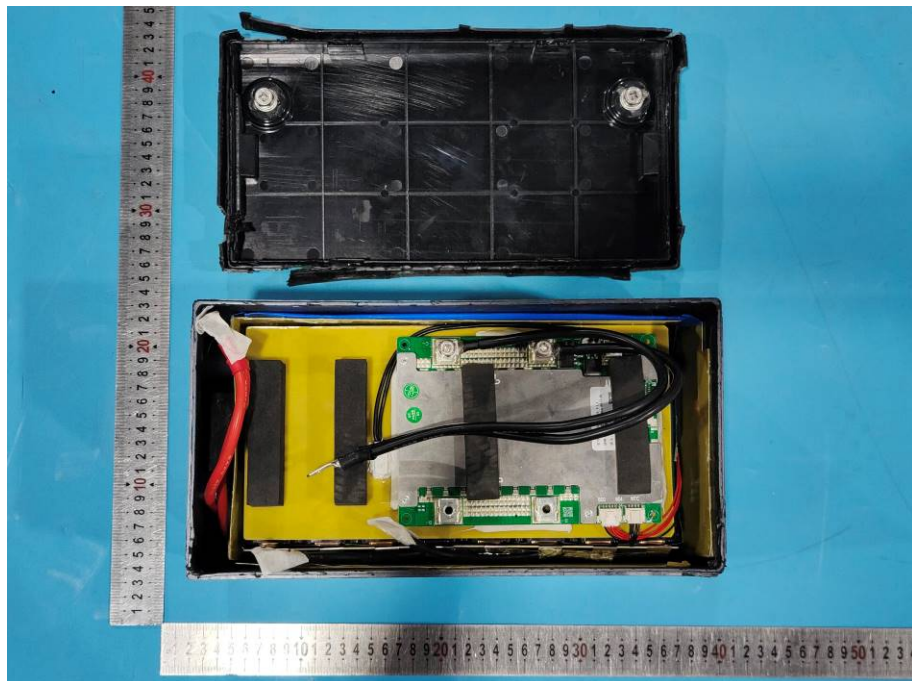
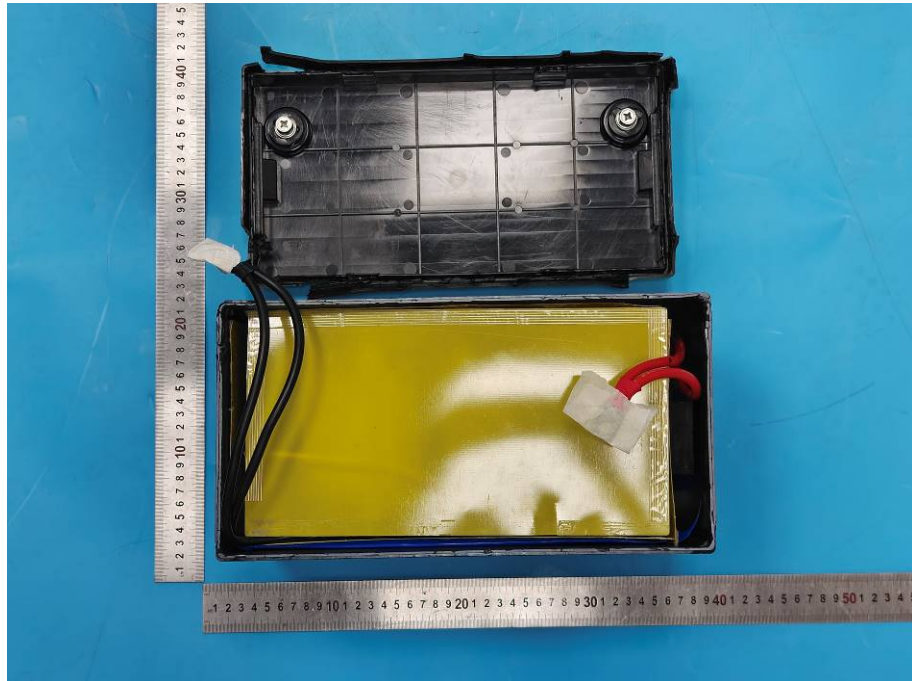
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ID 02-02



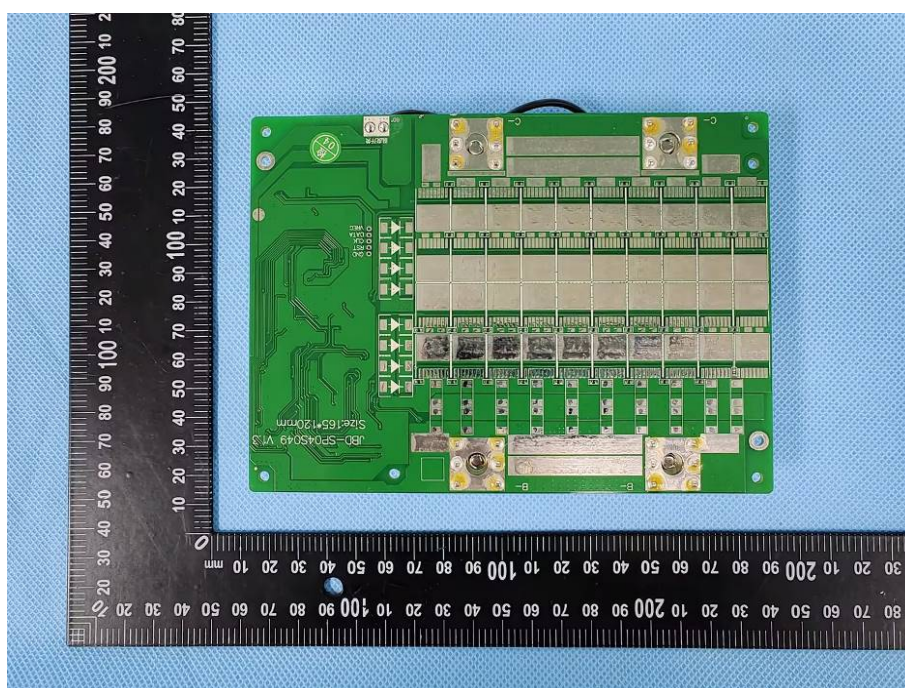
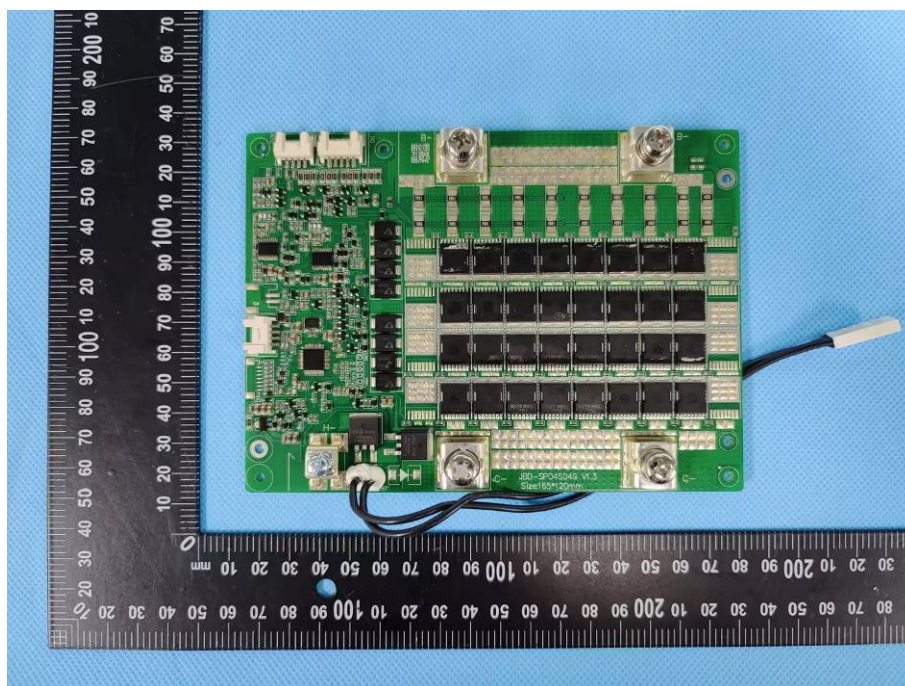
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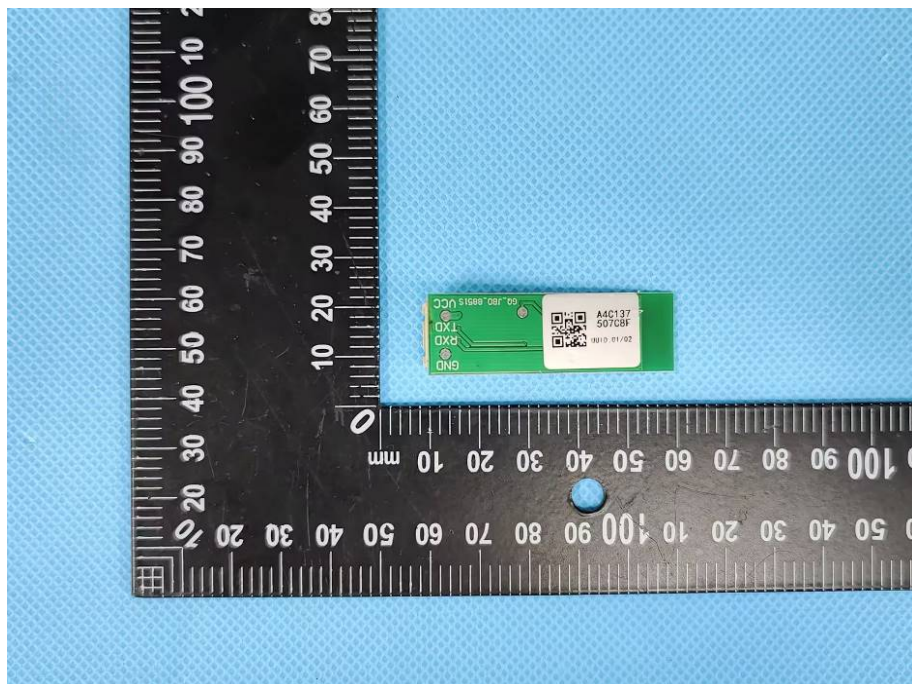
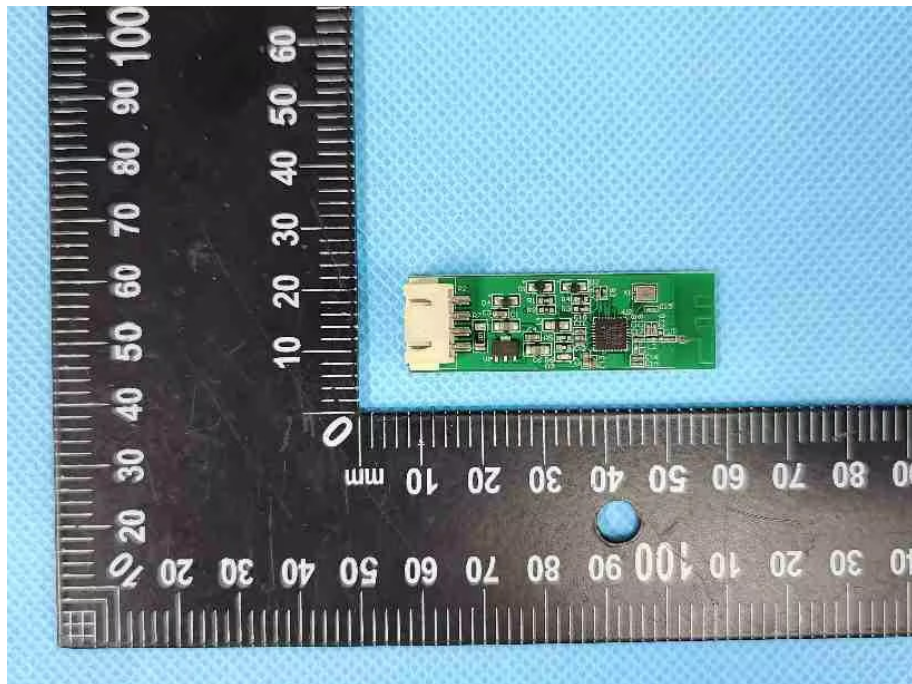
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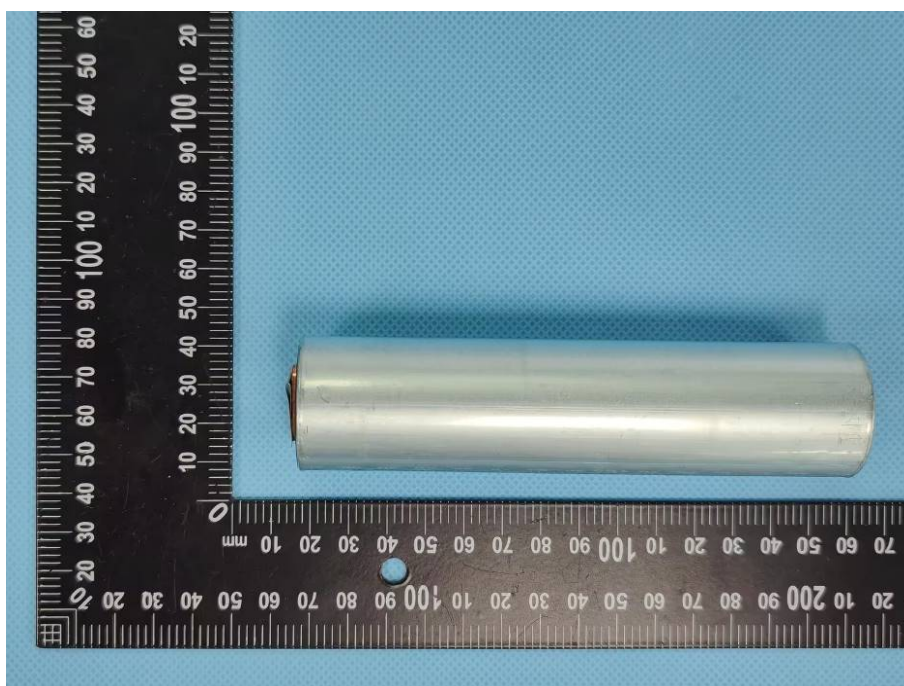
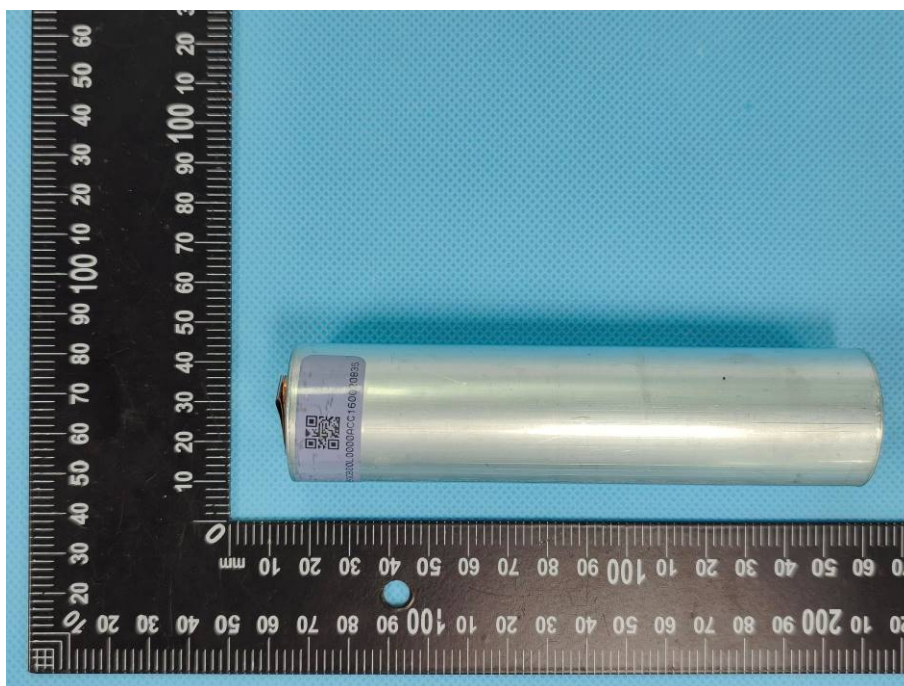
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ID 05



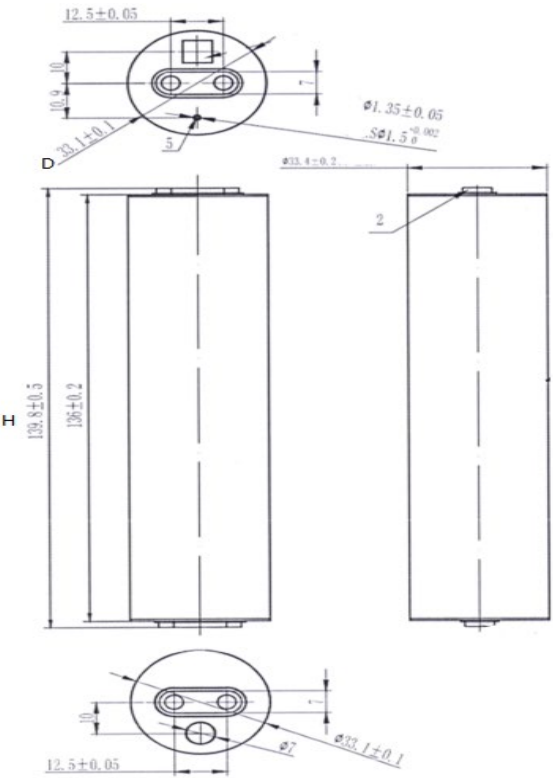
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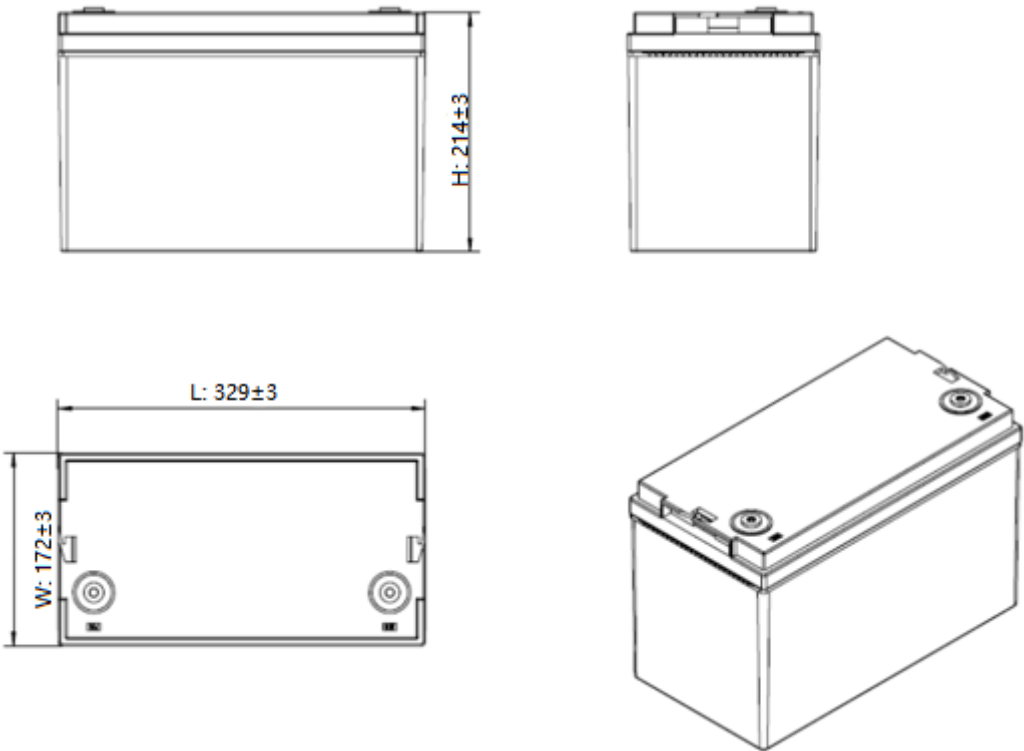


ID 08



Cell (Unit: mm)

ID 09



Battery (Unit: mm)

ID 10

Package Information	
Package Weight	12.3kg
Battery Number	1Pcs
Package size	L(405mm)*W(250mm)*H(295mm)

