Test Test Test Total Tota	st Report issued under the responsibility of: B TÜV SÜD PSB Pte. Ltd. International Business Park, V SÜD @IBP, ngapore 609937, ngapore	SUD	
	TEST REPORT IEC 62619		
Secondary cells and bat electrolytes - Safety rec batteries, fo	teries containing alkaline or other quirements for secondary lithium o or use in industrial applications	non-acid cells and	
Report Number:	085-282260504-000		
Date of issue:	2023-04-21		
Total number of pages:	19 pages		
Name of Testing Laboratory preparing the Report:	TÜV SÜD New Energy Testing (Guangdong) Co	., Ltd.	
Applicant's name:	Shenzhen Ensmar Technology Co., Ltd		
Address FI.5, Block A, Wanhe Technology Building, Huitong Road, Fenghuang Community, Guangming District, 518107 Shenzhen City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA			
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:	Rechargeable	Lithium Ion Battery System
Trade Mark:	ENSI	MAR
Manufacturer:	Dongguan En	smar New Energy Technology Co., Ltd
	Room 403, Blo Dongguan City CHINA	ock 6, No. 169, Xianjiang Road, Dalang Town, 523000 y, Guangdong Province, PEOPLE'S REPUBLIC OF
Model/Type reference:	ES S-48100H	
Ratings:	51.2Vd.c., 100	)Ah
Responsible Testing Laboratory (as	applicable), test	ing procedure and testing location(s):
CB Testing Laboratory:		TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.
Testing location/ address	:	North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuanggi Road, Shilou Town, Panyu District, Guangzhou/511447, China
Tested by (name, function, signature	):	Lena Li (Project Handler
Approved by (name, function, signa	ture):	Vitta Wang (Designated Reviewer)
Testing procedure: CTF Stag	e 1:	
Testing location/ address		
Tested by (name, function, signature	):	
Approved by (name, function, signat	,	
	,	
Testing procedure: CTF Stag	e 2:	
Testing location/ address	:	
Tested by (name + signature)	:	
Witnessed by (name, function, signa	ture):	
Approved by (name, function, signat	ure):	
Testing procedure: CTF Stag	e 3:	
Testing procedure: CTF Stag	e 4:	
Testing location/ address	:	
Tested by (name, function, signature	):	
Witnessed by (name, function, signa	ture):	
Approved by (name, function, signat	ure):	
Supervised by (name, function, signation)	ature) :	
List of Attachmonts (including a tota		os in oach attachment):
Attachment No. 1: photo documentation	n ( 6 pages)	-> 111 - actil allacilitietily.

Summary of testing:				
Tests performed (name of test and test clause):		Testing location:		
In section 7 and section 8, tests of clause 7.2.3.3, clause 8.2.2, clause 8.2.3 and clause 8.2.4 were performed on battery, model No.: ES S-48100H.		TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.		
Name of test, test clause	Date of test performed	Address: North-1/F, 2/F & Unit 301-3/F TÜV SÜD Testing		
- CI.7.2.3.3 Edge or corner drop test (cell or cell block, and battery system)	2022-12-21	Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu		
- CI.8.2.2 Overcharge control of voltage (battery system)	2022-12-16	District, Guangzhou 511447, China		
- CI.8.2.3 Overcharge control of current (battery system)	2022-12-15			
- CI.8.2.4 Overheating control (battery system)	2022-12-20			
The samples comply with the above requirements of Edition).				
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.

ENSMAR Model	No.: ES S-48100H
Rechargeable Lithium Ion I	Battery System
Total Energy	5.12KWh
Nominal Voltage	51.2Vd.c
Rated Capacity	100Ah
Working Voltage Range	44.8~56.8V
Suggested Charge Current	20A
Max. Cont. Charge Current	95A
Suggested Discharge Current	20A
Max. Cont. Discharge Current	95A
Installation Condition	Indoor
Charge Temperature Range	0~55°C
Discharge Temperature Range	-15~55°C
Ingress Protection	IP20
Protective Class	I
Dimension (H*D*W, mm, max)	200*403*602mm
Weight	49.5KG
Address: FI.5, Block A, Wanhe Technology B Huitong Road, Fenghuang Commu Guangming District, 518107 Shenz Guangdong Province, PEOPLE'S F OF CHINA S/N:E10011010C020230 Made in China	uilding, nity, hen City, EEPUBLIC
WARNING	
Accurate the battery away from children     Aced manual before installation and operation     S. Heavy enough may cause injury     D. Do not dispose of the product with household waste     Recycling	<u>▲</u> ★ &

#### Remark:

1. There are serial number with 21 characters tracing the detail information of the battery system, such as "E10011010C0203600001". The 10th to 12th characters represent the manufacture date, and "C02" indicates the manufacture date in the 2<sup>nd</sup> week of 2023. This is not the serial of actual sample and for example only. 2. "+" "-" are marked near the connectors.

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Test item particulars	Rechargeable Lithium Ion Battery System		
Classification of installation and use	Use in industrial applications		
Supply Connection	Supply by connectors		
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:	2022-12-08		
Date (s) of performance of tests:	2022-12-12 to 2023-04-20		
General remarks:			
"(See Enclosure #)" refers to additional information ap "(See appended table)" refers to a table appended to th	opended to the report. ne report.		
Throughout this report a $\Box$ comma / $oxtimes$ point is used as the decimal separator.			
Manufacturer's Declaration per sub-clause 4.2.5 of	IECEE 02:		
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided	<ul> <li>☐ Yes</li> <li>☑ Not applicable</li> </ul>		
When differences exist; they shall be identified in t	he General product information section.		
Name and address of factory (ies):	Dongguan Ensmar New Energy Technology Co., Ltd		
	Room 403, Block 6, No. 169, Xianjiang Road, Dalang Town, 523000 Dongguan City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA		

### General product information and other remarks:

The Rechargeable Lithium Ion Battery System is used in industrial application, which consist of cells model no. IFP48173115-100Ah connected in 16S. The cell model No. IFP48173115-100Ah has been approved with IEC 62619:2017 (First Edition) certification.

Additionally, details information of the battery, module and the built-in cell are shown in following table:

Product name	Li-ion Prismatic Power Cell	Rechargeable Lithium Ion Battery System
Type/model	IFP48173115-100Ah	ES S-48100H
Nominal voltage	3.2Vd.c.	51.2Vd.c.
Rated capacity	100Ah	100Ah
Charging voltage declared by manufacturer	3.65V	56.8V
Upper limit charging voltage	3.65V	57.6 V
Charging current declared by manufacturer	50A	20A
Maximum continuous charging current	100A	95A
Discharging current declared by manufacturer	50A	20A
Maximum continuous discharging current	100A	95A
End of discharge voltage	2.5V	44.8V or 2.8V/cell
Standard temperature range for charging	0°C to 60°C	0°C to 55°C
Standard temperature range for discharging	-20°C to 60°C	-15°C to 55°C
Standard charging method by manufacturer	At 25°C±2°C, Constant-current charge to 3.65V at 50A, constant voltage charge to stop until 5A.	Charge at constant current 20A until total voltage reaches 56.8V, then at constant voltage 56.8V till charge current reduces to 5A
Charging method for internal short-circuit test	At constant current 100A till cell voltage reaches 3.65V, then switch to constant voltage 3.65V till charge current drops to 5A (0.05 lt)	-
Dimension	Thickness x Wide x Height: 49.3mm (max.) x 174.4mm (max.) x 121.6mm (max.)	H × D × W: Max.200mm ×Max.403mm ×Max.602mm
Weight	2.0±0.1kg	49.5kg
Configuration	-	16S

The final evaluation of the battery must be conducted in the end product for which the battery will be used.

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4	PARAMETER MEASUREMENT TOLERANCES		Р
	Parameter measurement tolerances		Р

5	GENERAL SAFETY CONSIDERATIONS	
5.1	General	Р
	Cells and batteries are safe under conditions of both intended use and reasonably foreseeable misuse: See also table 5.1 for Critical components information	Р
5.2	Insulation and wiring	Р
	Voltage, current, altitude, and humidity requirements	Р
	Adequate clearances and creepage distances between connectors	Р
	The mechanical integrity of internal connections	Р
5.3	Venting	Р
	Pressure relief function	Р
	Encapsulation used to support cells within an outer casing	Р
5.4	Temperature/voltage/current management	Р
	The design prevents abnormal temperature-rise	Р
	Voltage, current, and temperature limits of the cells	Р
	Specifications and charging instructions for equipment manufacturers	Р
5.5	Terminal contacts of the battery pack and/or battery system	Р
	Polarity marking(s)	Р
	Capability to carry the maximum anticipated current	Р
	External terminal contact surfaces	Р
	Terminal contacts are arranged to minimize the risk of short circuits	Р
5.6	Assembly of cells, modules, or battery packs into battery systems	Р
5.6.1	General	Р
	Independent control and protection method(s)	Р
	Recommendations of cell operating limits by the cell manufacturer	Р
	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	Р
5.6.2	Pattory system decign	P
	Dattery system design	•

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	The voltage control for series-connected batteries		Р
5.7	Operating region of lithium cells and battery syste	Operating region of lithium cells and battery systems for safe use	
	The cell operating region:	See page 6	Р
	Designation of battery system to comply with the cell operating region		Р
5.8	Quality plan		Р
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented:	Manufacturing quality plan prepared and implemented	Р
	The process capabilities and the process controls		Р

6	TYPE TEST CONDITIONS	Р
6.1	General	Р
6.2	Test items	Р
	Cells or batteries that are not more than six months old (See Table 1 of IEC62619)	Р
	Capacity confirmation of the cells or batteries	Р
	Default ambient temperature of test, 25 °C ± 5 °C	Р

7	SPECIFIC REQUIREMENTS AND TESTS		Р
7.1	Charging procedure for test purposes		Р
	The battery discharged to a specified final voltage prior to charging		Р
	The cells or batteries charged using the method specified by the manufacturer:	See page 6	Р
7.2	Reasonably foreseeable misuse		Р
7.2.1	External short-circuit test (cell or cell block)		N/A
	Short circuit with total resistance of 30 m $\Omega$ ± 10 m $\Omega$ at 25 °C ± 5 °C		N/A
	Results: no fire, no explosion	See Table 7.2.1.	N/A
7.2.2	Impact test (cell or cell block)		N/A
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		N/A
	Results: no fire, no explosion.		N/A
7.2.3	Drop test (cell or cell block, and battery system)		Р
7.2.3.1	General		Р
7.2.3.2	Whole drop test (cell or cell block, and battery system)		N/A

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	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)		Р
	Description of the Test Unit:	Model: ES S-48100H	_
	Mass of the test unit (kg)	Measured: 49.40kg	_
	Height of drop (m)	0.10m	
	Results: no fire, no explosion		Р
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
	Upper limit charge voltage of the cell		N/A
	Cells connected in series in the battery system :		N/A
	Redundant or single protection for discharge voltage control provided in battery system:		N/A
	Target Voltage:		N/A
	Maximum discharge current of the cell, Im		N/A
	Discharge current for forced discharge, 1.0 It		N/A
	Discharging time, t = (1 It / $I_m$ ) x 90 (min.):		N/A
	Results: no fire, no explosion:	See Table 7.2.6.	N/A
7.3	Considerations for internal short-circuit – Design	evaluation	N/A
7.3.1	General		N/A
7.3.2	Internal short-circuit test (cell)		N/A
	Samples preparation procedure:		N/A
	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		
	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 °C $\pm$ 5 °C.		N/A

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	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, no explosion:	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:	See Annex B	N/A
	Results: No external fire from the battery system or no battery case rupture	See Table 7.3.3	N/A

8 BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		CTIONAL SAFETY)	Р
8.1	General requirements		Р
	Functional safety analysis for critical controls		Р
	Conduct of a process hazard, risk assessment and mitigation of the battery system		Р
8.2	Battery management system (or battery managen	nent unit)	Р
8.2.1	Requirements for the BMS		Р
	The safety integrity level (SIL) target of the BMS		Р
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4		Р
8.2.2	Overcharge control of voltage (battery system)		Р
	The exceeded charging voltage applied to the whole battery system		Р
	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	Р
	The BMS interrupted the overcharging before reaching 110% of the upper limit charging voltage		Р
8.2.3	Overcharge control of current (battery system)		Р
	Results: no fire, no explosion	See Table 8.2.3	Р
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current		Р
8.2.4	Overheating control (battery system)		Р
	The cooling system, if provided, was disconnected		N/A

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Elevated temperature for charging, 5 °C above maximum operating temperature	65°C	Р
Results: no fire, no explosion	See Table 8.2.4	Р
The BMS detected the overheat temperature and terminated charging		Р
The battery system operated as designed during test		Р

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

10	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)	Р	
	The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual.	Р	
	Cell or battery system has clear and durable markings	Р	
	Cell designation	N/A	
	Battery designation	Р	
	Battery structure formulation	Р	

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ANNEX A	A OPERATING REGION OF CELLS FOR SAFE USE	
A.1	General	Р
A.2	Charging conditions for safe use	Р
A.3	Consideration on charging voltage	Р
A.4	Consideration on temperature	Р
A.5	High temperature range	N/A
A.6	Low temperature range	N/A
A.7	Discharging conditions for safe use	Р
A.8	Example of operating region	Р

ANNEX B	PROCEDURE OF 7.3.3 PROPAGATION TEST	N/A
B.1	General	N/A
B.2	Test conditions:	N/A
	<ul> <li>The battery fully charged according to the manufacturer recommended conditions</li> </ul>	-
	- Target cell forced into thermal runaway:	—
	<ul> <li>A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing</li> </ul>	_
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	Р
	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	Ρ

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5.1 T	TABLE: Critical components information				Р
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
1.Cell	JIANGXI ANCHI NEW ENERGY TECHNOLOGY CO., LTD	IFP48173115-100Ah	3.2Vd.c., 100Ah	IEC 62619: 2017	CB cert. No.: JPTUV- 129418 Report No.: CN21NGY W 001
2. BMS Shanghai Energy Electronic Technology Co., Ltd. EMU1101 PCBA-V16 Hardware version V16 Software version: 16.04		EMU1101 PCBA- V16 Hardware version: V16 Software version: 16.04	Overcharge detection voltage for each cell: $3.65 \pm 0.01V$ , Overcharge detection voltage for battery: 57.6V, Overdischarge detection voltage for each cell: $2.7\pm 0.01V$ , Overdischarge detection voltage for battery: $43.2V$ , Charge overcurrent detection current: $100\pm 1.1A$ , Discharge overcurrent detection current: $100\pm 1.1A$ , High temperature charging protection: $55\pm 2^{\circ}C$ , High temperature discharging protection: $0\pm 2^{\circ}C$ , Low temperature discharging protection: $0\pm 2^{\circ}C$ , Low temperature discharging protection: $0\pm 2^{\circ}C$ , Low temperature discharging protection: $-15\pm 2^{\circ}C$		-
Below list is th	e critical compone	nts of Main Board, Moc	el: 48100-1101-10E-BC1	7-16S	
- PCB material	JIANGSU COMBO ELECTRONIC TECHNOLOGY CO LTD	CB-D-1	130°C, V-0	UL 796	UL E307203
- IC for MCU (U5)	Synwit Technology Co., Ltd.	SWM181RCT6	Supply voltage: 2.3V to 3.6V Operating temperature: -40 to 85°C	-	-
- IC for AFE (U6)	LAPIS Semiconductor	ML5238	V <sub>DD</sub> : -0.3 to 86.5 V, Operating temperature: -40°C to 85°C	-	-

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- DCDC Converter (U1)	Silicon Content Technology Co., Ltd.	SCT2A23ASTER	Wide Input Range: 4.5V to 100V, Operating junction temperature: -40°C to 150°C	-	-
- VOLTAGE REGULATOR S (U2)	UNISONIC TECHNOLOGIE S CO., LTD.	LD1117/A-3.3V	3.3V, 1A, V <sub>IN</sub> : 18V, T <sub>OPR</sub> : 20°C to 125°C	-	-
- VOLTAGE REGULATOR S (U3)	UNISONIC TECHNOLOGIE S CO., LTD.	LD1117/A-5.0V	5.0V, 1A, V <sub>IN</sub> : 18V, T <sub>OPR</sub> : -20°C to 125°C	-	-
-Three- terminal adjustable regulator (U4)	LESHAN RADIO COMPANY,LTD	LTL431ATLT1G	Торк: -40°С to 125°С, Vка: 36V, Iка: 100mA	-	-
- MÓSFET for charge (MC1, MC1', MC2', MC3, MC5, MC5', MC6', MC7)	CRMICRO	CRSS042N10N V <sub>DS</sub> : 100V, V <sub>GS</sub> : ±20V, I <sub>D</sub> : 120A, T <sub>J</sub> : -55°C to 150°C		-	-
- MOSFET for discharge (MD1, MD1', MD2', MD3, MD5, MD5', MD6', MD7)	CRMICRO	CRSS042N10N	V⊳s: 100V, V <sub>G</sub> s: ±20V, I⊳: 120A, TJ: -55°C to 150°C	-	-
- MOSFET for Current limit (MH1)	CRMICRO	CRSS042N10N	V <sub>DS</sub> :100V, V <sub>GS</sub> : ±20V, I <sub>D</sub> :120A, T <sub>J</sub> : -55-150°C	-	-
- MOSFET for Current limit (ML1)	NCEPOWER	NCEP15T14	V <sub>DS</sub> :150V, V <sub>GS</sub> : ±20V, I <sub>D</sub> : 140A, T <sub>J</sub> : -55°C to175°C	-	-
-Inductance (L1)	Moshang Electronic Technology (Jiangsu) Co., Ltd	RPI2714-330K	L: 33μH±10%, I <sub>sat</sub> :2A, R <sub>dc</sub> : 8.0mΩ, -40°C to 150°C	-	-
-Shunt (RFL)	Shanghai kaibu Applied Electronics Co., Ltd	SKB300A75EDBK	300±1.5A, 75mV, T <sub>J</sub> : -40°C to 170°C	-	-
-Transformer (T1)	SUZHOU PENGSHENGH E ELECTRONIC CO LTD	PSH-349A (PSH-130-349A)	Class 130(B); -40°C to 150°C	UL 1466	UL E341022

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3. NTC (4pcs)	YuanSu Electronics Technology (kunshan)Co.,Lt d	NTC103B23435FH0 09	$R_{25} = 10k\Omega \pm 1\%$ , $B_{25/50} = 3435K \pm 1\%$ , $T_{opr}$ : -40°C to 125°C	-	-
4. Contactor for charge and discharge protection	DONGGUAN CHUROD ELECTRONICS CO LTD	CHDC-148D200BS	Coil voltage: 48VDC Contact: 60V, 200A	IEC60947- 4-1	UL E341422
5. Connector for P+ P-	Dongguan Wanlian Electronics Co., LTD	WL-CN-120Z	1000V, 120A, -40°C to 125°C	-	-
- Plastic part of connector	SABIC INNOVATIVE PLASTICS US L LC	EXL9330	PC9330, 3mm, V-0	UL94	UL E121562
6. Connector for cable gland	Dongguan Wanlian Electronics Co., LTD	WL-CN-120T	1000V, 120A, -40°C to 125°C	-	-
7. Wiring for Connector (B+, B-)	Zhongshan City Dingxiang Electrical Co Ltd	3512	4AWG, 200°C, 600Va.c.	UL758	UL E354487
8. Wiring for Connector (P+,P-)	Zhongshan City Dingxiang Electrical Co Ltd	3512	4AWG, 200°C, 600Va.c.	UL758	UL E354487
9. Wiring for voltage sampling	YuanSu Electronics Technology (kun shan)Co.Ltd	1007	28AWG, 80°C, 300Va.c.	-	-
10. Case	Dongguan Dawei Technology Co., LTD	FBC-BT-01-48- 120A-2	SPCC (Steel), Thickness: 1.5mm	-	-
Supplementary	/ information: N/A				

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7.2.1 TABLE: External short-circuit test (cell or cell block)					N/A	
Sample I	No.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (mΩ)	Maximum Case Temperature Rise ∆T (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	ABLE: Overcharge test (cell or cell block)						
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):

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Clause	Requirement + Test		Result - Remark	Verdict

7.2.6	TABL	3LE: 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)	Res	sults
		-	-	-	-		-
		-	-	-	-		-
-				-			
Supplementary information:							
Results: A - No fire or Explosion B - Fire							

C - Explosion

D - Other (Please explain):

7.3.2	TABLE	: Internal short-circ	uit test (cell)			N/A
Sample	e No.	OCV at start of test, (V dc)	Particle location <sup>1)</sup>	Maximum applied pressure, (N)	Res	sults
-		-	-	-		-
-		-	-	-		-
-		-	-	-		-
			-			
-		-	-	-		-

#### Supplementary information:

<sup>1)</sup> 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: There is no particle location 2 in this product.

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Clause F	Requirement + Test		Result - Remark	Verdict

7.3.3	TA	ABLE: Propagation test (battery system)					N/A	
Sample N	0.	OCV of Battery System Before Test, (V dc)	OCV Cell Tes	of Target Before t, (V dc)	Maximum Cell Case Temperature, (°C)	Maximum DUT Enclosure Temperature, (°C)	Re	sults
-			-	-	-		-	
Method of cell failure <sup>1)</sup>			Location of target cell		Area for fire	protectio	on (m²)	
-				-		-		

#### 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	FABLE: Overcharge control of voltage (battery system)     P					
Sample	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)		F	Results			
Battery	Battery 1 2.922 95 58.553		3.586		A, D, F		
· · · ·				Charge Voltage A	pplied Battery S	ys	tem: 1)
				Whole(V dc)	Pa	rt	
				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)

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Clause	Requirement + Test	Result - Remark	Verdict

8.2.3	TABLE:	Overcharge cont	rol of current (battery sy	/stem)		Р
Sample No.		OCV at start of test, (V dc)	120% of Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Resu	lts
Batter	y 1	51.443	120	54.250	A, D, F	
Supplement Results: A – No fire of B – Fire C – Explosi D - Overcur E - Overcur F - All funct G - All funct H - Other (F	or Explosion on rent sens rent sens ion of bat Please exp	rmation: ion ing function of BM ing function of BM tery system did op tery system did no olain):	U did operate and then c U did not operate and the erate as intended during t operate as intended du	harging stopped en charging stopped the test. ring the test.	I	

8.2.4 TABLE: Overheating control (battery system)				
OCV at start (SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charging Voltage, V dc		
Battery 1 52.859		53.797		
Temperature of Battery tem, °C	Maximum Measured Cell Case Temperature, °C	Results	3	
55	55.4	A, D, F		
nation: n ng function of BMU did oper ng function of BMU did not o ry system did operate as into ry system did not operate as ain):	ate and then charging stoppe perate and then charging sto ended during the test. s intended during the test.	ed opped		
	Overheating control (battery OCV at start (SOC 50%) of test, V dc         52.859         Temperature of Battery otem, °C         55         nation:         n         ng function of BMU did oper ng function of BMU did not oper ry system did operate as inter ery system did not operate as ain):	werheating control (battery system)         OCV at start (SOC 50%) of test, V dc       Maximum Charging Current, A         52.859       20         Temperature of Battery otem, °C       Maximum Measured Cell Case Temperature, °C         55       55.4         nation:       n         ng function of BMU did operate and then charging stopped or y system did operate as intended during the test.         ry system did not operate as intended during the test.         ain):	overheating control (battery system)         OCV at start (SOC 50%) of test, V dc       Maximum Charging Current, A       Maximum Ch Voltage, V         52.859       20       53.797         Temperature of Battery stem, °C       Maximum Measured Cell Case Temperature, °C       Results         55       55.4       A, D, F         nation:       n       n         ng function of BMU did operate and then charging stopped ng function of BMU did not operate and then charging stopped ry system did operate as intended during the test.       ry system did not operate as intended during the test.         ry system did not operate as intended during the test.       ry system did not operate as intended during the test.	

--- End of test report --

 Details of:
 Fig.1 Overview 1 of Rechargeable Lithium Ion Battery System, model: ES S-48100H

 Image: Fig.1 Overview 1 of Rechargeable Lithium Ion Battery System, model: ES S-48100H

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 Image: Fig.1 Overview 1 of Rechargeable Lithium Ion Battery



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 Details of:
 Fig.3 Overview of Connector

Details of	Fig. 4 Marking plate of Rechargeable Lithium Ion Battery System,
Detaile of.	model: ES S-48100H
	ENSIMAR Model No.: ES S-48100H
	Rechargeable Lithium Ion Battery System
	Total Energy 5 12KWh
	Nominal Voltage 51.2Vd.c
	Rated Capacity 100Ah
	Working Voltage Range 44.8~56.8V
	Suggested Charge Current 20A
	Max. Cont. Charge Current 95A
	Suggested Discharge Current 20A
	Max Cont. Discharge Current 95A
	Installation Condition Indoor
	Charoe Temperature Range 0-55 C
	Discharge Temperature Range -15~55 C
	Incress Protection IP20
	Protective Class
	Dimension (H*D*W, mm, max) 200*403*602mm
	Weight 49.5KG
	IEoP50/175/122/I16S1M/0+50/95
	Sharehan Engener Tachardan (a. 144
	Address: FI.5. Block A, Wanhe Technology Building, Huitong Road, Fenghuang Community, Guangming District, 518107 Shenzhen City, Guangdong Province, PEOPLE'S REPUBLIC OF CHINA
	S/N:E10011010C02023600001 Made in China
	WARNING
	1. Caution, risk of electric shock
	2.Keep the battery away from open flame or ignition sources 3.Keep the battery away from children
	4. Read manual before installation and operation 5. Heavy mough may cause injury
	6.Do not dispose of the product with household waste 7.Recycling
	Remark:
	1 There are serial number with 21 characters tracing the detail information of the battery
	system such as "E10011010C0203600001". The 10th to 12th characters represent the
	manufacture data and "CO2" indicates the manufacture data in the 2014 representation of the
	manufacture date, and CO2 indicates the manufacture date in the 2 <sup>m</sup> week of 2023. This is not
	the serial of actual sample and for example only.
	2. "+" "-" are marked near the connectors.

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Details of:	Fig. 8 Bottom view of BMS Main board, model: 48100-1101-10E-BC17-16S





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