

锂离子电芯规格书

Specification For Lithium-ion Rechargeable Cell

电芯型号 : N18650CL-29

Cell Type : N18650CL-29

Document No	P/PR03/PB-D-N18650CL-29	revised date	2017-9-28
Version	A/04	Pages	11
Approved	Checked	Designed	
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1 preface 前言

This specification describes the type, dimension, performance, technical characteristics, warnings and cautions of the lithium ion rechargeable cell. The specification only applies to N18650CL-29 cells supplied by Shenzhen KH Battery Co., Ltd.

本标准描述了圆柱型锂离子电芯的外型尺寸、特性、技术要求及注意事项。本标准适用于深圳市科恒锂电有限公司生产的圆柱型N18650CL-29 锂离子电芯。

2 Definition 定义

2.1 Nominal capacity

标称容量

The nominal capacity is obtained by discharging a cell at 1-hour rate to cut-off voltage 2.5 V under 25 ± 2 °C. The rated capacity is signed as Cap and uses mAh as unit.

标称容量指在 25 ± 2 °C 环境下，以 1 小时率放电至终止电压 2.5V 时的容量，以 Cap 表示，单位为毫安时（mAh）。

2.2 Standard charge method

标准充电方式

Under 25 ± 2 °C, the cell is charged to 4.2V at a constant current of 0.5C (1375 mA), and then charged constantly under the voltage of 4.2V until the current reaches 0.01C (28 mA).

指在 25 ± 2 °C 环境下，以 0.5C (1375 mA) 的电流恒流充电至单体电芯电压 4.2 V 后，转为恒压 4.2 V 充电，至充电电流小于 0.01C (28 mA) 时，停止充电。

2.3 Standard discharge method

标准放电方式

Under 25 ± 2 °C, the cell is discharged to 2.5V at a constant current of 1C (2750 mA).

指在 25 ± 2 °C 环境下，以 1C (2750 mA) 恒流放电至单体电芯电压 2.5 V。

3 Cell type and dimension 电芯型号及尺寸

3.1 Description and model 电芯说明及型号

Description: Cylindrical Li-ion rechargeable cell

Model: N18650CL-29

N18650CL-29 型号的圆柱锂离子二次电芯

3.2 Cell dimension 电芯尺寸

Cell physical dimension is listed in Figure 1 (unit: mm).

电芯尺寸示意图如图 1 所示（单位：mm）。

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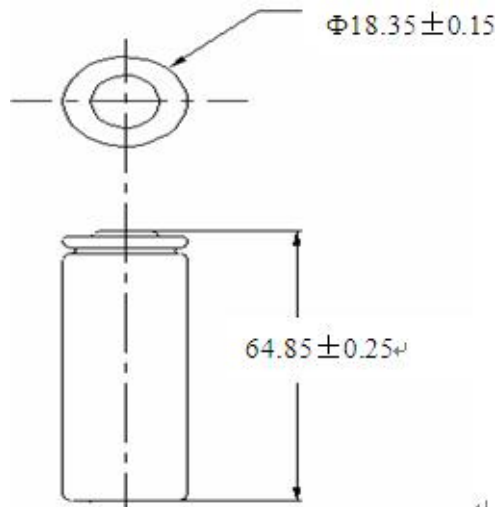


Figure 1/ 图 1

4 Cell characteristics (Unless otherwise specified, the cell is fresh cell and tested by standard charge and discharge.)

电芯特性 (除非有特殊说明, 否则所有测试要求为: 温度在 25 ± 2 °C 条件下, 样品为新电池, 充放电制度为标准充电和标准放电)

ITEM 项目		SPECIFICATION 规格
Capacity 容量	Rated capacity(Minimum) 倍率容量	2750 mAh @ 1 C
	Nominal capacity(Typical) 典型容量	2900 mAh @ 0.2 C
	Nominal capacity(Minimum) 最小容量	2800 mAh @ 0.2 C
Nominal voltage 标称电压		3.6 V
Charge voltage 充电电压		4.20 V
Discharge cut-off voltage 放电终止电压		2.50 V
Energy density 能量密度		213 Wh/Kg (1C) 225 Wh/Kg (0.2C)
Max charge current 最大充电电流		1C (2750 mA) 25 °C (not for cycle life)
Max discharge current 最大放电电流		3C (8250 mA) 25 °C (not for cycle life)
Storage temperature 存储温度		1 year: -20~25 °C 3 months: 25~45 °C 1 month: 45~60 °C

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Humidity range 湿度范围	0~60% RH (non-condensing 不冷凝)
Internal resistance 内阻	≤ 35 mΩ (AC Impedance, 1000 Hz)
Cell dimension 电芯尺寸	Height: 64.85 ± 0.25 mm 高度: 64.85 ± 0.25 mm Diameter: 18.35 ± 0.15 mm 直径: 18.35 ± 0.15 mm
Weight 重量	≤ 48 g

5 Technical requirements 技术要求

5.1 Cell usage conditions 电芯使用环境

Temperature of charge 充电温度: 0~45 °C

Temperature of discharge 放电温度: -20~60 °C

5.2 Cell testing conditions 电芯试验环境

Unless otherwise specified, all tests stated should be done under 25 ± 2 °C.

除非有特殊说明, 所有测试须在 25 ± 2 °C 环境下完成

5.3 Requirement of the testing equipment 测量仪表要求

The voltage measurement device: Not less than 0.5 grade

电压测量装置: 不低于 0.5 级

The current measurement device: not less than 0.5 grade

电流测量装置: 不低于 0.5 级

AC Impedance: 1000 Hz

交流阻抗测量频率: 1000 Hz

Temperature meter: precision ≤ 0.5 °C

温度仪表要求: 测量温度的仪表精度不高于 0.5 °C

Time measurement unit: ± 0.1%

时间测量装置: ± 0.1%

The size measurement device: ± 0.1%

尺寸测量装置: ± 0.1%

The quality measurement device: ± 0.1%

质量测量装置: ± 0.1%

5.4 Electrochemical Characteristics (Unless otherwise specified, the cell should be fresh cell and tested by standard charge and discharge.)

电芯特性 (除非有特殊说明, 否则所有测试要求为: 温度在 25±2 °C 条件下, 样品为新电池, 充放电制度为标准充电和标准放电)

NO. 序号	ITEM 测试项目	CRITERION 性能标准
5.4.1	Discharge rate	Test conditions: Temperature: 25 ± 2 °C

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	capability 倍率放电 性能	Charge: standard charge Discharge: CC discharge at variable values with cut-off voltage 2.5 V $\frac{\text{discharge capacity at } 3C}{\text{discharge capacity at } 1C} \geq 90\% ; \frac{3C \text{ 放电容量}}{1C \text{ 放电容量}} \geq 90\%$
5.4.2	循环寿命	Test conditions: Temperature : 25 ± 2 °C Charge: standard charge Discharge: standard discharge $\frac{\text{Discharge capacity of 501th cycle}}{\text{Original discharge capacity}} \geq 90\% ; \frac{\text{第501次循环的放电容量}}{\text{初始放电容量}} \geq 90\% \text{ or}$ $\frac{\text{Discharge capacity of 1001th cycle}}{\text{Original discharge capacity}} \geq 80\% ; \frac{\text{第1001次循环的放电容量}}{\text{初始放电容量}} \geq 80\%$
5.4.3	High-Low temperature discharge performance 高低温放电 性能	Test conditions: Charge: standard charge Discharge: CC discharge at 1C (2750 mA) under various temperatures with cut-off voltage 2.5V (2.0 V at -20 °C) $\frac{\text{discharge capacity at } -20^{\circ}\text{C}}{\text{discharge capacity at } 25^{\circ}\text{C}} \geq 70\% ; \frac{-20^{\circ}\text{C 放电容量}}{60^{\circ}\text{C 放电容量}} \geq 70\%$ $\frac{\text{discharge capacity at } 60^{\circ}\text{C}}{\text{discharge capacity at } 25^{\circ}\text{C}} \geq 90\% ; \frac{60^{\circ}\text{C 放电容量}}{60^{\circ}\text{C 放电容量}} \geq 90\%$
5.4.4	Storage performance 存储性能	5.4.4.1 RT Storage Performance (100% SOC) Test conditions: Charge: standard charge Stored at 25 °C for 28 days Discharge: standard discharge $\frac{\text{Residual capacity after 28 days storage}}{\text{Original discharge capacity}} \geq 85\% ; \frac{\text{存储28天残余容量}}{\text{初始容量}} \geq 85\%$ $\frac{\text{Recovery capacity after 28 days storage}}{\text{Original discharge capacity}} \geq 90\% ; \frac{\text{存储28天恢复容量}}{\text{初始容量}} \geq 90\%$ 5.4.4.2 High Temperature Storage Performance (100% SOC) Test conditions: Charge: standard charge

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		<p>Stored at 60 °C for 7 days Discharge: standard discharge after kept for 5 h at RT</p> <p style="text-align: center;"> <u>Residual capacity after 7 days storage</u> $\geq 85\%$; $\frac{\text{存储7天残余容量}}{\text{初始容量}} \geq 85\%$ Original discharge capacity </p> <p style="text-align: center;"> <u>Recovery capacity after 7 days storage</u> $\geq 90\%$; $\frac{\text{存储7天恢复容量}}{\text{初始容量}} \geq 90\%$ Original discharge capacity </p> <p>5.4.4.3 High Temperature Storage Performance(50%SOC)</p> <p>Test conditions: Charge: standard charge Discharge: CC discharge at 1C (2750 mA) for 30 min Stored at 45 °C for 28 days Charge: standard charge after kept for 5 h at RT Discharge: standard discharge</p> <p style="text-align: center;"> <u>Recovery capacity after 28 days storage</u> $\geq 90\%$; $\frac{\text{存储28天恢复容量}}{\text{初始容量}} \geq 90\%$ Original discharge capacity </p>
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5.5 Environmental characteristics and safety characteristics 环境适应性能和安全性能

NO. 序号	ITEM 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
5.5.1	Overcharge test 过充测试	No leak, no flame, no fire, no explosion 电芯不起火、不爆炸	After fully charged according to the standard charge method, the cell is charged at 1C till the ending conditions: the cell voltage reaches 1.5 times of the cut-off voltage of standard charge or the 1C charge time reaches 60 min. The cell is observed for 1 h afterwards. 电芯以标准充电方式充满电，然后以 1C 充电至电压达到充电终止电压的 1.5 倍或充电时间达 1h 后停止充电,观察 1h。
5.5.2	130 °C hot oven test 130 °C 热箱测试	No fire, no explosion 电芯不起火、不爆炸	After fully charged according to the standard charge method, the cell is put in a oven at a heating speed of 5 °C per minute until the temperatures of both the cell and the oven reach 130 °C. The cell shall be maintained at 130 °C for 30 min or until a fire or explosion is obtained. 电芯按照标准充电方式充满电后，将电芯放进热箱里，然后将热箱按 5 °C/min 升温到 130 °C，当电芯的温度也达到 130 °C 时，电芯在热箱 130 °C 环境下保持 30 min 或者电芯起火爆炸为止。

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5.5.3	Crush test 挤压测试	No fire, no explosion 电芯不起火、不爆炸	<p>After fully charged according to the standard charge method, the cell is crushed with a half cylinder, of which the radius is 75 mm and which is longer than the cell. The direction of the crushing force shall be vertical to axis of the cylinder. When the cell voltage reaches 0 V or the deformation extent reaches 30% or the crushing force reaches 200 kN, the test is stopped, and the cell is observed for 1 h.</p> <p>电芯以标准充电方式充满电,按垂直于电芯极板方向施压,挤压头为半径 75 mm 的半圆柱体,半圆柱体长度(L)大于被挤压电池的尺寸,当受挤压电芯电压达到0V 或变形量达到30%或挤压力达到200 kN 后停止挤压,观察 1 h。</p>
5.5.4	Short circuit test 短路测试	No fire, no explosion 电芯不起火、不爆炸	<p>After fully charged according to the standard charge method, the cell is short-circuited by connecting the positive and negative terminals with a copper wire for 10 min. The wire resistance shall be less than 5 mΩ. The cell is observed for 1 h after test.</p> <p>以标准充电方式充满电后,用内阻小于 5 mΩ 的电线将电芯正、负极外部短路 10min,观察 1h。</p>
5.5.5	Over discharge test 过放测试	No fire, no explosion, no leak 电芯不起火、不爆炸、不漏液	<p>After fully charged according to the standard charge method, the cell is discharged at 1 C for 90 min and then observed for 1 h.</p> <p>电芯按标准充电后以1C 电流放电90min,观察1h。</p>
5.5.6	Drop test 跌落测试	No fire, no explosion, no leak 电芯不起火、不爆炸、不漏液	<p>After fully charged according to the standard charge method, the cell is dropped with both ends from a height of 1.5 m onto the cement floor. Afterwards, the cell is observed for 1 h.</p> <p>电芯按标准充电后分别以正负端子两个方向从 1.5m 高度处自由跌落到水泥地面上。</p>
5.5.7	Seawater immersion 海水浸泡	No fire, no explosion, no leak 电芯不起火、不爆炸	<p>After fully charged according to the standard charge method, the cell is immersed in sea water (3.5wt% of NaCl) for 2 h. Afterwards, the cell is observed for 1 h.</p> <p>电芯按标准充电后完全浸入3.5% NaCl 溶液(质量百分比,模拟常温下的海水成分)中2h,并观察1h。</p>

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5.5.8	Thermal cycling 温度循环	No fire, no explosion, no leak 电芯不起火、不爆炸、不漏液	<p>After fully charged according to the standard charge method, the cell is put in an oven. Then</p> <ol style="list-style-type: none"> 1. Decrease the chamber temperature from RT to -40 °C within 60 min and keep the cell under -40 °C for 90 min. 2. Raise the chamber temperature from -40 °C to 25 °C within 60 min. 3. Raise the chamber temperature from 25 °C to 85 °C within 90 min and keep the cell under 85 °C for 110 min. 4. Decrease the chamber temperature from 85 °C to 25 °C within 70 min. 5. Repeat the sequence for a further 4 cycles. <p>Afterwards, the cell is observed for 1 h.</p> <p>电芯首先按标准制式充电，放入温度箱中，温度箱温度调节如下：</p> <ol style="list-style-type: none"> 1. 在 60 min 内由 25 °C 降温至 -40 °C，保持 90 min 2. 在 60 min 内温度升至 25 °C 3. 在 90 min 内温度升至 85 °C，保持 110 min 4. 在 70 min 内降温至 25 °C。 5. 循环以上步骤 4 次 <p>结束后观察 1h.</p>
5.5.9	Low pressure 低气压	No fire, no explosion, no leak 电芯不起火、不爆炸、不漏液	<p>After fully charged according to the standard charge method, the cell is put at the pressure of 11.6 kPa for 6 h. Afterwards, the cell is observed for 1 h.</p> <p>电芯以标准充电方式充满电后将其放入低气压箱中，调节试验箱中气压为 11.6 kPa，温度为室温，静置 6 h，之后观察 1 h。</p>
5.5.10	Penetration test 针刺测试	No fire, no explosion 电芯不起火、不爆炸	<p>After fully charged according to the standard charge method, the cell is penetrated with a needle (diameter 5 ~ 8 mm, cone angle 45°~ 60°) at speed of (25±5) mm/s. The surface of the needle shall be clean and stainless. The direction of penetration shall be vertical to axis of the cylinder. The needle shall be kept in the cell after penetrating. Afterwards, the cell is observed for 1 h.</p> <p>电芯以标准充电方式充满电，用 φ5mm~φ8mm 的耐高温钢针(针尖的圆锥角度为 45°~60°，针的表面光洁、无锈蚀、氧化层及油污)、以(25±5) mm/s 的速度，从垂直于电芯极板的方向贯穿，贯穿位置宜靠近所刺面的几何中心，钢针停留在电芯中，之后观察 1h。</p>
Note 备注	<p>Unless otherwise specified, all safety tests above shall be conducted in ventilated environment at 25 ± 2 °C and under protective equipment.</p> <p>除特殊说明，以上所有安全测试均应在 25°C±2 °C 通风橱中，且附带有保护装置的条件下进行。</p>		

6 Package picture 包装图片

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Small box

big box

pallet

(100pcs cells in a small box, 4 small boxes in a big box)

7 Shipment 出货

The Cell shall be shipped in voltage range of 3.6 ~ 3.9 V or in accordance with customers' requirement. The remaining capacity before charging shall be changed depending on the storage time and conditions.

单体电芯按 3.6~3.9V 的充电电压或客户要求出货,电芯出货后充电前的剩余容量取决于储存时间和条件。

8 Warranty 质量保证

The Warranty period of cell is made according to business contract. However, even though the problem occurs within this period, KH won't replace a new cell for free as long as the problem is not due to the failure of KH manufacturing process or is due to customers' abuse or misuse.

自出货之日起,电芯的保质期限依合同而定。但是,在此期限内,如果非科恒新能源科技(深圳)有限公司的制程原因,而是客户的误用造成的电芯质量问题,科恒新能源科技(深圳)有限公司不承诺免费更换。KH will not be responsible for the trouble caused by handling in violation of cautions in instructions.

科恒新能源科技(深圳)有限公司对违反安全守则操作所产生的问题不承担任何责任。

KH will not be responsible for the trouble caused by matching electric circuit, cell pack and charger.

科恒新能源科技(深圳)有限公司对与电路、电池组、充电器搭配使用所产生的问题不承担任何责任。

KH will not be responsible for any defect of cells caused during assembling after acceptance.

出货后客户在电芯组装过程中产生的不良电芯不在科恒新能源科技(深圳)有限公司质量保证的范围之列。

9 Storage and Shipment Requirement 存储及运输要求

	Item 项目	Requirement 要求
Storage environment 储存环境	Short period less than 1 month 短期少于 1 个月	45 °C ~ 60 °C, 60% RH Max
	Long period more than 3 month 长期超过 3 个月	25 °C ~ 45 °C, 60% RH Max
	Recommend storage 推荐存储	-20 °C ~ 25 °C, 60% RH Max
Long time storage :		
If the cell is stored for a long time, the cell's storage voltage should be 3.6~3.9 V. Also, it is recommended		

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to charge the cell every six months.

10 Warning and cautions in handling the lithium-ion cell

电芯使用时警告事项及注意事项

Lithium-ion rechargeable batteries subjected to abuse can cause damage to the cell and/or personal injury. Please read and observe the standard cell precautions below before utilization.

滥用锂离子充电电芯可能会造成电芯的损害或人身的伤害。在使用锂离子充电电芯以前，请仔细阅读以下的安全守则：

Note 1. The customer is required to contact KH in advance, if and when the customer needs other applications or operating conditions not described in this document.

注释 1. 如果客户需要其它应用程序或本档中描述之外的操作条件，客户需要提前联系比克。

Note 2. KH will take no responsibility for any accident when the cell is used under other conditions not described in this document.

注释 2. 在该文件说明的条件之外使用该电芯而产生的事故，科恒新能源科技（深圳）有限公司不承担任何责任。

Warnings 警告

To prevent the possibility of the battery from leaking, heating, explosion, please observe the following precautions: (It should be indicated especially in manual or instruction for users.)

危险警告：（应在使用说明手册或说明书中，特别注明）为防止电池可能发生泄漏，发热，爆炸，请注意以下预防措施：

1	Do not use and leave the cell near a heat source such as fire or heater. 禁止将电芯在热高温源旁，如火，加热器等旁边使用和留置。
2	Do not use or leave the cell under the blazing sun (or in heated car by sunshine). 不要将电芯放置在太阳光直射的地方。
3	Do not use or leave the battery at very high temperature conditions (e.g., strong direct sunlight or a vehicle in extremely hot conditions). Otherwise, it can overheat or catch fire or its performance will be degenerate and its service life will be decreased. 禁止在高温下（直热的阳光下或很热的汽车中）使用或放置电池，否则可能会引起电池过热，起火或功能失效，寿命减短。
4	Do not short circuit, over-charge or over-discharge the cell. 不要将电芯短路,过充或过放。
5	Don't immerse the battery in water and seawater. Please put it in cool and dry environment if no using. 严禁将电池浸入海水或水中，保存不用时，应放置在阴凉干燥的环境中。
6	Don't reverse the positive and negative terminals 严禁颠倒正负极使用电池。
7	Do not disassemble or modify the cell. 不要拆卸或修整电芯。
8	Do not transport or store the battery together with metal objects such as necklaces, hairpins, coins, etc. 禁止将电池与金属，如发夹，项链等一起运输或贮存。
9	Make sure the cell is not with conspicuous damage or deformation. 不要使电芯受到明显的损害或变形。

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10	Don't connect the cell to an electrical outlet directly. 严禁将电芯直接插入电源插座。
11	If the cell leaks and the electrolyte splashes into the eyes, rinse the eyes with clean running water immediately for at least 15 minutes, and go to hospital for treatment if necessary. 如果电芯发生泄露，电解液进入眼睛，请立即用清水冲洗眼睛至少 15 min，必要时请立即前往医院接受治疗。
12	Mixed use of batteries of different types is not allowed. 禁止与液态锂离子或不同型号的锂电池混合使用。
13	Keep the battery away from babies. 电池应远离小孩。
14	Do not directly solder the battery and pierce the battery with a nail or other sharp object 禁止直接焊接电池和用钉子或其它利器刺穿电池。
15	Do not strike, throw or trample the battery. 禁止敲击或抛掷，踩踏电池等。
16	Use the battery charger specifically for that purpose when charging. 充电时请选用锂离子电池专用充电器。
17	Please separate cells of different electrochemical systems from one another when disposing of secondary cells. 二次电池处理时，请将电池和其他电化学体系的产品分开。
18	Clean the terminals with a dry cloth before use if the battery terminals are dirty. Otherwise power failure or charge failure may occur due to the poor connection with the instrument. 如果电池弄脏，使用前应用干布抹净，否则可能会导致接触不良功能失效。
19	Batteries should be removed from the device or charger immediately and not used again if they are over heat, give off odor, discolor or deform, or appear abnormally in any way during use, charging and storage. 如果电池发出异味，发热，变色，变形或使用，贮存，充电过程中出现任何异常现象，立即将电池从装置或充电器中移离并停用。
20	The battery replacement shall be done only by either cell supplier or device supplier instead of the user. 更换电芯应由电芯供应商或设备供应商完成，用户不得自行更换。
21	Please tape the terminals to insulate batteries before discarding them in case of fire and explosion. 废弃电池之前应用绝缘纸包住电极，以防起火、爆炸。
22	Do not use cells in strong electrostatic and magnetic occasions, otherwise, it can cause safety problems easily. 禁止在强静电和强磁场的地方使用，否则易带来不安全的隐患。
23	Use of damaged cells is not permitted. 禁止使用已损坏的电芯。
24	Make sure package designing will not cause battery damages. 电池外壳设计和包装禁止损伤电池。
25	Battery packing should be conducted strictly according to level range, any misuse of different levels should not be permitted. 电池配组时需严格按等级执行，不能跨等级成组。
26	Disassembling cells from pack or module is not permitted unless under the guidance of professional

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technicians.
严禁将电池从电池包或电池模组中拆卸，除非在专业技术人员的指导下进行。

11 The restriction of the use of hazardous substances 有害物质控制要求

This model of lithium-ion cell is in accordance with our company's request of "The hazardous substances and material management standard" or customer's requirements.

本型号锂离子电芯符合本公司《有害物质与材料管理规范》要求或参照客户要求执行！

12 Contact information 联系方式

If you have any questions regarding the cell, please contact the following address:

如有疑问，请按以下地址联系：

Headquarter: 8th Floor, Building D8, Jindida Technology Park, Danlang Street, Longhua District, Shenzhen (518110)

厂址：深圳市龙华新区大浪街道金地大科技园D8栋8楼(518110)

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13 Version change record 修订履历

Version 版次	Change Content 修改内容	Page 页码	修改人 PIC	修改日期 Date
A/00	无	全部	孙新科	2016-06-13
A/01	存储温度由 3 months : -20~45 °C 变更为 25~45 °C 1 month : -20~60 °C 变更为 45~60 °C 存储湿度由 0~90% RH 变更为 0~60% RH	P2, P8	孙新科	2017-3-29
A/02	能量密度由 206Wh/Kg 更改为 213Wh/Kg 电芯重量由 ≤49g 更改为 ≤48g 电芯高度由 65.0 更改为 65.1	P2 P3 P2, P3	孙新科	2017-8-4
A/03	高度由 65.1Max 更改为 64.85±0.25; 帽盖直径由 18.50Max 更改为 18.35±0.15	P2, P3	孙新科	2017-8-16
A/04	将标称容量更改为倍率容量 增加最小容量 增加能量密度 225 Wh/Kg (0.2C)	P2	孙新科	2017-9-28

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