



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..... : 4395835.50

Date of issue..... : 2022-12-01

Total number of pages 34 pages

Name of Testing Laboratory preparing the Report DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou Branch

Applicant's name Zucchetti Centro Sistemi SpA

Address..... Via Lungarno 305/A 52028 Terranuova Bracciolini (AR), Italy

Test specification:

Standard IEC 62619: 2017

Test procedure CB Scheme

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..... :	Energy Storage Battery	
Trade Mark :		
Manufacturer :	Same as applicant	
Model/Type reference :	AZZURRO HV ZBT 5K	
Ratings :	Battery: 51,2 Vdc, 100 Ah, 5120 Wh Input/Output: 300-435 Vdc, 7 A, 2,5 kW Max Output Current: 7,5 A	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒	CB Testing Laboratory:	DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou Branch
Testing location/ address..... :		Block 5, No.3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China
Tested by (name, function, signature)..... :		Steven Chen (Project Engineer) <i>Steven chen</i>
Approved by (name, function, signature)... :		Alger Yang (Reviewer) <i>[Signature]</i>
☐	Testing procedure: CTF Stage 1:	
Testing location/ address..... :		
Tested by (name, function, signature)..... :		
Approved by (name, function, signature)... :		
☐	Testing procedure: CTF Stage 2:	
Testing location/ address..... :		
Tested by (name + signature) :		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature)... :		
☐	Testing procedure: CTF Stage 3:	
☐	Testing procedure: CTF Stage 4:	
Testing location/ address..... :		
Tested by (name, function, signature)..... :		
Witnessed by (name, function, signature) . :		
Approved by (name, function, signature)... :		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment): Attachment 1: Photos and illustrations (7 pages)	
Summary of testing:	
Tests performed (name of test and test clause): The cell model 001CB0Y0 was tested according to IEC 62619:2017 in CB test report no. 085-282260053-000 Original issued on 2022-03-31, issued by TÜV SÜD New Energy Testing (Guangdong) Co., Ltd. and CB certificate SG PSB-BT-03142 issued on 2022-04-04, issued by TÜV SÜD PSB Pte Ltd and no. 085-282260053-001 Amendment 1 issued on 2022-10-17, issued by TÜV SÜD New Energy Testing (Guangdong) Co., Ltd. and CB certificate SG PSB-BT-03142A1 issued on 2022-10-18, issued by TÜV SÜD PSB Pte Ltd Battery model AZZURRO HV ZBT 5K was subjected to the tests as below at CBTL: ☒ Clause 7.2.3 Drop test (cell or cell block, and battery system) Battery model AZZURRO HV ZBT 5K was subjected to the tests as below at Dongguan Lepont Testing Service Co., Ltd.: ☒ Clause 8.2.2 Overcharge control of voltage (battery system) ☒ Clause 8.2.3 Overcharge control of current (battery system) ☒ Clause 8.2.4 Overheating control (battery system)	Testing location: DEKRA Testing and Certification (Shanghai) Ltd., Guangzhou Branch Block 5, No.3, Qiyun Road, Huangpu District, Guangzhou, Guangdong, China Dongguan Lepont Testing Service Co., Ltd. Room 202, Building 1, No. 65, Jiulong Road, Dongcheng Subdistrict, Dongguan, Guangdong, China
Summary of compliance with National Differences (List of countries addressed): N/A	

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.



Energy Storage Battery

Model:

AZZURRO HV ZBT 5K

Battery Type: LFP

Battery Interface: Isolated

Total Energy: 5120Wh

Enclosure Type: IP65

Max Output Current: 7.5A

Weight: 50 kg

Input/Output: 300-435Vdc; 7A; 2.5kW

Operating Temperature Range: -10 ~ +50°C

Zucchetti Centro Sistemi SpA
Via Lungarno 305/A
52028 Terranuova Bracciolini (AR) , Italy
Manufactured in EXTRA EU





SD1001250KC218100001

	Proc essi ng site	Produc t catego ry	The material code of the product project sequence	Specific ation Value: 250KW	Sales area	Year	Month	Day	Serial number: 1st Machine
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Remark: The other items willl be marked on the user manual.

Test item particulars: Energy Storage Battery	
Classification of installation and use: Stationary	
Supply Connection: 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: 2022-08-04	
Date (s) of performance of tests: 2022-08-04 to 2022-11-11	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. This report is not intended to use for CMA application. The measurement result is considered in conformance with the requirement if it is within the prescribed limit, It is not necessary to calculate the uncertainty associated with the measurement result. Throughout this report a ☒ comma / ☐ point is used as the decimal separator. The sample has been tested and found compliant with the requirement of the safety standards listed below: IEC 62619:2017 EN 62619:2017	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 62619-2:	
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): Guangdong SOFARSOLAR Co., Ltd. 3/F.-4/F., Building No.4, Plant of Area D, Qiaosheng Industrial Park, Lizhen Road, Panli Village, Lilin Town, Zhongkai High-tech Zone, Huizhou City, Guangdong, China	

General product information and other remarks:

The battery tested in this report was a Energy Storage Battery, including 16 cells connected in series, DCDC module and BMS

The cell model 001CB0Y0 was tested according to IEC 62619:2017 in CB test report no. 085-282260053-000 Original issued on 2022-03-31, issued by TÜV SÜD New Energy Testing (Guangdong) Co., Ltd. and CB certificate SG PSB-BT-03142 issued on 2022-04-04, issued by TÜV SÜD PSB Pte Ltd and no. 085-282260053-001 Amendment 1 issued on 2022-10-17, issued by TÜV SÜD New Energy Testing (Guangdong) Co., Ltd. and CB certificate SG PSB-BT-03142A1 issued on 2022-10-18, issued by TÜV SÜD PSB Pte Ltd

The supply of tests is applied at the input point of cell block and BMS only in order to meet the testing requirement. The supply from product input is also double checked, which will not more than following value.

Product name	Rechargeable Li-ion Cell	Energy Storage Battery
Type/model	001CB0Y0	AZZURRO HV ZBT 5K
Nominal voltage	3,2 V	51,2 V
Rated capacity	100 Ah	100 Ah
Charging voltage declared by manufacturer	3,65 V	56,16 V
Upper limit charging voltage	3,65 V	56,16 V
Charging current declared by manufacturer	50 A	50 A
Maximum continuous charging current	100 A	50 A
Maximum continuous discharging current	100 A	50 A
End of discharge voltage	2,5 V	48 V
Standard temperature range for charging	0 °C to 65 °C	0 °C to 50 °C
Standard temperature range for discharging	-30 °C to 65 °C	-10 °C to 50 °C
Weight	(1,96+0,15) kg	Approx. 49,9 kg

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
4	PARAMETER MEASUREMENT TOLERANCES		
	Parameter measurement tolerances		P
5	GENERAL SAFETY CONSIDERATIONS		
5.1	General		P
	Cells and batteries are safe under conditions of both intended use and reasonably foreseeable misuse.. :	See also table 5.1 for Critical components information	P
5.2	Insulation and wiring		P
	Voltage, current, altitude, and humidity requirements		P
	Adequate clearances and creepage distances between connectors		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
	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 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

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The voltage control function		P
	The voltage control for series-connected batteries		P
5.7	Operating region of lithium cells and battery systems for safe use		P
	The cell operating region..... :	See page 6	P
	Designation of battery system to comply with the cell operating region		P
5.8	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented	ISO9001 certificate provided	P
	The process capabilities and the process controls		P
6	TYPE TEST CONDITIONS		
6.1	General		P
6.2	Test items		P
	Cells or batteries that are not more than six months old (See Table 1 of IEC62619)		P
	Capacity confirmation of the cells or batteries		P
	Default ambient temperature of test, 25 °C ± 5 °C		P
7	SPECIFIC REQUIREMENTS AND TESTS		
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	Battery: 50 A CC (constant current) charge to 56,16 V, then CV (constant voltage 56,16 V) charge till charge current decline to 10 A.	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	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
7.2.2	Impact test (cell or cell block)		P
	Cylindrical cell, longitudinal axis impact		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Prismatic cell, longitudinal axis and lateral axis impact		P
	Results: no fire, no explosion.	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	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)..... :	Approx.1,946 kg	—
	Height of drop (m)..... :	1,0 m	—
	Results: no fire, no explosion	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)		P
	Description of the Test Unit..... :	Battery	—
	Mass of the test unit (kg)..... :	Approx. 49,7 kg	—
	Height of drop (m)..... :	10 cm	—
	Results: no fire, no explosion		P
7.2.4	Thermal abuse test (cell or cell block)		P
	Results: no fire, no explosion	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
7.2.5	Overcharge test (cell or cell block)	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
	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	P
7.2.6	Forced discharge test (cell or cell block)	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
	Upper limit charge voltage of the cell..... :	3,65 Vdc	P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	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	-3,65 Vdc	P
	Maximum discharge current of the cell, I_m	100 A	P
	Discharge current for forced discharge, 1.0 I_t	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
	Discharging time, $t = (1 I_t / I_m) \times 90$ (min.)	90	P
	Results: no fire, no explosion	See 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)	Refer to CB test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1	P
	Samples preparation procedure: a), in accordance with 8.3.9 of IEC62133:2012; or b), the nickel particle inserted before charging, or c), the nickel particle was inserted before electrolyte filling	In accordance with 8.3.9 of IEC62133:2012	P
	Tested according to Cl. 8.3.9 of IEC 62133:2012 test method, except all tests were carried out in an ambient temperature of $25\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.		P
	The appearance of the short-circuit location recorded by photograph or other means	Nickel particle inserted between positive and negative (active material) coated area	—
	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	400 N	P
	Results: no fire, no explosion	See Table 7.3.2.	P
7.3.3	Propagation test (battery system)		N/A
	Method to create a thermal runaway in one cell ...	See Annex B	N/A
	Results: No external fire from the battery system or no battery case rupture	See results in Table 7.3.3	N/A
8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		
8.1	General requirements		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Functional safety analysis for critical controls	The functional safety of battery system was evaluated according to Annex H of IEC 60730-1:2013	P
	Conduct of a process hazard, 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) :		N/A
	Results: no fire, no explosion..... :	See Table 8.2.2.	P
	The BMS interrupted the overcharging before reaching 110% of 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	The charging current was limited by BMS(max. 50 A)	P
8.2.4	Overheating control (battery system)		P
	The cooling system, if provided, was disconnected		P
	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

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

9	INFORMATION FOR SAFETY		
	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

10	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)		
	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	The cells will be used in the manufacture of battery pack only.	N/A
	Battery designation		P
	Battery structure formulation		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

ANNEX A	OPERATING REGION OF CELLS FOR SAFE USE		
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		P
A.6	Low temperature range		P
A.7	Discharging conditions for safe use		P
A.8	Example of operating region		P

ANNEX B	PROCEDURE OF 7.3.3 PROPAGATION TEST		
B.1	General		N/A
B.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.....		—
B.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 C	PACKAGING		
	The materials and pack design chosen in such a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		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⁾	
Cell	Contemporary Amperex Technology Co., Limited	001CB0Y0	3,2 Vdc, 100 Ah	IEC 62619: 2017	CB Cert. no.: SG PSB-BT- 03142 CB report no.: 085- 282260053- 000 Original and CB Cert. no.: SG PSB-BT- 03142A1 CB report no.: 085- 282260053- 001 Amendment 1	
PCB (Control Board & Power_Module Board)	SHEN ZHEN SUN & LYNN CIRCUITS CO LTD	SL-4M	V-0, 130 °C	UL 796	UL E234156	
PCB (Control Board & Power_Module Board) Alternative	Interchangeable	Interchangea ble	V-0, 130 °C	UL 796	DEKRA or other NRTL	
Control Borad						
IC (U4)	Nuvoton Technology Corporation	M483KGCAE	V _{IN} : 5,5 V, T _A : - 40 °C to 85 °C	IEC 62619: 2017	Tested in appliance	
IC (U6)	TEXAS INSTRUMENTS	BQ79616PAP TQ1	V _{BAT} : -0,3 V to 100 V, T _A : -40 °C to 125 °C	IEC 62619: 2017	Tested in appliance	
IC (U502)	TEXAS INSTRUMENTS	TMS302F280 049	V _{IN} : -0,3 V to 4,6 V, T _J : -40 °C to 150 °C	IEC 62619: 2017	Tested in appliance	
Optocoupler (U23, U25, OT1000)	LITE-ON Technology Corporation	LTV-816B	I _F : 50 mA, V _{CEO} : 80 V, T _{opr} : -50 °C to 110 °C	UL 1577	UL E113898	
Power_Module Board						
Transformer (T1)	Huizhou Baohui Electronics Technology Co., Ltd	115-22-005B	Class B, 130 °C	IEC 62619: 2017	Tested in appliance	

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
-Magnet wire	SHENZHEN JIAZHENGXIN INDUSTRIAL CO LTD	xUEW@/155	MW 79-C, 155 °C	UL 1446	UL E334055
-Magnet wire Alternative	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWN/U@	MW 80-C, 155 °C	UL 1446	UL E201757
-Insulation Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111
-Margin Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF-2902	130 °C	UL 510A	UL E165111
-Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	MW 28-C, 130 °C	UL 1446	UL E228349
-Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF	600 V, 200 °C	UL 224	UL E203950
Transformer (T1) Alternative	Huizhou Click Electronics Technology Co., Ltd	PQ45C-027	Class B, 130 °C	IEC 62619: 2017	Tested in appliance
-Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	UEWN/U@	MW 80-C, 155 °C	UL 1446	UL E201757
-Magnet wire (Alternative)	FENG CHING METAL CORP	xUEW	MW 75C, 130 °C	UL 1446	UL E172395
-Insulation Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
-Margin Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	WF-2902	130 °C	UL 510A	UL E165111
-Varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1150*	MW 28-C, 155 °C	UL 1446	UL E303754
-Tube	JINGJIANG YAHUA PRESSURE SENSITIVE GLUECO Co., Ltd	WF	600 V, 180 °C	UL 224	UL E165111
Transformer (T1) (Alternative)	GUAN DONG LI WANG NEW EN ERGY Co., Ltd	LWT45Q0015	Class B, 130 °C	IEC 62619: 2017	Tested in appliance
-Magnet wire	Tongling Jingda Special Magnet Wire Co Ltd	xUEW N/155	MW 80C, 155°C	UL 1446	UL E223994
-Magnet wire (Alternative)	Guangdong Jinyan Electrotechnics Joint Stock Co Ltd	xUEW/NY/155	MW 80-C, 155 °C	UL 1446	UL E238500
-Insulation Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111
-Margin Tape	Jingjiang YAHUA Pressure Sensitive Glue Co., Ltd	WF-2901	130 °C	UL 510A	UL E165111
-Margin Tape (Alternative)	Jingjiang YAHUA Pressure Sensitive Glue Co., Ltd	WF-2902	130 °C	UL 510A	UL E165111
-Varnish	YUEYANG GREEN TECHNOLOGY CO LTD	JX-1150*	MW 28-C, 155 °C	UL 1446	UL E303754

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
-Tube	PENGYUAN Electronics Materials Co., Ltd	PTFEL	600 V, 200 °C	UL 224	UL E515092
Transformer (T10)	Huizhou Baohui Electronics Technology Co., Ltd	PQ45C-027	Class B, 130 °C	IEC 62619: 2017	Tested in appliance
-Magnet wire	PACIFIC ELECTRIC WIRE & CABLE (SHENZHEN) CO LTD	2UEW@/155	MW 79-C, 155 °C	UL 1446	UL E201757
-Magnet wire (Alternative)	SHANDONG SAINT ELECTRIC CO LTD	2UEW/155	MW 79-C, 155 °C	UL 1446	UL E194410
-Insulation Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111
-Margin Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111
-Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	MW 28-C, 130 °C	UL 1446	UL E228349
-Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF	600 V, 200 °C	UL 224	UL E203950
Transformer (T1000)	Huizhou Baohui Electronics Technology Co., Ltd	PQ45C-027	Class B, 130 °C	--	--
-Magnet wire	SHENZHEN KAIZHONG HEDONG NEW MATERIALS CO LTD	TIW-F	155 °C	UL 1446	UL E357240

IEC 62619					
Clause	Requirement + Test			Result - Remark	Verdict
-Magnet wire (Alternative)	HUIZHOU JINMAXIANCAI TECHNOLOGY CO LTD	TIW-F	155 °C	UL 1446	UL E516017
-Insulation Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111
-Margin Tape	JINGJIANG YAHUA PRESSURE SENSITIVE GLUE CO LTD	PF-301	180 °C	UL 510A	UL E165111
-Varnish	SUZHOU TAIHU ELECTRIC ADVANCED MATERIAL CO LTD	T-4260(a)	MW 28-C, 130 °C	UL 1446	UL E228349
-Tube	SHENZHEN WOER HEAT-SHRINKABLE MATERIAL CO LTD	WF	600 V, 200 °C	UL 224	UL E203950
Y-capacitor (C244, C245, C251, C252)	Walsin Technology Corp	CE	Y1, 4,7 nF, 500 Vac	IEC 62619: 2017	Tested in appliance
Inductance coil (L1)	ABC-ATEC ELECTRONICS GROUP	GSDE60281 01M2AH	34 uH	IEC 62619: 2017	Tested in appliance
Inductance coil (L3)	Huizhou Baohui Electronic Technology Co.,Ltd.	115-17-075C	0,52 mH	IEC 62619: 2017	Tested in appliance
MOSFET (Q1, Q2, Q3, Q4)	Infineon Technologies AG	IPW65R041C FD7	V _{DS} : 650 V, V _{GS} : ±20 V, I _D : 50 A (T _C =25°C), T _J : -55 °C to 150 °C	IEC 62619: 2017	Tested in appliance
MOSFET (Q1, Q2, Q3, Q4) (Alternative)	Suzhou Oriental Semiconductor Co., Ltd	OSG65R038 HZF	V _{DS} : 650 V, V _{GS} : ±20 V, I _D : 80 A (T _C =25°C), T _J : -55 °C to 150 °C	IEC 62619: 2017	Tested in appliance
MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19)	China Resources Microelectronics (Chongqing) Limited	CRSS023N0 8N	V _{DS} : 85 V, V _{GS} : ±20 V, I _D : 240 A (T _C =25 °C), T _J : -55 °C to 150 °C	IEC 62619: 2017	Tested in appliance

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) (Alternative)	Suzhou Oriental Semiconductor Co., Ltd	SFG180N10K F	V _{DS} : 100 V, V _{GS} : ±20 V, I _D : 180 A (T _C =25°C), T _j : -55 °C to 150 °C	IEC 62619: 2017	Tested in appliance
Relay (RLY1)	XIAMEN HONGFA ELECTROACOUSTIC CO LTD	HF161F-W/12HT(477)	277 VAC, 33 A, T _{OPR} : -40 °C to 85 °C	UL 60947-1	UL E134517
Relay (RLY1) (Alternative)	Zettler Relay (Xiamen) Co., Ltd	AZSR131-1AE-12D	277 VAC, 33 A, T _{OPR} : -40 °C to 85 °C	UL 60947-1	UL E365652
Fuse (F1, F2)	Hollyland (China) Electronics Technology Corporation Ltd.	L-1000	65 VDC, 100 A, T _{OPR} : -40 ~ 125 °C	IEC 62619: 2017	Tested in appliance
Fuse (F1, F2) (Alternative)	Sinofuse Co., Ltd	RT303-100A	65 VDC, 100 A, T _{OPR} : -40 °C to 125 °C	IEC 62619: 2017	Tested in appliance
Fuse (F4)	LITTELFUSE INC	453008.MR	125 Vdc, 8 A, Interrupting Rating: 50 A	UL 248-1 UL 248-14	UL E10480
Fuse (F4) (Alternative)	DONGGUAN BETTER ELECTRONICS TECHNOLOGY CO LTD	2410180010000	125 Vdc, 8 A, Interrupting Rating: 50 A	UL 248-1 UL 248-14	UL E497847
Fan	PROTECHNIC ELECTRIC (WUJIANG) CO LTD	MGA4012YB-O10	12 Vdc, 0,16 A	UL 507	UL E522586
Connector (Connect to Battery)	K S TERMINALS INC	BMC2S	600 V, 50 A	UL 1977	UL E131576
Connector (Discharge&Charge)	DONGGUAN VACONN ELECTRONICS TECHNOLOGY CO LTD	VP-D4B-CHSF0B(Female) VP-D4B-CHDF0B(Male)	1100 V, 35 A	IEC 62619: 2017	Tested in appliance
NTC (CN6)	SHENZHEN SHI KEMIN SENSOR CO LTD	MF5210K	R _{25°C} : 10 K±1%, T _{moa} : 120 °C	UL 1434	UL E356449
Monitor wire	DONGGUAN TENGDA WIRE CO LTD	1332	24 AWG, 300 Vac, 200 °C	UL 758	UL E503909

IEC 62619					
Clause	Requirement + Test		Result - Remark		Verdict
Monitor wire Alternative	Interchangeable	Interchangeable	Min.24 AWG, 300 Vac, 200 °C	UL 758	DEKRA or other NRTL
Lead wire	3Q WIRE & CABLE CO LTD	10269	8 AWG, 1000 Vac, 105 °C	UL 758	UL E341104
Lead wire Alternative	Interchangeable	Interchangeable	Min. 8 AWG, 1000 Vac, 105 °C	UL 758	DEKRA or other NRTL
Metal Enclosure	Shenzhen XinChengYuan Tech Co., Ltd.	200.01000103-0	SPCC, /T=1,2 mm /μ=120 μm	--	--
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	
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): ____ Remark: Cell was approved in test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1.						

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
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: Cell was approved in test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1.						

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
Supplementary information: Results: A - No fire or Explosion B - Fire C - Explosion D - Other (Please explain): ____ Remark: Cell was approved in test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1.					

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	
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): ____ Remark: Cell was approved in test report no. 085-282260053-000 Original and 085-282260053-001 Amendment 1.					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.3	TABLE: Propagation test (battery system)					N/A
Sample No.	OCV of Battery System Before Test, (V dc)	OCV of Target Cell Before Test, (V dc)	Maximum Cell Case Temperature, (°C)	Maximum DUT Enclosure Temperature, (°C)	Results	
Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m ²)		
Supplementary information: 1) Cell can be failed through 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	
4395835/B01	51,66	50	55,92	3,507	A, D, F	
			Charge Voltage Applied Battery System: 1)			
			Whole		Part	
			64,24		--	
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): _____						
Remark: Tested with MOSFET (Q1, Q2, Q3, Q4) IPW65R041CFD7 and MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) CRSS023N08N						

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
4395835/B01	51,73	50	56,17	3,522	A, D, F
			Charge Voltage Applied Battery System: 1)		
			Whole		Part
			64,24		--

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

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): _____

Remark: Tested with alternative MOSFET (Q1, Q2, Q3, Q4) OSG65R038HZF and MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) SFG180N10KF

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	
4395835/B01	51,47	60 A(applied current before BMS) 50 A max. (measured current through cell block)	56,16	A, F, H	

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): The charging current was limited by BMS (max. 50 A).

Remark: Tested with MOSFET (Q1, Q2, Q3, Q4) IPW65R041CFD7 and MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) CRSS023N08N

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	
4395835/B01	51,61	60 A(applied current before BMS) 50 A max.	56,16	A, F, H	

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

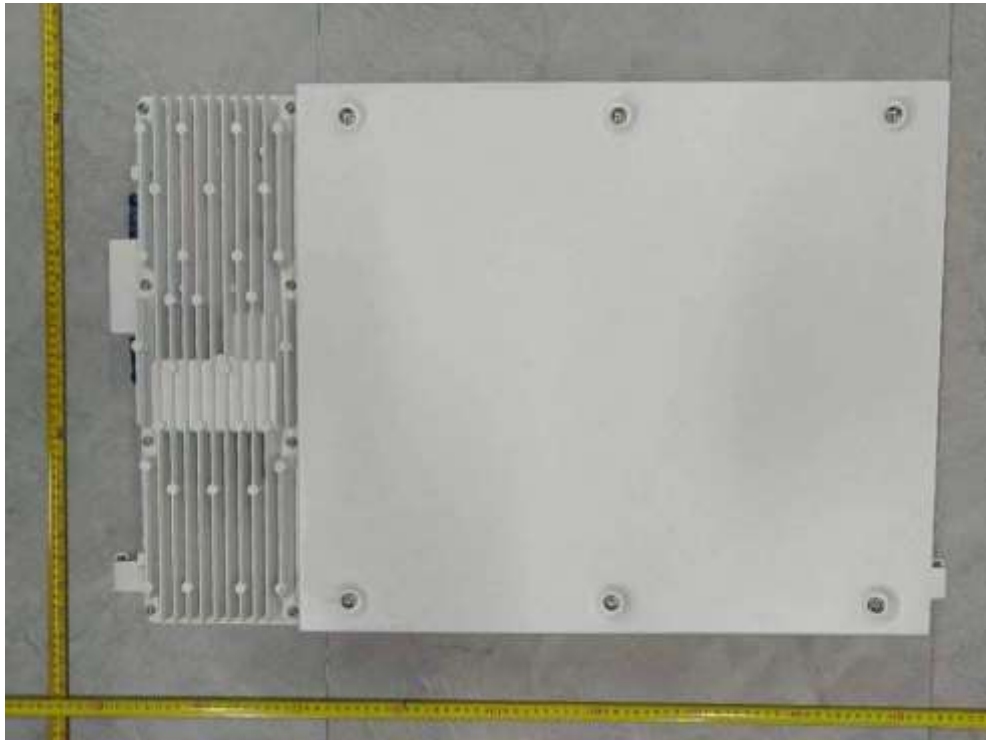
		(measured current through cell block)		
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D - Overcurrent sensing function of BMU did operate and then charging stopped E - Overcurrent sensing function of BMU did not operate and then charging stopped F - All function 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): The charging current was limited by BMS (max. 50 A). Remark: Tested with alternative MOSFET (Q1, Q2, Q3, Q4) OSG65R038HZF and MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) SFG180N10KF				

8.2.4	TABLE: Overheating control (battery system)			P
Model No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charging Voltage, V dc	
4395835/B01	52,87	50	53,68	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	
50		53,9	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): _____				
Remark: Tested with MOSFET (Q1, Q2, Q3, Q4) IPW65R041CFD7 and MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) CRSS023N08N				

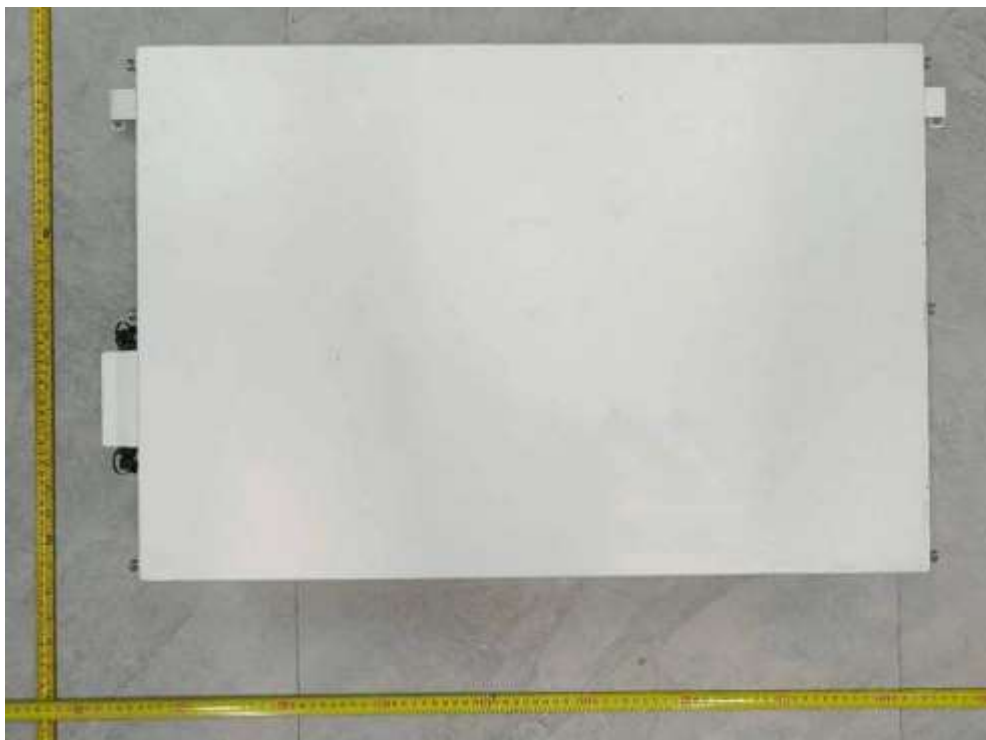
8.2.4	TABLE: Overheating control (battery system)			P
Model No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charging Voltage, V dc	
436588/B01	51,94	50	53,42	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
50		53,4	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): _____ Remark: Tested with alternative MOSFET (Q1, Q2, Q3, Q4) OSG65R038HZF and MOSFET (Q5, Q6, Q13, Q14, Q16, Q17, Q18, Q19) SFG180N10KF			

Attachment 1: Photos and illustrations



Overview



Overview

Attachment 1: Photos and illustrations

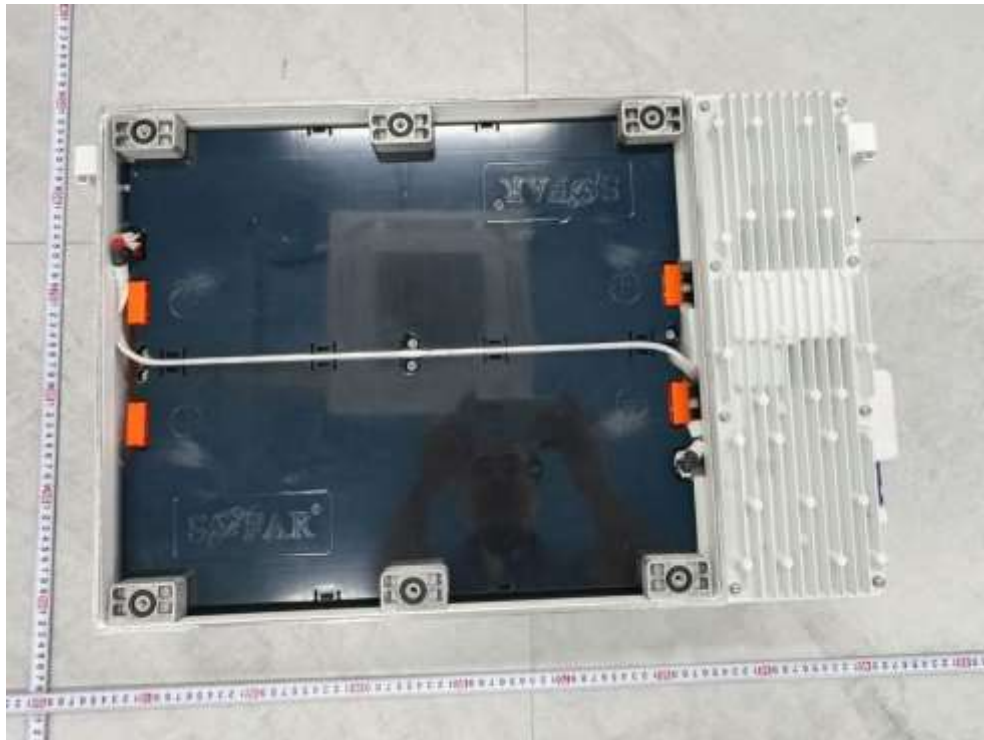


Overview



Overview

Attachment 1: Photos and illustrations

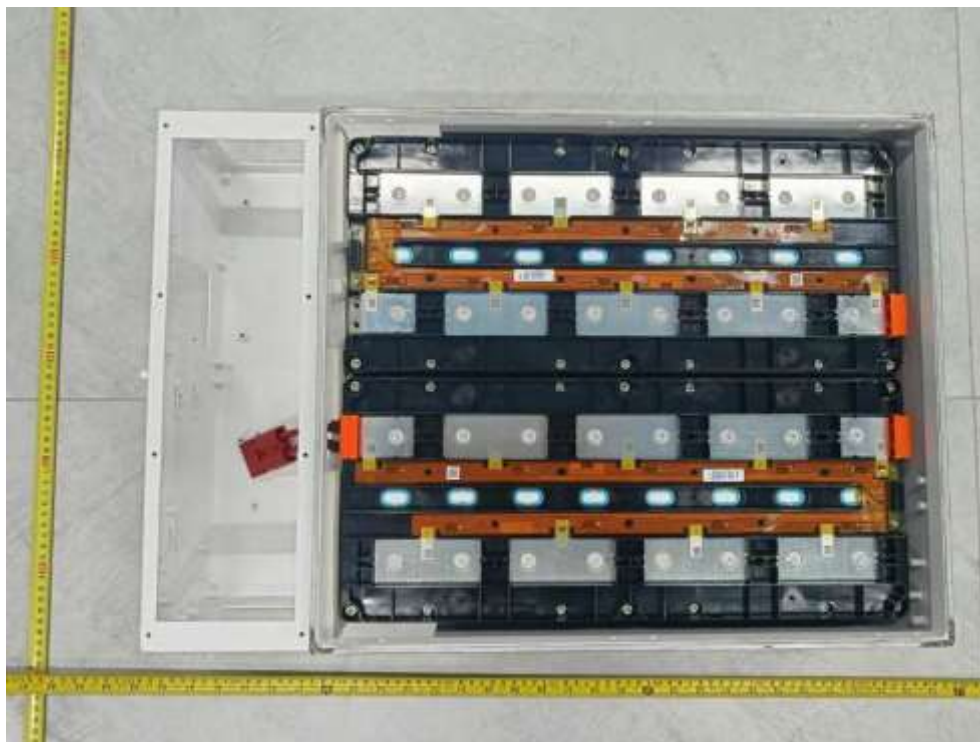


Internal view

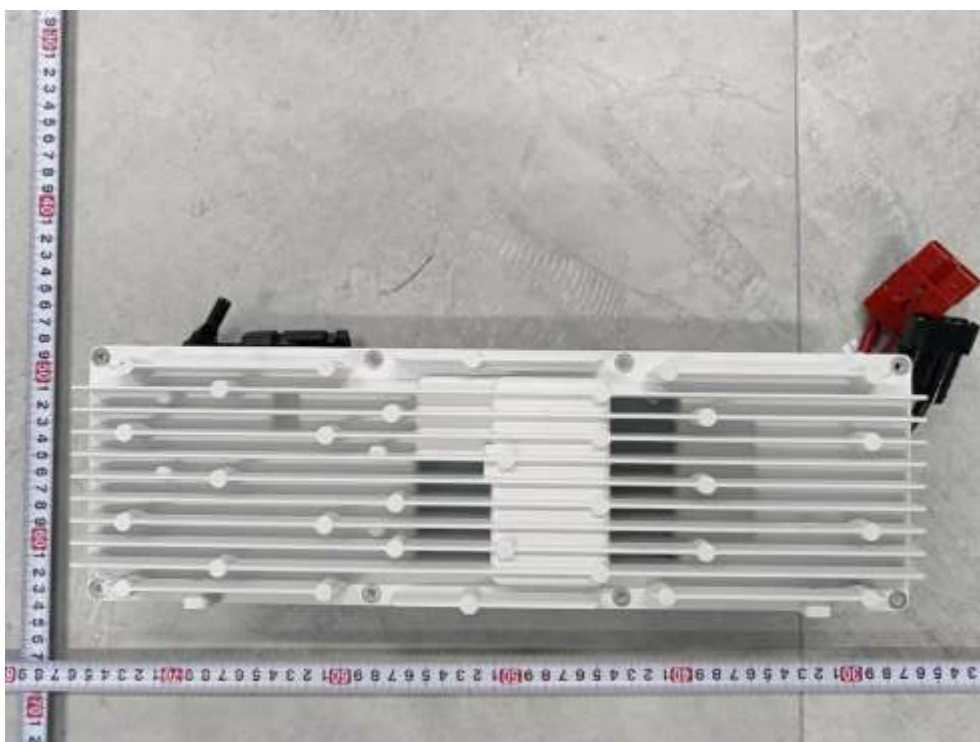


Internal view

Attachment 1: Photos and illustrations

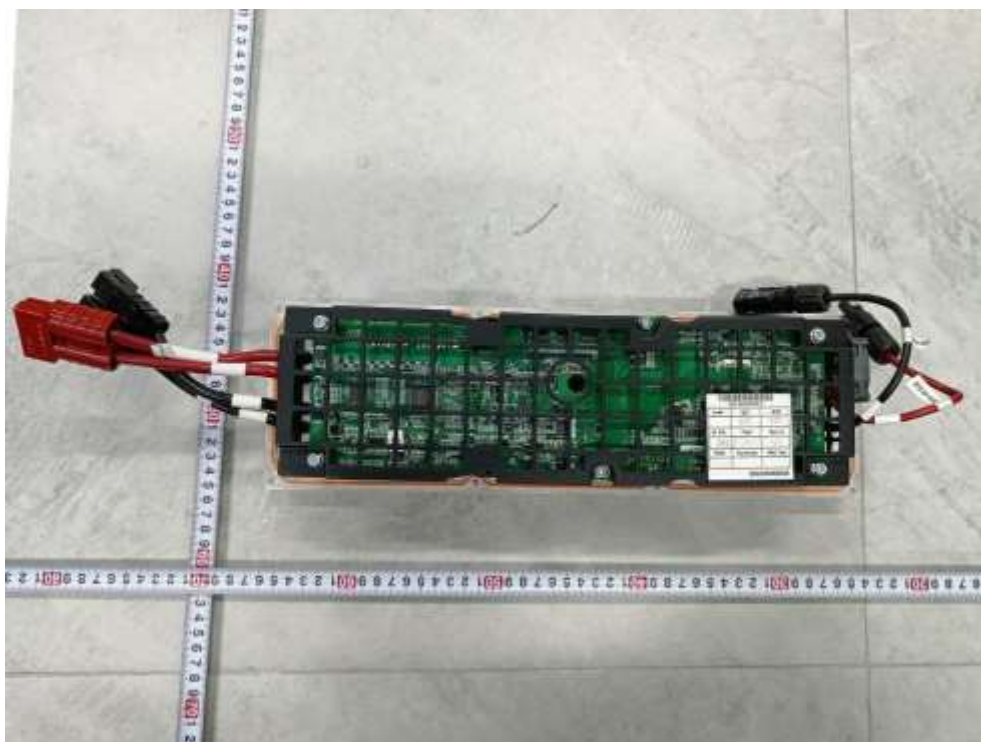


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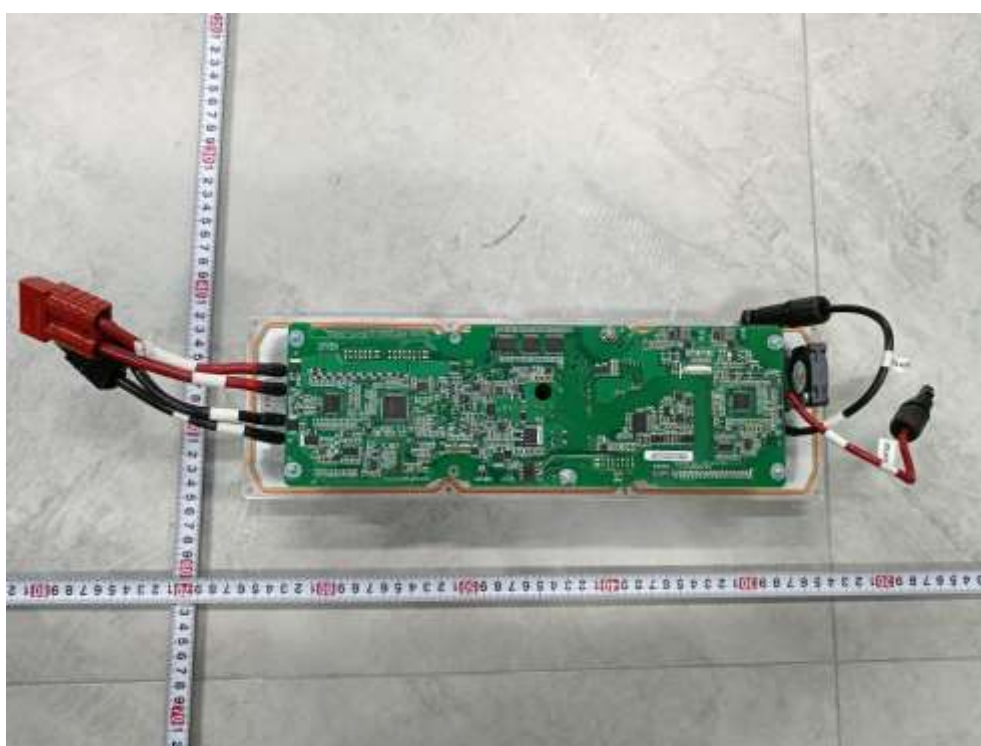


Internal view

Attachment 1: Photos and illustrations

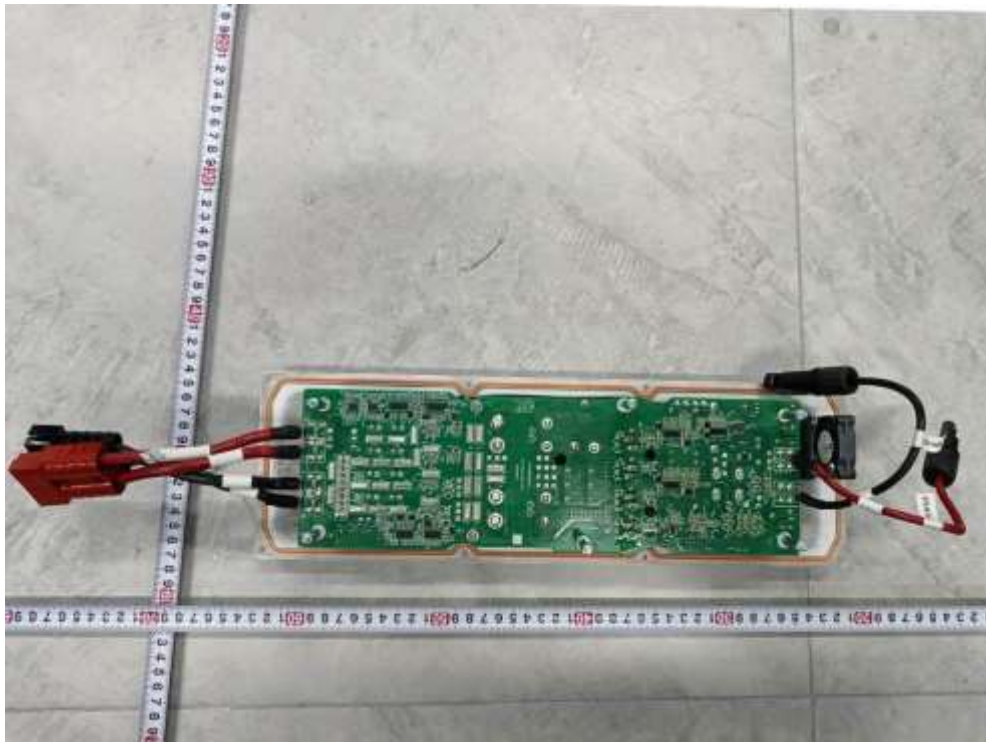


Internal view

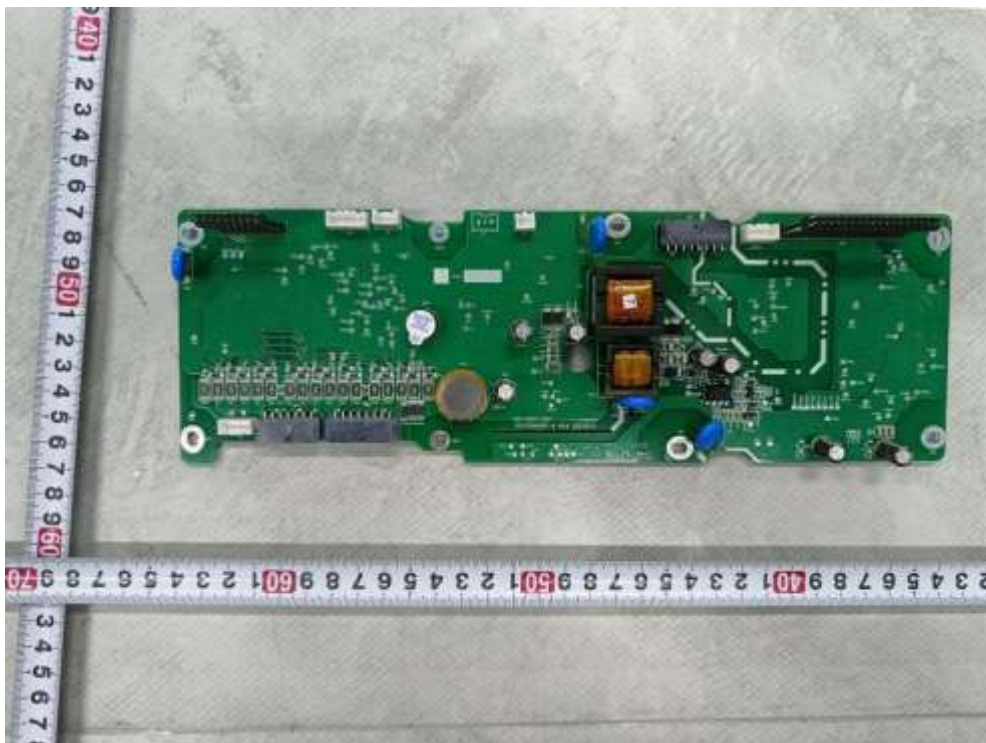


Internal view

Attachment 1: Photos and illustrations

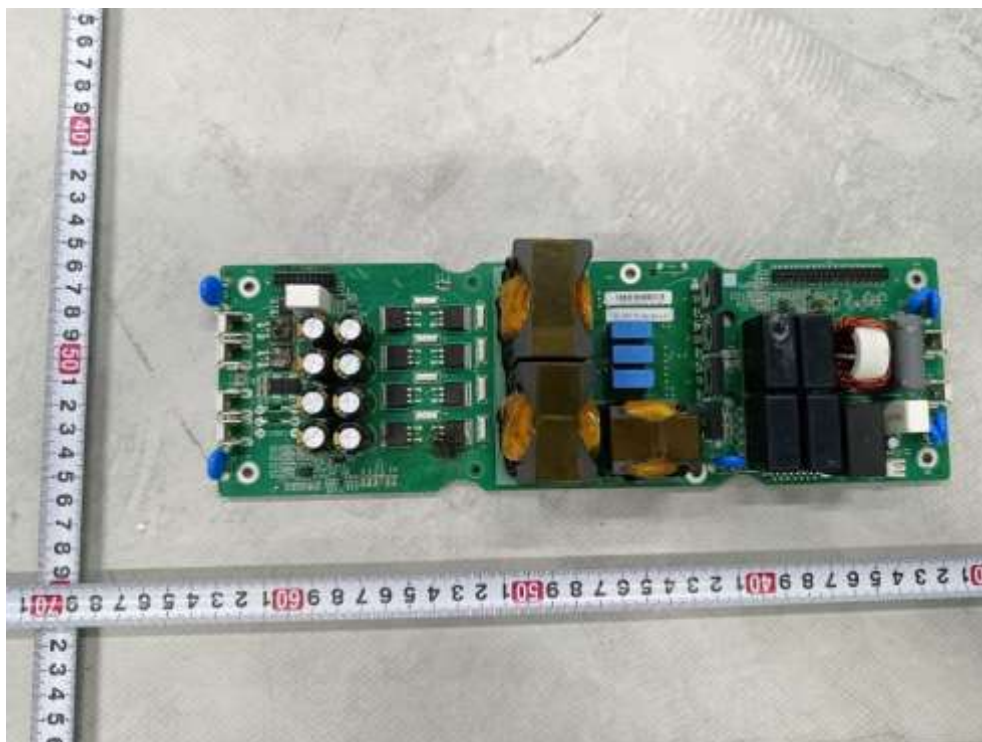


Internal view

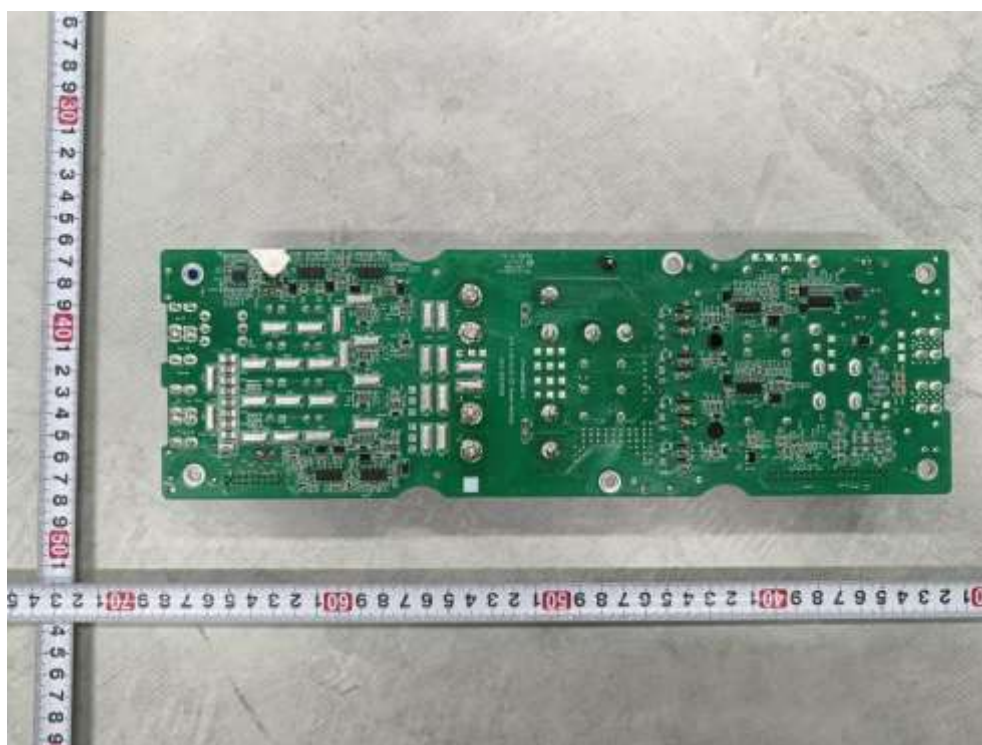


Internal view

Attachment 1: Photos and illustrations



Internal view

Internal view
-END-