

# 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	64.280.21.60053.01
Date of issue:	2021-04-29
Total number of pages:	17 pages
Name of Testing Laboratory	TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.
preparing the Report:	North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China
Applicant's name:	EVE Power Co., Ltd.
Address:	No. 68, Jingnan Avenue, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S REPUBLIC OF CHINA
Test specification:	
Standard	IEC62619A
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
Master TRF	ОL(Demko) Dated 2018-06-07

# Copyright © 2018 IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE System). All rights reserved.

This publication may be reproduced in whole or in part for non-commercial purposes as long as the IECEE is acknowledged as copyright owner and source of the material. IECEE takes no responsibility for and will not assume liability for damages resulting from the reader's interpretation of the reproduced material due to its placement and context.

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

## General disclaimer:

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

This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.



Rechargeable Li-ion Cell
<b>EVE</b> °
Same as applicant
LF100L
3.2Vd.c., 102Ah

# Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

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 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China			
Tested by (name, function, signature)     Vitta Wang       (Project Handler)				
Approved by (name, function, signature):	Ryan Jin (Designated Reviewer)	Ry an et mi		
List of Attachments (including a total number of pages in each attachment): N/A				
Summary of testing:	Summary of testing:			
Tests performed (name of test and test clause):	Т	esting location:		
In section 7, each test clause below is performed with three cells except for clause 7.2.2 with six cells and clause 7.3.2 with five cells.		ÜV SÜD New Energy Testing Guangdong) Co., Ltd.		
- Cl. 7.2.1 External short-circuit test (cell or cell block)	A	ddress: North-1/F, 2/F & Unit 01-3/F, TÜV SÜD Testing		

- Cl. 7.2.2 Impact test (cell or cell block)
- Cl. 7.2.3.2 Whole drop test (cell or cell block, and battery system)
- Cl. 7.2.4 Thermal abuse test (cell or cell block)
- Cl. 7.2.5 Overcharge test (cell or cell block)
- Cl. 7.2.6 Forced discharge test (cell or cell block)
- Cl. 7.3.2 Internal short-circuit test (cell)

The samples comply with the above requirements of IEC 62619:2017 (First Edition).

## Summary of compliance with National Differences: N/A

List of countries addressed: N/A

Center, D1, No. 63 Chuangqi

District, Guangzhou 511447,

Road, Shilou Town, Panyu

China





http://www.tuv-sud.cn

TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China



Test item particulars       :         Classification of installation and use				
Classification of installation and use	Test item particulars			
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	Classification of installation and use:	Used in industrial application		
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: P (Fail)         Testing	Supply Connection	Supply by terminals		
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: P (Fail)  Testing  Date of receipt of test item: 2021-02-09 Date (s) of performance of tests: 2021-03-16 to 2021-04-28  General remarks:  "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a □ comma / ⊠ point is used as the decimal separator. Remark: Photo Documentation: 3 pages  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 When differences exist; they shall be identified in the General product information section. Name and address of factory (ies)	Possible test case verdicts:			
test object does meet the requirement: P (Pass)     test object does not meet the requirement: F (Fail)  Testing: Date of receipt of test item: 2021-02-09 Date (s) of performance of tests: 2021-03-16 to 2021-04-28  General remarks:  "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a □ comma / ⊠ point is used as the decimal separator. Remark: Photo Documentation: 3 pages  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  When differences exist; they shall be identified in the General product information section. Name and address of factory (ies): EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	- test case does not apply to the test object::	N/A		
- test object does not meet the requirement: F (Fail)         Testing	- test object does meet the requirement::	P (Pass)		
Testing:       Date of receipt of test item       : 2021-02-09         Date (s) of performance of tests       : 2021-03-16 to 2021-04-28         General remarks:       "(See Enclosure #)" refers to additional information appended to the report.         "(See appended table)" refers to a table appended to the report.         "Throughout this report a □ comma / ☑ point is used as the decimal separator.         Remark: Photo Documentation: 3 pages         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	- test object does not meet the requirement::	F (Fail)		
Date of receipt of test item:: 2021-02-09         Date (s) of performance of tests:: 2021-03-16 to 2021-04-28         General remarks:         "(See Enclosure #)" refers to additional information appended to the report.         "(See appended table)" refers to a table appended to the report.         Throughout this report a □ comma / ☑ point is used as the decimal separator.         Remark: Photo Documentation: 3 pages         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	Testing:			
Date (s) of performance of tests:: 2021-03-16 to 2021-04-28         General remarks:         "(See Enclosure #)" refers to additional information appended to the report.         "(See appended table)" refers to a table appended to the report.         Throughout this report a □ comma / ☑ point is used as the decimal separator.         Remark: Photo Documentation: 3 pages         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	Date of receipt of test item:	2021-02-09		
General remarks:         "(See Enclosure #)" refers to additional information appended to the report.         "(See appended table)" refers to a table appended to the report.         Throughout this report a □ comma / ☑ point is used as the decimal separator.         Remark: Photo Documentation: 3 pages         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	Date (s) of performance of tests:	2021-03-16 to 2021-04-28		
General remarks:         "(See Enclosure #)" refers to a dditional information appended to the report.         "(See appended table)" refers to a table appended to the report.         Throughout this report a □ comma / ☑ point is used as the decimal separator.         Remark: Photo Documentation: 3 pages         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				
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a □ comma / ☑ point is used as the decimal separator. Remark: Photo Documentation: 3 pages 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	General remarks:			
Throughout this report a □ comma / ☑ point is used as the decimal separator.         Remark: Photo Documentation: 3 pages         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         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	"(See Enclosure #)" refers to additional information ap "(See appended table)" refers to a table appended to the	opended to the report. ne report.		
Remark: Photo Documentation: 3 pages         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         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	Throughout this report a $\Box$ comma / $\boxtimes$ point is used as the decimal separator.			
Remark: Photo Documentation: 3 pages         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         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S				
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         When differences exist; they shall be identified in the General product information section.         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	Remark: Photo Documentation: 3 pages			
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         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S				
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         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)       EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	Manufacturer's Declaration per sub-clause 4.2.5 of	IECEE 02:		
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       Image: Not applicable         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)       EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	The application for obtaining a CB Test Certificate	☐ Yes		
when differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	includes more than one factory location and a declaration from the Manufacturer stating that the	⊠ Not applicable		
representative of the products from each factory has been provided         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	sample(s) submitted for evaluation is (are)			
been provided       :         When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)       :         EVE Power Co., Ltd.         Gaoxin Road 89, Jingmen Hi-tech Zone, 448000         Jingmen City, Hubei Province, PEOPLE'S	representative of the products from each factory has			
When differences exist; they shall be identified in the General product information section.         Name and address of factory (ies)         EVE Power Co., Ltd.         Gaoxin Road 89, Jingmen Hi-tech Zone, 448000         Jingmen City, Hubei Province, PEOPLE'S	been provided:			
Name and address of factory (ies) EVE Power Co., Ltd. Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	When differences exist; they shall be identified in t	he General product information section.		
Gaoxin Road 89, Jingmen Hi-tech Zone, 448000 Jingmen City, Hubei Province, PEOPLE'S	Name and address of factory (ies):	EVE Power Co., Ltd.		
		Gaoxin Road 89, Jingmen Hi-tech Zone, 448000		
REPUBLIC OF CHINA		REPUBLIC OF CHINA		



## General product information and other remarks:

Rechargeable Li-ion Cell model No. LF100L is used in industrial applications. Additionally, details information of the cell is shown in following table:

Product name	Rechargeable Li-ion Cell
Type/model	LF100L
Nominal voltage	3.2Vd.c.
Rated capacity	102 Ah
Charging voltage declared by manufacturer	3.65V
Upper limit charging voltage	3.9V
Charging current declared by manufacturer	50A
Maximum Continuous Charging Current	100A
Discharging current declared by manufacturer	50A
Maximum Continuous Discharging Current	250A
Discharge Cut-Off Voltage	2.0V
Standard charging temperature range	0°C ~ 65°C
Standard discharge temperature range	-30°C ~ 65°C
Standard charging method by manufacturer	Charge at constant current 50A until the voltage reaches 3.65V, then charge at 3.65V till charge current is $0.05 I_t A$ (5.1A)
Charging method for internal short circuit test	Charge at constant current 100A until the voltage reaches $3.9V$ , then charge at 3.9V till charge current is $0.05hA$ (5.1A)
Dimension	T*W*H: (49.9±0.5)mm*(160.0±0.8)mm*(118.5±0.5)mm
Weight	(1.98±0.1) kg

The final evaluation of the cell must be conducted in the end products for which the cell will be used.



	IEC 62619		
Clause	Requirement + Test	Result - Remark	Verdict
4	PARAMETER MEASUREMENT TOLERANCES		Р
	Parameter measurement tolerances		Р
F			
5	GENERAL SAFETY CONSIDERATIONS		P
5.1	General	See also table 5.1 for Critical	
	intended use and reasonably foreseeable misuse:	components information	P
5.2	Insulation and wiring		Р
	Voltage, current, altitude, and humidity requirements		Р
	Adequate clearances and creepage distances between connectors		N/A
	The mechanical integrity of internal connections		Р
5.3	Venting		Р
	Pressure relief function		Р
	Encapsulation used to support cells within an outer casing		N/A
5.4	Temperature/voltage/current management		N/A
	The design prevents abnormal temperature-rise		N/A
	Voltage, current, and temperature limits of the cells		N/A
	Specifications and charging instructions for equipment manufacturers		N/A
5.5	Terminal contacts of the battery pack and/or battery system		N/A
	Polarity marking(s)		N/A
	Capability to carry the maximum anticipated current		N/A
	External terminal contact surfaces		N/A
	Terminal contacts are arranged to minimize the risk of short circuits		N/A
5.6	Assembly of cells, modules, or battery packs into	battery systems	N/A
5.6.1	General		N/A
	Independent control and protection method(s)		N/A
	Recommendations of cell operating limits by the cell manufacturer		N/A
	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		N/A
5.6.2	Battery system design		N/A

Telephone : +86 20 3817 0580 Telefax : +86 20 3832 0478 TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

http://www.tuv-sud.cn



	IEC 62619		
Clause	Requirement + Test	Result - Remark	Verdict

	The voltage control function		N/A
	The voltage control for series-connected batteries		N/A
5.7	Operating region of lithium cells and battery syste	ems for safe use	Р
	The cell operating region:	See page 5	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 5	Р
7.2	Reasonably foreseeable misuse		Р
7.2.1	External short-circuit test (cell or cell block)		Р
	Short circuit with total resistance of 30 m $\Omega\pm$ 10 m $\Omega$ at 25 °C $\pm$ 5 °C		Р
	Results: no fire, no explosion	See Table 7.2.1.	Р
7.2.2	Impact test (cell or cell block)		Р
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		Р
	Results: no fire, no explosion.		Р
7.2.3	Drop test (cell or cell block, and battery system)		Р
7.2.3.1	General		Р

Telephone : +86 20 3817 0580 Telefax : +86 20 3832 0478 TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.



	IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict	
7.2.3.2	Whole drop test (cell or cell block, and battery system)		Р	
	Description of the Test Unit:	Cell		
	Mass of the test unit (kg)	Measured: Max. 2.009kg		
	Height of drop (m)	1.00m		
	Results: no fire, no explosion		Р	
7.2.3.3	Edge and corner 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	
7.2.4	Thermal abuse test (cell or cell block)		Р	
	Results: no fire, no explosion		Р	
7.2.5	Overcharge test (cell or cell block)		Р	
	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.	Р	
7.2.6	Forced discharge test (cell or cell block)		Р	
	Upper limit charge voltage of the cell	3.9V	Р	
	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:	-3.9V	Р	
	Maximum discharge current of the cell, Im:	250A	Р	
	Discharge current for forced discharge, 1.0 It:	102A	Р	
	Discharging time, t = (1 It / $I_m$ ) x 90 (min.):	90min	Р	
	Results: no fire, no explosion	See Table 7.2.6.	Р	
7.3	Considerations for internal short-circuit – Design	evaluation	Р	
7.3.1	General		Р	
7.3.2	Internal short-circuit test (cell)		Р	

TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

http://www.tuv-sud.cn



	IEC 62619		
Clause	Requirement + Test	Result - Remark	Verdict

Samples preparation procedure:	a)	Р
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.		Р
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	400N	Р
Results: no fire, no explosion:	See Table 7.3.2.	Р
Propagation test (battery system)		N/A
Method to create a thermal runaway in one cell:		N/A
Results: No external fire from the battery system or no battery case rupture		N/A
	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: 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 ± 5 °C. 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 - The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached Results: no fire, no explosion: <b>Propagation test (battery system)</b> Method to create a thermal runaway in one cell: Results: No external fire from the battery system or no battery case rupture	Samples preparation procedure:       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 ± 5 °C.         The appearance of the short-circuit location         recorded by photograph or other means            The pressing was stopped               The pressing force of 800 N (cylindrical cells) or         400N         Results: no fire, no explosion            Bropagation test (battery system)         Method to create a thermal runaway in one cell         Method to create a thermal runaway in one cell            Results: No external fire from the battery system or         no battery case rupture

8	BATTERY SYSTEM SAFETY (CONSIDERING FUN	CTIONAL SAFETY)	N/A
8.1	General requirements		N/A
	Functional safety analysis for critical controls		N/A
	Conduct of a process hazard, risk assessment and mitigation of the battery system		N/A
8.2	Battery management system (or battery managen	nent unit)	N/A
8.2.1	Requirements for the BMS		N/A
	The safety integrity level (SIL) target of the BMS		N/A
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4		N/A
8.2.2	Overcharge control of voltage (battery system)		N/A
	The exceeded charging voltage applied to the whole battery system		N/A
	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	N/A
	The BMS interrupted the overcharging before reaching 110% of the upper limit charging voltage		N/A
8.2.3	Overcharge control of current (battery system)		N/A

Telephone : +86 20 3817 0580 Telefax : +86 20 3832 0478 TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China



IEC 62619				
Clause	Requirement + Test		Result - Remark	Verdict

r			1
	Results: no fire, no explosion	See Table 8.2.3	N/A
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current		N/A
8.2.4	Overheating control (battery system)		N/A
	The cooling system, if provided, was disconnected		N/A
	Elevated temperature for charging, 5 °C above maximum operating temperature:		N/A
	Results: no fire, no explosion:	See Table 8.2.4	N/A
	The BMS detected the overheat temperature and terminated charging		N/A
	The battery system operated as designed during test		N/A

9	INFORMATION FOR SAFETY		
	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.	N/A	

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.				
	Cell or battery system has clear and durable markings	Р			
	Cell designation	Р			
	Battery designation	N/A			
	Battery structure formulation	N/A			



IEC 62619				
Clause	Requirement + Test	Result - Remark	Verdict	

ANNEX 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				
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	<ul> <li>Method used for initiating the thermal runaway.</li> <li>1) Heater (Heater, Burner, Laser, Inductive heating</li> <li>2) Overcharge</li> <li>3) Nail penetration of the cell</li> <li>4) Combination of above methods</li> <li>5) Other methods</li></ul>		_		

ANNEX C	EX 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		Ρ

5.1 T	TABL	BLE: Critical components information				
Object/part n	ю.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
1. Rechargeal Li-ion Cell	ble	EVE Power Co., Ltd.	LF100L	3.2Vd.c., 102Ah	IEC 62619: 2017	-
-Electrolyte		ShenZhen Capch emTechnology Co.,Ltd.	JD10-438- 08	LiPF6:EC:PC:DMC:EMC= 10~15%:25~35%:0~5%:0~ 5%:40~65%	-	-
-Separator		Sinoma Lithium Battery Separator Co., Ltd.	JP07-453- 05-107.5mm	PE + boehmite, Size: L*W*T 12069mm×107.5mm×12µm Remark: The above dimensions refer to one core, and there are two cores in one cell.	-	-
-Positive electrode		EVE Power Co., Ltd.	-	LFP, Conductive Additive, PVDF, Aluminum Foil Size: L*W*T 10814.7mm×102mm× 161µm Remark: The above dimensions refer to one core, and there are two cores in one cell.	-	-
-Negative electrode		EVE Power Co., Ltd.	-	Carbon, Conductive Additive Copper Foil Size: L*W*T 11133.74mm×103.5mm× 116µm Remark: The above dimensions refer to one core, and there are two cores in one cell.	-	-
-Positive electrode tab		Guangzhou Nano New Material Technology Co., Ltd	-	Aluminum Foil Size: W*T: 31.5mm*12µm	-	-
-Negative electrode tab		Jiangxi Tongbo Technology Co., Ltd	-	Copper Foil Size: W*T: 31.7 mm*6µm	-	-
-Insulation tap	C	Jingmen Qisi New Energy Materials Co., Ltd.	Inner protective film  50160   H55	PP Size: L*T: 264.5(±0.5)mm*220(±0.5) mm	-	-
-Blue film		INNOVA ELECTRONIC MATERIALS CO.,LTD	Outer protective film   0.11*230mm *100m	Double layer PTE+Pantone 2144C~2146C Size: T*L*W 0.11mm*215mm*288mm	-	-

-Case	Shenzhen kedali Industry Co., Ltd	Aluminum case   49.7*159.7* 115.2mm	AI 3003 Bottom:1.2mm(T) Front:0.5mm(T) Side:0.6mm(T)	-	-
-Venting	Shenzhen kedali Industry Co., Ltd	-	MFX2-0 Size: φ18 (0.85±0.15) MPa	-	-
Supplementary information: N/A					

TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

North-1/F, 2/F & Unit 301-3/F, TÜV SÜD Testing Center, D1, No. 63 Chuangqi Road, Shilou Town, Panyu District, Guangzhou 511447, China

7.2.1 TABLE: External short-circuit test (cell or cell block)							Р
Sample N	0.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (mΩ)	Maximum Case Temperature Rise ∆T (K)	R	lesults
LF100L		26.6	3.366	30.2	27.5		A, E
LF100L		22.9	3.365	30.4	35.4		A, E
LF100L		21.8	3.393	30.2	33.1		A, E

# Supplementary information:

A - No fire or Explosion

B - Fire

C - Explosion

D - The test was completed after 6 h

E - The test was completed after the cell casing cooled to 20% of the maximum temperature rise

F - Other (Please explain):

7.2.5	TAB	TABLE: Overcharge test (cell or cell block)							
Sample N	0.	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		
LF100L		2.824	3.399	100	4.68	44.2	A, E		
LF100L		2.805	3.404	100	4.68	54.3	A, E		
LF100L		2.815	3.453	100	4.68	46.9	A, E		

## Supplementary information:

Results:

A - No fire or Explosion

B - Fire

C - Explosion

D - Test concluded when temperature reached a steady state condition

E - Test concluded when temperature returned to ambient

F - Other (Please explain):

7.2.6	TABL	E: Forced dischar	ge test (cell o	or cell block)			Р
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
LF100L		2.802	-3.9	102	90		A
LF100L		2.815	-3.9	102	90	90 A	
LF100L 2.817		2.817	-3.9	102	90		A
Supplementary information:							
Results: A - No fire or Explosion B - Fire C - Explosion D - Other (Please explain):							

7.3.2	7.3.2     TABLE: Internal short-circuit test (cell)					
Sample No.	OCV at start of test, (V dc)	Particle location <sup>1)</sup>	Maximum applied pressure, (N)	Results		
LF100L	3.395	1	400	A, E		
LF100L	3.380	1	400	A, E		
LF100L	3.393	1	400	A, E		
LF100L	3.375	1	400	A, E		
LF100L	3.376	1	400	A, E		

# Supplementary information:

<sup>1)</sup> Identify one of the following:

1: Nickel particle inserted between positive and negative material.

2: Nickel particle inserted between positive current collector aluminium foil and negative material.

# **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.

http://www.tuv-sud.cn

TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

7.3.3	ТА	BLE: Propagation	test (b	attery sys	tem)			N/A
Sample No.		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 protection (m <sup>2</sup>		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	TABL	E: Overcharge contro	ol of voltage (I	oattery system)		N/A
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
-		-	-	-	-	-
				Charge Voltage A	pplied Battery S	ystem: 1)
				Whole	Par	t
				-	-	
Supplement	ton in	formation			•	

## 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):

TÜV SÜD New Energy Testing (Guangdong) Co., Ltd.

8.2.3	TABLE:	Overcharge cont	rol of current (battery sy	/stem)		N/A
Sample No.		OCV at start of test, (V dc)	start of120% of Max.Max. Charging(V dc)Charging Current, (A)Voltage, (V dc)		Resu	lts
-		-	-	-	-	
Supplement Results: A – No fire of B – Fire C – Explosio D - Overcur E - Overcur F - All funct G - All funct H - Other (F	or Explosi on rent sens ion of batt 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.	ł	

8.2.4	TABLE	: Overheating control (battery	v system)		N/A		
Sample	No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Maximum Charg Voltage, V dc			
-		-	-	-			
Maximum	i Specifi S	ed Temperature of Battery System, °C	Maximum Measured Battery Case Temperature, °C	Results			
Supplemen	tary info	ormation:					
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--

http://www.tuv-sud.cn