



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..... : TSZ24LS028A01-01

Date of issue : 2025-01-26

Total number of pages : 24 Pages

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

Applicant's name : Shenzhen Himax Electronics Co., Ltd
Address : Floor 501, Building B, Nantong Avenue No.5, Tongle
Community, Baolong Street, Longgang, SHENZHEN
GUANGDONG 518000, CHINA

Test specification:

Standard : IEC 62619:2022

Test procedure : CB Scheme

Non-standard test method : N/A

TRF template used : IECEE OD-2020-F1:2022, Ed.1.5

Test Report Form No. : IEC62619B

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

Master TRF : Dated 2023-02-24

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General disclaimer:

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

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Test item description..... :	Li-ion Battery	
Trademark(s) :	N/A	
Manufacturer :	Same as applicant	
Model/Type reference :	LAF12400	
Ratings :	12.8V, 400Ah, 5120Wh	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ CB Testing Laboratory:	Shenzhen Tiansu Calibration and Testing Co., Ltd.	
Testing location/ address..... :	Building 4, No.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China.	
Tested by (name, function, signature)..... :	Leon Gong /Project Handler	<i>Leon Gong</i>
Approved by (name, function, signature).... :	Davis Ding /Reviewer	<i>Davis Ding</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): Enclosures (8 pages)	
Summary of testing:	
Tests performed (name of test, test clause and date test performed): Testing for Battery Pack (LAF12400) 7.2.3 Drop test (battery system) Test Period: 2024-12-10 8.2.2 Overcharge control of voltage (battery system) Test period: 2024-12-06 8.2.3 Overcharge control of current (battery system) Test period: 2024-12-05 8.2.4 Overheating control (battery system) Test period: 2024-12-09 Cell (Model: PR50160116-100CF01) has been evaluated according to IEC 62619: 2022, Certificate No.: JPTUV-149499, Report No.: CN23B07G 001.	Testing location: (CBTL, SPTL, CTF, Subcontractor) CBTL Shenzhen Tiansu Calibration and Testing Co., Ltd. Building 4, No.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China.
Summary of compliance with National Differences (List of countries addressed): EU group *, United Kingdom (Per customer's request shown separately) *=No National or Group Differences declared. ☒ The product fulfils the requirements of EN IEC 62619: 2022 ☒ The product fulfils the requirements of BS EN IEC 62619: 2022	

Use of uncertainty of measurement for decisions on conformity (decision rule) :

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☐ Other: ... (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

Information on uncertainty of measurement:

The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

	Product Name: Li-ion Battery
+	Manufacturer: Shenzhen Himax Electronics Co., Ltd
	Model Name: LAF12400
	IFpP/51/162/120/[4P4S]E/-10+40/90
	Ratings: 12.8V 400Ah 5120Wh
	YYYYMMDD0001 Made in China
-	Recommended Charge: 80A charge to 14.4V CC-CV
	Caution: Risk of Fire and Burns.
	Disposal instructions: Comply with local regulations.

Remark:

1: The date code "YYYYMMDD0001"

1.1: YYYY stands for year.

1.2: MM stands for month.

1.3: DD stands for date.

1.4: 0001 represents the flow code.

Test item particulars: --	
Classification of installation and use: --	
Supply Connection: DC Connector	
Possible test case verdicts: - test case does not apply to the test object.....: N/A - test object does meet the requirement.....: P (Pass) - test object does not meet the requirement.....: F (Fail)	
Testing:	
Date of receipt of test item: 2024-11-27	
Date (s) of performance of tests: 2024-12-05 to 2024-12-10	
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report.	
Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC60060-2:	
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): Same as applicant	

General product information and other remarks:

The battery Pack consists of sixteen cells in 4P4S which fixed by metal frame, protective circuit, metal enclosure.

- Rechargeable Li-ion Battery Module (Model: LAF12400) has been evaluated to comply with ST/SG/AC.10/11/Rev.8/Subsection 38.3, test report No.: TSZ24LS028A02 issued on 2025-01-21, issued by Shenzhen Tiansu Calibration and Testing Co., Ltd.

- Type reference IFpP/51/162/120/[4P4S]E/-10+40/90 is IEC 62620:2014 designation which is identical Model LAF12400 except for model designation.

- Detailed information of the cell, as following:

Product name:	LFP Li-ion Cell	Cell model:	PR50160116-100CF01
Nominal Voltage	3.22V	Normal Charge Current	50A
Rated Capacity	100Ah	Maximum Charge Current	160A
Energy	322Wh	Normal Discharge Current	50A
Maximum Charge Voltage	3.65V	Maximum Discharge Current	200A
Discharge Cut-Off Voltage	2.5V	End of charging current	5A
Charging Temperature Range	0°C to 60°C	Discharging Temperature Range	-30°C to 60°C

- Detailed information of the battery pack, as following:

Product name:	Li-ion Battery	Battery model:	LAF12400
Nominal Voltage	12.8V	Normal Charge Current	80A
Rated Capacity	400Ah	Maximum Charge Current	200A
Energy	5140Wh	Normal Discharge Current	80A
Maximum Charge Voltage	14.4V	Maximum Discharge Current	200A
Discharge Cut-Off Voltage	10.5V	End of charging current	20A
Charging Temperature Range	0°C to 55°C	Discharging Temperature Range	-20°C to 55°C

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Clause	Requirement + Test	Result - Remark	Verdict
4	PARAMETER MEASUREMENT TOLERANCES		P
	Parameter measurement tolerances		P
5	GENERAL SAFETY CONSIDERATIONS		P
5.1	General		P
	Cells and batteries are safe under conditions of both intended use and reasonably foreseeable misuse... :	Clause 6, Clause 7, 8.1, and 8.2. See also table 5.1 for Critical components information.	P
	Reduce the risk of injuries from moving parts		P
5.2	Insulation and wiring		P
	Voltage, current, altitude, and humidity requirements		P
	Adequate clearances and creepage distances between connectors and live parts at different voltages or between live parts and non-current-carrying accessible parts		P
	Protect from hazardous live parts, including during installation		P
	The mechanical integrity of internal connections		P
5.3	Venting		P
	Pressure relief function		P
	Encapsulation used to support cells within an outer casing		N/A
5.4	Temperature/voltage/current management		P
	The design prevents abnormal temperature-rise		P
	Voltage, current, and temperature limits of the cells		P
	Specifications and charging instructions for equipment manufacturers	Charging instructions included in the product specification.	P
5.5	Terminal contacts of the battery pack and/or battery system		P
	Polarity marking(s)		P
	Polarity marking not provided for keyed external connector		N/A
	Capability to carry the maximum anticipated current	Connector complied with the requirements. See table 5.1 for Critical components information.	P
	External terminal contact surfaces		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	Assembly of cells, modules, or battery packs into battery systems		P
5.6.1	General		P
	Independent control and protection method(s)		P
	Recommendations of cell operating limits, mounting advice, storage conditions and other design recommendations by the cell manufacturer		P
	Batteries designed for the selective discharge of a portion of their series connected cells		N/A
	Protective circuit component(s) and consideration to the end-device application		P
5.6.2	Battery system design		P
	The voltage control function		P
	Maximum charging/discharging current of the cell are not exceeded		P
5.7	Operating region of lithium cells and battery systems for safe use		P
	The cell operating region..... :	Refers to page 7.	P
	Designation of battery system to comply with the cell operating region	Refers to page 7.	P
5.8	System lock (or system lock function)		N/A
	Non-resettable function to stop battery operation	Provided in the BMS software security mechanism.	P
	Manual with procedure for resetting of battery operation		P
	Emergency battery final discharge		N/A
5.9	Quality plan		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented :	ISO 9001: 2015 certificate provided.	P
	The process capabilities and the process controls		P

6	TYPE TEST CONDITIONS		P
6.1	General		P
6.2	Test items		P
	Cells or batteries that are not more than six months old (See Table 1 of IEC 62619)		P
	Capacity confirmation of the cells or batteries		P

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Clause	Requirement + Test	Result - Remark	Verdict

	Default ambient temperature of test, 25 °C ± 5 °C		P
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7	SPECIFIC REQUIREMENTS AND TESTS		P
7.1	Charging procedure for test purposes		P
	The battery discharged to a specified final voltage prior to charging	10.5V	P
	The cells or batteries charged using the method specified by the manufacturer..... :	See page 7.	P
7.2	Reasonably foreseeable misuse		N/A
7.2.1	External short-circuit test (cell or cell block)	CB approval cell.	N/A
	Short circuit with total resistance of 30 mΩ ± 10 mΩ at 25 °C ± 5 °C		N/A
	Results: no fire, no explosion		N/A
7.2.2	Impact test (cell or cell block)	CB approval cell.	N/A
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		N/A
	Results: no fire, no explosion.		N/A
7.2.3	Drop test (cell or cell block, and battery system)		P
7.2.3.1	General		N/A
7.2.3.2	Whole drop test (cell or cell block, and battery system)	CB approval cell.	N/A
	Description of the Test Unit..... :		—
	Mass of the test unit (kg)..... :		—
	Height of drop (m)..... :		—
	Results: no fire, no explosion		N/A
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)		P
	Description of the Test Unit..... :	Battery Pack	—
	Mass of the test unit (kg)..... :	38.308	—
	Height of drop (m)..... :	0.1	—
	Results: no fire, no explosion		P
7.2.4	Thermal abuse test (cell or cell block)	CB approval cell.	N/A
	Results: no fire, no explosion		N/A
7.2.5	Overcharge test (cell or cell block)	CB approval cell.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	For those battery systems that are provided with only a single protection for the charging voltage control		—
	Results: no fire, no explosion		N/A
7.2.6	Forced discharge test (cell or cell block)	CB approval 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, I_m		N/A
	Discharge current for forced discharge, $1.0 I_t$		N/A
	Discharging time, $t = (1 I_t / I_m) \times 90$ (min.)		N/A
	Results: no fire, no explosion		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)	CB approval cell.	N/A
	Samples preparation procedure: In accordance with Clause A.5 and A.6 of IEC 62133-2:2017		N/A
	Tested per 7.3.2 b) in an ambient temperature of $25\text{ °C} \pm 5\text{ °C}$.		N/A
	The appearance of the short-circuit location recorded by photograph or other means		N/A
	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		N/A
7.3.3	Propagation test (battery system)		N/A
	Method to create a thermal runaway in one cell ...		N/A
	Results: No external fire from the battery system, no battery case rupture		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
8	BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)		P
8.1	General requirements		P
	Functional safety analysis for critical controls	Analysis for functional safety according to Annex H of IEC 60730-1 :2020.	P
	Conduct of a process hazard analysis for both the cell manufacturing process and the battery system manufacturing process	Hazard analysis	P
	Conduct of risk assessment and mitigation of the battery system	FEMA provided	P
8.2	Battery management system (or battery management unit)		P
8.2.1	Requirements for the BMS		P
	The safety integrity level (SIL) target of the BMS	Annex H of IEC 60730-1 :2020, Class B.	P
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4		P
8.2.2	Overcharge control of voltage (battery system)		P
	The exceeded charging voltage applied to the whole battery system		P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s)..... :		N/A
	Results: no fire, no explosion..... :	See Table 8.2.2.	P
	The BMS terminated the charging before exceeding the upper limit charging voltage		P
8.2.3	Overcharge control of current (battery system)		P
	Results: no fire, no explosion..... :	See Table 8.2.3	P
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current		P
8.2.4	Overheating control (battery system)		P
	The cooling system, if provided, was disconnected		N/A
	Elevated temperature for charging, 5 °C above maximum operating temperature..... :	60°C	P
	Results: no fire, no explosion..... :	See Table 8.2.4	P
	The BMS detected the overheat temperature and terminated charging		P
	The battery system operated as designed during test		P

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Clause	Requirement + Test	Result - Remark	Verdict

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

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

11	MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)		P
	The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual.	See Page 5, Copy of marking plate for more information.	P
	Cell or battery system has clear and durable markings		P
	Cell designation		N/A
	Battery designation	IFpP/51/162/120/[4P4S]E/-10+40/90	P
	Battery structure formulation		P

12	PACKAGING AND TRANSPORT		P
	Refer to Annex D		P

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

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Clause	Requirement + Test	Result - Remark	Verdict

ANNEX B	PROCEDURE OF 7.3.3 PROPAGATION TEST BY LASER IRRADIATION		N/A
B.1	General		N/A
B.2	Test conditions		N/A
B.2.1	Cell test (preliminary test)		N/A
	The cell fully charged according to the manufacturer recommended conditions		—
	Laser irradiation point on the cell		—
	Output power of laser irradiation		—
	Tested in an ambient temperature of 25 °C ± 5 °C		N/A
	Repeat of cell test for 3 times		N/A
B.2.2	Battery system test (main test)		N/A
	The battery system fully charged according to the manufacturer recommended conditions		—
	Target cell to be laser irradiated		—
	The irradiation point on the target cell same or similar as that on the cell test		
	Output power of laser irradiation		—
	Tested in an ambient temperature of 25 °C ± 5 °C		N/A

ANNEX C	PROCEDURE OF 7.3.3 PROPAGATION TEST BY METHODS OTHER THAN LASER		N/A
C.1	General		N/A
C.2	Test conditions:		N/A
	– The battery fully charged according to the manufacturer recommended conditions		—
	– Target cell forced into thermal runaway		—
	– A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing.....		—
C.3	Method used for initiating the thermal runaway. 1) Heater (Heater, Burner, Laser, Inductive heating 2) Overcharge 3) Nail penetration of the cell 4) Combination of above methods 5) Other methods.....		—

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Clause	Requirement + Test	Result - Remark	Verdict

ANNEX D	PACKAGING AND TRANSPORT		P
	The materials and pack design chosen in a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		P
	Regulations concerning international transport of secondary lithium batteries		P

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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	Hunan Lead Power Technology Co., LTD.	PR50160116-100CF01	3.22Vdc, 100Ah, 322Wh	IEC 62619:2022	TÜV Rheinland Certificate No.: JPTUV-149499, Report No.: CN23B07G 001	
Key components for Battery Pack						
Enclosure	CHI MEI CORPORATION	PA-765(+)	Material: ABS, 522*240*218mm, Min Thickness: 2.5mm, 5VA	UL 746 UL 94	UL E56070	
Power Terminals	XinFeng xinhonlin Packing Co.LTD	12V200L	Material: Copper, Size: φ20(23)mm*L31mm	--	Tested with appliance	
Internal power wires (Parallel four)	Dongguan Yue Zhen Wire & Cable Co Ltd	3135	8AWG, 600V, 66A, 200°C	UL 758	UL E354338	
Internal power wires (Parallel four) (Alternative)	Interchangeable	Interchangeable	8AWG, 600V, 66A, 200°C	UL 758	UL approved	
Wire (sampling)	SHENZHEN JIAHUIDA ELECTRONICS CO LTD	1332	22AWG, 300V, 1.5A, 200°C	UL 758	UL E361915	
Wire (sampling) (Alternative)	Interchangeable	Interchangeable	22AWG, 300V, 200°C	UL 758	UL approved	
Insulation Sleeving	SHENZHEN YITONGDA PYROCONDENSATION MATERIAL CO LTD	DLK-1	Rating 600V, 125 °C, VW-1	UL 224	UL E239589	
Insulation Sleeving (Alternative)	Interchangeable	Interchangeable	Rating 600V, 125°C, VW-1	UL 224	UL approved	
Cell Holder	FORMOSA CHEMICALS & FIBRE CORP PLASTICS DIV	AC310(+)	Material: PC/ABS, 85°C, Min Thickness: 1.5mm, V-0	UL 94 UL 1694	UL E162823	
Key components for BMU						

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Clause	Requirement + Test		Result - Remark		Verdict
PCB	KINGBOARD LAMINATES HOLDINGS LTD	KB-6160	130°C, V-0°C	UL 94 UL 746B	UL E123995
PCB (Alternative)	Interchangeable	Interchangeable	130°C, V-0°C	UL 94 UL 746B	UL approved
Protect IC (MCU1)	Nuvoton Technology Corporation	NANO100SD3 BN	AV _{DD} : 1.8V to 3.6V, T _{DET} : -40°C to 85°C	--	Tested with appliance
Protect IC (AU1, AU2)	TEXAS INSTRUMENTS	BQ76920	V _{BAT} : -0.3V to 36V, T _{stg} : -65°C to 150°C	--	Tested with appliance
IC (VU6)	HOLTEK	HT7533-1	V _{IN} : 30V, V _{OUT} : 3.201V to 3.399V, I _{OUT} : 100mA	--	Tested with appliance
MOSFET of Charge and Discharge (PMC1 to PMC40, PMD1 to PMD40)	Wuxi NCE Power Co., Ltd	NCEP018N85 LL	V _{DS} : 85V, V _{GS} : ±20V, I _D : 320A, T _J : -55°C to 175°C	--	Tested with appliance
Resistor (RN1 to RN40)	jiangsu Juyongchang Electronics Technology Co., Ltd	ARD-2512-3W-5%-0.5mR	0.5mΩ, 3W	--	Tested with appliance
MOSFET of Heating (HM1, HM2)	China Resources Microelectronics (Chongqing) Limited	CRSS052N08 N	V _{DS} : 85V, I _D : 480A, T _J : -50°C to 150°C	--	Tested with appliance
Bluetooth module IC (U2)	Telink Semiconductor	TLSR8251F51 2ET24	Temperature Range: -40 °C to 85 °C, V _{DD} : 1.8V to 3.6V	--	Tested with appliance
Temperature Protector (HPTC1)	Yangzhou Baohu Electronic technology Co LTD	BH05-BB5D60°C	Protect temperature: 60°C, Release temperature: 45°C	UL 60730-1 UL 60730-2-9	UL E500324
NTC (NTC-CELL1, NTC-CELL2)	DONG GUAN SENSICOM ELECTRONICS TECHNOLOGY CO LTD	SNS103	B: 3935, 10k ohms at 25°C, T _{moa} : 125°C	UL 1434	UL E318986
Supplementary information: 1) Provided evidence ensures the agreed level of compliance. See OD-2039. 2) The CBTL has verified the component information. 3) License available upon request.					

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Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: External short-circuit test (cell or cell block)					N/A
Sample No.	Ambient (at 25°C ± 5°C)	OCV at start of test (V dc)	Resistance of Circuit (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):____						

7.2.5	TABLE: Overcharge test (cell or cell block)					N/A
Sample No.	OCV at start of test (V dc)	OCV at end of test (V dc)	Measured Maximum Charging Current (A)	Measured Maximum Charging Voltage (V dc)	Max. Cell Case Temperature, (°C)	Results
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--	--	--	--	--	--	--
--	--	--	--	--	--	--
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D – Test concluded when temperature reached a steady state condition E – Test concluded when temperature returned to ambient F – Other (Please explain): Remark: Maximum charge voltage of the cell is 3.65V. The customer requires to use the maximum charge voltage of 110% for the test as the tightening test condition						

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Clause	Requirement + Test	Result - Remark	Verdict

7.2.6	TABLE: Forced discharge test (cell or cell block)					N/A
Sample No.	OCV before applying reverse charge, (V dc)	Target Voltage (V dc)	Measured Reverse Charge Current I_t , (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): ____						

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Clause	Requirement + Test	Result - Remark	Verdict

7.3.2	TABLE: Internal short-circuit test (cell)				N/A
Sample No.	OCV at start of test, (V dc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results	
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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 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.					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.3	TABLE: Propagation test (battery system)					N/A
Sample No.	OCV of Battery System Before Test, (V dc)	OCV of Target Cell Before Test, (V dc)	Maximum Cell Case Temperature, (°C)	Maximum DUT Enclosure Temperature, (°C)	Results	
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Method of cell failure ¹⁾		Location of target cell		Area for fire protection (m ²)		
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--		--		--		
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Supplementary information:						
1) Cell can be failed through laser exposure, applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method						
2) If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.						
Results:						
A – No fire external to DUT enclosure or area for fire protection or no battery case rupture						
B – Fire external to DUT enclosure or area for fire protection						
C – Explosion						
D – Battery case rupture						
E – Other (Please explain): ____						

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.2	TABLE: Overcharge control of voltage (battery system)					P
Sample No.	OCV at start of test for Cell/Cell Blocks, (V dc)	Maximum Charging Current, (A)	Max. Charging Voltage, (V dc)	Max. Voltage of Cell/Cell Blocks, (V dc)	Results	
B01#	Min 2.910	200	14.776	3.620	A, D, F	
			Charge Voltage Applied Battery System: 1)			
			Whole	Part		
			16.06V	--		
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): ____						

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.3	TABLE: Overcharge control of current (battery system)			P
Sample No.	OCV at start of test, (V dc)	Max. Charging Current, (A)	Max. Charging Voltage, (V dc)	Results
B01#	11.116	240	12.771	A, D, F
Supplementary information: Results: A – No fire or Explosion B – Fire C – Explosion D – Overcurrent sensing function of BMU did operate and then charging stopped E – Overcurrent sensing function of BMU did not operate and then charging stopped F – All function of battery system did operate as intended during the test. G – All function of battery system did not operate as intended during the test. H – Other (Please explain): _____				

8.2.4	TABLE: Overheating control (battery system)			P
Model No.	OCV at start(SOC 50%) of test, V dc	Maximum Charging Current, A	Measured Maximum Charging Voltage, V dc	
B01#	13.206	80	13.625	
Maximum Specified Temperature of Battery System, °C		Maximum Measured Cell Case Temperature, °C	Results	
55		57.6	A, D, F	
Supplementary information:				
Results:				
A – No fire or Explosion				
B – Fire				
C – Explosion				
D – Temperature sensing function of BMU did operate and then charging stopped				
E – Temperature sensing function of BMU did not operate and then charging stopped				
F – All function of battery system did operate as intended during the test.				
G – All function of battery system did not operate as intended during the test.				
H – Other (Please explain): _____				

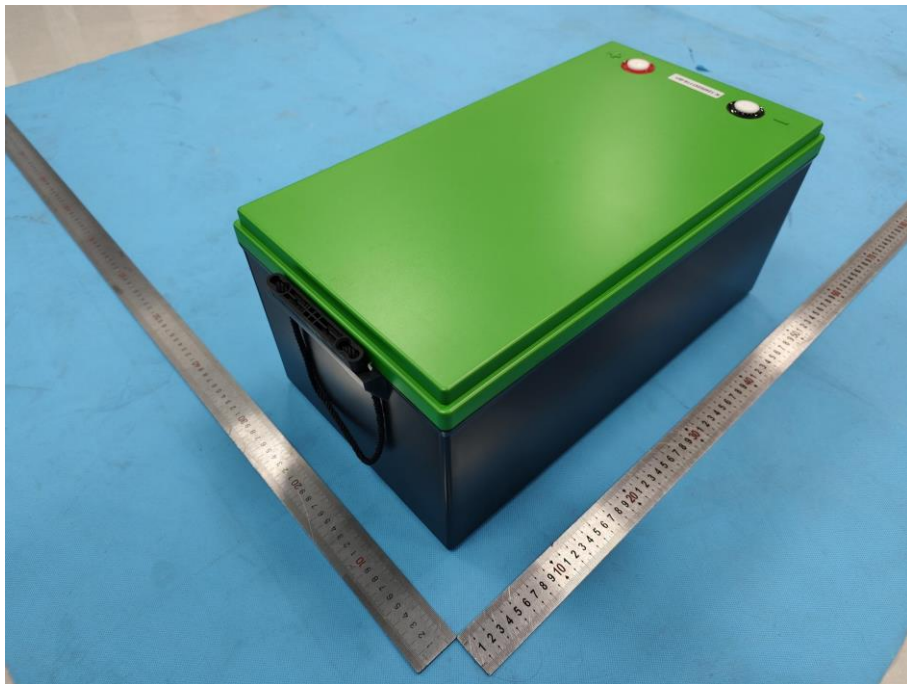
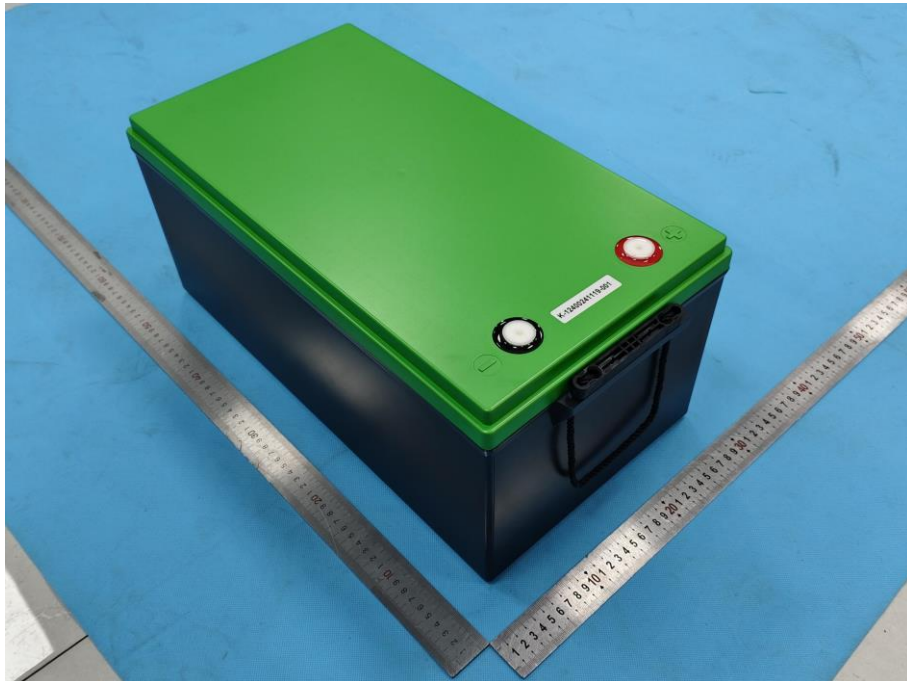
IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

9	TABLE: EMC				N/A
Standard used for EMC test:					
Sample No.	EMC Test Item	Battery Condition	EMC Test Level/ Parameters	Compliance Criteria	Results
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Supplementary information: Battery Condition During EMC test 1 – In Operation Mode, [] Supplied at _____, [] Load at _____ 2 – In non-operation Mode, Battery state of charge (SOC) before test at around _____ Compliance Criteria and Test Results: A – No fire or Explosion B – Fire C – Explosion D – Battery system did operate as intended during the test. E - All function of battery system did operate as intended after the test. F - All function of battery system did not operate as intended during the test, (Please explain): _____ G - Other (Please explain): _____					

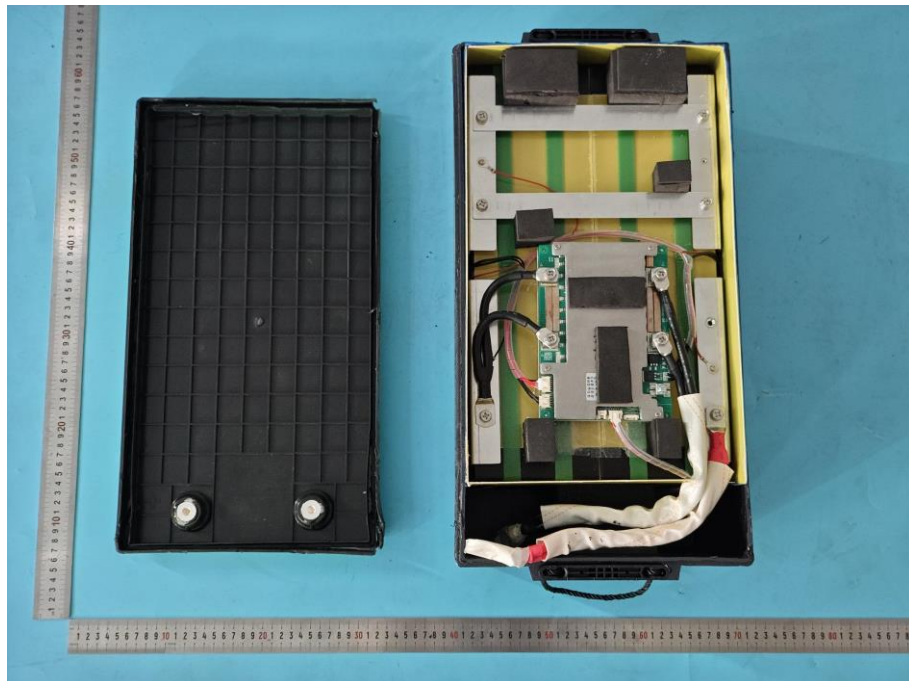
ENCLOSURES

Supplement ID	Description
01	Overall view of Rechargeable Li-ion Battery, Model: LAF12400
02	Internal view of Rechargeable Li-ion Battery, Model: LAF12400
03	Overall view of PCB
04	Overall view of Lithium-Ion Rechargeable Cell, Model: PR50160116-100CF01
05	Dimension drawing of Rechargeable Li-ion Battery, Model: LAF12400
06	Cautions in use of Rechargeable Li-ion Battery, Model: LAF12400

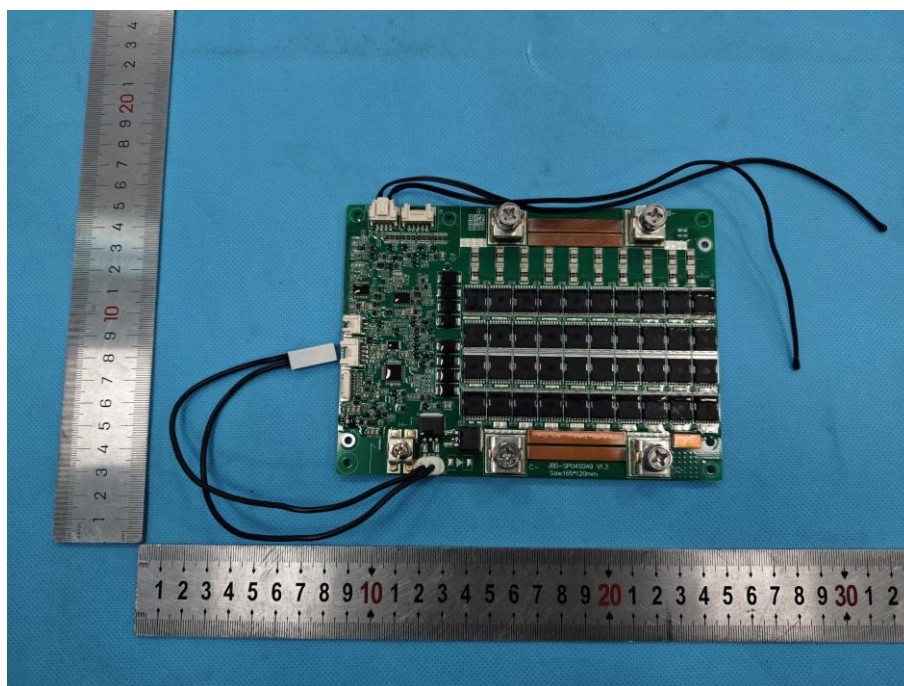
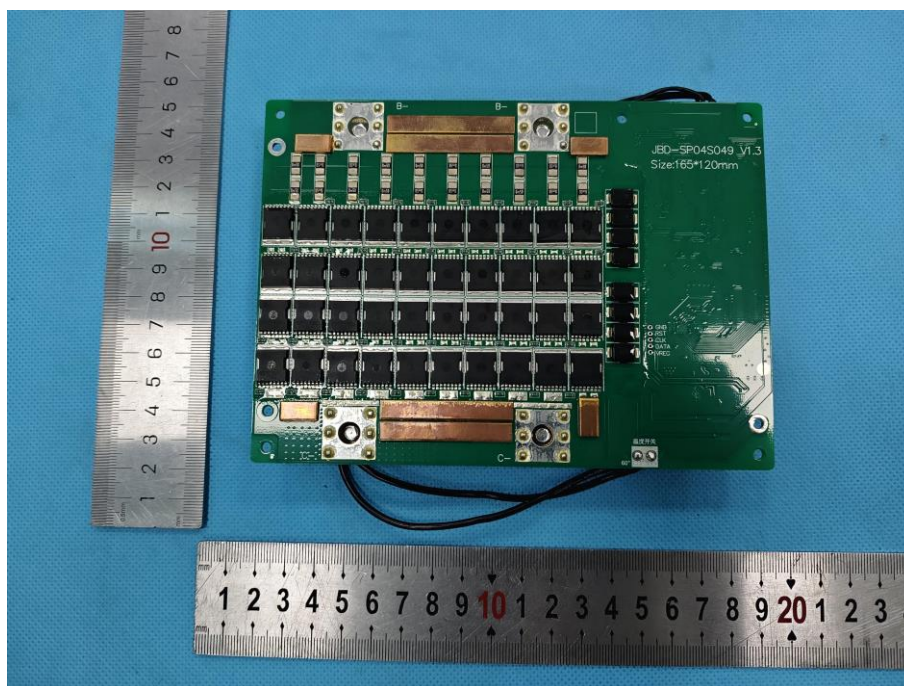
ID 01



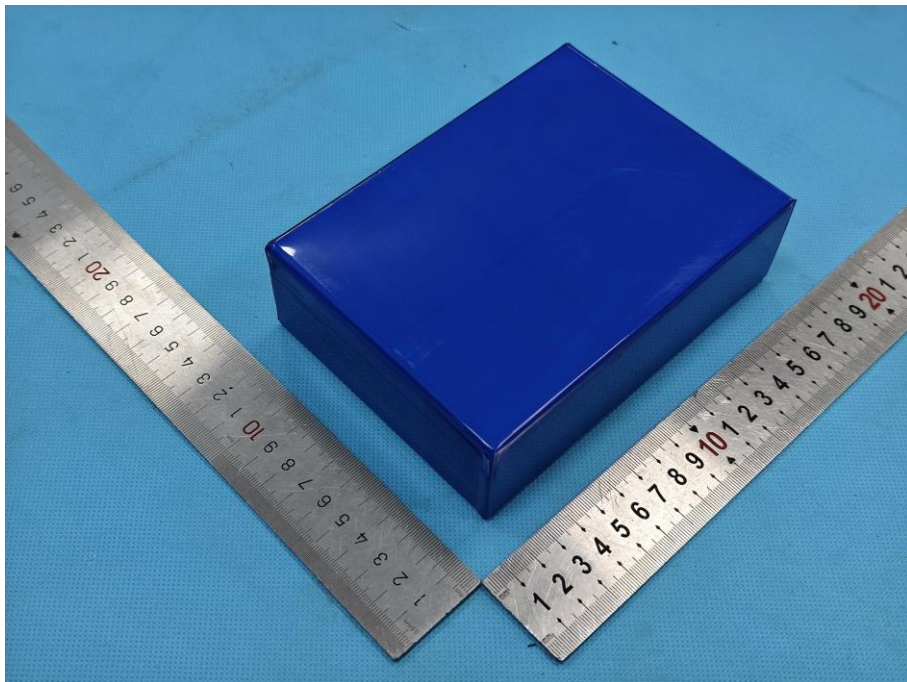
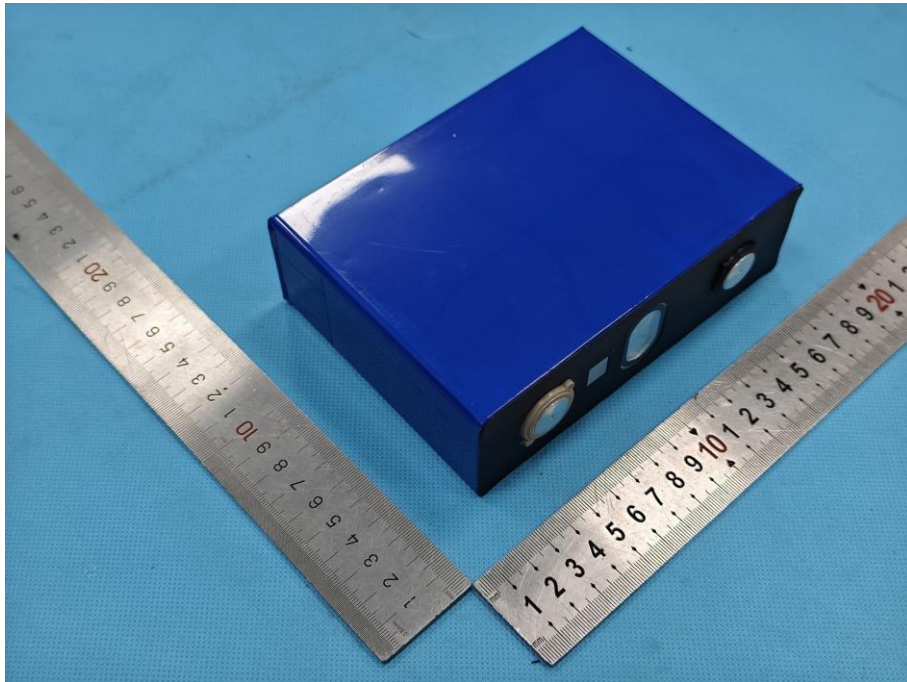
ID 02



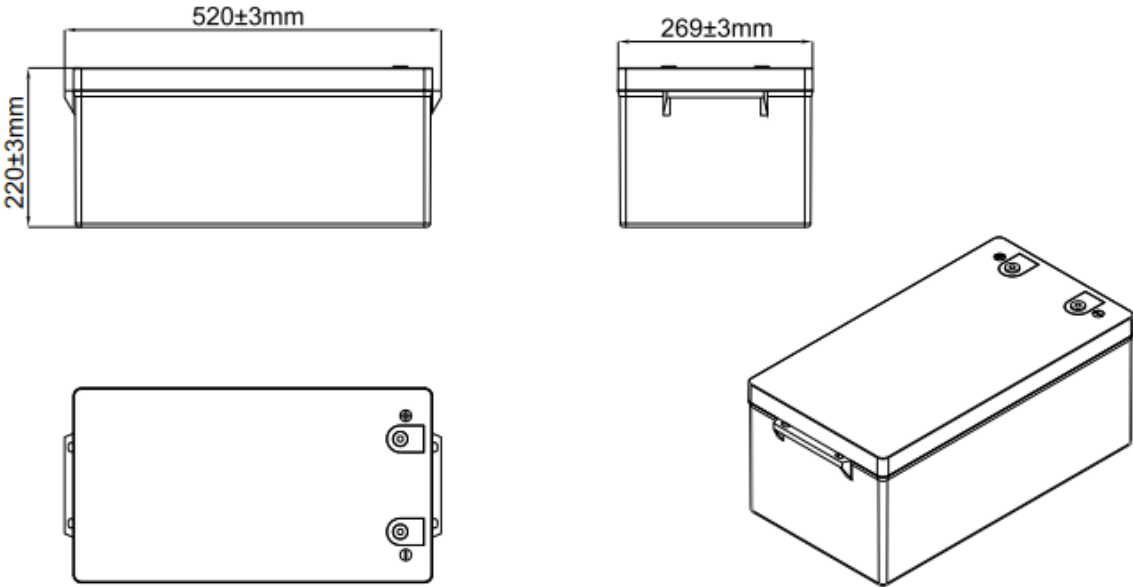
ID 03



ID 04



ID 05



Battery (Unit: mm)

ID 06

12. Period of Warranty ↵

The period of warranty is 1 year from the date of shipment. HIMAX guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse. ↵

13. Warnings ↵

To prevent the possibility of the battery from leaking, heating, fire, Please READ this specification carefully before usage and observe the following precautions: ↵

◎When recharging, use the LiFePO₄ battery charger specifically for that purpose. ↵

◎Do not strike battery with any sharp edge parts, such as Ni-tabs, pins and needles. ↵

◎Do not immerse the battery in water and seawater. ↵

◎Do not use and leave the battery near a heat source as fire or heater. ↵

◎Do not reverse the positive and negative terminals. ↵

◎Do not connect the battery to an electrical outlet. ↵

◎Do not discard the battery in fire or heat it. ↵

◎The battery tabs are not so stubborn especially for aluminum tab. Do not bend tab. ↵

◎Do not short-circuit the battery by directly connecting the positive and negative terminal
· · with metal object. ↵

◎Do not transport and store the battery together with metal objects such as necklaces,
· · hairpins etc. ↵

◎Do not knock or throw, trampling battery etc. ↵

◎Do not directly solder the battery and pierce the battery with a nail or other sharp object. ↵

◎Do not split the battery without permission. ↵

14. Battery operation instruction ↵

14.1 Charging ↵

Charging current: Do not surpass the biggest charging current which in this specification. ↵

Charging voltage: Do not surpass the highest voltage which in this specification. ↵

Charge temperature: The charge temperature is in according to this specification. ↵

↵

14.2 Discharging ↵

Discharge current: Do not surpass the biggest discharge current which in this specification. ↵

Discharging with a higher current may result in the capacity fade and over-heat. ↵

Discharge temperature: The discharge temperature is in according to this specification. ↵

↵

14.3 Over-discharges ↵

After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity. ↵

↵

14.4 Storing the Batteries ↵

The battery should store in the product specification book stipulation temperature range. If has surpasses above for 3 months the long time storage, suggested you should carry on additional charge to the battery. . . . ↵

. ↵

14.5 Please do not continuously charge the battery over 8 hours. ↵

↵

↵