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TESTING
CNAS L2999

TEST REPORT

Report ID: 20241106B31183
Sample Name: Rechargeable Li-ion Battery
Model/Type: EBT480-147SGDJX
46.8V 14.7Ah 687Wh
Applicant: JOYCUBE BATTERY CO., LTD.

中认英泰检测技术有限公司
CQC Intime Testing Technology Co.,Ltd.

TEST REPORT
EN 50604

Secondary lithium batteries for light EV (electric vehicle) applications - Part 1: General safety requirements and test methods

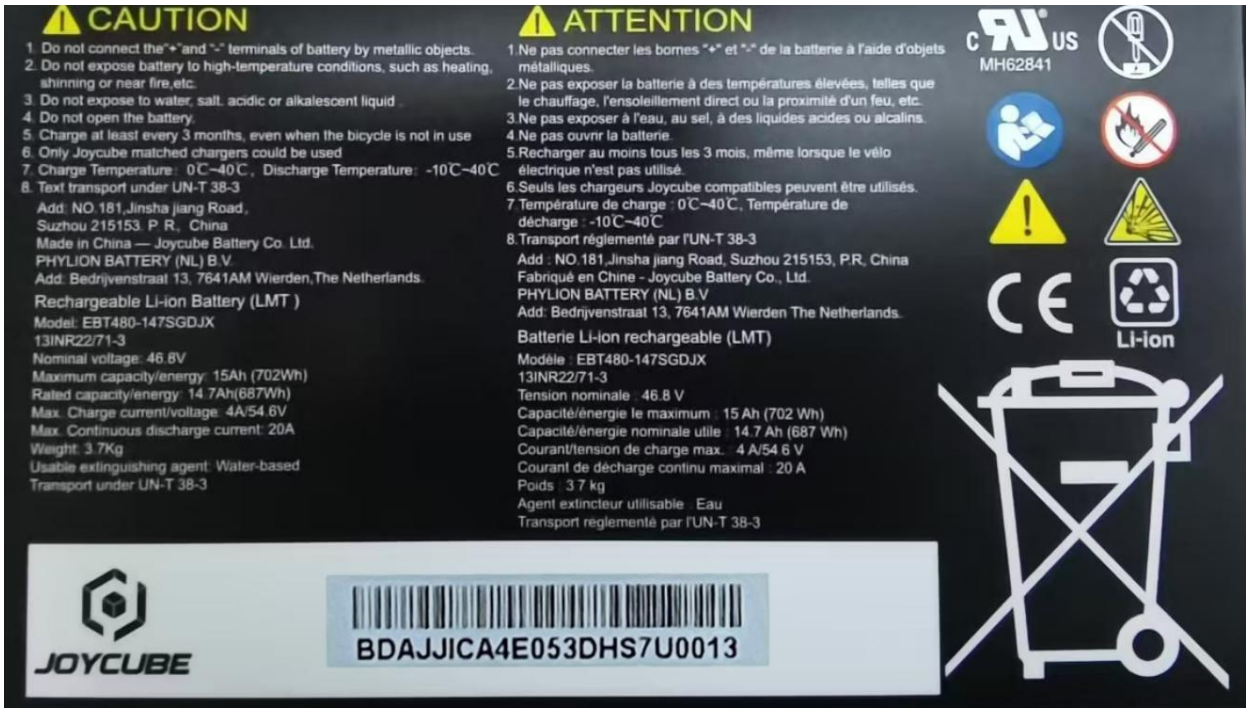
Report Number. ……:	20241106B31183
Date of issue……..:	2024.12.09
Total number of pages ……:	29 pages
Applicant's name ……..:	JOYCUBE BATTERY CO., LTD.
Address ……..:	No.181, Jinshajiang Road, New District, Suzhou 215153, P.R. China
Test specification:	
Standard……..:	EN 50604-1: 2016+A1: 2021
Non-standard test method ……:	/
Test item description ....:	Rechargeable Li-ion Battery
Trade Mark .....:	JOYCUBE
Manufacturer .....:	JOYCUBE BATTERY CO., LTD.
Model/Type reference .....:	EBT480-147SGDJX
Ratings .....:	46.8V 14.7Ah 687Wh

Testing procedure and testing location:			
☒	**Testing Laboratory:**	CQC Intime Testing Technology Co., Ltd.	
Testing location/ address.....:		No.1368, Wuzhong Road, Wuzhong Economic Development Zone 215104, Suzhou, Jiangsu, China	
Associated Testing Laboratory:			
Testing location/ address ..... :			
Tested by (name + signature) ..... :		Zhong chao	Zhong chao
Checked by (name + signature) ..... :		Hou fengwen	Hou Fengwen
Approved by (name + signature) ..... :		Zhao Runsheng	Zhao Runsheng
☐	**Testing procedure: TMP**		
Testing location/ address.....:			
Tested by (name + signature) ..... :			
Approved by (name + signature) ..... :			
☐	**Testing procedure: WMT**		
Testing location/ address.....:			
Tested by (name + signature)..... :			
Witnessed by (name + signature) .... :			
Approved by (name + signature) ..... :			
☐	**Testing procedure: SMT**		
Testing location/ address.....:			
Tested by (name + signature) ..... :			
Approved by (name + signature) ..... :			
Supervised by (name + signature) .. :			

List of Attachments (including a total number of pages in each attachment): Attachment No.1: 5 pages of Photo Documentation	
Summary of testing:	
Tests performed (name of test and test clause): 6.101 Vibration 6.102 Mechanical shock 6.103 Drop test 7.1 Dewing (temperature change) 7.2 Thermal-shock cycling 8.3 Water immersion 8.101 Crush 8.102 Over-temperature condition 8.103 Under-temperature condition 9.1 Short-circuit 10.1 Overcharge protection 10.2 Over-discharge protection 10.3 Loss of thermal control/cooling 10.4 Deep discharge protection Annex BB.5 Label test	**Testing location:** CQC Intime Testing Technology Co.,Ltd. No.1368, Wuzhong Road, Wuzhong Economic Development Zone 215104, Suzhou, Jiangsu, China
Summary of compliance with National Differences List of countries addressed: N/A	

Copy of marking plate

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



Test item particulars.....:	
Classification of installation and use.....:	Rechargeable Li-ion Battery for Light Electric Vehicle
Supply connection.....:	Terminal for the prepared conductor specified by the manufacturer
Standard Charge Method.....:	3A charge to 54.6V and then to 54.6V until 200mA
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.....:	CQC Intime Testing Technology Co.,Ltd.
Date of receipt of test item.....:	2024.11.01
Date (s) of performance of tests.....:	2024.11.01 to 2024.12.09

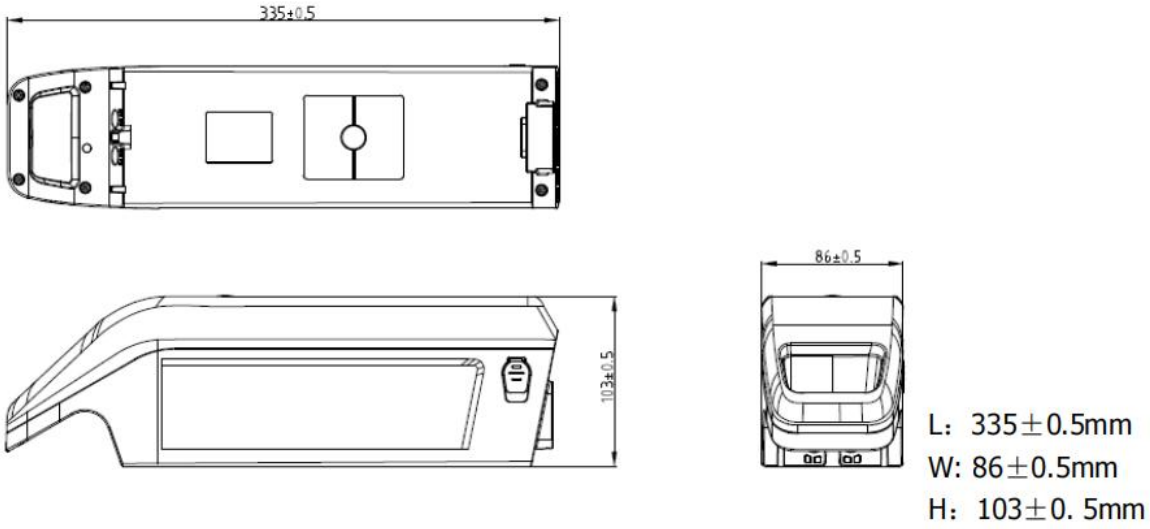
General remarks:

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 testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

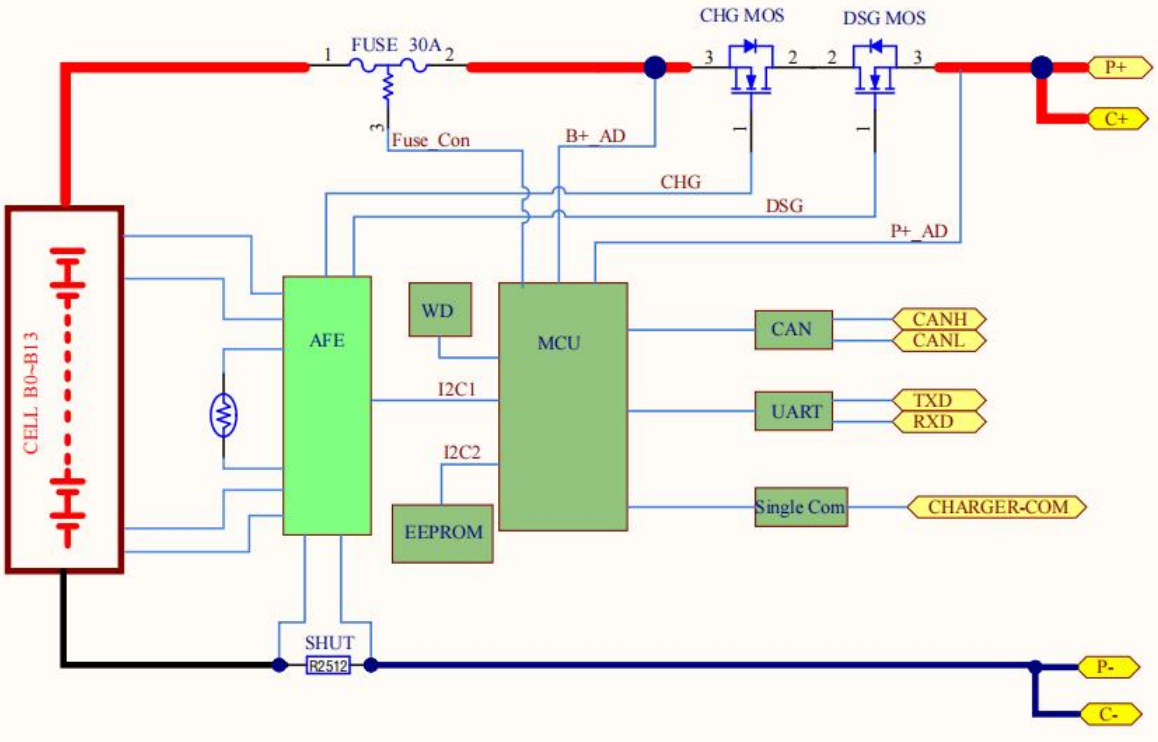
Throughout this report a ☐ comma / ☐ point is used as the decimal separator.

Name and address of factory (ies)..... :	JOYCUBE BATTERY CO., LTD. No.181, Jinshajiang Road, New District, Suzhou 215153, P.R. China

General product information:



Circuit diagram:



EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
5	**General requirements**		**P**
	This clause of ISO 12405-3:2014 is applicable except as follows:		P
5.1	General		P
	Replacement:		P
5.1.101	General conditions		P
	A battery pack/system to be tested according to this standard shall fulfil the following requirements:		P
	Electrical safety design shall be approved according the requirements given in ISO 6469-1 and ISO 6469-3		P
	The necessary documentation for operation and needed interface parts for connection to the test equipment (i.e. connectors, plugs including cooling) shall be delivered together with the DUT		P
	A battery system shall enable the specified tests, e.g. by specified test modes implemented in the BCU/BMS, and shall be able to communicate with the test bench via e.g. common communication buses		P
	The DUT may also be equipped with additional sensors, wires, support which are necessary to conduct the specific test or to obtain the required data for such test. Such additional devices shall not influence the result with respect to the intended purpose of the test.		P
5.2	Test sequence plan		P
	This subclause of ISO 12405-3: 2014 is applicable		P
	“For details on test sequences and numbers of samples, see Annex GG, Table GG.1.		P
5.3	Preparation of the DUT for testing		P
	This subclause of ISO 12405-3:2014 is applicable.		P
5.4	Pre-conditioning cycles		P
	This subclause of ISO 12405-3:2014 is applicable.		P
5.5	General safety requirements		P
	This subclause of ISO 12405-3:2014 is applicable.		P

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
5.101	Battery pack/system requirements		P
	Battery packs/systems shall contain only Li-ion cells which comply with the UN Recommendations on the Transport of Dangerous Goods - Manual of Tests and Criteria: Section 38.3, and with one of the following: — relevant Li-ion battery cell standard EN 62660-3; or — relevant Li-ion battery cell standard EN 62133-2. Compliance is checked by a valid certificate. NOTE Battery packs/systems containing cells with other chemistries are shown in Annex HH.		P
	The BMS shall be an integral part of the removable battery system. The BMS shall provide (see 3.5 and 5.106):		P
	— controlling of charging/discharging process;		P
	— active or passive protective devices (see 5.104);		P
	— protective devices as part of BMS (see 5.104): — avoiding overcharge/overdischarge, — detection of internal short-circuits, — respecting temperature limits at least one temperature sensor which measures the temperature of the interior of the battery pack/system as close as possible to the most critical spot according to the design,		P
	— compatibility check between battery system and connected equipment.		P
	Compliance is checked by inspection.		P
	Enclosure of removable battery packs/systems shall provide at least:		P
	- mechanical strength to withstand stress caused by normal use and rough handling;		P
	- sufficiently resistant to degradation caused by sunlight radiation;		P
	- reducing the possibility of ignition and spread of flame;		P
	-providing suitable insulation characteristics, at least basic insulation according to IEC 60664- 1:2007		P
	- protection against ingress of foreign objects and water: IP54		P
	- the battery pack/system housing constructed in a way that it cannot be opened without the use of tools and any opening should be easily detectible by a broken seal;		P
	— for RESS connector or RESS inlet, standard plug and standard socket-outlets and connectors (e.g. IEC 60320 series) shall not be used;		P

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	— the RESS connector shall prevent reverse polarity connections;		P
	— the RESS connector shall not have a simple shape, which cannot grant a sufficiently unique mechanical profile (see NOTE 1);		P
	— an internal switch in the DC power circuit of the battery pack/system, controlled by the BMS, able to interrupt all power flow and ensure safety. The switch shall only be closed after a successful compatibility check;		P
	— a compatibility check between battery system and EV supply equipment shall be performed based on at least two of the following: — mechanical; — electrical (e.g. additional contacts or voltages); — electronical; — communication means		P
5.103	Battery pack/system safety considerations		P
	All tests, which could be influenced by integration of the battery pack/system into the vehicle (e.g. installation into the frame), shall be carried out with the battery pack/system integrated into the vehicle.		N/A
	Removable RESS can be tested without the vehicle or parts of it.		P
	In a battery system consisting of two or more battery packs, each battery pack shall be isolated from each other battery pack by thermal isolation, protective barrier, or protective separation, or a stable gap from other battery packs and the enclosure.		N/A
	Wire ways shall be smooth and free from sharp edges, and internal wiring shall be routed, supported, clamped or secured in a manner that reduces the likelihood of excessive strain on wire and on terminal connections.		P
	Holes through which insulated wires pass shall have smooth well-rounded surfaces or be provided with bushings.		P
	Wire insulation shall be sufficient to withstand the maximum anticipated voltage, current, temperature, altitude, humidity requirements and mechanical stress.		P
	In connections by soldered terminations, the conductor shall be held in position additionally to the soldering to maintain it in position.		P

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	Connection to the cells shall be made according to the specification of the cell manufacturer in a manner that does not result in damage to the cells.		P
	The enclosure of a removable battery pack/system shall provide at least IP54 according to EN 60529:1991.		P
	A crush test is not required if the battery system in the EV is secured by double mechanical protection (e.g. latch and mechanical cover).Compliance shall be verified by inspection of a test report. Only for battery systems permanently fixed to vehicles with maximum speed more than 45 km/h, crash tests which may replace a crush test are defined by the countries where the vehicles are released.		N/A
5.102.2	Precautions when conducting tests		P
5.104	Options for tests for evaluation of protective devices		P
	The evaluation of active or passive protective devices including electronics and software depends on the design. The functionality of the active or passive protective devices shall be designed and tested according to option 1, option 2 or option 3.		P
5.104.2	Evaluation option 1		N/A
	All active protective devices are bypassed unless they comply with the functional safety standard as described in option 2. These active protective devices may also be bypassed at the demand of the manufacturer. This condition shall be stated in the corresponding test report.		N/A
5.104.3	Evaluation option 2		P
	All protective devices are operating.		P
	All protective devices shall be proven to be reliable according to the EN 61508 (series) or EN ISO 13849 (all parts) performance level c. Compliance is given by evaluation of evidence.		P
5.104.4	Evaluation Option 3		N/A

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	Active protective devices in operation with all single faults injected and tested separately. If protective devices which are not proven to reach performance level c according to the EN ISO 13849 (all parts) or EN 61508 (series) are used, a design review (e.g. FMEA according to EN IEC 60812:2018 or SAE J 1739:2009) shall be performed to identify failure modes taking in consideration also EMC conditions according to EN 61000-6-7:2015 or EN 61326-3-1:2017. All single faults which could influence the test result according to the design review shall be separately injected during the tests and separately tested for each fault injection. Each protective device shall be rendered inoperative separately (common causes) e.g.:		N/A
5.105	Voltage classes		P
	Battery packs/systems according to this document can be rated for voltage class A or voltage class B up to a maximum voltage of 200 V DC.		P
5.106	Requirements for the BMS		P
	The BMS evaluates and controls the condition of each cell, cell block and battery pack/system, and it maintains cells, cell blocks and battery pack/systems within the specified cell operating region as defined by the cell manufacturer (See IEC 62619:2017, Annex A).		P
	Key factors of the cell operating region are voltage, temperature and current. (See IEC 62619:2017, Figures A.1 and A.2)		P
	Battery systems intended to be used in conjunction with products or systems described in the IEC/TS 61851-3 series shall provide a BMS according to IEC/TS 61851-3-4.		N/A
5.107	Charging/discharging		P
5.108	Test result explosion		P
5.109	Test result fire		P
5.110	Test result leakage		P
5.111	Flammability of non-metallic materials		P
	Non metallic materials employed for the cell holder and outer enclosures of a battery pack/system, which are used in an amount of > 1 cm3 shall have a minimum flame rating of V-2 in accordance with IEC 60695- 11- 10.		P

6	**Mechanical tests**	**P**

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	Replacement:		N/A
6.101	Vibration		P
	While vibrated, each fully charged DUT shall be with a current typical to the application at least C/3 of the DUT over part of the vibration test duration up to a discharged capacity of 25 % SOCfor each of three mounting positions mutually perpendicular		P
	Peak acceleration of logarithmic sweep from ca. 20 Hz/50 Hz to 200 Hz (gn)		P
	Number of cycles per perpendicular direction.....	12	P
	Duration of each cycle per perpendicular direction (min)	15	P
	Number of perpendicular directions tested	3	P
	Results: no leakage, no rupture, no explosion or fire, voltage class B DUT shall maintain an isolation resistance of at least 100Ω/V.	(See appended table 6.101)	P
6.102	Mechanical shock		P
	Peak acceleration of half-sine shock (gn) .....:	150	P
	Pulse duration of half-sine shock(ms) .....:	6	P
	Number of cycles per perpendicular direction in positivedirection.....:	3	P
	Number of cycles per perpendicular direction in Negative direction	3	P
	Number of perpendicular directions tested .....:	3	P
	Results: no leakage, no rupture, no explosion or fire, voltage class B DUT shall maintain an isolation resistance of at least 100Ω/V	(see appended table 6.102)	P
6.103	Drop Test		P
	DUT shall be placed in a climate chamber at the lowest operation temperature specified by the supplier:	See below	P
	Drop height (m) ..... :	1m	P
	Number of drops..... :	3	P
	Results: no leakage, rupture, fire or explosion after 6h post-test observation		P
6.104	Thermoplastic materials exposed to sunlight		N/A
	The test has to be performed without cells in the housing, but the temperature inside the housing shall be recorded.	The battery cannot be exposed to sunlight when it used in the light electrical vehicle.	N/A

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	Alternatively, the test shall be performed with a part of the material at least 3 × 3 cm produced by the same methods like the housing		N/A
	UV test according to EN ISO 4892-2:2013 Method A, Cycle 1 providing a total test period of 500 h. For enclosures constructed of insulating materials compliance is checked by verification that the flexural strength (according to EN ISO 178:2010) and Charpy impact (according to EN ISO 179 (series)) of insulating materials have 70 % minimum retention.		N/A
	For compliance, enclosures constructed of metals entirely coated by synthetic material, the adherence of the synthetic material shall have a minimum retention of category 3 according to EN ISO 2409:2013.		N/A
	This test does not need to be carried out if the original manufacturer can provide data from the material supplier to demonstrate that material of the same type and thickness or thinner complies with this requirement.		N/A
	“The DUT shall not exhibit any cracks, contour changes, waviness and delamination.”		N/A
7	**Climatic tests**		**P**
7.1	**Dewing (temperature change)**		**P**
	This subclause of ISO 12405-3:2014 is applicable.		P
7.2	Thermal shock cycling		P
	This subclause of ISO 12405-3:2014 is applicable.		P
	During the test and for a 1 h post-test observation period, the battery system shall exhibit no evidence of leakage or battery enclosure rupture, fire, or explosion, and voltage class B DUT shall maintain an isolation resistance of at least 100 Ω/V.	(see appended table 7.2)	P
8	**Simulated vehicle accidents**		**P**
8.101	Crush test		P
	Description of orientations tested		P
	Test stamp in thecentre with a speed of 15 mm/s ± 5 mm/s not exceeding a peak force on the test stamp of 1000 times weight-force or 50 % deformation whatever comes first.	(see appended table 8.101)	P
	Results: no rupture, fire or disassembly	(see appended table 8.101)	P
8.3	Water immersion		P
	Immerse the DUT in ambient temperature salt water (5 % by weight NaCl in H2O) for a minimum of 2 h or until any visible reactions have stopped		P
	DUT can be tested by vehicle emulated condition		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: During the test and for a 1 h post-test observation period, the DUT shall exhibit no evidence of fire or explosion.		P
8.4	Exposure to fire		N/A
	This subclause of ISO 12405-3:2014 is only applicable for battery systems to be used in vehicles with passenger compartments which can be closed or locked or in vehicles where the use of safety belts is compulsory		N/A
	Results: no explosion		N/A
8.102	Over-temperature condition test		P
	The temperature of the DUT shall be set to 50°C, that is 10°K above the maximum temperature for performance testing (40°C).		P
	A rest period of 2 h or until thermal equilibration has been reached shall be performed.		P
	Perform a discharge and then a charge at the maximum current rate according to the specifications of the supplier.	(see appended table 8.102)	P
	Repeat the discharge and charge cycle until the intervention of the over-temperature protection measure or at the thermal stabilization of the DUT. The DUT‟s temperature shall be monitored by the measurement devices which are integrated in the DUT by the supplier.	(see appended table 8.102)	P
	Results: no leakage, rupture, fire, or explosion.	(see appended table 8.102)	P
8.103	Under-temperature condition test		P
	“Adjust the SOC to 100 % before starting the test. Perform a discharge to 80 % ± 5 % SOC according to the specification of the supplier.		P
	The DUT shall then be placed in a climate chamber. The temperature shall be set 10 K under the low temperature limit for charging according to the specification of the supplier. A rest period of 2 h or until thermal equilibration has been reached shall be performed.	(see appended table 8.103)	P
	Perform a charge at the maximum current rate according to the specification of the supplier.	(see appended table 8.103)	P
	This test shall be performed one of below: option 1;option 2;option 3.	Test performed for option 2 only.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	“The DUT shall not accept any charge or discharge under these conditions. If a charging current can be detected, the DUT has failed. The DUT shall not exhibit any evidence of rupture, explosion, venting or fire. “	(see appended table 8.103)	P
9.1	**Short circuit**		**P**
	Option 1		N/A
	The DUT shall be at RT, fully charged and under normal operating conditions. An appropriately sized conductor directly contacted to the battery cells of (20 +0/-10) mΩ shall be used to apply a “hard short” in less than one second for 10 min, or until another condition occurs that prevents completion of the test (e.g. component melting). The test shall be performed without integrated, passive and active protective devices for short circuit protection operational.		N/A
	Option 2 or Option 3		P
	The DUT shall be at RT, fully charged and under normal operating conditions (main contactors are closed, battery systems are controlled by the BCU/BMS). An appropriately sized conductor of (20 +0/-10) mΩ shall be used to apply a “hard short” in less than one second for 10 min, or until another condition occurs that prevents completion of the test (e.g. component melting). The test shall be performed with integrated, passive and active protective passive short circuit protection devices operational	(see appended table 9.1)	P
	The overcurrent protection function for option 2 or option 3, if any, shall disconnect the short circuit current.		P
	Results:The DUT shall not exhibit any evidence of: disassembly or fire. The temperature of the battery casing shall not exceed 150 °C within 6 h.	(see appended table 9.1)	P
9.101	**Leakage current of a battery system while switched-off**		N/A
	“This test applies to battery packs and systems. The DUT shall be at RT, fully charged and under normal operating conditions (main contactors are closed, battery systems are controlled and protected by the BMS).”		N/A
	a) a steady-state current flowing between simultaneously accessible conductive parts not exceeding the threshold of perception, 0,5 mA a.c. or 2 mA d.c. under normal operating conditions; values not exceeding the threshold of pain 3,5 mA a.c. or 10 mA d.c. may be specified under abnormal or fault conditions;		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	b) for stored energy available between simultaneously accessible conductive parts the following values are proposed according to IEC/TS 60479-2:2007, Figure 19:1) + 0,5 mJ corresponding to the threshold of pain and 2) +,5 uJ corresponding to the threshold of perception.		N/A
10	**System functionality tests**		P
10.1	**Overcharge protection**		P
	According to ISO 12405-1:2011, 9.3.2, or ISO 12405-2:2012, 9.3.2, as appropriate for the DUT. This test applies to battery packs and systems. In all cases the relevant overcharge protection device as intended by the battery supplier shall be included in the DUT. The test may be conducted at a higher temperature than specified in ISO 12405-1:2011, 9.3.2, or ISO 12405-2:2012, 9.3.2, as appropriate for the DUT, according to agreement between customer and supplier. A standard cycle according to ISO 12405-1:2011, 6.2 or ISO 12405-2:2012, 6.2, as appropriate for the DUT, shall be performed if not inhibited by the DUT after the overcharge. “The DUT shall be charged at a constant current which is agreed between the supplier and customer, using a supply voltage sufficient to maintain the before described current throughout the duration of the test. The voltage shall not exceed 1,2 times the maximum allowed cell voltage as defined by the supplier unless EV supply equipment is limited in voltage. Then the voltage applied to the DUT shall be set to the maximum output voltage of the EV supply equipment that can occur.		P
	This test shall be performed for Option 1, Option 2 or Option 3.”		P
	Results: “The DUT shall not exhibit any evidence of rupture, explosion, venting or fire.“	(see appended table 10.1)	P
10.2	**Over-discharge protection**		P
	For Option 2 or Option 3: ISO 6469- 1:2019, 5.5.3 is applicable		P
10.3	**Loss of thermal control/cooling**		P
	This clause of ISO 12405-3:2014 is applicable.		P
10.4	**Deep discharge protection**		P
	Option 1:		N/A
	Over discharge cells with constant current defined by the supplier and up to 10 % below the minimum cell voltage of at least one cell in the battery. Discharge shall be continued with constant voltage (10 % below the minimum cell voltage of at least one cell) and up to the point where the current falls below 10 % of the constant current as defined by the supplier.		N/A

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	Results: The DUT shall not accept any charge under these conditions. If a charging current can be detected, the DUT has failed.		N/A
	Results: The DUT shall not exhibit any evidence of rupture, explosion, venting or fire.		N/A
	Option 2 or 3:		P
	The construction / software of the DUT is reviewed to verify one of the following		P
	A functionality shall exist in the BMS, which measures single cell voltages and permanently disables charging, if any single cell voltage is detected to be 10 % below the minimum cell voltage (as defined by the supplier) for more than 5 s; or		P
	Test for possibility for re-charging and re-charge conditions: a) if a single cell voltage is below 1V: charging of the battery pack/system shall be done with very small current (C/50 or smaller); andP b) when the single cell voltage reaches 2 V or is above 2 V, charging of the battery pack/system shall be done with a current equivalent to C/10.		P
	Results: The analysis of the functionality of the BMS shall demonstrate that all the aspects of Test 1 are fulfilled and that they prevent battery pack/system from being charged and permanently disable it for further use.		P
	Results: this shall result in the single cell voltage reaching the 1 V level after 30 s; — if this is not the case, charging shall be terminated, and the battery pack/system permanently disabled for further use.		P
	Results: this shall result in the single cell voltage reaching the 3 V level after 6 min.	(see appended table 10.4)	P

Annex AA	**Battery systems and related parts**		N/A
Annex BB	**General Marking requirements**		P
BB.1	**Marking and instructions**		P
BB.1.1	**Removable (RESS) battery systems (packs) marking**		P
	Each removable (RESS) battery system (pack) shall carry clear and durable marking on the outer enclosure providing all of the following information in BB.1.2, if applicable:		P
	-graphical symbol for rechargeable Li or Li-ion		P
	- graphical symbol Crossed Wheelie Bin		P
	- polarity of terminals (unless standardized, polarized connectors are used);		N/A
	- nominal voltage;		P
	- maximum charge current/voltage and maximum discharge current in A/V		P

EN 50604			
Clause	Requirement + Test	Result - Remark	Verdict
	- rated capacity in Ah, and rated energy in Wh		P
	- name, trade mark or identification mark of the supplier or responsible vendor;		P
	- serial number;		P
	- model or type reference (optional);		P
	- graphical symbol caution;		P
	- graphical symbol read operator's manual;		P
	- graphical symbol dangerous voltage (for voltage class B);		N/A
	- graphical symbol hot surface (if the temperature exceeds 60°C);		N/A
	- graphical symbol keep away from open flame and great heat;		P
	- graphical symbol danger of explosion and fire due to short circuit, overheating or other electrical/ mechanical misuse;		P
	- for Li-ion battery systems, text transport under UN-T 38-3		P
	- symbol BATSO (optional)		N/A
	- text: “Do not open”, “Do not expose to water”, “Damaged batteries are not allowed to transport”(optional).		P
BB.1.2	**Graphical symbols**		P
BB.2	**Instructions**		P
BB.3	**Instructions for built-in battery system**		P
BB.4	**Language**		P
BB.5	**Label test**		P
BB.6	**Markings**		P

5.1	TABLE: Critical components information				P
Object/part no	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
Cell	SAMSUNG SDI Co., LTD.	INR21700-50GB	3.65Vdc 4900mAh	IEC 62133-2：2017，IEC 62133-2:2017/AMD1:2021	CB certification NL-80874/M1
PCB	Suichuan Pingtai	DT18-48V	Substrate model ： FR-4 Copper foil thickness：2 OZ Board thickness：1.6mm Color ： Green Four Layers Board： L*W : 222.2mm*60.2mm	-	-
NTC	Shiheng	MF52A 103F3950(A2)	10K 1% B:3950K	-	-
AFE	TI	BQ769X2PFBR	OV protect:4.195V UV protect:2.8V Over current: 25A	-	-
MOS	CRmicro	CRSS052N08N	VDSS:85V VGS:±20V ID:120A	-	-
MCU	ST	STM32G0B1CCT6	256K flash，48pin	-	-
FUSE	Dexerials	SFK-4030X	Rated current:30A Operating voltage:28.0~62V	-	-
FUSE	WAY ON	WPF30A14K	Rated current:30A Operating voltage:28.0~62V	-	-
Supplementary information:					

6.101	TABLE: Vibration						P
Sample no.	**OCV at start of test (Vdc)**	**Mass at start of test (g)**	**OCV after of test (Vdc)**	**Mass after of test (g**	**Mass Loss (%)**	**Isolation resistance (Ω/V)**	**Results**
B01	54.2	3690.0	54.1	3688.0	0.054	>100Ω/V	P
B02	54.2	3691.0	54.0	3690.0	0.027	>100Ω/V	P
B03	54.2	3690.0	54.1	3689.0	0.027	>100Ω/V	P
Supplementary information: Results: No leakage. No fire. No explosion. No rupture, the DUT accept discharge under the conditions, Isolation resistance>100Ω/V.							

6.102	TABLE: Mechanical shock					P
Sample no.	**OCV at start of test (Vdc)**	**Mass at start of test (g)**	**OCV after of test (Vdc)**	**Mass after of test (g**	**Mass Loss (%)**	**Results**
B04	54.1	3689.0	54.0	3688.0	0.027	P
B05	54.1	3693.0	54.1	3692.0	0.027	P
B06	54.2	3692.0	54.0	3692.0	0.000	P
B07	54.1	3689.0	54.0	3688.0	0.027	P
Supplementary information: Results: No leakage. No fire. No explosion. No rupture after test and 1 h post-test observation period.						

7.2	TABLE: Thermal shock cycling		P
Sample no	**Mass at start of test (g)**	**Mass after of test (g)**	**Results**
B14	3689.0	3687.0	P
B15	3692.0	3690.0	P
B16	3690.0	3689.0	P
B17	3689.0	3687.0	P
Supplementary information: Results: No leakage. No fire. No explosion. No rupture after test and 1 h post-test observation period.			

8.101	TABLE: Crush test			P
Sample no	**OCV before test (Vdc)**	Maximum force applied (kN)	Max. Temperature rise of enclosure (°C)	**Results**
B18	54.2	37	0.2	P
B19	54.1	37	0.4	P
Supplementary information: Test is at the Room Ambient Temperature. Results: No rupture, fire or disassembly after test.				

8.102	TABLE: Over-temperature condition test				P
Sample no.	**Chamber temperature (°C)**	**Max. charge current (A)**	**Max. discharge current (A)**	**Max. Temperature rise of battery (°C)**	**Results**
B22	50	4	20	1.0	P
B23	50	4	20	0.7	P
B24	50	4	20	0.7	P
The DUT shall not exhibit any evidence of leakage, rupture, fire, or explosion					

8.103	TABLE: Under-temperature condition test			P
Sample no.	**Chamber temperature (°C)**	**Max. charge current (A)**	**Max. Temperature rise of battery (°C)**	**Results**
B25	-10	4	0.1	P
B26	-10	4	0	P
B27	-10	4	0	P
The DUT shall not exhibit any evidence of rupture, explosion, venting or fire.				

9.1	TABLE: Short-circuit test				P
Sample no.	**Ambient temperature (°C)**	**OCV before test (Vdc)**	**Resistance of circuit (m Ω)**	**Maximum temperature rise (°C)**	**Results**

B28	23.8	54.1	17	0.5	P
B29	23.8	54.2	18	0.8	P
B30	23.8	54.1	18	0.6	P
Supplementary information: The over current protection function disconnect the short circuit current.The DUT not exhibit any evidence of: disassembly or fire. The temperature of the battery casing not exceed 150 ° C within 6 h					

10.1	TABLE: Overcharge protection				P
Sample no	**Ambient temperature (°C)**	**Charge Voltage (V)**	**Max. charge current (A)**	**Max. Temperature of battery (°C)**	**Results**
B31	23.4	65.52	3	23.5	P
B32	23.3	65.52	3	23.5	P
B33	23.4	65.52	3	23.4	P
Supplementary information: Max charged current as specific: 3A. Results: No fire. No disassembly.					

10.4	TABLE: Deep discharge protection		P
Sample no.	**Single cell voltage before charge**	**Charge current for single cell**	**Results**
B40	2.583	0	P

List of test equipment used:

No	Equipment No.	Test Equipment	Equipment Model	Range used	Calibration due date
1	ITCK240102	Vibration test system	HV-300-D-25	4~4000Hz,25.00mm(p-p),1.50m/s,980m/s2	2025-02-06
2	ITCB230313	Electronic load	IT8513C+	120.0V 120.0A	2025-01-23
3	ITCB180207	Battery Shock Tester	IS350	50G~150G 6~11ms	2025-02-21
4	ITCEN07011	Explosion-proof drop test chamber	H-FD-500	0-1.2m	2025-01-23
5	ITCS06004	Temperature and humidity control box	SETH-Z-061LK	-40—150℃ 20-98%RH	2025-01-08
6	ITCB200503	Crush test	RJD-ZJ-C50T-3000	/	2025-01-16
7	ITCS06042-6	Water immersion	L700*W700*D1270mm	/	/
8	ITCB180606	Battery charge/discharge testing equipment	CDS-60V100A-BMS	0-60V 0-100A	2025-01-16
9	ITCB200605	Short circuit	B-RUL-1000	20-150℃	2025-01-16
10	ITCB230501	Battery short circuit tester	GX-6055-NT5	0-100V 0-1000A 80mΩ	2025-01-15
11	ITCB13011	Power Battery Charge and Discharge Test System	BNT100-0100ME	0-100V 0-100A	2025-10-20
12	ITCK240118	Rapid Temperature Change Damp Heat Test Chamber	NTH-1000-E	-70~150℃	2025-01-15

Attachment No.1

Photo Documentation

Overview of battery



Overview of battery



Overview of battery



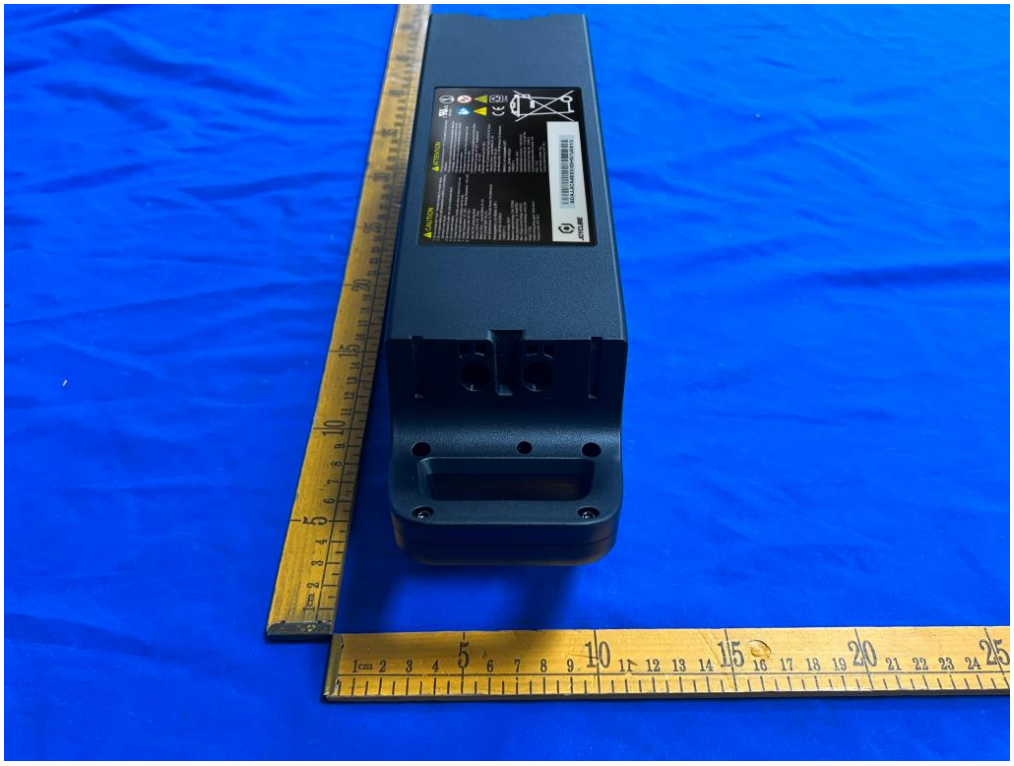
Overview of battery



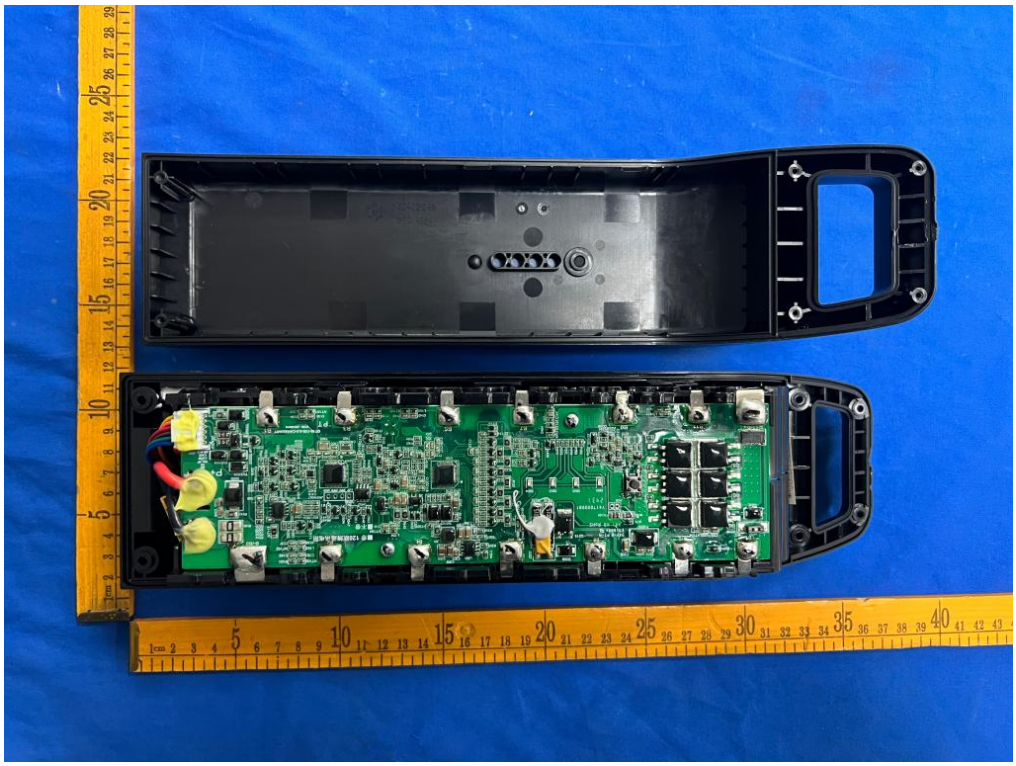
Overview of battery



Overview of battery



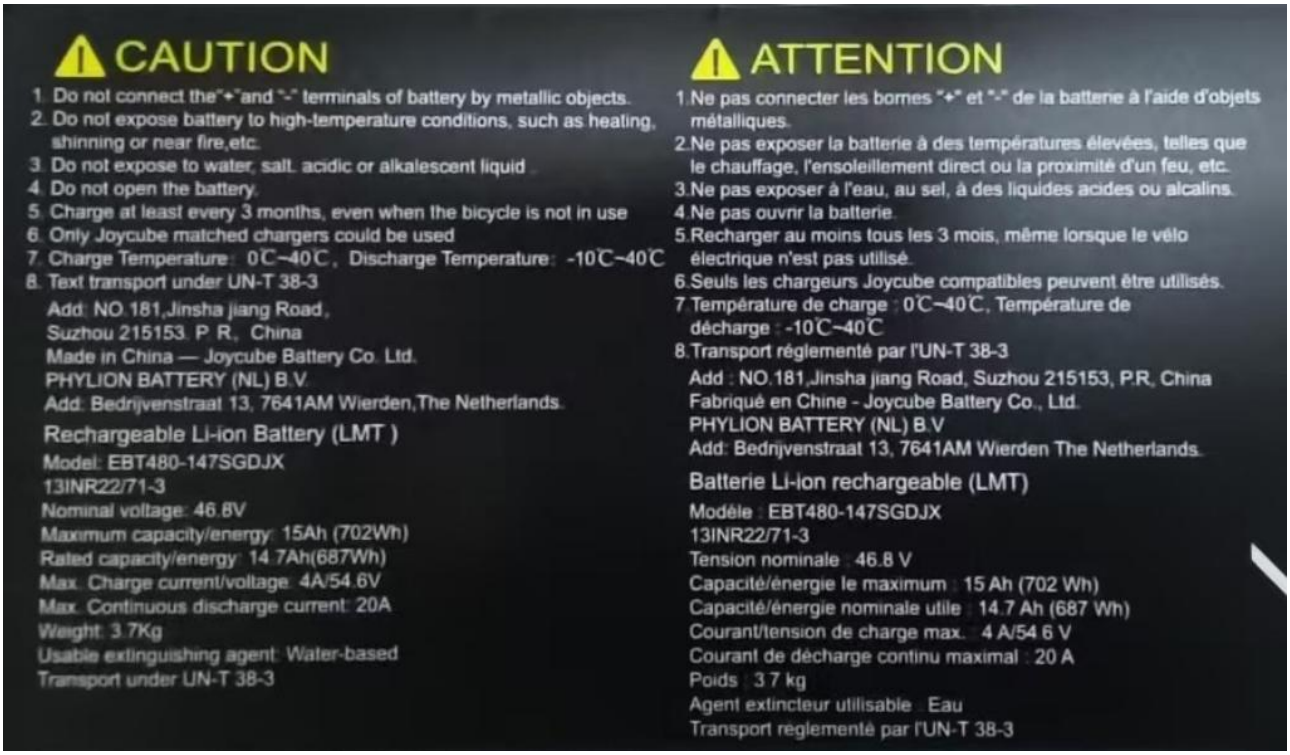
Overview of battery internal structure



Overview of PCB



warning Label



Statement

1. The report is invalid without the special test seal of the test department.
2. Any changes, modifications, or partial photocopy of this report without the written approval of the laboratory shall be deemed invalid. The report shall be used properly and legally.
3. The test report is only responsible for the tested sample.
4. The representativeness and authenticity of the samples submitted for testing shall be the responsibility of the client.
5. The test results given in this test report should only be used for purposes of scientific research, teaching and internal quality control when the CMA mark is not presented.
6. Objections to the test result shall be submitted to the laboratory in written form within 10 days after receiving the report.

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