Test Report

Report No.: AGC01085190801TA01

PRODUCT DESIGNATION	:	Li-Polymer Battery
BRAND NAME	:	CUBOT
MODEL NAME	:	P30
APPLICANT	:	Shenzhen Huafurui Technology Co., Ltd.
DATE OF ISSUE	:	Aug. 26, 2019
STANDARD(S)	:	IEC 62133-2:2017
REPORT VERSION	:	V1.0

***A**ttestation of **G**lobal **C**ompliance (Shenzhen) Co., Ltd*

IEC 62133-2:2017

Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems

Report Reference No.	AGC01085190801TA01
Tested by (+ signature)	Xu Ren
Reviewed by (+ signature)	Xue Jiajia
Approved by (+signature)	Matte He
Date of issue	Aug. 26, 2019
Contents	Total 26 pages.

Testing laboratory

Name	Attestation of Global Compliance (Shenzhen) Co., Ltd.
Address	2/F., Building 2, No.1-No.4, Chaxi Sanwei Technical Industrial Park, Gushu, Xixiang, Bao'an District, Shenzhen, Guangdong, China
Testing location	Same as above.

Applicant

Name	Shenzhen Huafurui Technology Co., Ltd.
Address	Unit 1401 & 1402, 14/F, Jinqizhigu mansion (No. 4 building of Chongwen Garden), Crossing of the Liuxian street and Tangling road, Taoyuan street, Nanshan district, Shenzhen, Guangdong province, China

Manufacturer

Name	Zhongshan Tianmao Battery Co., Ltd.
Address	No. 208, Qianjin 1st Road, Xinqianjin Village, Tanzhou Town, Zhongshan

Test specification

Standard	IEC 62133-2:2017
Test procedure	Type test
Procedure deviation	N/A
Non-standard test method	N/A

Test Report Form/blank test report

Test Report Form No.	AGC62133C1
Test Report Form(s) Originator	AGC
Master TRF	Dated 2017-09

Test item		
Product designation	:	Li-Polymer Battery
Brand name	:	CUBOT
Test model	:	P30
Rating(s)	:	3.85V, 4000mAh, 15.4Wh
Test item particulars		
Classification of installation and use	:	N/A
Supply connection	:	DC electrode tab
Recommend charging method declared by the manufacturer	:	800mA constant current charge to 4.4V, then constant voltage 4.4V charge till charged current declines to 20mA.
Discharge current(0.2I_tA)	:	800mA
Specified final voltage	:	3.0V
Chemistry	:	☐ nickel systems ☒ lithium systems
Recommend of charging limit for lithium system		
Upper limit charging voltage per cell	:	4.4V
Maximum charging current	:	4000mA
Charging temperature upper limit	:	45℃
Charging temperature lower limit	:	0℃
Polymer cell electrolyte type	:	☐ gel polymer ☐ solid polymer ☒ N/A
Test case verdicts		
Test case does not apply to the test object	:	N (/A)
Test item does meet the requirement	:	P (ass)
Test item does not meet the requirement	:	F (ail)
Testing		
Date of receipt of test item	:	Aug. 12, 2019
Date(s) of performance of test	:	Aug. 12, 2019 - Aug. 26, 2019
Attachment		
Attachment A	:	Photos of product

General remarks

This report shall not be reproduced except in full without the written approval of the testing laboratory.
The test results presented in this report relate only to the item tested.
"(See remark #)" refers to a remark appended to the report.
"(See appended table)" refers to a table appended to the report.
Throughout this report a point is used as the decimal separator.

Report Revise Record:

Report Version	Revise Time	Issued Date	Valid Version	Notes
V1.0	/	Aug. 26, 2019	Valid	Original report

General product information

	Battery	Cell
Model	P30	406488PPN
Nominal capacity	4000mAh	4000mAh
Nominal voltage	3.85V	3.85V
Nominal charge current	800mA	800mA
Nominal discharge current	800mA	800mA
Maximum charge current	4000mA	4000mA
Maximum discharge current	4000mA	4000mA
Maximum charge voltage	4.4V	4.4V
Cut-off voltage	3.0V	3.0V
Upper limit charge voltage	4.4V	4.4V
Taper-off current	200mA	200mA
Lower limit charge temperature	0℃	0℃
Upper limit charge temperature	45℃	55℃

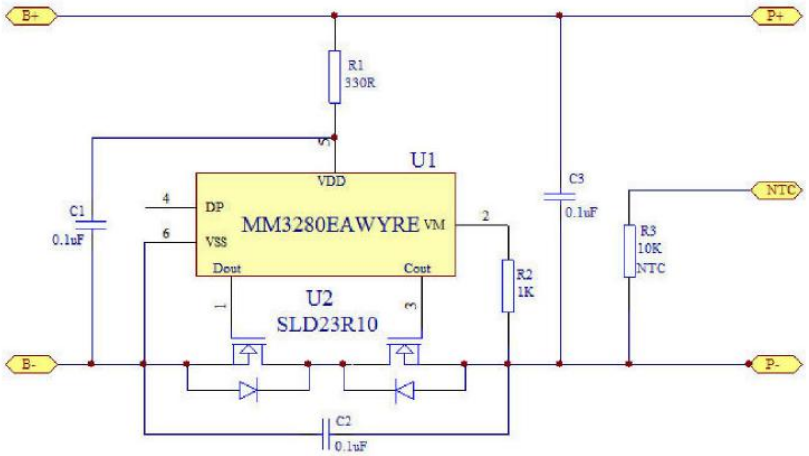
Copy of marking plate

This is reference label, final label should be including the content of it.

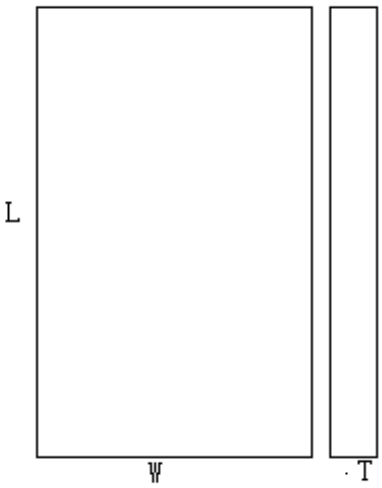
+ -
CUBOT
Li-Polymer Battery
P30
3.85V, 4000mAh, 15.4Wh
1ICP4/64/86 Date：YYYYMMDD

Remark: YYYY means year, MM means month, DD means day.

Circuit diagram

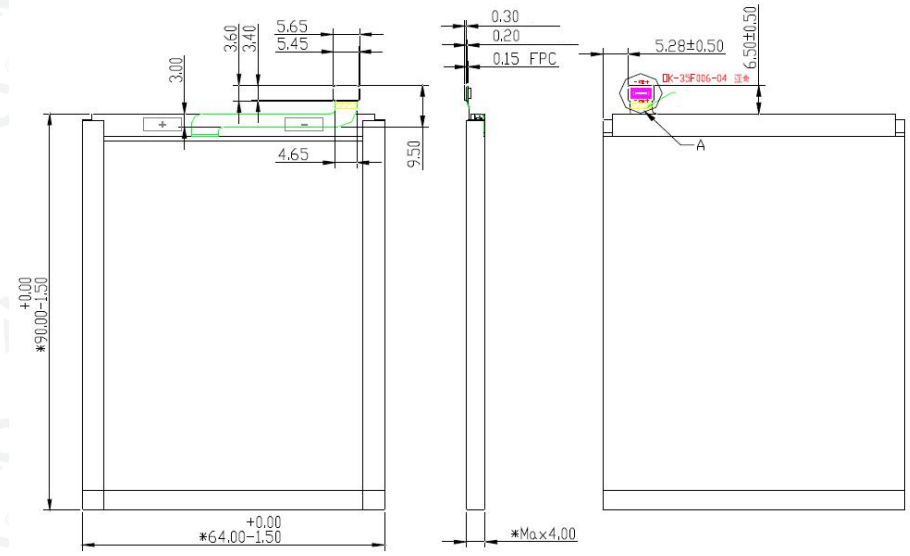


Construction



T	≤4.0mm
W	≤64.0mm
L	≤86.0mm

Cell



Battery (unit: mm)

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
4	**Parameter measurement tolerances**		**P**
	Parameter measurement tolerances	Comply with relevant requirements.	P

5	**General safety considerations**		P
5.1	**General**		P
	Cells and batteries so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse		P
5.2	**Insulation and wiring**		P
	The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ	Not metal case exists.	N
	Insulation resistance (MΩ):		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		P
	Orientation of wiring maintains adequate clearance and creepage distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		P
5.3	**Venting**		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition	Venting mechanism exists on the narrow side of pouch cell.	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		N
5.4	**Temperature, voltage and current management**		P
	Batteries are designed such that abnormal temperature rise conditions are prevented	Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 8.	P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer	See above.	P
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that specified chargers are designed to maintain charging within the temperature, voltage and current limits specified	The charging limits specified in the manufacturer's specification.	P
5.5	**Terminal contacts**		P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	DC electrode tab used.	P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		P

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
	Terminal contacts are arranged to minimize the risk of short-circuit		P
5.6	**Assembly of cells into batteries**		P
5.6.1	**General**		P
	Each battery have an independent control and protection for current, voltage, temperature and any other parameter required for safety and to maintain the cells within their operating region	Single cell battery	N
	This protection may be provided external to the battery such as within the charger or the end devices		N
	If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation		N
	If there is more than one battery housed in a single battery case, each battery have protective circuitry that can maintain the cells within their operating regions		N
	Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/ designer may ensure proper design and assembly		N
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer		N
	Protective circuit components added as appropriate and consideration given to the end-device application		N
	The manufacturer of the battery provide a safety analysis of the battery safety circuitry with a test report including a fault analysis of the protection circuit under both charging and discharging conditions confirming the compliance		N
5.6.2	**Design recommendation**		P
	For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2	Charging voltage: 4.4V, not exceed 4.4V specified in clause 7.1.2, Table 2	P
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks		N
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that charging is stopped when the upper limit of the charging voltage is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		N
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an		N

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
	overcharge protection		
	For batteries consisting of series-connected cells or cell blocks, cells have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer		N
	It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage		P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system		P
5.6.3	**Mechanical protection for cells and components of batteries**		P
	Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse		P
	The mechanical protection can be provided by the battery case or it can be provided by the end product enclosure for those batteries intended for building into an end product		P
	The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer		P
	For batteries intended for building into a portable end product, testing with the battery installed within the end product considered when conducting mechanical tests		P
5.7	**Quality plan**		P
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery	Complied. Quality plan provided.	P
5.8	**Battery safety components**		P
	According annex F	See TABLE: Critical components information.	P

6	**Type test and sample size**		**P**
	Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old		P
	Coin cells with resistance ≤ 3 Ω (measured according annex D) are tested according table 1	Not coin cells	N
	Unless otherwise specified, tests are carried out in an		P

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
	ambient temperature of 20 °C ± 5 °C		
	The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and overdischarge protection		P
	When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test		P

7	**Specific requirements and tests**		**P**
7.1	**Charging procedure for test purposes**		P
7.1.1	**First procedure**		P
	This charging procedure applies to subclauses other than those specified in 7.1.2		P
	Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of 20 °C ± 5 °C, using the method declared by the manufacturer		P
	Prior to charging, the battery have been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage		P
7.1.2	**Second procedure**		P
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		P
	After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method	Charging temperature specified by client is: 0-55℃ 60℃ used for upper limit tests; -5℃ used for lower limit tests.	P
7.2	**Intended use**		P
7.2.1	**Continuous charging at constant voltage (cells)**		P
	Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer	Tested complied.	P
	Results: No fire. No explosion. No leakage.....:	(See appended table 7.2.1)	P
7.2.2	**Case stress at high ambient temperature (battery)**	No moulded case exists.	N
	Oven temperature (°C).....:		—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells		N

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
7.3	**Reasonably foreseeable misuse**		P
7.3.1	**External short-circuit (cell)**		P
	The cells were tested until one of the following occurred:		P
	- 24 hours elapsed; or		N
	- The case temperature declined by 20 % of the maximum temperature rise		P
	Results: No fire. No explosion.....:	(See appended table 7.3.1)	P
7.3.2	**External short-circuit (battery)**		P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		P
	- The case temperature declined by 20 % of the maximum temperature rise		N
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		N
	A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test		N
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor		N
	Results: No fire. No explosion.....:	(See appended table 7.3.2)	P
7.3.3	**Free fall**		P
	Results: No fire. No explosion	No fire. No explosion	P
7.3.4	**Thermal abuse (cells)**		P
	Oven temperature (°C).....:	130°C ±2°C	—
	Results: No fire. No explosion	No fire. No explosion	P
7.3.5	**Crush (cells)**		P
	The crushing force was released upon:		P
	- The maximum force of 13 kN ± 0,78 kN has been applied; or		P
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N
	Results: No fire. No explosion.....:	(See appended table 7.3.5)	P
7.3.6	**Over-charging of battery**		P
	The supply voltage which is:		P

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
	- 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or		P
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and		N
	- Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached		P
	Test was continued until the temperature of the outer casing:		P
	- Reached steady state conditions (less than 10 °C change in 30-minute period); or		N
	- Returned to ambient		P
	Results: No fire. No explosion.....:	(See appended table 7.3.6)	P
7.3.7	**Forced discharge (cells)**		P
	If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration		P
	If the discharge voltage does not reach the negative value of upper limit charging voltage within the testing duration, the test is terminated at the end of the testing duration		P
	Results: No fire. No explosion.....:	(See appended table 7.3.7)	P
7.3.8	**Mechanical tests (batteries)**		P
7.3.8.1	**Vibration**		P
	Results: No fire, no explosion, no rupture, no leakage or venting..... :	(See appended table 7.3.8.1)	P
7.3.8.2	**Mechanical shock**		P
	Results: No leakage, no venting, no rupture, no explosion and no fire..... :	(See appended table 7.3.8.2)	**P**
7.3.9	**Design evaluation – Forced internal short-circuit (cells)**		N
	The cells complied with national requirement for.....:		N
	The pressing was stopped upon:		N
	- A voltage drop of 50 mV has been detected; or		N
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached		N
	Results: No fire.....:		N

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
8	**Information for safety**		P
8.1	**General**		P
	Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products	Information of safety mentioned in manufacturer's specification.	P
	Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards	Information of safety mentioned in manufacturer's specification.	P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N
	As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user		P
	Do not allow children to replace batteries without adult supervision		P
8.2	**Small cell and battery safety information**	Not small cell and battery	N
	The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them:		N
	- Keep small cells and batteries which are considered swallowable out of the reach of children		N
	- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion		N
	- In case of ingestion of a cell or battery, seek medical assistance promptly		N

9	**Marking**		P
9.1	**Cell marking**		P
	Cells marked as specified in IEC 61960, except coin cells	The final product is battery.	N
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity		N
	By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked		N
9.2	**Battery marking**		P
	Batteries marked as specified in IEC 61960, except for coin batteries	The battery is marked in accordance with IEC 61960, also see page 4.	P

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement	Not coin batteries.	N
	Terminals have clear polarity marking on the external surface of the battery	"+", "-"	P
	Batteries with keyed external connectors designed for connection to specific end products need not be marked with polarity markings if the design of the external connector prevents reverse polarity connections		N
9.3	**Caution for ingestion of small cells and batteries**	Not small cell and battery	N
	Coin cells and batteries identified as small batteries according to 8.2 include a caution statement regarding the hazards of ingestion in accordance with 8.2		N
	When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package		N
9.4	**Other information**		P
	Storage and disposal instructions	Information for storage and disposal instructions mentioned in manufacturer's specifications.	P
	Recommended charging instructions	Information for recommended charging instructions mentioned in manufacturer's specifications.	P

10	**Packaging and transport**		P
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3	Not coin cell	N
	The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		P

Annex A	**Charging and discharging range of secondary lithium ion cells for safe use**		P
A.1	**General**		P
A.2	**Safety of lithium ion secondary battery**	Complied.	P
A.3	**Consideration on charging voltage**	Complied.	P
A.3.1	General		P
A.3.2	Upper limit charging voltage	4.4V	P
A.3.2.1	General		P

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
A.3.2.2	Explanation of safety viewpoint	4.4V applied.	P
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied		P
A.4	**Consideration of temperature and charging current**		P
A.4.1	General		P
A.4.2	Recommended temperature range	Charging temperature declared by client is: 0-55℃.	P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied		P
A.4.3	High temperature range	Charging high temperature declared by client is:55℃.	P
A.4.3.1	General		P
A.4.3.2	Explanation of safety viewpoint		P
A.4.3.3	Safety considerations when specifying charging conditions in the high temperature range		P
A.4.3.4	Safety considerations when specifying a new upper limit in the high temperature range	60℃applied.	P
A.4.4	Low temperature range	Charging low temperature declared by client is: 0℃.	P
A.4.4.1	General		P
A.4.4.2	Explanation of safety viewpoint		P
A.4.4.3	Safety considerations, when specifying charging conditions in the low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	-5℃ applied.	P
A.4.5	Scope of the application of charging current		P
A.4.6	Consideration of discharge		P
A.4.6.1	General		P
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		P
A.4.6.3	Discharge current and temperature range		P
A.4.6.4	Scope of application of the discharging current		P
A.5	**Sample preparation**		P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short		P
A.5.3	Disassembly of charged cell		P

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
A.5.4	Shape of nickel particle		P
A.5.5	Insertion of nickel particle in cylindrical cell		N
A.5.5.1	Insertion of nickel particle in winding core		N
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator		N
A.5.6	Insertion of nickel particle in prismatic cell		P
A.6	**Experimental procedure of the forced internal short-circuit test**		N
A.6.1	Material and tools for preparation of nickel particle		N
A.6.2	Example of a nickel particle preparation procedure		N
A.6.3	Positioning (or placement) of a nickel particle		N
A.6.4	Damaged separator precaution		N
A.6.5	Caution for rewinding separator and electrode		N
A.6.6	Insulation film for preventing short-circuit		N
A.6.7	Caution when disassembling a cell		N
A.6.8	Protective equipment for safety		N
A.6.9	Caution in the case of fire during disassembling		N
A.6.10	Caution for the disassembling process and pressing the electrode core		N
A.6.11	Recommended specifications for the pressing device		N

Annex B	**Recommendations to equipment manufacturers and battery assemblers**	N

Annex C	**Recommendations to the end-users**	N

Annex D	**Measurement of the internal ac resistance for coin cells**		N
D.1	**General**		N
D.2	**Method**		N
	A sample size of three coin cells is required for this measurement..... :	(See appended table D.2)	N
	Coin cells with an internal resistance of less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1		N
	Coin cells with an internal resistance greater than 3 Ω require no further testing		N

IEC 62133-2:2017			
Clause	Requirement – Test	Result – Remark	Verdict
Annex E	**Packaging and transport**		N

Annex F	**Component standards references**	P

Table: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
PCB	SHENZHEN JIRUIDA CIRCUIT TECHNOLOGY CO., LTD	JRD-S	130°C	--	--
IC	MITSUMI ELECTRIC CO., LTD.	MM3280EAWYRE	Overcharge detection voltage: 4.475V±0.02V, Overdischarge detection voltage: 2.5V±0.035V, Discharging overcurrent detection voltage: 0.13V±0.01V, T_{OPR}: -40 to 85°C	--	--
MOSFET	SOLOSEMI	SLD23R10	V_{DS}: 20V, V_{GS}: ±10V, I_D: 9.5A, I_{DM}: 30A, T_{STG}: -55 to 150°C	--	--
NTC	MURATA MFG CO., LTD	NCP15XH103	10KΩ±1%, B=3380	--	--
Connector	OCN TECHNOLOGY	OK-35F006-04	30V AC, DC 3.0A (Power Pin), 0.3A (Signal Pin) Temperature: -25 to 85°C	--	--
Cell	Zhongshan Tianmao Battery Co., Ltd.	406488PPN	3.85V, 4000mAh	--	--
Electrolyte	Shenzhen Capchem Technology Co., Ltd	LBC3045Q19	$LiPF_6$, Dimethyl, carbonate, Ethyl acetate, Ethylene carbonate	--	--
Separator	Shenzhen xu ran Electronic Co., Ltd	11±2μm	PE, PVDF, Al_2O_3 two layers	--	--
Positive electrode	HuNan Shanshan Advanced Material Co., Ltd.	LC9000E/GL-9B	$LiCoO_2$	--	--
Negative electrode	Jiangxi Zichen Technology Co., Ltd	G49	Graphite	--	--
Aluminum plastic film	DNP	D-EL40H	113μm, Nylon Aluminum, cpp	--	--
Supplementary information: 1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

7.2.1	Table: Continuous charging at constant voltage (cells)			P
Sample no.	**Recommended charging voltage Vc (Vdc)**	**Recommended charging current I_{rec} (A)**	**OCV before test (Vdc)**	**Results**
C01	4.4	0.8	4.38	P
C02	4.4	0.8	4.39	P
C03	4.4	0.8	4.39	P
C04	4.4	0.8	4.39	P
C05	4.4	0.8	4.39	P

Supplementary information:

- No fire or explosion
- No leakage
- Others (please explain)

7.3.1	Table: External short-circuit (cell)				P
Sample no.	**Ambient T (°C)**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature ~~rise~~ ~~ΔT~~ (℃)**	**Results**
Samples charged at charging temperature upper limit (60℃)					
C06	54.1	4.36	88	123.1	P
C07	54.1	4.36	86	121.4	P
C08	54.1	4.37	87	124.5	P
C09	54.1	4.37	87	119.6	P
C10	54.1	4.37	89	123.5	P
Samples charged at charging temperature lower limit (-5℃)					
C11	55.2	4.29	86	124.3	P
C12	55.2	4.29	84	123.7	P
C13	55.2	4.29	87	122.3	P
C14	55.2	4.30	86	123.9	P
C15	55.2	4.30	87	125.8	P

Supplementary information:

- No fire or explosion
- Others (please explain)

7.3.2	Table: External short-circuit (battery)					P
Sample no.	**Ambient T (°C)**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature ~~rise ΔT~~ (℃)**	**Component single fault condition**	**Results**
B01	23.2	4.34	88	94.6	MOSFET U2	P
B02	23.2	4.35	87	98.5	MOSFET U2	P
B03	23.2	4.35	87	96.7	MOSFET U2	P
B04	23.2	4.34	88	98.9	MOSFET U2	P
B05	23.2	4.34	88	23.7	--	P
Supplementary information: - No fire or explosion - Others (please explain)						

7.3.5	Table: Crush (cells)			P
Sample no.	**OCV before test (Vdc)**	**OCV at removal of crushing force (Vdc)**	**Maximum force applied to the cell during crush (kN)**	**Results**
Samples charged at charging temperature upper limit (60℃)				
C16	4.36	4.36	13.14	P
C17	4.37	4.37	13.07	P
C18	4.37	4.37	13.25	P
C19	4.36	4.36	13.21	P
C20	4.36	4.36	13.19	P
Samples charged at charging temperature lower limit (-5℃)				
C21	4.29	4.29	13.07	P
C22	4.30	4.30	13.04	P
C23	4.30	4.30	13.15	P
C24	4.29	4.29	13.19	P
C25	4.29	4.29	13.22	P
Supplementary information: - No fire or explosion - Others (please explain)				

7.3.6	Table: Over-charging of battery	P
Constant charging current (A)..... :	8	—
Supply voltage (Vdc)..... :	6	—

Sample no.	OCV before charging (Vdc)	Total charging time (minute)	Maximum outer case temperature (°C)	Results
B06	3.38	70	23.2	P
B07	3.37	70	23.9	P
B08	3.37	70	23.4	P
B09	3.39	70	23.5	P
B10	3.38	70	23.6	P

Supplementary information:
- No fire or explosion
- Others (please explain)

7.3.7	Table: Forced discharge (cells)	P

Sample no.	OCV before application of reverse charge (Vdc)	Measured reverse charge I_t (A)	Lower limit discharge voltage (Vdc)	Results
C26	3.40	4	3.0	P
C27	3.41	4	3.0	P
C28	3.41	4	3.0	P
C29	3.40	4	3.0	P
C30	3.40	4	3.0	P

Supplementary information:
- No fire or explosion
- Others (please explain)

7.3.8.1	Table: Vibration	P

Sample no.	OCV before test (Vdc)	OCV after test (Vdc)	Mass before test (g)	Mass after test (g)	Results
B14	4.34	4.34	53.379	53.377	P
B15	4.34	4.34	53.087	53.085	P
B16	4.35	4.35	53.547	53.545	P

Supplementary information:
- No fire or explosion
- No rupture
- No leakage
- No venting
- Others (please explain)

7.3.8.2	Table: Mechanical shock				P
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test (g)**	**Results**
B17	4.35	4.35	53.377	53.375	P
B18	4.35	4.35	53.618	53.616	P
B19	4.34	4.34	53.448	53.446	P

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting
- Others (please explain)

7.3.9	Table: Forced internal short circuit (cells)				N/A
Sample no.	**Chamber ambient T (°C)**	**OCV before test (Vdc)**	**Particle location [1)]**	**Maximum applied pressure (N)**	**Results**
Samples charged at charging temperature upper limit (℃)					
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Samples charged at charging temperature lower limit (℃)					
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Supplementary information: --

D.2	Table: Internal AC resistance for coin cells			N/A
Sample no.	**Ambient T (°C)**	**Store time (h)**	**Resistance Rac (Ω)**	**Results [1)]**
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Supplementary information: --				

Attachment A
Photos of product

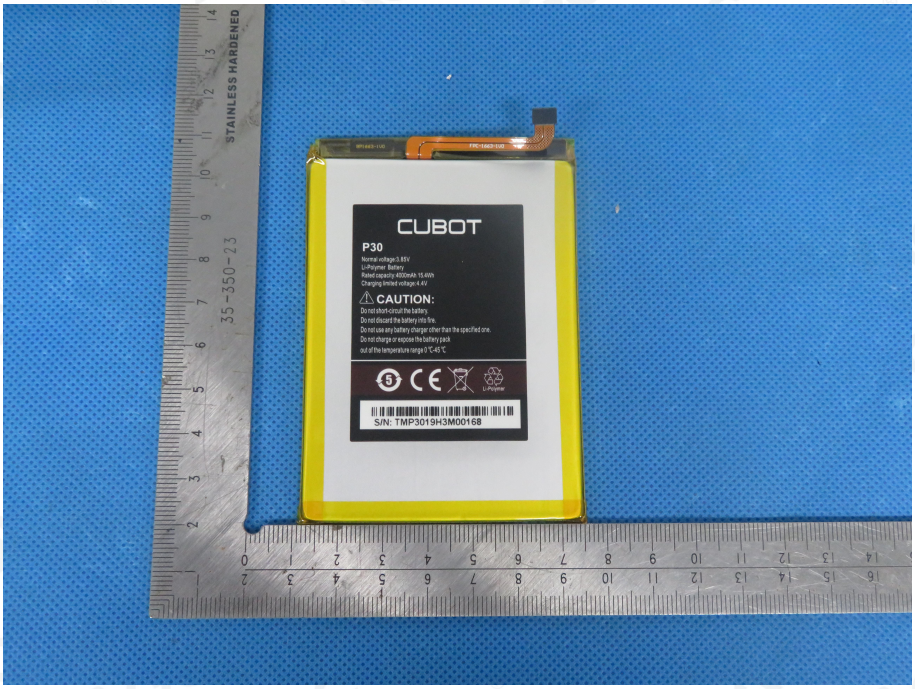

Fig. 1—View of battery

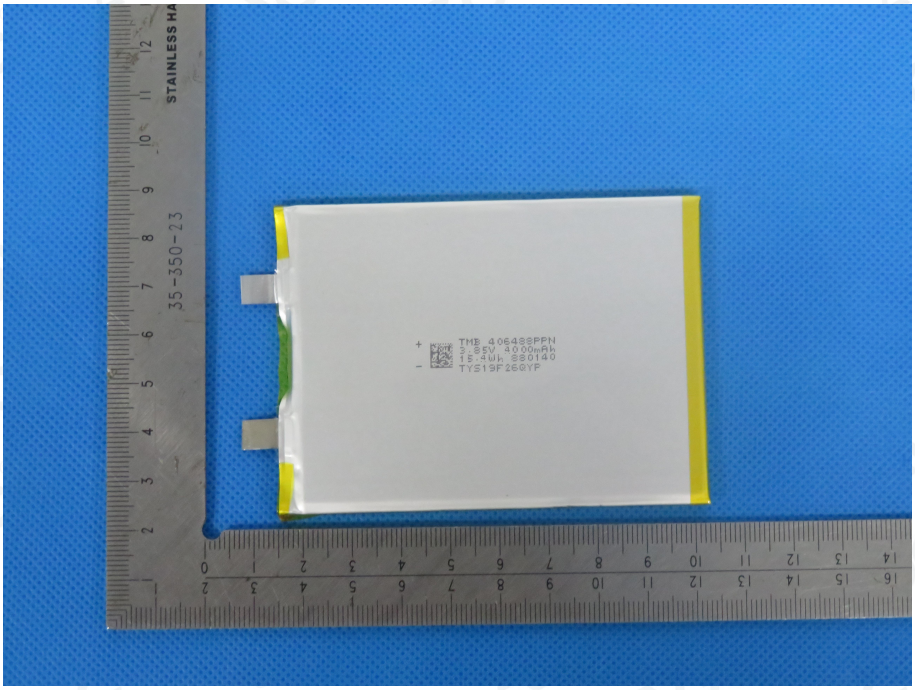

Fig. 2—View of cell

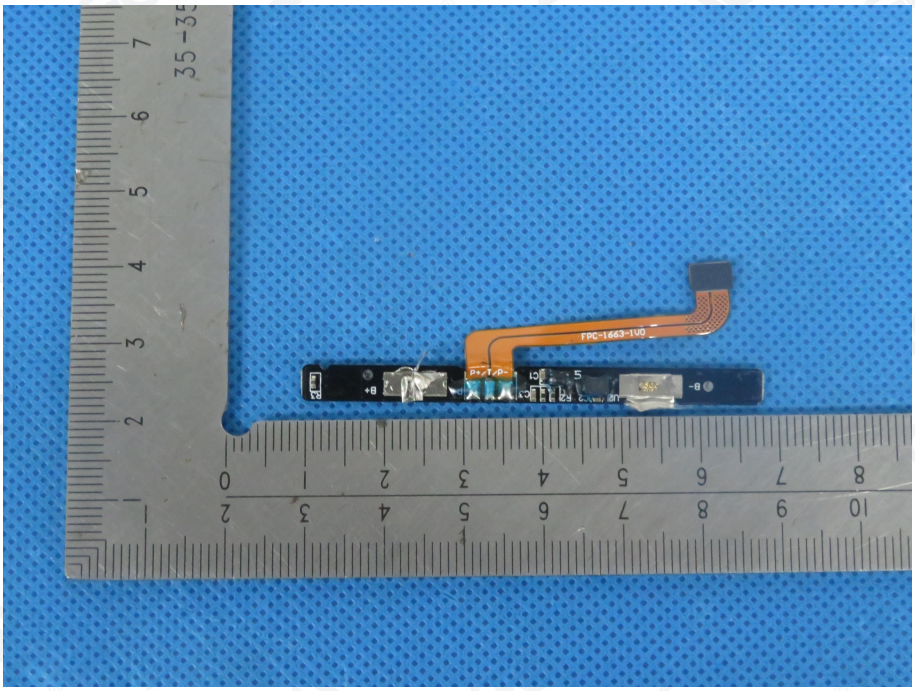

Fig. 3 ─ View of PCB

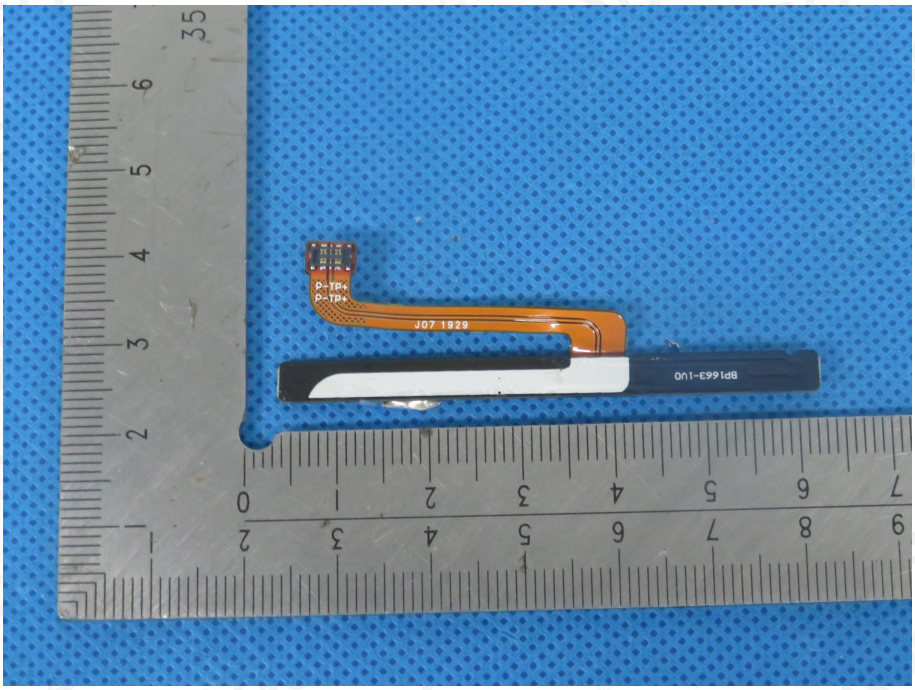

Fig. 4 ─ View of PCB

Test Equipment

No	Name	Model specifications	Device Number	Calibration validity	Using (√)
1	Battery Testing System	CT-3008W-15V3A	AGC-BT-E001	2020-01-14	√
2	Battery Testing System	CT-3008W-15V3A	AGC-BT-E002	2020-01-14	√
3	Battery Short-circuit Testing Machine	XB-OTS-Y3	AGC-BT-E009	2020-01-14	√
4	Battery Short-circuit Temperature Control Box	XB-OTS-T1	AGC-BT-E010	2020-01-14	√
5	Battery Crush Test Machine	XB-658	AGC-BT-E011	2020-01-14	√
6	Drop Test Machine	XB-OTS-220A	AGC-BT-E013	2020-01-14	√
7	Fast temperature change test chamber	EAT225-40A5	AGC-BT-E016	2020-01-14	√
8	DC regulated power supply	PSW30-36	AGC-BT-E045	2019-12-04	√
9	DC regulated power supply	PSW30-36	AGC-BT-E046	2019-12-04	√
10	DC regulated power supply	PSW30-36	AGC-BT-E047	2019-12-04	√
11	DC regulated power supply	PSW30-36	AGC-BT-E048	2019-12-04	√
12	Battery Testing System	CT-4008-5V6A-S1	AGC-BT-E062	2019-12-04	√
13	Battery Testing System	CT-4008-5V6A-S1	AGC-BT-E064	2019-12-04	√
14	Vibration Test Instrument	MPA403 /M124M /GT600M	AGC-BT-E070	2020-01-18	√
15	Temperature Experiment Chamber	EAT225-40A5	AGC-BT-E074	2020-01-14	√
16	Data Acquisition Instrument	34970A	AGC-BT-E076	2019-11-20	√
17	Electronic balance	JJ3233BC	AGC-BT-E079	2019-11-22	√
18	Battery Testing System	CT-4008-30V10A-NA	AGC-BT-E083	2019-11-22	√
19	Digital Multimeter	15B+	AGC-BT-E093	2019-12-05	√
20	Temperature controlled short circuit tester.	BE-8102	AGC-BT-E106	2019-09-16	√
21	Data Acquisition Instrument	AT4524	AGC-BT-E103	2019-09-16	√
22	Temperature control test machine	RF-311	AGC-BT-E112	2019-09-15	√
23	Mechanical Shock Tester	DP-1200-60	AGC-RE-E062	2019-12-10	√

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----END OF REPORT----