



**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.....: 704082443411-00

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Name of Testing Laboratory preparing the Report.....: TÜV SÜD New Energy Vehicle Testing (Jiangsu) Co., Ltd.

Applicant's name: Shanghai Elecnova Energy Storage Co., Ltd.

Address: T1-3F, Hongqiao Hui No. 990 Shenchang Road, Minhang District, 201100 Shanghai, PEOPLE'S REPUBLIC OF CHINA

Test specification:

Standard.....: IEC 62619:2022

Test procedure.....: TÜV Mark

Non-standard test method.....: N/A

Test Report Form No.: IEC62619A

Test Report Form(s) Originator: UL (Demko)

Master TRF: Dated 2018-06-07

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Test item description	Rechargeable Li-ion Battery System	
Trade Mark	N/A	
Manufacturer	Shanghai Elecnova Energy Storage Co., Ltd. T1-3F, Hongqiao Hui No. 990 Shenchang Road, Minhang District, 201100 Shanghai, PEOPLE'S REPUBLIC OF CHINA	
Model/Type reference	ECO-E64WX, ECO-E101WX(DC)	
Ratings	ECO-E64WX: DC 573.6V, 120Ah ECO-E101WX(DC): DC 844.8V, 120Ah	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
Testing Laboratory:	TÜV SÜD New Energy Vehicle Testing (Jiangsu) Co., Ltd.	
Testing location/ address	No.15 Factory Building A, Jintong International Industrial Park, No.8 Xihu Road, Changzhou, Jiangsu, 213164, P. R. China	
Tested by (name, function, signature)	Jishuai Ban (Project Handler)	 
Approved by (name, function, signature) ..	Xiaohang Chen (Designated Reviewer)	
List of Attachments (including a total number of pages in each attachment): N/A		
Summary of testing:		
Tests performed (name of test and test clause): In section 7, clause 7.2.3.3 was performed with battery module for ECO-P1P24WX -Cl. 7.2.3.3 Edge or corner drop test (cell or cell block, and battery system); In section 8, tests of clauses 8.2.2, 8.2.3 and 8.2.4 were performed with one battery module, ECO-P1P24WX and one high voltage control box combined as a subsystem. - Cl. 8.2.2 Overcharge control of voltage (battery system) - Cl. 8.2.3 Overcharge control of current (battery system) - Cl. 8.2.4 Overheating control (battery system) The samples comply with the above requirements of IEC 62619:2022 (Second Edition).	Testing location: TÜV SÜD New Energy Vehicle Testing (Jiangsu) Co., Ltd. No.15 Factory Building A, Jintong International Industrial Park, No.8 Xihu Road, Changzhou, Jiangsu, 213164, P. R. China	
Summary of compliance with National Differences: N/A		
List of countries addressed: N/A		

Copy of marking plate:

For model: ECO-E64WX

Elecnova Energy storage system	
Product Model	ECO-E64WX
Battery Designation	IFpP49/175/171/(((24S)7S))M/-20+50/95
Rated Capacity	120Ah
Rated Energy	64.512kWh
Rated Voltage	DC 537.6V
Voltage Range	DC 470.4V,...,604.8V
Maximum Current	DC 120A
General Data	
Ingress Protection	IP55
Auxiliary Voltage	1/N/PE AC 230V
Auxiliary Current	AC 15A Max
Auxiliary Frequency	50/60Hz
Operating Ambient Temperature Range	-25°C,...,55°C
Protection Class	I



Shanghai Elecnova Energy Storage CO., LTD.

For model: ECO-E101WX(DC)

Elecnova Rechargeable Li-ion Battery System	
Product Model	ECO-E101WX(DC)
Battery Designation	IFpP49/175/171/(((24S)11S))M/-20+50/95
Rated Capacity	120Ah
Rated Energy	101.376kWh
Rated Voltage	DC 844.8V
Voltage Range	DC 739.2V,...,950.4V
Maximum Continuous Discharging Current	DC 135A
Maximum Continuous Charging Current	DC 120A
Operating Ambient Temperature Range	-25°C,...,50°C
Protection Class	I



Shanghai Elecnova Energy Storage CO., LTD.



S/N	ECOACJ51P264WB12458193338	
Production Date	2024.08.19	

Remark:

1. "P+", "P-" are marked near the polarity of the battery system, "P+" positive electrode output, "P-" negative electrode output.

2. Product S/N: ECOACJ51P264WB12458193338

ECO: Product type, Rechargeable Li-ion Battery System and Energy storage system.

AC: A represent Industry and commerce; C represent Cabinet

J5: Cell Type, J represent Hithium,5 represent 120Ah.

1P264W: 1P264 represent 264 cells in series. W represent Wind cooling, L represent Liquid cooling.

B: Version Upgrade.

1: 0 represent displayscreen with protective cover and no ups supply voltage; 1 represent displayscreen outside and no ups supply voltage; 2 represent displayscreen outside and ups supply voltage; 3 represent no displayscreen and ups supply voltage; 4 represent no displayscreen and no ups supply voltage.

24: year,23 represent the year of 2023, 24 represent the year of 2024, 25 represent the year of 2025...

58: month

19: day,19 represent the date of 19th, 20 represent the date of 20th, 21 represent the date of 21th...

3338: serial number.

51	52	53	54	55	56
January	February	March	April	May	June
57	58	59	60	61	62
July	August	September	October	November	December



Test item particulars	
Classification of installation and use: Use in industrial application	
Supply Connection	
Supply by terminals	
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 : 2024-09-10	
Date (s) of performance of tests	
: 2024-10-08 to 2024-10-15	
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 <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Remark: Photo Documentation: 24 pages	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60335-2-12:	
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.....	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)	Jiangsu Sfer Electric Co., Ltd. No.1, Dongding Road 214400 Jiangyin, Jiangsu PEOPLE'S REPUBLIC OF CHINA Jiangsu Sfer Electric Co., Ltd. No.888, Yanling Road East, 214400 Jiangyin, Jiangsu, PEOPLE'S REPUBLIC OF CHINA

General product information and other remarks:

1. The Rechargeable Li-ion Battery System, ECO-E64WX, ECO-E101WX(DC) are used in industrial appliance. The battery system, ECO-E64WX consist of one high voltage control box and 7 Rechargeable Li-ion Battery Modules with model ECO-P1P24WX connected in series, ECO-E101WX(DC) consist of one high voltage control box and 11 Rechargeable Li-ion Battery Modules with model ECO-P1P24WX connected in series.
2. The Rechargeable Li-ion Module ECO-P1P24WX consists of 24 Rechargeable Li-ion Cells with model LFP71173207/280Ah connected in series.
3. The Rechargeable Li-ion Battery System, model no. ECO-E101WX(DC) is used as a component fixed in the energy storage system, mode no. ECO-E101WX.

Table:

Product name	Rechargeable Li-ion Cell	Rechargeable Li-ion Battery Module	Rechargeable Li-ion Battery System
Type/model	LFP71173207	ECO-P1P24WX	ECO-E64WX ECO-E101WX(DC)
Nominal voltage	DC 3.2V	DC 76.8V	ECO-E64WX: DC 537.6V ECO-E101WX(DC): DC 844.8V
Rated capacity	120Ah	120Ah	120Ah
Charging voltage declared by manufacturer	DC 3.65V	DC 86.4V	ECO-E64WX: DC 604.8V ECO-E101WX(DC): DC 950.4V
Upper limit charging voltage	DC 3.7V	DC 87.6V	ECO-E64WX: DC 613.2V ECO-E101WX(DC): DC 963.6V
Charging current declared by manufacturer	DC 120A	DC 120A	DC 120A
Maximum continuous charging current	DC 120A	DC 120A	DC 120A
Discharging current declared by manufacturer	DC 120A	DC 120A	DC 120A
Maximum continuous discharging current	DC 240A	DC 135A	DC 135A
Discharge cut-off voltage	DC 2.5V	DC 67.2V	ECO-E64WX: DC 470.4V ECO-E101WX(DC): DC 739.2V
Standard temperature range for charging	0°C to 50°C	0°C to 50°C	0°C to 50°C
Standard temperature range for discharging	-20°C to 55°C	-20°C to 50°C	-20°C to 50°C
Standard charging method by manufacturer	Charge at constant current 120A until voltage reaches 3.65V, then charge at constant voltage 3.65V till current is 6A.	Charge at constant current 120A until voltage reaches 3.6V	Charge at constant current 120A until voltage reaches 3.6V
Charging method for internal short-circuit test	Charge at constant current 120A until voltage reaches 3.7V, then charge at constant voltage 3.7V till current is 6A.	-	-



Dimension	Thickness: 48.3±0.5mm Width: 173.9±0.5mm Height: 170.0±0.6mm	Length: 830±2mm Width: 470±2mm Height: 196±2mm	ECO-E64WX: Length: 800±4mm Width: 1200±4mm Height: 2030±4mm ECO-E101WX(DC): Length: 1200±4mm Width: 1250±4mm Height: 2250±4mm
Weight	2.86kg	98±1kg	ECO-E64WX: 1300±5kg ECO-E101WX(DC): 1850±5kg
Configuration	-	1P24S	ECO-E64WX: (1P24S)7S ECO-E101WX(DC): (1P24S)11S

Remark: N/A

Information for testing sample:

Sample #	Type	Test Item
2024-1062	ECO-P1P24WX	tests of clause 7.2.3.3
2024-1062	ECO-P1P24WX combined with one high voltage control box	tests of clause 8.2.2, 8.2.3 and 8.2.4

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... :	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
	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 & 7	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		P
	Manual with procedure for resetting of battery operation		P
	Emergency battery final discharge		P
5.9	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented.....:	Manufacturing quality plan was implemented.	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
	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 & 7	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 $30\text{ m} \pm 10\text{ m}$ at $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$		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 module ECO-P1P24WX	—
	Mass of the test unit (kg)..... :	Measured: 96.195 Kg	—
	Height of drop (m)..... :	0.05 m	—
	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
	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, I_m :		N/A

	Discharge current for forced discharge, 1.0 It..... :		N/A
	Discharging time, $t = (1 It / Im) \times 90$ (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: 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 $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.		N/A
	The appearance of the short-circuit location recorded by photograph or other means..... :		—
	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		N/A
	Results: no fire	See Table 7.3.2.	N/A
7.3.3	Propagation test (battery system)	Test of clause 7.3.2 was performed in the approved cell report	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

8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		P
8.1	General requirements		P
	Functional safety analysis for critical controls	Functional safety analysis has been done according to IEC 60730-1(Annex H). Please refer to FS test report.	P
	Conduct of a process hazard analysis for both the cell manufacturing process and the 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		P
	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.....	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

9	EMC		
	Battery system fulfil EMC requirements of the end-device application.....	See Table 9 [✓] See attachment [Report No. 4840824482800] for detail EMC report [] Intended for to be tested in the end use application [include specific application]	

10	INFORMATION FOR SAFETY		
	The cell manufacturer provides information about current, voltage and temperature limits of their products		
	The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users.		

11	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)		P
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	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

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		—
	Repeat of cell test for 3 times		—
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		—

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 :		—

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	Report No.:RZUN2024-5620	P



5.1 TABLE: Critical components information					
Object/part No.	Manufacturer/trademark	Type/Model	Technical Data	Standard	Marks of SConformity
For battery module ECO-P1P24WX					
1.Cell (20pcs)	Jiangsu Hige Energy Co., Ltd.	HJLFP48173170 E-120Ah	DC 3.2V 120Ah	IEC 62619:2022	TÜV SÜD CB No.: SG PSB-BT- 04164 Report No.: 085- 282360508- 000
2.Copper bar between B- and connector	Jiangsu Huasen Precision Technology Co., Ltd	25*3	Materials:Red Copper Cross-section: 25*3(mm2) Rated current: 276A	IEC 62477-1	Test with unit
3.Heat-shrinkable Tube	Changyuan	CB-HFT	Flame class: V-0 70°C	UL 94	CTI CNAS No.A223043 8524101C
4.FUSE	We, Eaton Bussmann Xi'an Fusegear Co., Ltd.	ESP2D-750	Voltage: 250V Current: 750A Topr: -40°C - 120°C	EN 60269-1 EN 60269-4	TÜV Rheinland R 50576949 0001
5.CCS	Shenzhen TOPOS Sensor Technology co., LTD.	1P10S A/B	For voltage and temperature sampling	IEC 62477-1	Test with unit
-FPCA	ALLSTAR TECH(ZHONGSHAN)TO LTD	ASC-FC-H	Flame class: V-0	IEC 60695	UL E301444
-Plastic uptake	TEESUN	CL8811	Flame class: V-0 80°C	UL 94 UL 746	UL E329660
-Connector	POLYPLASTICS CO LTD	13065B	Flame class: V-0 130°C	UL 94 UL 746	UL E109088
-NTC (8pcs)	Shenzhen TOPOS Sensor Technology co., LTD.	103KT1608T-1P	R25 =10KΩ±1% B25/85=3435K±1% Topr: -40°C - 85°C	IEC 62477-1	Test with unit
- Temperature sampling wire	SUZHOU XINCHENGDA WIRE&CABLE CO.,LTD	1332	Flame class: VW-1 Voltage: 300V 22 AWG Topr: 200°C	UL 758	UL E537778
-Voltage sampling line	SUZHOU XINCHENGDA WIRE&CABLE CO.,LTD	1332	Flame class: VW-1 Voltage: 300V AWG 22 Topr: 200°C	UL 758	UL E537778



6.HV connector (B+)	Phoenix Contact Asia-Pacific (Nanjing) Co., Ltd.	C-ES-FTB-IP20-120 OG	Rated current: 280A Operating voltage: DC1500V Topr: -40°C - 70°C V-0	UL 1059 UL 60947-1 UL 508	UL E40625
7. HV connector (B-)	Phoenix Contact Asia-Pacific (Nanjing) Co., Ltd.	C-ES-FTB-IP20-120 BK	Rated current: 280A Operating voltage: DC1500V Topr: -40°C - 70°C V-0	UL 1059 UL 60947-1 UL 508	UL E40625
8.Plastic material for Cover of CCS	CHENGDU KANGLONGXIN PLASTICS CO LTD	KLX FRPC-1860B	Flame class: V-0 80°C	UL 94	UL E315185
9.Fan	TINGXIANG ELECTRIC (SHANGHAI) CO LTD	TX9238H24B	Rated Voltage: 24V Topr: -20°C - 70°C V-0	UL 507	UL E526072
10.Bumper Strip	JUWAN	EPDM	Flame class:V-0	IEC 62477-1	Test with unit
11. Enclosure	Wuxi Huineng Automation Equipment Co, Ltd.	470x950x231	Material: SPCC T=2.0mm	IEC 62477-1	Test with unit
For Slave board in battery box, model: ESBMM-2412-F HV7.0.1					
13.Slave board in battery box	GOLD	ESBMM-2412-F Hardware version: HV7.0.1 Software version: SV_M2412_63_7.1.2-PWO.1	Monitoring the cells' temperature and voltage	IEC 62619: 2022 IEC 60730-1:2013 IEC 60664-3	Test with unit TÜV SÜD Report No.70.409.2 2.690.01-00
-PCB material	Kingbrother	KB-04	UL 94V-0	UL 796	UL E225430
-Coating material	BT	BT51	UL 94V-0,130°C	IEC 60695-11-10	UL E531378
-MCU(U12)	GD	GD32F303RCT6	-40°C -85°C Voltage: 3V - 5.5V	IEC 62477-1	Test with unit
-AFE chip(U8_1, U8_2)	GOLD	GT1812	Operational voltage: 10V~60 V Operational temp: -40°C~+125°C	IEC 62477-1	Test with unit



-Balanced resistance (R38_1, R38_2, R40_1, R40_2, R43_1, R43_2, R47_1, R47_2, R48_1, R48_2, R49_1, R49_2, R50_1, R50_2, R51_1, R51_2, R52_1, R52_2, R53_1, R53_2, R54_1, R54_2, R55_1, R55_2, R57_1, R57_2, R58_1, R58_2, R66_1, R66_2, R67_1, R67_2, R68_1, R68_2, R69_1, R69_2, R70_1, R70_2, R71_1, R71_2, R72_1, R72_2, R73_1, R73_2, R74_1, R74_2, R75_1, R75_2)	YAGEO	RC1206FR	62Ω /200V/1%/1/4W/100PP M/-55-155°C	IEC 62477-1	Test with unit
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-Optical Couple (U3_1, U3_2, U5_1, U5_2, U6_1, U6_2, U7_1, U7_2)	UMW	EL1018	Isolation voltage: 5000 Vrms Topr: -55°C-+110°C	UL 1577	UL E214129
Digital isolator(U4_1, U4_2)	Chipanalog	CA-IS3841HWW	Isolation voltage: 5700 Vrms Topr: -40°C-+125°C	UL 1577	UL E511334
Shell	Henan Shenma Huawei Plastic CO.,Ltd	27GF-3	V-0, 65°C Min. thickness 1,5mm,	UL 94	UL E318518
Socket (J8)	LOTES	AAUS01AP2-028K02	1000V DC Topr: -40-125°C Flame class: UL94V-0	UL 94 UL 1977	UL E187055
Socket (J7)	LOTES	AAUS01BP2-028K02	voltage:1000V DC Topr: -40-125°C Flame class: UL94V-0	UL 94 UL 1977	UL E187055
-Relay (K1)	HF	HFD4/5	HFD4/5-S"/Standard SMT/Monostable/Operating current: approx. 30mA/Withstand voltage-Coil and electric shock: 1.6kVAC- Disconnect contact: 1kVA- Contact group: 1.8kAC/Switching capacity: 1A-30VDC&0.3A-125VAC/Coil voltage: 5V	UL 60947	UL E133481
-FUUSE (F6)	BrightKing	SMD2920B185TF	Current: 1.85A Voltage: 33v Topr: -40-85°C	-	UL E482628
For high voltage control box: contain BCU board, controller and protect devices					
1.HV Switch	Shanghai Liangxin Electric Appliance Co., Ltd	NDG3VH-315	Rated current: 315A Rated insulation voltage: DC1500V Topr: -40°C - 85°C IC: 10 KA	EN 60947-3	TÜV Rheinland R 50531200

2.Main positive / Main negative Contactor	Join Electric (ShangHai) Co.,Ltd	EVHB250A-24B	Max Load Voltage: DC1500V Contact Rating Current: 250A Topr: -40°C - 85°C IC: 2.5 KA	EN 60947-4-1	TÜV SÜD N8A 109076 0001 Rev.02
3.AC/DC	MORNSUN Guangzhou Science & Technology Co., Ltd.	LMF500-23B24UH	Rated voltage: 85-305VAC/120-430VDC Rated insulation voltage: 4000VAC Topr: -40°C - 85°C	EN 62368-1	UL E235235
4.DC/DC	MORNSUN Guangzhou Science & Technology Co., Ltd.	PV200-29B24R3	Rated voltage: 250-1500VDC Rated insulation voltage: 4000VAC Topr: -40°C - 70°C	UL 1741	UL E492461
5.HALL	Sinomags Technology Co., Ltd.	STB-CAB500M-22	Supply voltage: 12V Topr: -40°C - 85°C	IEC 62477-1	Test with unit
6.Fuse	We, Eaton Bussmann Xi'an Fusegear Co., Ltd.	ESS2H-250	Voltage: DC1500V Current: 250A Breaking capacity: 250kA, TC≤4mS Topr: -5°C - 40°C	EN 60269	TÜV Rheinland R50627994 0001
7. Insulation Pillar for fuse	HAITAN	SM51	Isolation voltage: 1500V Icc: 63KA	GB/T 10316-2013	CCDT CNAS No.2024WT0 393-7
8.HV Connector (B+, P+ Socket)	Phoenix Contact Asia-Pacific (Nanjing) Co., Ltd.	ES-BPC-C 50-70 OG	Rated current: 250A Operating voltage: DC1500V Topr: -40°C - 125°C V-0	PPP51090A:2 018	TÜV SÜD Z2 077026 0023 Rev.03



9.HV Connector (B+, P+ Plug)	Phoenix Contact Asia-Pacific (Nanjing) Co., Ltd.	ES-FT-BPC-B/S 35-70 OG	Rated current: 250A Operating voltage: DC1500V Topr: -40°C - 125°C V-0	PPP51090A:2 018	TÜV SÜD Z2 077026 0023 Rev.03
10.HV Connector (B-, P- Socket)	Phoenix Contact Asia-Pacific (Nanjing) Co., Ltd.	ES-BPC-C 50-70 BK	Rated current: 250A Operating voltage: DC1500V Topr: -40°C - 125°C V-0	PPP51090A:2 018	TÜV SÜD Z2 077026 0023 Rev.03
11.HV Connector (B-, P- Plug)	Phoenix Contact Asia-Pacific (Nanjing) Co., Ltd.	ES-FT-BPC-B/S 35-70 BK	Rated current: 250A Operating voltage: DC1500V Topr: -40°C - 125°C V-0	PPP51090A:2 018	TÜV SÜD Z2 077026 0023 Rev.03
12.AC Breaker	Shanghai Liangxin Electric Appliance Co., Ltd	NDB2-63	Rated current:63A Rated insulation voltage: AC 690V Topr: -40°C - 70°C	EN 60898-1 EN 60898-2	TÜV Rheinland R 50436891
13.Diode	Liuqing Rectifier Co., Ltd.	LJ-MD25A	Voltage: AC1500V Current: 25A Topr: 160°C	IEC 60747-2:2016	TÜV Rheinland R 50606763 0001
14.KA3 Relay	HONGFA	HF115F	Max Load Voltage: DC300V Contact Rating Current: 16A Topr: -40°C - 85°C	UL 60947-1 UL 60947-4-1	UL E134517
15.DC Wiring	Jiukai Special Cable(Shanghai)Co.,Ltd	UL 10271	Flame class: VW-1 Voltage:1000V AWG 3 Topr:105°C	UL 758	UL E342399
BMS main board in voltage control box, model: ESBCM-F133-L-S, HV5.0.1					

16.BMS (Main board)	GOLD	Model: ESBCM-F133-L Hardware version: HV5.0.1 Software version: SV_CF133_b3_5.0.1_G B1.10_202303036_01.0 9	Over-charge detection voltage for each cell: 3.65 Over-discharge detection voltage for each cell: 2.7V Charge overcurrent detection current: 121A Discharge overcurrent detection current: 140A Charge high temperature protection: 50°C Charge low temperature protection: 0°C Discharge high temperature protection: 55°C Discharge low temperature protection: -20°C	IEC 62619: 2022 IEC 60730- 1:2013 IEC 60664-3	Test with unit TÜV SÜD Report No.70.409.2 2.690.01-00
-PCB	SHENZHEN KING BROTHER ELECTRONI CS TECHNOLO GY CO LTD	KB-04	UL 94V-0	UL 796	UL E225430
-MCU(U16)	Beijing Zhixin Microelectro nics Technology Co., Ltd	SCM620L144MJA0	3.0V-3.6V, -40°C+105°C	IEC 62477-1	Test with unit
-IC for DC/DC POWER (U1)	SCT	SCT2430	Voltage range: 0.8V~40V Topr: -40°C to 125°C	IEC 62477-1	Test with unit
-IC for digital isolator (U31 U33 U26)	Suzhou Novosense Microelectro nics Co., Ltd	NSi8221N1	3750 Vrms 2.5V-5V -40°C+125°C	IEC 62477-1	Test with unit
-IC for EEPROM(U20)	Shanghai beiling Company Limited	BL24C512A	Supply voltage: 1.7V-5.5V Topr: -40°C to 125°C	IEC 62477-1	Test with unit
-IC for WDT (U18)	IMP	IMP706SESA	1.2V-5.5V -40°C +-85°C	IEC 62477-1	Test with unit

-Alternative	SGMICRO	SGM706B-SXS8G/TR	-0.6V-6V -40°C --+125°C	IEC 62477-1	Test with unit
-IC for Flash (U22,U23)	WINBOND	W25Q128FV	2.7V-3.6V -40-+85°C	IEC 62477-1	Test with unit
-Connector (CN1)	CZT	11110205D001	-55 --+105 °C	UL 94	UL E28476
-IC for CAN (U24 U32 U33)	SIT	SIT1051T	4.5V-5.5V -40°C-+150°C	IEC 62477-1	Test with unit
-IC for RS485 (U27)	SIT	SIT65176B	4.5V~5.5V -40°C --+105 °C	IEC 62477-1	Test with unit
-Transformer (T2 T3 T4 T5 T7 T8)	Hanrun Electronics Company Limited	HR600781	Isolation voltage:3750 Vac -40°C-+125°C	IEC 62477-1	Test with unit
-Case	WAH HONG INDUSTRIA L CORP	WH-9100	V-0, 130°C, CTI I	UL 94	UL E150608
-Cover	POLYPLAS TICS CO LTD	E130i	V-0, 130°C	UL 746C	UL E106764
-Wire	HUIZHOU CITY DENGGAO DA ELECTROT ECH CO LTD	FIW F	155°C 0.094-0.039mm	UL 60950-1	UL E501004
-Transformer (T6 T10)	Mianyang Dunyu Electronics Technology Co.,Ltd	ST06709A0	Isolation voltage: 4300VDC 1mA 60s or 2600VAC Topr: -40°C to 125°C	IEC 62477-1	Test with unit
-IC for HV sampling (U43, U45)	Suzhou Nov osense Micr oelectronics Co., Ltd	NSI1311-DSWVR	Supply voltage: 0.3V-6.5V, Isolation voltage: 5000 Vrms Topr: -40-+125°C	UL 1577	UL E500602
-Optocoupler (U35, U37, U39, U41, U42)	Everlight Electronics., Ltd.	EL1019	Supply voltage: 1.45V, Isolation voltage: 5000 Vrms Topr: -55-+110°C	UL 1577	UL E214129
-Relay(K1)	XIAmen Hongfa ELECTROACO USTIC Co.Ltd	HF D3-VI/5	VDC:5V Operation temperature: -40°C --+85°C	IEC 62776-1	UL E133481
-Resettable fuse (F2 F3 F5 F6 F7 F8 F9 F10 F11 F12)	POLYTRON ICS TECHNOLO GY CORP	SMD1206P035TF	33V, Ih: 0,35A, It: 0,75A, Imax: 100A	UL 1434	UL E201431



-Shell	HENAN SHENMA HUAWEI PLASTIC ENGINEERING CO LTD	27GF(a)	V-0, Min thickness: 1.5mm	UL 94	UL E318518
-Coating material	Guangdong Raise BT Technology Co Ltd	BT51	Coating Flame Class: V-0	IEC 60695-11-10	UL E531378

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 (K)	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):

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):

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):

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)		
-		-		N/A		

Supplementary information:

- 1) Cell can be failed through 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):

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 of Battery System, (V dc)	Max. Voltage of Cell/Cell Blocks, (V dc)	Results
ECO-P1P24WX combined with one high voltage box	2.940/2.940/2.930	120.930	87.202	3.610	A, D, F
			Charge Voltage Applied Battery System: 1)		
			Whole	Part	
			-	97.680	

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 IEC62619 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)	120% of Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Results
ECO-P1P24WX combined with one high voltage box	70.187	144	75.137	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):				

8.2.4	TABLE: Overheating control (battery system)			P
Sample No.	OCV at start (SOC 50%) of test, V dc	Recommended Charging Current, A	Maximum Charging Voltage, V dc	
ECO-P1P24WX combined with one high voltage box	79.315	120.930	82.493	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Battery Case Temperature, °C	Results	
50		51.560	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):				

--- End of test report ---