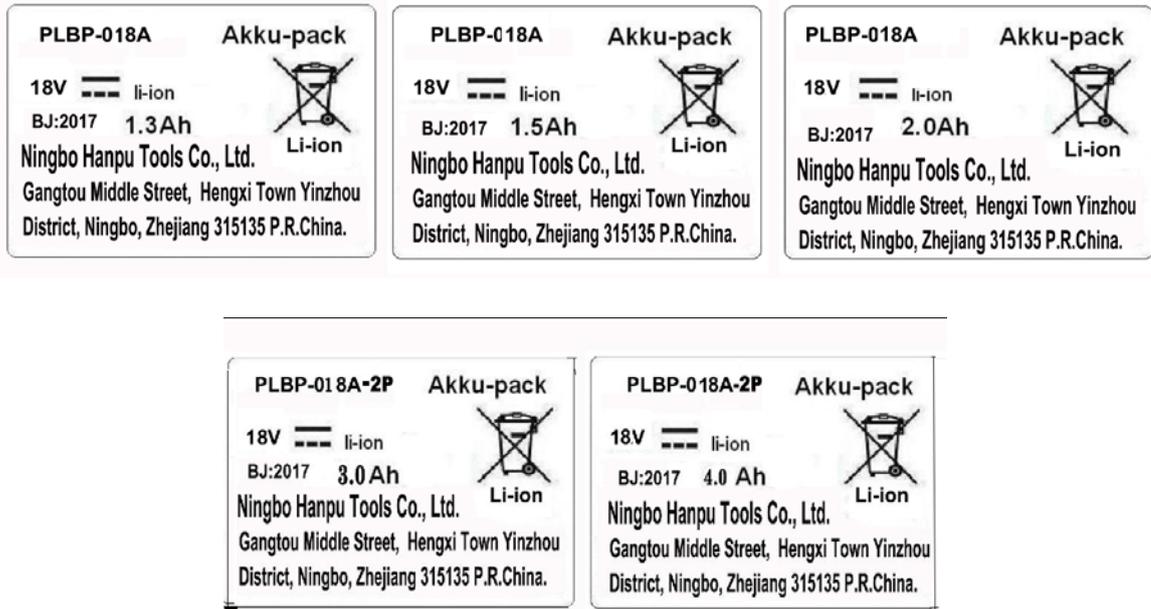


Prüfbericht-Nr.: <i>Test Report No.:</i>	50098085 001	Auftrags-Nr.: <i>Order No.:</i>	154274700	<i>Seite 1 von 16</i> <i>Page 1 of 16</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	01.09.2017		
Auftraggeber: <i>Client:</i>	Ningbo Hanpu Tools Co., Ltd. / Gangtou Middle Street, Hengxi Town, Yinzhou District, Ningbo Zhejiang 315135, P.R. China				
Prüfgegenstand: <i>Test item:</i>	Rechargeable Li-ion Battery Pack				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	PLBP-018A; PLBP-018A-2P				
Auftrags-Inhalt: <i>Order content:</i>	Type Test				
Prüfgrundlage: <i>Test specification:</i>	Section 38.3 of ST/SG/AC.10/11/Rev.6				
Wareneingangsdatum: <i>Date of receipt:</i>	06.09.2017				
Prüfmuster-Nr.: <i>Test sample No.:</i>	A000614421-002~005; A000614405-001~023				
Prüfzeitraum: <i>Testing period:</i>	22.09.2017 - 01.11.2017				
Ort der Prüfung: <i>Place of testing:</i>	See Page 4				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:		kontrolliert von / reviewed by:			
15.11.2017 Qian Yuzeng / PE		15.11.2017 Huilan Xi / Reviewer			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other: For safety assessment. Tested according to standards UN 38.3.					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					



Copy of marking plate:



General product information

The two models PLBP-018A; PLBP-018A-2P are same except their shape of enclosure, quantity of battery cells and rated capacity.

The main features of the battery pack are shown as below:

Battery pack Model	Rated voltage	Rated capacity	Recommended charging current	Recommended charging voltage	Discharge cut-off voltage	End charging voltage
PLBP-018A	18V d.c.	1300mA; 1500mA; 2000mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.
PLBP-018A-2P	18V d.c.	3000mA; 4000mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.

	Manufacturer	Model	Technical data	Standard	Mark(s) of conformity
Battery Cell (only for PLBP-018A)	Ningbo Hanpu Tools Co., Ltd.	C18650P-1300mAh	Li-ion, 3.6V, 1300mAh	IEC 62133	TÜV Rheinland JPTUV-061222
(alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P-1500mAh	Li-ion, 3.6V, 1500mAh	IEC 62133	TÜV Rheinland JPTUV-061222
(alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P-2000mAh	Li-ion, 3.6V, 2000mAh	IEC 62133	TÜV Rheinland JPTUV-061222

For PLBP-018A, Five battery cells connected to a group in series.

For PLBP-018A-2P, Ten battery cells were assembled in the battery pack. Each 2 battery cells were grouped in parallel connection and 5 such battery groups were then in series connection. Thus the equivalent capacity of the battery pack should be 2 times the rated capacity of the battery cell.

Pictures of battery pack:

Please refer to Attachment 1 of this test report.

Summary of testing:

T1: Altitude simulation

T2: Thermal test

T3: Vibration

T4: Shock

T5: External short circuit

T6: Impact / Crush

T7: Overcharge

T8: Forced discharge

All tests were performed on PLBP-018A-2P (Capacity: 4.0Ah), and Test T3 and T4 were performed on PLBP-018A (Capacity: 2.0Ah). Besides, Test T6 and T8 were performed with 1500 battery cells.

Test laboratory:**TÜV Rheinland (Shanghai) Co., Ltd.**

No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

Testing location:**Shanghai Testing and Inspection Institute for Electrical Appliances**

No.518, Songhui Rd, Qingpu District, Shanghai

Factory:**Ningbo Hanpu Tools Co., Ltd.**

Gangtou Middle Street, Hengxi Town, Yinzhou District, Ningbo Zhejiang 315135, P.R. China

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
38.3	Lithium metal and lithium ion batteries		P
38.3.1	Purpose	Lithium ion battery	P
38.3.2	Scope	Rechargeable battery	P
38.3.3	Number and condition of cells and batteries		P
38.3.4	Procedure		P
	Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries.	Meet the requirement.	P
	Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries.	Meet the requirement.	P
38.3.4.1	Test T.1: Altitude simulation		P
38.3.4.1.1	Purpose		P
	This test simulates air transport under low-pressure conditions.		P
38.3.4.1.2	Test procedure		P
	Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C).		P
38.3.4.1.3	Requirement		P
	Cells and batteries meet this requirement if there is		P
	No leakage, no venting, no disassembly, no rupture and no fire, and	Meet the requirement.	P
	The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 1)	P
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P
38.3.4.2	Test T.2: Thermal test		P
38.3.4.2.1	Purpose		P
	This test assesses cell and battery seal integrity and internal electrical connections.		P
	The test is conducted using rapid and extreme temperature changes.		P
38.3.4.2.2	Test procedure		P

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2 °C, followed by storage for at least six hours at a test temperature equal to -40 ± 2 °C.		P
	The maximum time interval between test temperature extremes is 30 minutes.		P
	This procedure is to be repeated until 10 total cycles are complete		P
	All test cells and batteries are then to be stored for 24 hours at ambient temperature (20 ± 5 °C).		P
	For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.		N/A
38.3.4.2.3	Requirement		P
	Cells and batteries meet this requirement if there is		P
	no leakage, no venting, no disassembly, no rupture and no fire, and	Meet the requirement.	P
	The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 2)	P
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P
38.3.4.3	Test T.3: Vibration		P
38.3.4.3.1	Purpose		P
	This test simulates vibration during transport.		P
38.3.4.3.2	Test procedure		P
	Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration.		P
	The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes.		P
	This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell.		P
	One of the directions of vibration must be perpendicular to the terminal face.		P
	Different logarithmic frequency sweep as below:		P

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Clause	Requirement + Test	Result - Remark	Verdict
	For cells and small batteries: from 7 Hz a peak acceleration of 1 g _n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 g _n occurs (approximately 50 Hz). A peak acceleration of 8 g _n is then maintained until the frequency is increased to 200 Hz.		P
	For large batteries: from 7 Hz to a peak acceleration of 1 g _n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 g _n occurs (approximately 25 Hz). A peak acceleration of 2 g _n is then maintained until the frequency is increased to 200 Hz.		N/A
38.3.4.3.3	Requirement		P
	Cells and batteries meet this requirement if there is		P
	No leakage, no venting, no disassembly, no rupture and no fire during the test and after the test	Meet the requirement.	P
	The open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 3)	P
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P
38.3.4.4	Test T.4: Shock		P
38.3.4.4.1	Purpose		P
	This test assesses the robustness of cells and batteries against cumulative shocks.		P
38.3.4.4.2	Test procedure		P
	Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.		P
	Each cell or battery shall be subjected to a halfsine shock of peak acceleration of 150 g _n and pulse duration of 6 milliseconds.		P
	Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 g _n and pulse duration of 11 milliseconds.		N/A

Section 38.3 of ST/SG/AC.10/11/Rev.6												
Clause	Requirement + Test	Result - Remark	Verdict									
	Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.		P									
	<table border="1"> <thead> <tr> <th>Battery</th> <th>Minimum peak acceleration</th> <th>Pulse duration</th> </tr> </thead> <tbody> <tr> <td>Small batteries</td> <td> 150 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller </td> <td>6 ms</td> </tr> <tr> <td>Large batteries</td> <td> 50 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller </td> <td>11 ms</td> </tr> </tbody> </table> <p>* Mass is expressed in kilograms.</p>	Battery	Minimum peak acceleration	Pulse duration	Small batteries	150 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms	Large batteries	50 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms		P
Battery	Minimum peak acceleration	Pulse duration										
Small batteries	150 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms										
Large batteries	50 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms										
	Mass of small battery and applied minimum peak acceleration:	Applied with 150 g _n	P									
	Mass of large battery and applied minimum peak acceleration:		N/A									
	Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.		P									
38.3.4.4.3	Requirement		P									
	Cells and batteries meet this requirement if there is		P									
	No leakage, no venting, no disassembly, no rupture and no fire	Meet the requirement.	P									
	The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 4)	P									
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P									
38.3.4.5	Test T.5: External short circuit		P									
38.3.4.5.1	Purpose		P									

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Clause	Requirement + Test	Result - Remark	Verdict
	This test simulates an external short circuit.		P
38.3.4.5.2	Test procedure		P
	The cell or battery to be tested shall be shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57±4 °C, measured on the external case.		P
	This period of time depends on the size and design of the cell or battery and should be assessed and documented.		P
	If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries.		N/A
	Then the cell or battery at 57±4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.		P
	This short circuit condition is continued		P
	for at least one hour after the cell or battery external case temperature has returned to 57±4 °C,		P
	or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.		N/A
	The short circuit and cooling down phases shall be conducted at least at ambient temperature.		P
38.3.4.5.3	Requirement		P
	Cells and batteries meet this requirement if		P
	The external temperature does not exceed 170 °C, and	(See appendix table 5)	P
	No disassembly, no rupture and no fire during the test and within six hours after the test.	Meet the requirement.	P
38.3.4.6	Test T.6: Impact / Crush		P
38.3.4.6.1	Purpose		P
	These tests simulate mechanical abuse from an impact or crush that may result in an internal short circuit.		P
38.3.4.6.2	Test procedure – Impact (applicable to cylindrical cells not less than 18.0 mm in diameter)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The test sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm \pm 0.1 mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample.		P
	A 9.1 kg \pm 0.1kg mass is to be dropped from a height of 61 \pm 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass.		P
	The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.		P
	The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm \pm 0.1 mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.		P
38.3.4.6.3	Test Procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter)		N/A
	A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact.		N/A
	The crushing is to be continued until the first of the three options below is reached:		N/A
	(a) The applied force reaches 13 kN \pm 0.78 kN;		N/A
	(b) The voltage of the cell drops by at least 100 mV;		N/A
	(c) The cell is deformed by 50% or more of its original thickness.		N/A
	The pressure shall be released when:		N/A
	The maximum pressure has been obtained, or		N/A
	The voltage drops by 100 mV or more, or,		N/A
	The cell is deformed by at least 50% of its original thickness		N/A
	A prismatic or pouch cell shall be crushed by applying the force to the widest side.		N/A
	A button/coin cell shall be crushed by applying the force on its flat surfaces.		N/A
	For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h.		N/A
	The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.		N/A
38.3.4.6.4	Requirement		P
	Cells and component cells meet this requirement if their external temperature does not exceed 170 °C, and	Battery cells separately tested	P
	No disassembly and no fire during the test and within six hours after this test.		P
38.3.4.7	Test T.7: Overcharge		P
38.3.4.7.1	Purpose		P
	This test evaluates the ability of a rechargeable battery or a single cell rechargeable battery to withstand an overcharge condition.		P
38.3.4.7.2	Test procedure		P
	The charge current shall be twice the manufacturer's recommended maximum continuous charge current.		P
	The minimum voltage of the test shall be as follows:		P
	(a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.		N/A
	(b) when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.	25.2V	P
	Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.		P
38.3.4.7.3	Requirement		P
	Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	Meet the requirement	P
38.3.4.8	Test T.8: Forced discharge		P
38.3.4.8.1	Purpose		P
	This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.		P
38.3.4.8.2	Test procedure		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.		P
	The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).		P
38.3.4.8.3	Requirement		P
	Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	Acceptance test was performed and passed	P

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Clause	Requirement + Test	Result - Remark	Verdict
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TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾
Enclosure	NINGBO JIAERFENG TRADING CO LTD	--	PA6-GF30	UN 38.3	Accept test
PCB	LEUCHTEK ELECTRONICS (ZHEJIANG) CO LTD	PFR-4	130°C, V-0	UN 38.3; UL 796	Accept test; UL E199273
(alternative)	GUANGDE DONGFENG ELECTRONICS CO LTD	DF-2H	130°C, V-0	UN 38.3; UL 796	Accept test; UL E199900
Li-ion battery protection PCB module	LEUCHTEK ELECTRONICS (ZHEJIANG) CO LTD	PLBP-018* ("*" means: "A"- "Z")	--	UN 38.3	Accept test
(alternative)	GUANGDE DONGFENG ELECTRONICS CO LTD	PLBP-018* ("*" means: "A"- "Z")	--	UN 38.3	Accept test
Battery Cell	Ningbo Hanpu Tools Co., Ltd.	C18650P- 1300mAh	Li-ion, 3.6V, 1300mAh	IEC 62133	TÜV Rheinland JPTUV- 061222
(alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P- 1500mAh	Li-ion, 3.6V, 1500mAh	IEC 62133	TÜV Rheinland JPTUV- 061222
(alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P- 2000mAh	Li-ion, 3.6V, 2000mAh	IEC 62133	TÜV Rheinland JPTUV- 061222
Supplementary information:					
¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict

For PLBP-018A-2P:

TABLE 1: Altitude simulation						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	673.0	20.73	673.0	20.73	100.00	
002	676.7	20.72	676.7	20.71	99.95	
003	671.1	20.72	671.1	20.72	100.00	
004	671.3	20.75	671.3	20.75	100.00	
005	670.4	20.69	670.4	20.69	100.00	
006	672.4	20.65	672.4	20.64	99.95	
007	671.4	20.71	671.4	20.71	100.00	
008	672.4	20.66	672.4	20.66	100.00	

TABLE 2: Thermal test						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	673.0	20.73	673.0	20.47	98.75	
002	676.7	20.71	676.7	20.42	98.60	
003	671.1	20.72	671.1	20.44	98.65	
004	671.3	20.75	671.3	20.45	98.55	
005	670.4	20.69	670.4	20.42	98.70	
006	672.4	20.64	672.4	20.39	98.79	
007	671.4	20.71	671.4	20.42	98.60	
008	672.4	20.66	672.4	20.40	98.74	

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Clause	Requirement + Test	Result - Remark	Verdict

TABLE 3: Vibration						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	673.0	20.47	673.0	20.47	100.00	
002	676.7	20.42	676.7	20.42	100.00	
003	671.1	20.44	671.1	20.44	100.00	
004	671.3	20.45	671.3	20.45	100.00	
005	670.4	20.42	670.4	20.41	99.95	
006	672.4	20.39	672.4	20.39	100.00	
007	671.4	20.42	671.4	20.42	100.00	
008	672.4	20.40	672.4	20.39	99.95	

TABLE 4: Shock						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	673.0	20.47	673.0	20.47	100.00	
002	676.7	20.42	676.7	20.42	100.00	
003	671.1	20.44	671.1	20.44	100.00	
004	671.3	20.45	671.3	20.45	100.00	
005	670.4	20.41	670.4	20.41	100.00	
006	672.4	20.39	672.4	20.39	100.00	
007	671.4	20.42	671.4	20.42	100.00	
008	672.4	20.39	672.4	20.39	100.00	

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 5: External short circuit				P
Sample No.	OCV before test (V)	Ambient Temp. (°C)	External highest Temp. (°C)	
001	--	24.0	57.4	
002	--	24.0	58.8	
003	--	24.0	59.1	
004	--	24.0	59.4	
005	--	24.0	58.8	
006	--	24.0	59.2	
007	--	24.0	59.1	
008	--	24.0	58.4	

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict

For PLBP-018A:

TABLE 3: Vibration						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
009	392.993	20.56	392.986	20.56	100.00	
010	393.668	20.69	393.649	20.69	100.00	
011	392.657	20.44	392.648	20.44	100.00	
012	394.328	20.40	394.319	20.40	100.00	
013	394.789	20.49	394.781	20.49	100.00	
014	394.685	20.63	394.702	20.62	99.95	
015	392.507	20.48	392.493	20.47	99.95	
016	393.684	20.65	393.674	20.65	100.00	

TABLE 4: Shock						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
009	392.986	20.56	392.971	20.56	100.00	
010	393.649	20.69	393.628	20.68	99.95	
011	392.648	20.44	392.641	20.44	100.00	
012	394.319	20.40	394.303	20.40	100.00	
013	394.781	20.49	394.769	20.49	100.00	
014	394.702	20.62	394.684	20.62	100.00	
015	392.493	20.47	392.481	20.47	100.00	
016	393.674	20.65	393.668	20.65	100.00	

- End of Test Report -

PHOTO DOCUMENTATION
Attachment 1 of Test Report 50098085 001

for

**Rechargeable Li-ion Battery Pack
PLBP-018A; PLBP-018A-2P**

Ningbo Hanpu Tools Co., Ltd.



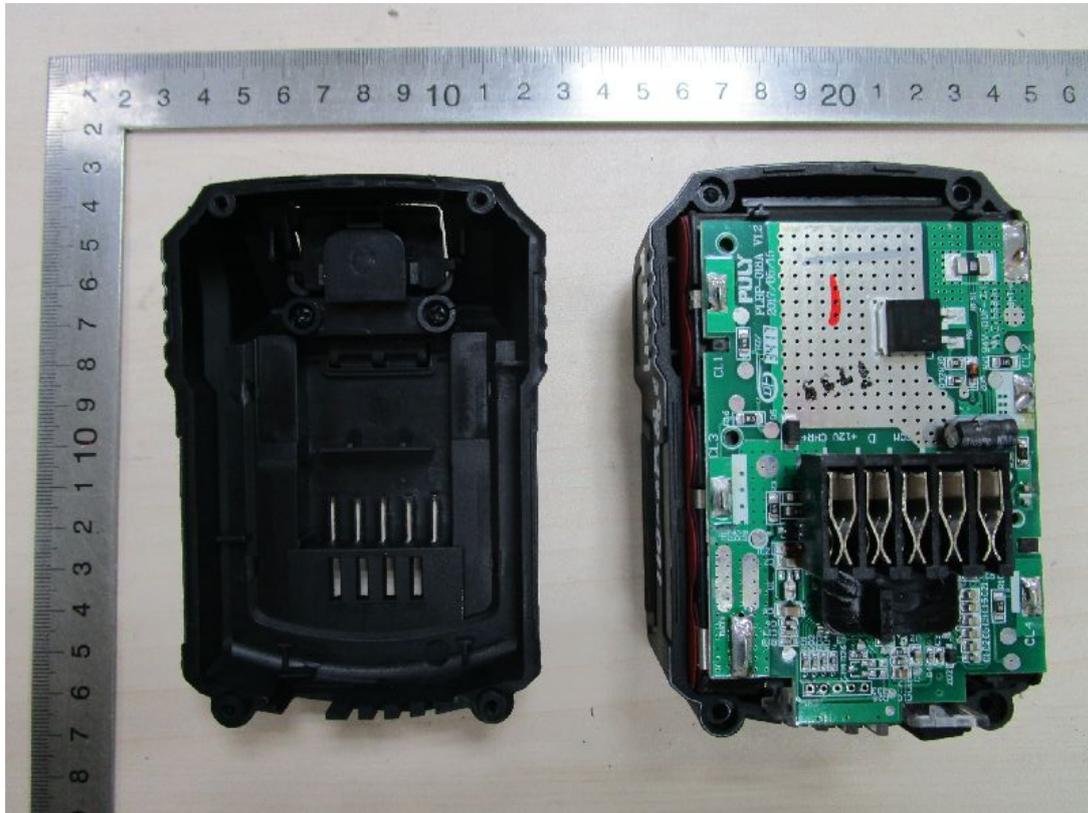
This documentation consists of 16 pages (excluding this cover page).

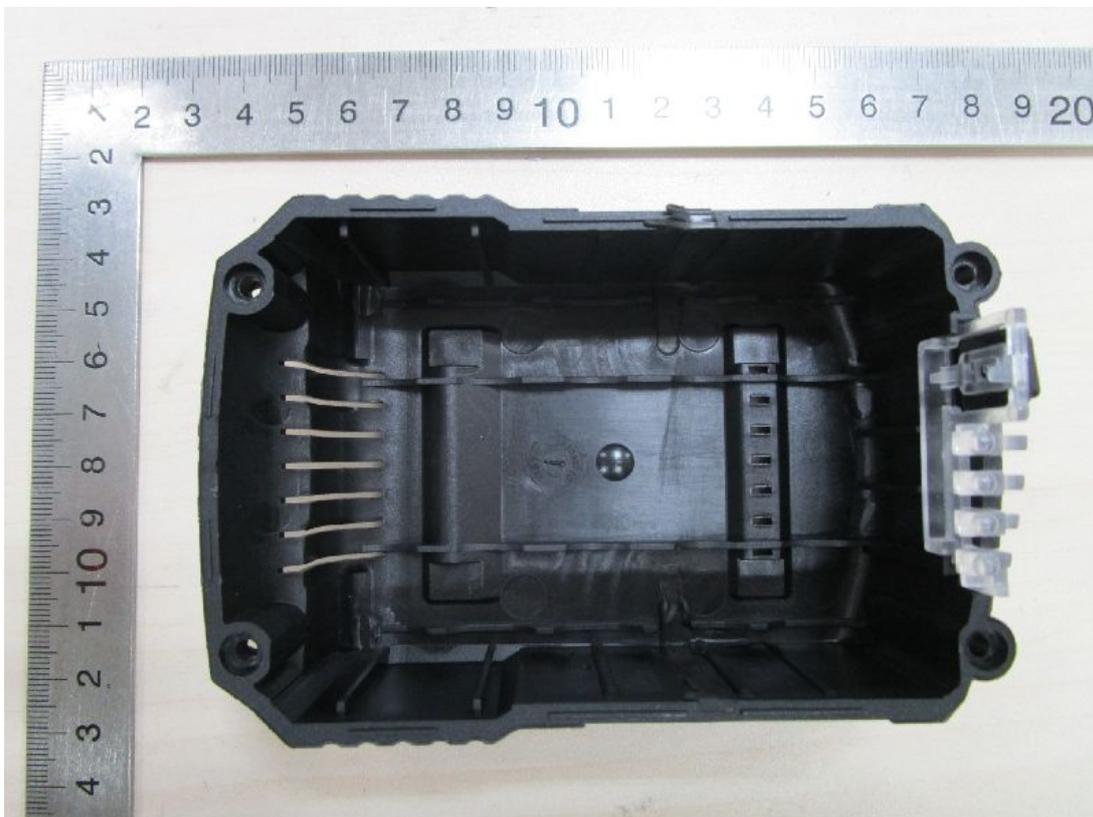
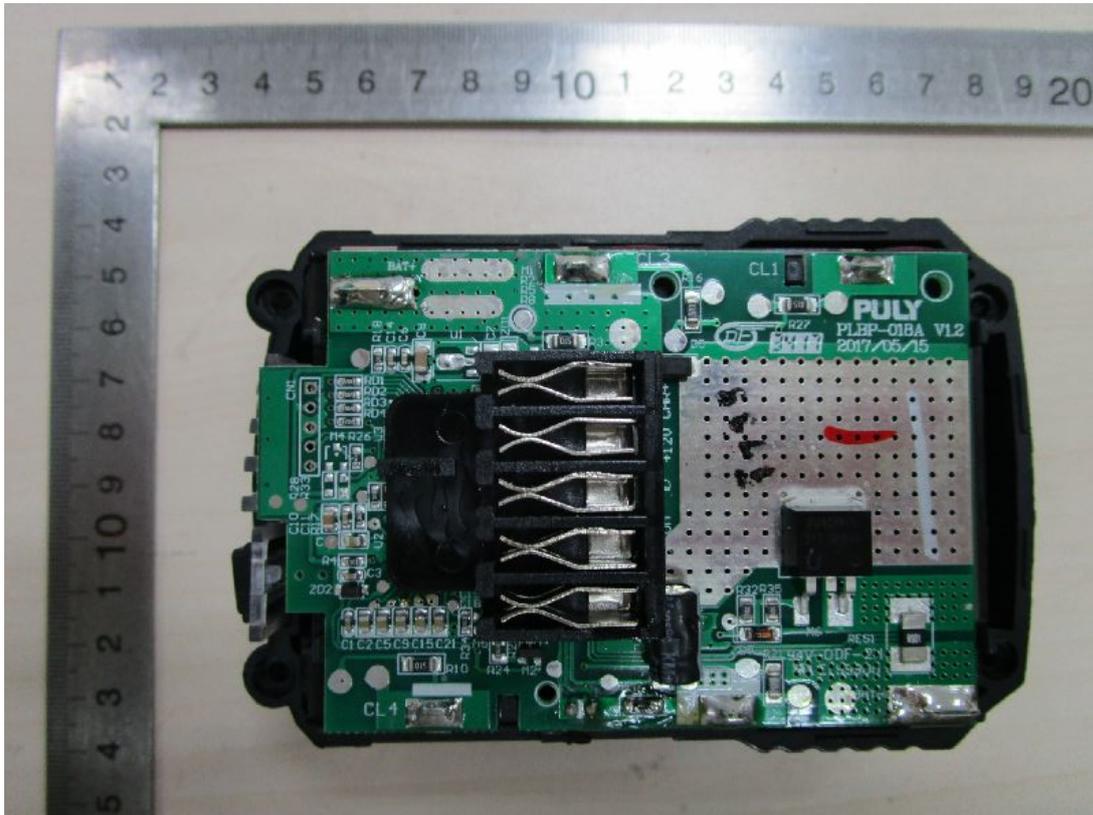
For PLBP-018A-2P

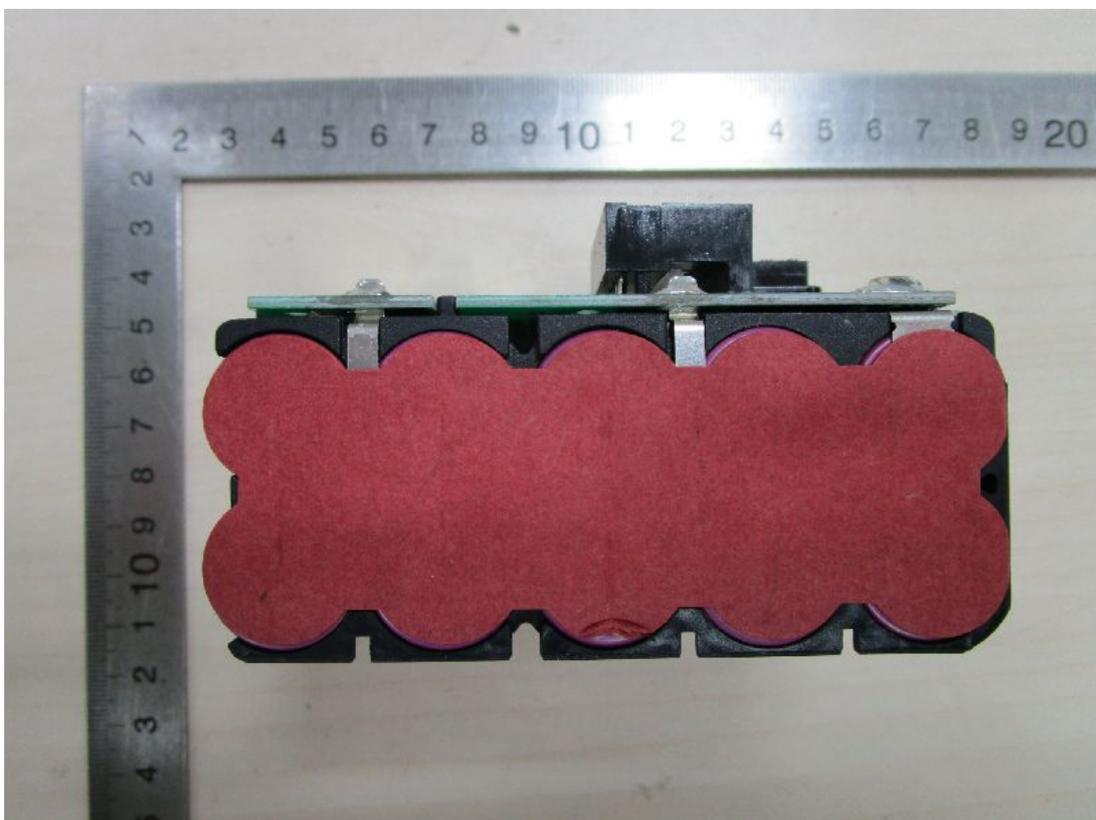
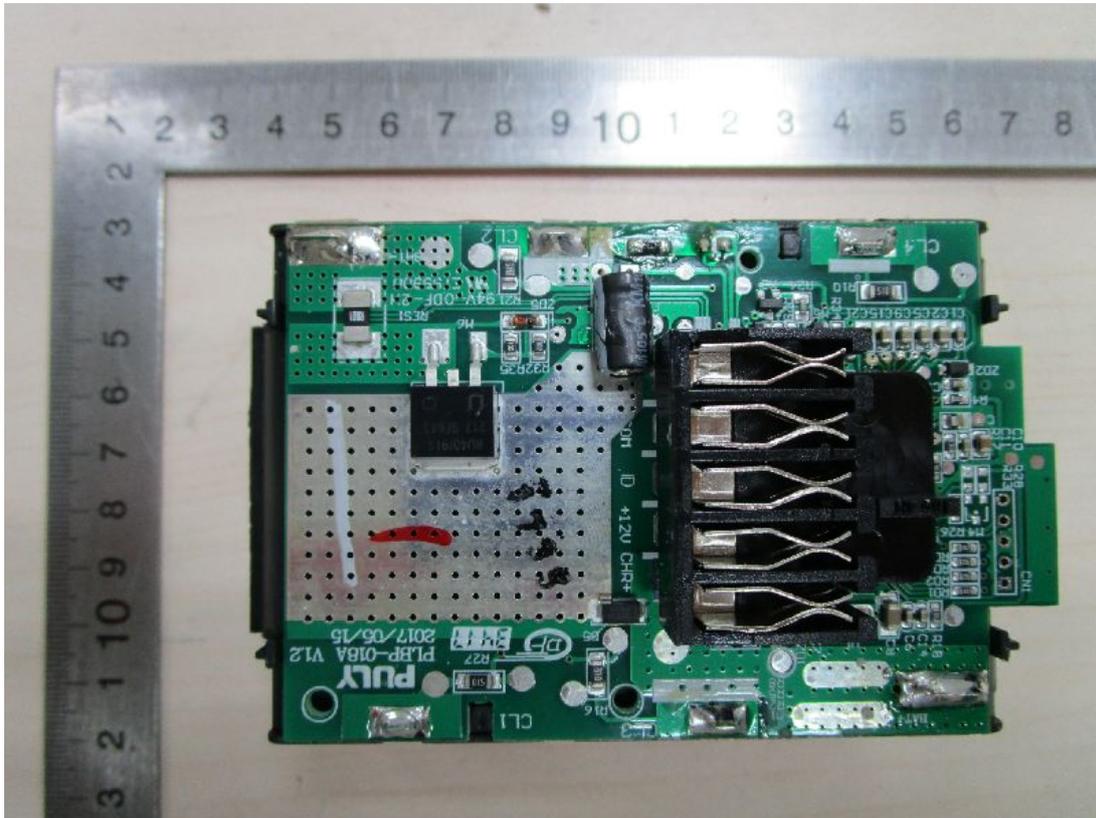




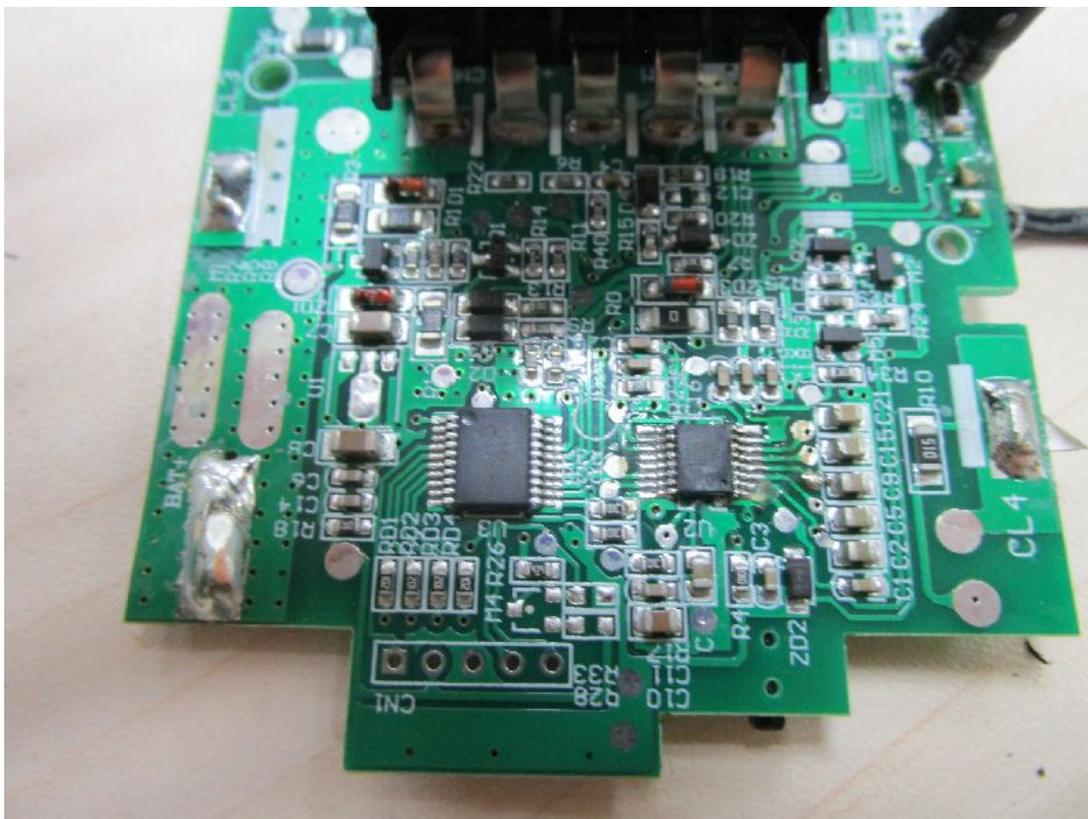
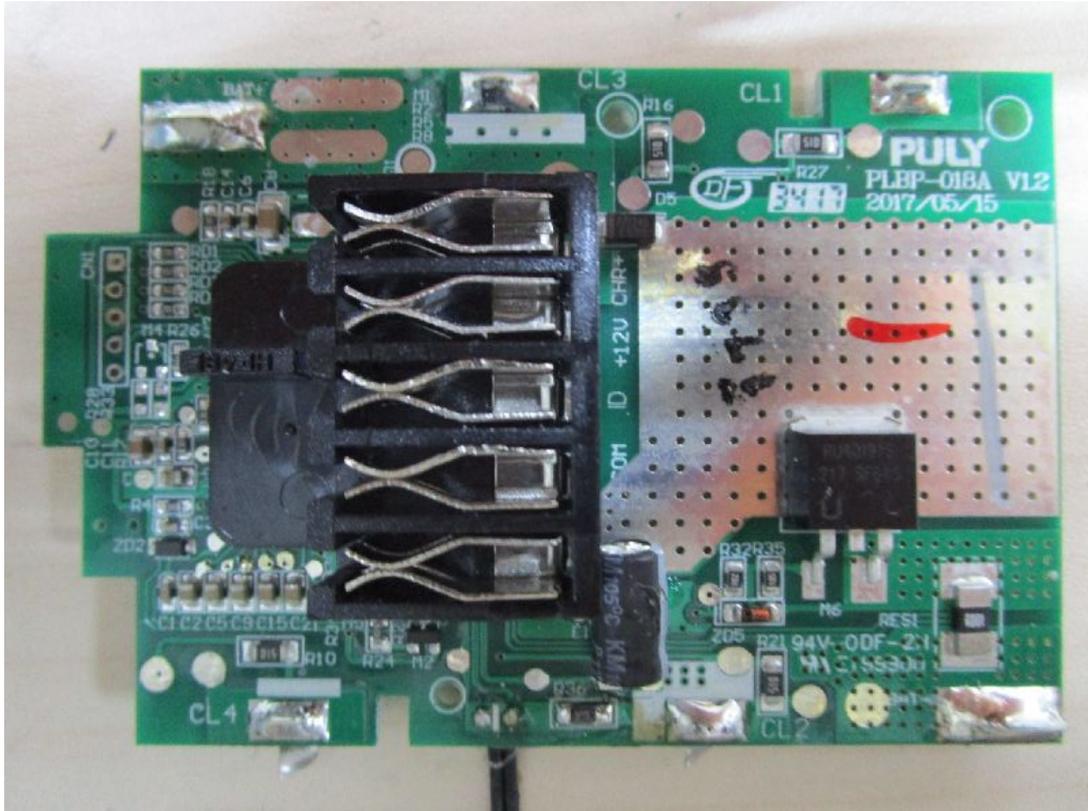


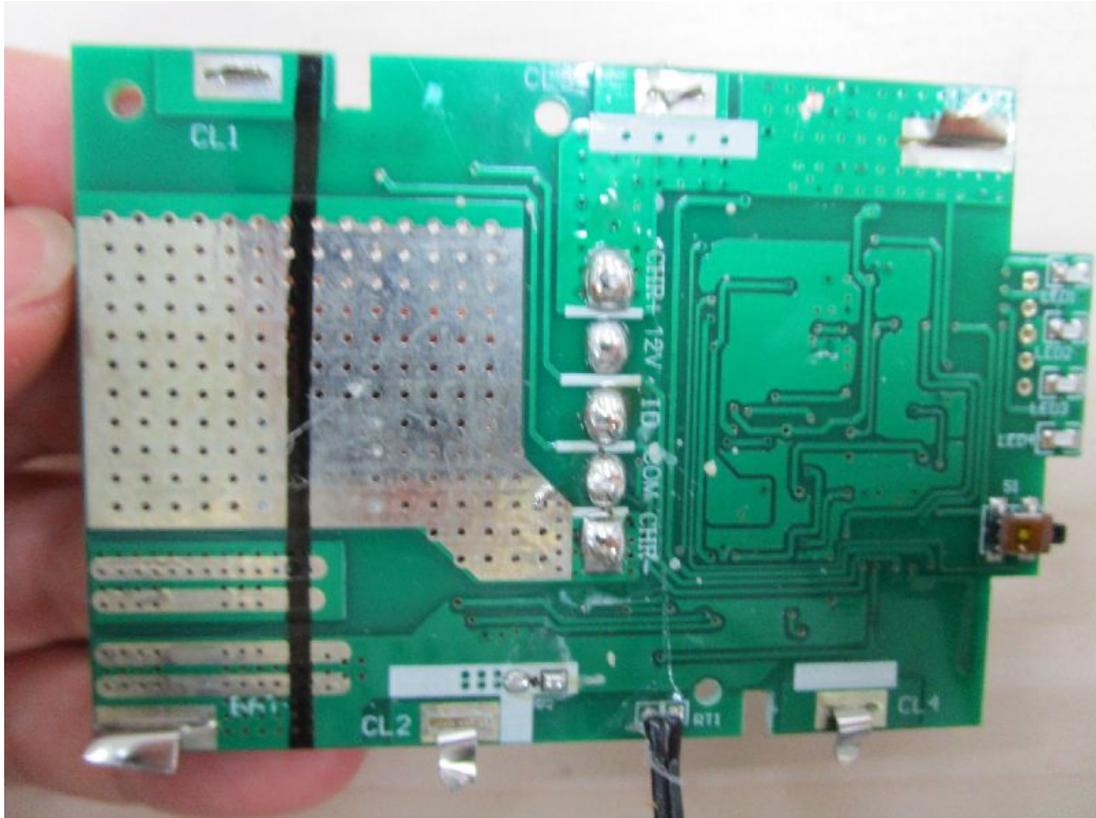










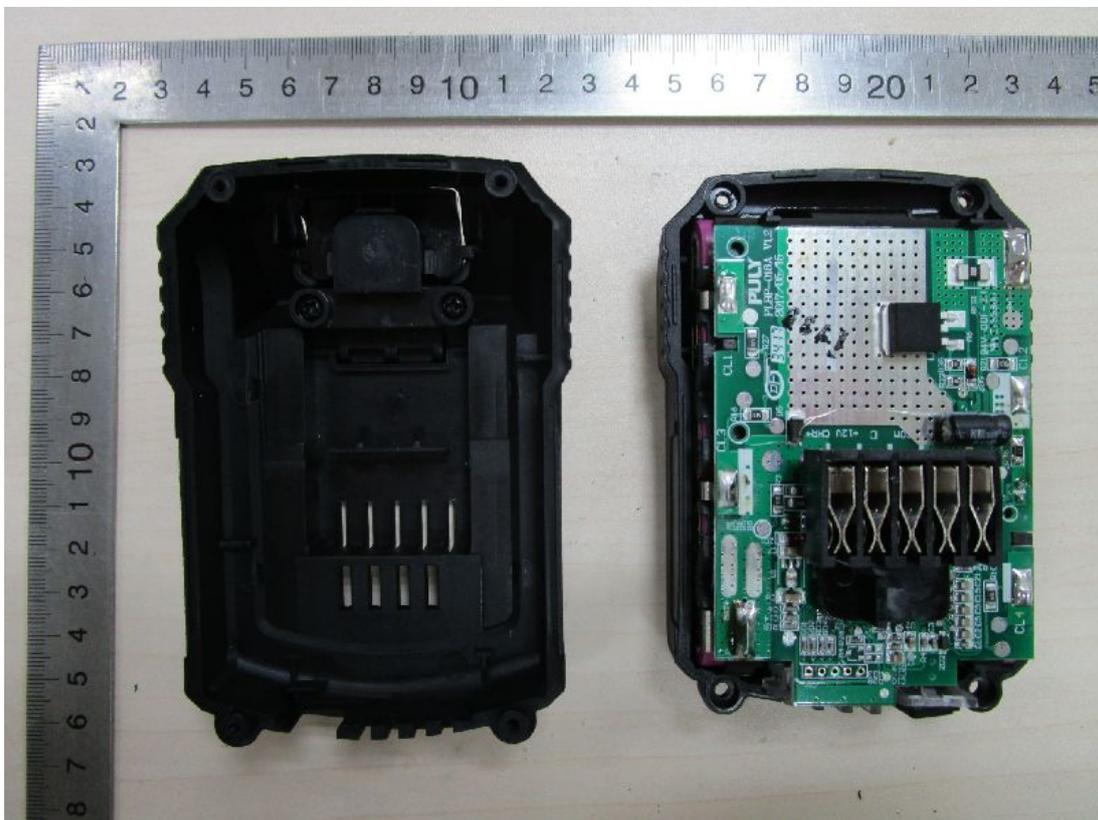


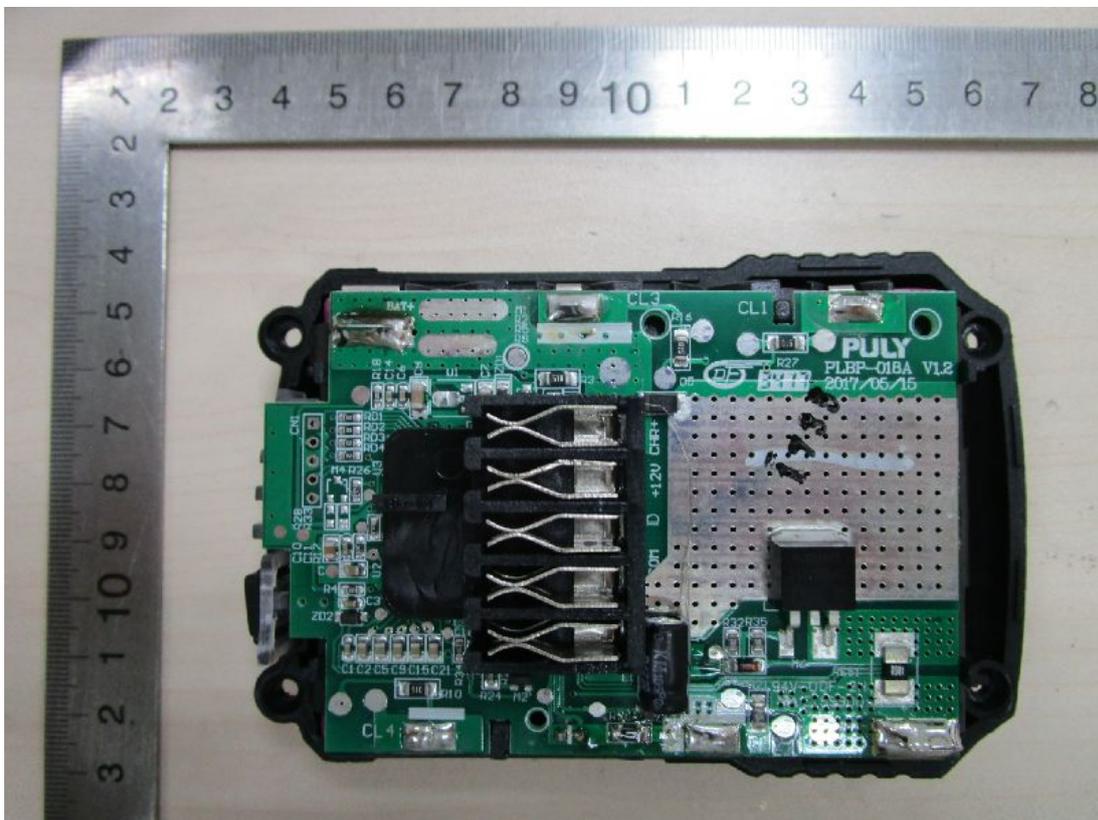
For PLBP-018A

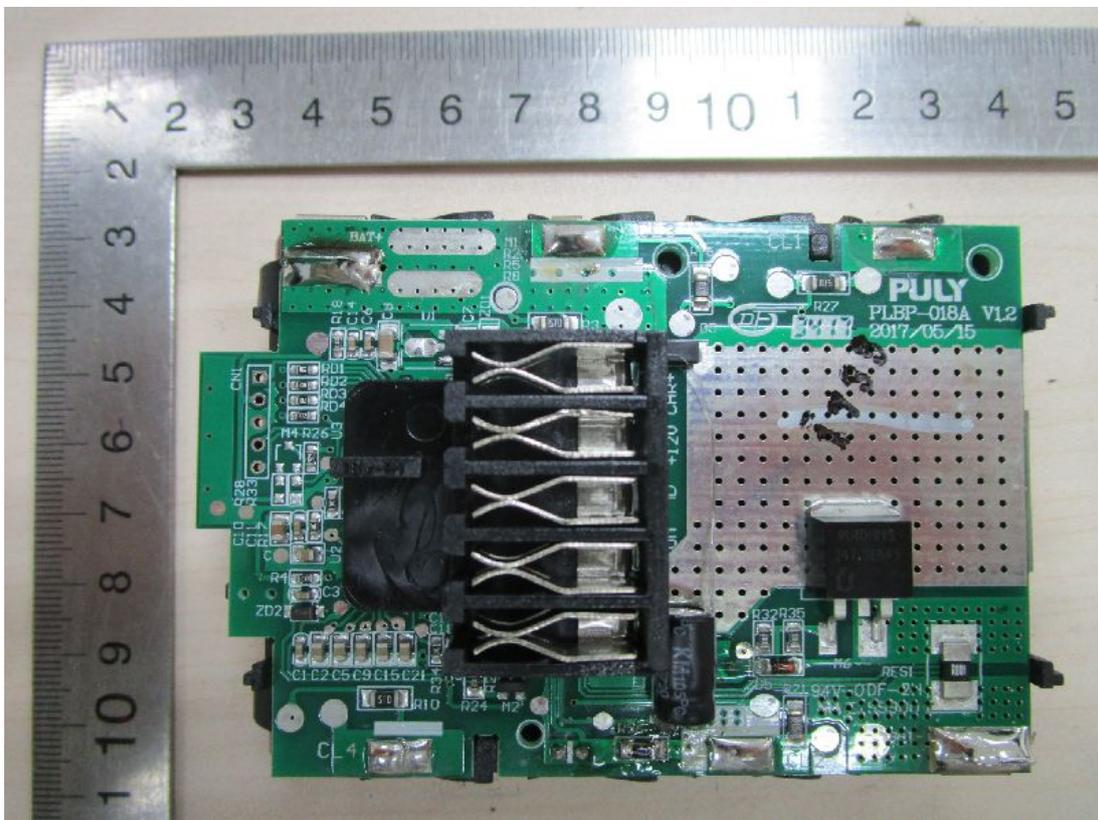


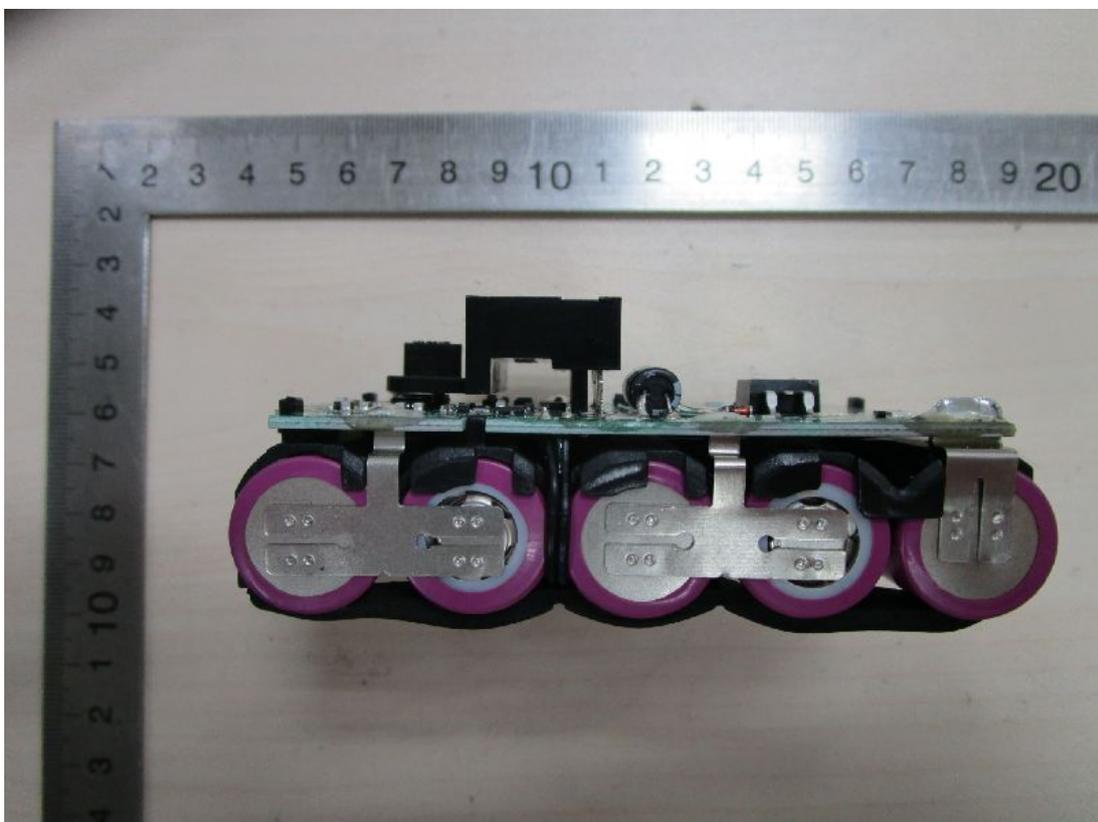








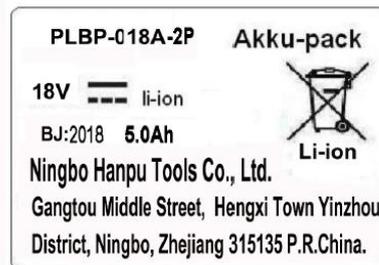






Prüfbericht-Nr.: <i>Test Report No.:</i>	50098085 002	Auftrags-Nr.: <i>Order No.:</i>	154297976	<i>Seite 1 von 16</i> <i>Page 1 of 16</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	14.12.2017		
Auftraggeber: <i>Client:</i>	Ningbo Hanpu Tools Co., Ltd. / Gangtou Middle Street, Hengxi Town, Yinzhou District, Ningbo Zhejiang 315135, P.R. China				
Prüfgegenstand: <i>Test item:</i>	Rechargeable Li-ion Battery Pack				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	PLBP-018A; PLBP-018A-2P				
Auftrags-Inhalt: <i>Order content:</i>	Type Test				
Prüfgrundlage: <i>Test specification:</i>	Section 38.3 of ST/SG/AC.10/11/Rev.6				
Wareneingangsdatum: <i>Date of receipt:</i>	13.12.2017				
Prüfmuster-Nr.: <i>Test sample No.:</i>	See other as below.				
Prüfzeitraum: <i>Testing period:</i>	21.12.2017 - 15.01.2018				
Ort der Prüfung: <i>Place of testing:</i>	See Page 4				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd.				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:					kontrolliert von / reviewed by:
12.02.2018 Qian Yuzeng / PE		12.02.2018 Jin Shan / Reviewer			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other:					
The report is based on 50098085 001. For safety assessment. Tested according to standards UN 38.3. Test sample No.: A000667431-001~011; A000667441-001~011.					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

Copy of marking plate:



General product information

The original models PLBP-018A; PLBP-018A-2P are same except their shape of enclosure, quantity of battery cells and rated capacity.

For above original models, respectively adding three rated capacity: 2.5Ah, 2.6Ah and 5.0Ah.

The main features of the battery pack with adding three rated capacity are shown as below:

Battery pack Model	Rated voltage	Rated capacity	Recommended charging current	Recommended charging voltage	Discharge cut-off voltage	End charging voltage
PLBP-018A	18V d.c.	2500mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.
PLBP-018A-2P	18V d.c.	2600mA; 5000mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.

	Manufacturer	Model	Technical data	Standard	Mark(s) of conformity
Battery Cell	Ningbo Hanpu Tools Co., Ltd.	C18650P-1300mAh	Li-ion, 3.6V, 1300mAh	IEC 62133	TÜV Rheinland JPTUV-061222
(Alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P-2500mAh	Li-ion, 3.6V, 2500mAh	IEC 62133	TÜV Rheinland JPTUV-084034

For PLBP-018A, Five battery cells connected to a group in series.

For PLBP-018A-2P, Ten battery cells were assembled in the battery pack. Each 2 battery cells were grouped in parallel connection and 5 such battery groups were then in series connection. Thus the equivalent capacity of the battery pack should be 2 times the rated capacity of the battery cell.

Pictures of battery pack:

Please refer to Attachment 1 of previous test report 50098085 001.

Summary of testing:

T1: Altitude simulation

T2: Thermal test

T3: Vibration

T4: Shock

T5: External short circuit

T6: Impact / Crush

T7: Overcharge

T8: Forced discharge

All tests were performed on PLBP-018A-2P (Capacity: 5.0Ah), and additional Test T3 and T4 were performed on PLBP-018A (Capacity: 2.5Ah).

Test laboratory:**TÜV Rheinland (Shanghai) Co., Ltd.**

No.177, 178, Lane 777 West Guangzhong Road, Jing'an District, Shanghai, China

Testing location:**Shanghai Testing and Inspection Institute for Electrical Appliances**

No.518, Songhui Rd, Qingpu District, Shanghai

Factory:**Ningbo Hanpu Tools Co., Ltd.**

Gangtou Middle Street, Hengxi Town, Yinzhou District, Ningbo Zhejiang 315135, P.R. China

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
38.3	Lithium metal and lithium ion batteries		P
38.3.1	Purpose	Lithium ion battery	P
38.3.2	Scope	Rechargeable battery	P
38.3.3	Number and condition of cells and batteries		P
38.3.4	Procedure		P
	Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells or batteries.	Meet the requirement.	P
	Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries.	Meet the requirement.	P
38.3.4.1	Test T.1: Altitude simulation		P
38.3.4.1.1	Purpose		P
	This test simulates air transport under low-pressure conditions.		P
38.3.4.1.2	Test procedure		P
	Test cells and batteries shall be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C).		P
38.3.4.1.3	Requirement		P
	Cells and batteries meet this requirement if there is		P
	No leakage, no venting, no disassembly, no rupture and no fire, and	Meet the requirement.	P
	The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 1)	P
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P
38.3.4.2	Test T.2: Thermal test		P
38.3.4.2.1	Purpose		P
	This test assesses cell and battery seal integrity and internal electrical connections.		P
	The test is conducted using rapid and extreme temperature changes.		P
38.3.4.2.2	Test procedure		P

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72 ± 2 °C, followed by storage for at least six hours at a test temperature equal to -40 ± 2 °C.		P
	The maximum time interval between test temperature extremes is 30 minutes.		P
	This procedure is to be repeated until 10 total cycles are complete		P
	All test cells and batteries are then to be stored for 24 hours at ambient temperature (20 ± 5 °C).		P
	For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.		N/A
38.3.4.2.3	Requirement		P
	Cells and batteries meet this requirement if there is		P
	no leakage, no venting, no disassembly, no rupture and no fire, and	Meet the requirement.	P
	The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 2)	P
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P
38.3.4.3	Test T.3: Vibration		P
38.3.4.3.1	Purpose		P
	This test simulates vibration during transport.		P
38.3.4.3.2	Test procedure		P
	Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration.		P
	The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes.		P
	This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell.		P
	One of the directions of vibration must be perpendicular to the terminal face.		P
	Different logarithmic frequency sweep as below:		P

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	For cells and small batteries: from 7 Hz a peak acceleration of 1 g _n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 g _n occurs (approximately 50 Hz). A peak acceleration of 8 g _n is then maintained until the frequency is increased to 200 Hz.		P
	For large batteries: from 7 Hz to a peak acceleration of 1 g _n is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 g _n occurs (approximately 25 Hz). A peak acceleration of 2 g _n is then maintained until the frequency is increased to 200 Hz.		N/A
38.3.4.3.3	Requirement		P
	Cells and batteries meet this requirement if there is		P
	No leakage, no venting, no disassembly, no rupture and no fire during the test and after the test	Meet the requirement.	P
	The open circuit voltage of each test cell or battery directly after testing in its third perpendicular mounting position is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 3)	P
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P
38.3.4.4	Test T.4: Shock		P
38.3.4.4.1	Purpose		P
	This test assesses the robustness of cells and batteries against cumulative shocks.		P
38.3.4.4.2	Test procedure		P
	Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.		P
	Each cell or battery shall be subjected to a halfsine shock of peak acceleration of 150 g _n and pulse duration of 6 milliseconds.		P
	Alternatively, large cells may be subjected to a half-sine shock of peak acceleration of 50 g _n and pulse duration of 11 milliseconds.		N/A

Section 38.3 of ST/SG/AC.10/11/Rev.6												
Clause	Requirement + Test	Result - Remark	Verdict									
	Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.		P									
	<table border="1"> <thead> <tr> <th>Battery</th> <th>Minimum peak acceleration</th> <th>Pulse duration</th> </tr> </thead> <tbody> <tr> <td>Small batteries</td> <td> 150 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller </td> <td>6 ms</td> </tr> <tr> <td>Large batteries</td> <td> 50 g_n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller </td> <td>11 ms</td> </tr> </tbody> </table> <p>* Mass is expressed in kilograms.</p>	Battery	Minimum peak acceleration	Pulse duration	Small batteries	150 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms	Large batteries	50 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms		P
Battery	Minimum peak acceleration	Pulse duration										
Small batteries	150 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms										
Large batteries	50 g _n or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms										
	Mass of small battery and applied minimum peak acceleration:	Applied with 150 g _n	P									
	Mass of large battery and applied minimum peak acceleration:		N/A									
	Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.		P									
38.3.4.4.3	Requirement		P									
	Cells and batteries meet this requirement if there is		P									
	No leakage, no venting, no disassembly, no rupture and no fire	Meet the requirement.	P									
	The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.	(See appendix table 4)	P									
	The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.		P									
38.3.4.5	Test T.5: External short circuit		P									
38.3.4.5.1	Purpose		P									

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	This test simulates an external short circuit.		P
38.3.4.5.2	Test procedure		P
	The cell or battery to be tested shall be shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57±4 °C, measured on the external case.		P
	This period of time depends on the size and design of the cell or battery and should be assessed and documented.		P
	If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries.		N/A
	Then the cell or battery at 57±4 °C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.		P
	This short circuit condition is continued		P
	for at least one hour after the cell or battery external case temperature has returned to 57±4 °C,		P
	or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.		N/A
	The short circuit and cooling down phases shall be conducted at least at ambient temperature.		P
38.3.4.5.3	Requirement		P
	Cells and batteries meet this requirement if		P
	The external temperature does not exceed 170 °C, and	(See appendix table 5)	P
	No disassembly, no rupture and no fire during the test and within six hours after the test.	Meet the requirement.	P
38.3.4.6	Test T.6: Impact / Crush		P
38.3.4.6.1	Purpose		P
	These tests simulate mechanical abuse from an impact or crush that may result in an internal short circuit.		P
38.3.4.6.2	Test procedure – Impact (applicable to cylindrical cells not less than 18.0 mm in diameter)		P

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	The test sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm \pm 0.1 mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample.		P
	A 9.1 kg \pm 0.1kg mass is to be dropped from a height of 61 \pm 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass.		P
	The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.		P
	The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm \pm 0.1 mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.		P
38.3.4.6.3	Test Procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter)		N/A
	A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact.		N/A
	The crushing is to be continued until the first of the three options below is reached:		N/A
	(a) The applied force reaches 13 kN \pm 0.78 kN;		N/A
	(b) The voltage of the cell drops by at least 100 mV;		N/A
	(c) The cell is deformed by 50% or more of its original thickness.		N/A
	The pressure shall be released when:		N/A
	The maximum pressure has been obtained, or		N/A
	The voltage drops by 100 mV or more, or,		N/A
	The cell is deformed by at least 50% of its original thickness		N/A
	A prismatic or pouch cell shall be crushed by applying the force to the widest side.		N/A
	A button/coin cell shall be crushed by applying the force on its flat surfaces.		N/A
	For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.		N/A

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h.		N/A
	The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.		N/A
38.3.4.6.4	Requirement		P
	Cells and component cells meet this requirement if their external temperature does not exceed 170 °C, and	Battery cells separately tested	P
	No disassembly and no fire during the test and within six hours after this test.		P
38.3.4.7	Test T.7: Overcharge		P
38.3.4.7.1	Purpose		P
	This test evaluates the ability of a rechargeable battery or a single cell rechargeable battery to withstand an overcharge condition.		P
38.3.4.7.2	Test procedure		P
	The charge current shall be twice the manufacturer's recommended maximum continuous charge current.		P
	The minimum voltage of the test shall be as follows:		P
	(a) when the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.		N/A
	(b) when the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.	25.2V	P
	Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.		P
38.3.4.7.3	Requirement		P
	Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	Meet the requirement	P
38.3.4.8	Test T.8: Forced discharge		P
38.3.4.8.1	Purpose		P
	This test evaluates the ability of a primary or a rechargeable cell to withstand a forced discharge condition.		P
38.3.4.8.2	Test procedure		P

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict
	Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.		P
	The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).		P
38.3.4.8.3	Requirement		P
	Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	Acceptance test was performed and passed	P

Section 38.3 of ST/SG/AC.10/11/Rev.6

Clause	Requirement + Test	Result - Remark	Verdict
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TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾
Enclosure	NINGBO JIAERFENG TRADING CO LTD	--	PA6-GF30	UN 38.3	Accept test
PCB	LEUCHTEK ELECTRONICS (ZHEJIANG) CO LTD	PFR-4	130°C, V-0	UN 38.3; UL 796	Accept test; UL E199273
(alternative)	GUANGDE DONGFENG ELECTRONICS CO LTD	DF-2H	130°C, V-0	UN 38.3; UL 796	Accept test; UL E199900
Li-ion battery protection PCB module	LEUCHTEK ELECTRONICS (ZHEJIANG) CO LTD	PLBP-018* ("*" means: "A"- "Z")	--	UN 38.3	Accept test
(alternative)	GUANGDE DONGFENG ELECTRONICS CO LTD	PLBP-018* ("*" means: "A"- "Z")	--	UN 38.3	Accept test
Battery Cell	Ningbo Hanpu Tools Co., Ltd.	C18650P- 1300mAh	Li-ion, 3.6V, 1300mAh	IEC 62133	TÜV Rheinland JPTUV- 061222
(alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P- 2500mAh	Li-ion, 3.6V, 2500mAh	IEC 62133	TÜV Rheinland JPTUV- 084034
Supplementary information: For PLBP-018A; PLBP-018A-2P with adding rated capacity: 2.5Ah, 2.6Ah and 5.0Ah.					
¹⁾ Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

Section 38.3 of ST/SG/AC.10/11/Rev.6

Clause	Requirement + Test	Result - Remark	Verdict
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For PLBP-018A-2P:

TABLE 1: Altitude simulation						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	674.2	20.35	674.2	20.35	100.00	
002	671.7	20.35	671.7	20.34	99.95	
003	676.2	20.33	676.2	20.33	100.00	
004	673.4	20.41	673.4	20.41	100.00	
005	675.4	20.36	675.4	20.36	100.00	
006	689.4	20.39	689.4	20.38	99.95	
007	673.3	20.06	673.3	20.02	99.80	
008	672.6	20.10	672.6	20.08	99.90	

TABLE 2: Thermal test						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	674.2	20.35	674.2	20.08	98.67	
002	671.7	20.34	671.7	20.07	98.67	
003	676.2	20.33	676.2	19.73	97.05	
004	673.4	20.41	673.4	20.03	98.14	
005	675.4	20.36	675.4	20.07	98.58	
006	689.4	20.38	689.4	20.06	98.43	
007	673.3	20.02	673.3	19.79	98.85	
008	672.6	20.08	672.6	19.83	98.75	

Section 38.3 of ST/SG/AC.10/11/Rev.6

Clause	Requirement + Test	Result - Remark	Verdict
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TABLE 3: Vibration						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	674.2	20.08	674.2	20.07	99.95	
002	671.7	20.07	671.7	20.06	99.95	
003	676.2	19.73	676.2	19.44	98.53	
004	673.4	20.03	673.4	19.96	99.65	
005	675.4	20.07	675.4	20.03	99.80	
006	689.4	20.06	689.4	20.04	99.90	
007	673.3	19.79	673.3	19.78	99.95	
008	672.6	19.83	672.6	19.83	100.00	

TABLE 4: Shock						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
001	674.2	20.07	674.2	20.07	100.00	
002	671.7	20.06	671.7	20.06	100.00	
003	676.2	19.44	676.2	19.44	100.00	
004	673.4	19.96	673.4	19.96	100.00	
005	675.4	20.03	675.4	20.03	100.00	
006	689.4	20.04	689.4	20.04	100.00	
007	673.3	19.78	673.3	19.78	100.00	
008	672.6	19.83	672.6	19.83	100.00	

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE 5: External short circuit				P
Sample No.	OCV before test (V)	Ambient Temp. (°C)	External highest Temp. (°C)	
001	--	16.8	57.0	
002	--	16.8	56.7	
003	--	16.8	56.8	
004	--	16.8	57.1	
005	--	16.8	56.9	
006	--	16.8	57.1	
007	--	16.8	56.5	
008	--	16.8	57.4	

Section 38.3 of ST/SG/AC.10/11/Rev.6			
Clause	Requirement + Test	Result - Remark	Verdict

For PLBP-018A:

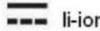
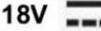
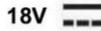
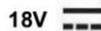
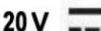
TABLE 3: Vibration						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
009	396.08	20.21	396.08	20.20	99.95	
010	391.25	20.26	391.25	20.25	99.95	
011	397.29	20.20	397.29	20.20	100.00	
012	397.01	20.43	397.01	20.42	99.95	
013	397.21	20.22	397.21	20.06	99.21	
014	398.20	20.34	398.20	20.33	99.95	
015	388.15	19.94	388.15	19.87	99.65	
016	387.67	20.45	387.67	20.43	99.90	

TABLE 4: Shock						P
Sample No.	Mass before test (g)	OCV before test (V)	Mass after test (g)	OCV after test (V)	Residual OCV (%)	
009	396.08	20.20	396.08	20.20	100.00	
010	391.25	20.25	391.25	20.25	100.00	
011	397.29	20.20	397.29	20.20	100.00	
012	397.01	20.42	397.01	20.42	100.00	
013	397.21	20.06	397.21	20.06	100.00	
014	398.20	20.33	398.20	20.33	100.00	
015	388.15	19.87	388.15	19.87	100.00	
016	387.67	20.43	387.67	20.43	100.00	

- End of Test Report -

Prüfbericht-Nr.: <i>Test Report No.:</i>	50098085 003	Auftrags-Nr.: <i>Order No.:</i>	244146645	Seite 1 von 4 <i>Page 1 of 4</i>	
Kunden-Referenz-Nr.: <i>Client Reference No.:</i>	N/A	Auftragsdatum: <i>Order date:</i>	31.05.2019		
Auftraggeber: <i>Client:</i>	Ningbo Hanpu Tools Co., Ltd. / Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. China				
Prüfgegenstand: <i>Test item:</i>	Rechargeable Li-ion Battery Pack				
Bezeichnung / Typ-Nr.: <i>Identification / Type No.:</i>	PLBP-018A; PLBP-018A-2P; PLBP-018A-20V; PLBP-018A-2P-20V				
Auftrags-Inhalt: <i>Order content:</i>	Type Test				
Prüfgrundlage: <i>Test specification:</i>	Section 38.3 of ST/SG/AC.10/11/Rev.6				
Wareneingangsdatum: <i>Date of receipt:</i>	N/A				
Prüfmuster-Nr.: <i>Test sample No.:</i>	N/A				
Prüfzeitraum: <i>Testing period:</i>	04.06.2019 – (Document check)				
Ort der Prüfung: <i>Place of testing:</i>	TÜV Rheinland (Shanghai) Co., Ltd				
Prüflaboratorium: <i>Testing laboratory:</i>	TÜV Rheinland (Shanghai) Co., Ltd				
Prüfergebnis*: <i>Test result*:</i>	Pass				
geprüft von / tested by:	kontrolliert von / reviewed by:				
04.06.2019 Patrick Wang / PE		04.06.2019 Qian Yuzeng / Reviewer			
Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>	Name / Stellung <i>Name / Position</i>	Unterschrift <i>Signature</i>
Sonstiges / Other: Client Contact: Tel.: 0574-88474547 The report is based on report: 50098085 001-002. For details, see Page 3.					
Zustand des Prüfgegenstandes bei Anlieferung: <i>Condition of the test item at delivery:</i>			Prüfmuster vollständig und unbeschädigt <i>Test item complete and undamaged</i>		
* Legende: 1 = sehr gut 2 = gut 3 = befriedigend 4 = ausreichend 5 = mangelhaft P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet Legend: 1 = very good 2 = good 3 = satisfactory 4 = sufficient 5 = poor P(ass) = passed a.m. test specification(s) F(ail) = failed a.m. test specification(s) N/A = not applicable N/T = not tested					
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens. <i>This test report only relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any test mark.</i>					

Copy of marking plate:

<p>PLBP-018A Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 1.3Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	<p>PLBP-018A Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 1.5Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	<p>PLBP-018A Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 2.0Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 
<p>PLBP-018A Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 2.5Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	<p>PLBP-018A-2P Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 2.6Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	
<p>PLBP-018A-2P Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 3.0Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	<p>PLBP-018A-2P Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 4.0Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	<p>PLBP-018A-2P Akku-pack</p> <p>18V  li-ion</p> <p>BJ: 201905 5.0Ah</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 
<p>PLBP-018A-20V Akku-pack</p> <p>20V  li-ion</p> <p>BJ: 201905 XXAh</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	<p>PLBP-018A-2P-20V Akku-pack</p> <p>20V  li-ion</p> <p>BJ: 201905 XXAh</p> <p>Ningbo Hanpu Tools Co., Ltd.</p> <p>Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA</p> 	

Remark: For Model PLBP-018A-20V, "XXAh" on the marking plate represents the rated capacity: 1300/1500/2000/2500mAh;
For Model PLBP-018A-2P-20V, "XXAh" on the marking plate represents the rated capacity: 2600/3000/4000/5000mAh.

General product information

Adding new model PLBP-018A-20V; PLBP-018A-2P-20V respectively based on PLBP-018A; PLBP-018A-2P, they are same except the nominal voltage.

For all models, the address of manufacturer and factory is changed to "Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA".

No additional tests need to be performed.

The main features of all battery packs are shown as below:

Battery pack Model	Rated voltage	Rated capacity	Recommended charging current	Recommended charging voltage	Discharge cut-off voltage	End charging voltage
PLBP-018A	18V d.c.	1300mA; 1500mA; 2000mA 2500mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.
PLBP-018A-2P	18V d.c.	2600mA; 3000mA; 4000mA; 5000mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.
PLBP-018A-20V	20V d.c.	1300mA; 1500mA; 2000mA 2500mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.
PLBP-018A-2P-20V	20V d.c.	2600mA; 3000mA; 4000mA; 5000mA	1000mA	21V d.c.	13.5V d.c.	21V d.c.

	Manufacturer	Model	Technical data	Standard	Mark(s) of conformity
Battery Cell	Ningbo Hanpu Tools Co., Ltd.	C18650P-1300mAh	Li-ion, 3.6V, 1300mAh	IEC 62133	TÜV Rheinland CB JPTUV-091966
(Alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P-1500mAh	Li-ion, 3.6V, 1500mAh	IEC 62133	TÜV Rheinland CB JPTUV-091966
(Alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P-2000mAh	Li-ion, 3.6V, 2000mAh	IEC 62133	TÜV Rheinland CB JPTUV-091966
(Alternative)	Ningbo Hanpu Tools Co., Ltd.	C18650P-2500mAh	Li-ion, 3.6V, 2500mAh	IEC 62133	TÜV Rheinland CB JPTUV-091966

Summary of testing:
None.
Test laboratory: TÜV Rheinland (Shanghai) Co., Ltd. No.177, 178, Lane 777 West Guangzhong Road, Jing'an District,Shanghai, China
Testing location: TÜV Rheinland (Shanghai) Co., Ltd. No.177, 178, Lane 777 West Guangzhong Road, Jing'an District,Shanghai, China
Factory: Ningbo Hanpu Tools Co., Ltd. Middle Street, Hengxi Town, Yinzhou District, Ningbo City, Zhejiang, P. R. CHINA

- End of Test Report -