Cylindrical Li-ion Battery

Specification

圆柱型锂离子电池规格书

MODEL/型号: INR18650P-1700-2500mAh

Prepared By/Date 编 制/日 期	Checked By/Date 审 核/日 期	Approved By/Date 批 准/日 期
陈梅锋 2018/01/10	黄加军 2018/01/12	周燕 2018/01/12

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Contents（目录）

1. Scope（适用范围）

This specification is applied to this kind of battery in this Specification that manufactured by Dongguan K-Tech New Energy Co., Ltd.

本规格书适用于本书中所提及的东莞凯德新能源有限公司制造的电池。

The product is in compliance with the directives ROHS. 本产品符合 ROHS 标准。

2. Product type and model 产品种类及型号

2.1 Product type 产品种类

Cylindrical Li-ion Battery 圆柱锂离子电池

2.2 Product model 产品型号

18650

3. Product Specification（产品规格）

Table 1 (表 1)

No. (序号)	Item （项目）	General Parameter (常规参数)		Remark （备注）
1	Rated Capacity （额定容量）	Typical （标称容量）	2500mAh	Standard discharge（0.2C) after Standard charge （标准充电后 0.2C 标准放电）
		Minimum (最小容量)	2500mAh	
2	Nominal Voltage （正常电压）	3.7V		Mean Operation Voltage （即工作电压）
3	Voltage at end of Discharge （放电终止电压）	2.75V		Discharge Cut-off Voltage （放电截止电压）
4	Charging Voltage (充电电压)	4.2V		
5	Internal Impedance (内阻)	≤25mΩ		Internal resistance measured at AC 1KHz after 50% charge (半电态下用交流法测量内阻)The battery is new that is within one week after shipment and cycled less than 5 times(使用出货后不到一个星期及循环次数少于 5 次的新电池测量)
6	Standard charge （标准充电）	Constant Current 0.5C Constant Voltage 4.2V 0.02 C cut-off （持续电流：0.5C 持续电压：4.2V 截止电流：0.02 C）		

No. (序号)	Item （项目）	General Parameter (常规参数)	Remark （备注）
7	Standard discharge （标准放电）	Constant current 0.2C end voltage 2.75V （持续电流：0.2C 截止电压：2.75V）	
8	Maximum Continuous Charge Current (最大持续充电电流)	0.5 C	
9	Maximum Continuous Discharge Current （最大持续放电电流）	5C	
10	Operation Temperature Range （工作温度范围）	Charge（充电）: 0~45℃	60±25%R.H. Bare Cell （单体电池储存湿度范围）
		Discharge（放电）: -20~60℃	
11	Storage Temperature Range （储存温度范围）	Less than 1 year: -20~25℃ （小于一年：-20~25℃）	60±25%R.H. at the shipment state （出货状态时的湿度范围）
		Less than 3 months: -20~40℃ （小于 3 个月：-20~40℃）	
		Less than 7 day : -20~60℃ （小于 7 天：-20~60℃）	
12	Cell Dimension （电芯尺寸）	High/高度: 65.1±0.2 mm	Including thermoplastic pipe (含热塑套管)
		Diameter/直径:18.4±0.2 mm	
13	Cell Weight （电芯重量）	Approx.47g 约 47g	

4. The dimension and appearance 尺寸及外观

4.1 The dimension 尺寸

Please see the attached draw of 18650 请参见 18650 附图

Diameter 直径: 18.4±0.2

Height 高度：65.1±0.2

4.2 Appearance 外观

There shall be no defect such as scratch, flaw, crack, rust, leakage, which may affect commercial value of battery.

电池外表面清洁，无电解液泄漏，无明显的划痕及机械损伤，无变形，无影响电池价值的其它外观缺陷。

5. Performance And Test Conditions (电池性能及测试条件)

5.1 Standard Test Conditions 标准测试条件

Test should be conducted with new batteries within one month after shipment from our factory and cells shall not be cycled more than five times before test. Unless there is special requirement, test shall be done under temperature of 25±2℃ and relative humidity of 45~75%. The test results are not affected evidently by such conditions of temperature 18~30℃ or humidity 25~85%RH.

测试电池必须是本公司出厂时间不超过一个月的新电池，且电池未进行过五次以上充放电循环。除非其它特殊要求，本产品规格书规定的测试条件为：温度 25±2℃，相对湿度45%~75%。在温度18~30℃，相对湿度25%~85%的条件下进行实验，测试结果不会受到明显影响。

5.2 Measuring Instrument 测试仪器

5.2.1 Dimension Measuring Instrument 尺寸测量工具

The dimension measurement shall be implemented by instruments with equal or more precious scale of 0.01mm.

测量尺寸的仪器精度应大于等于0.01mm

5.2.2 Voltmeter 万用表

Inner impedance of voltmeter is more than 10 MΩ when battery voltage is measured.

测量电池电压时万用表内阻应大于10 MΩ。

5.2.3 Impedance Meter 内阻仪

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

内阻测试仪测量原理应为交流阻抗法（1kHz LCR）。

5.2.4 Ammeter（安培计）

Total external resistance including ammeter and wire is less than 0.01Ω.

电流表及电线在内的总外阻应小于 0.01Ω。

5.3 Standard Charge\Discharge（标准充放电）

5.3.1 Standard Charge：Test procedure and its criteria are referred as follows:

标准充电：测试过程及标准如下：

0.5C =1250mA

Battery is charged at a 0.5C constant current until the voltage reaches 4.2V, and then the cell shall be charged at constant voltage of 4.2 volts. Charging shall be terminated when the charging current has declined to 0.02 C. Charge time: Approx 3h. The cell shall be no permanent damage when it is charged between 0 ºC and 45 ºC.

电池先 0.5C 恒流充至 4.2V，当充电电流逐渐减小时再以 4.2V 恒压充至电流减小到 0.02C，充电时间大约为 3 个小时。在 0℃-45℃内充电电池应没有永久损害。

5.3.2 Standard Discharge（标准放电）

0.2C =500mA

Cells shall be discharged at a constant current of 0.2 C to 2.75 volts @25 ± 2℃

电池以 0.2 C 恒流放电至 2.75V@ 25± 2℃

5.4 If there is no special instruction, the rest time between charge and discharge is 10min.

如果没有特别说明，电池充放电间隔时间为 10 分。

5.5 Initial Performance Test（初始性能测试）

Table 3（表 3）

Item （项目）	Test Method and Condition （测试方法及条件）	Requirements （要求）
(1) Open-Circuit Voltage （开路电压）	The open-circuit voltage shall be measured within 24 hours after standard charge. （标准充电后 24 小时内测量开路电压）	≥4.15V
(2) Internal impedance (初始内阻)	Internal resistance measured at AC 1KHz after 50% charge.（半充电状态下，测量其 AC 1KHz 下的交流阻抗）	≤25mΩ
(3) Minimal Rated Capacity (最小额定容量)	The rest time is 10min after full-charge, and then battery is discharged to 2.75V using 0.2C (标准充电后，搁置 10min，使用 0.2C 电流放电至 2.75V)	Discharge Capacity （放电容量） ≥2500mAh

5.6 Electrical Performance 电性能测试

5.6.1 Discharge performance in different temperature 不同温度放电特性

Cells shall be charged according to 5.3.1 and discharged @0.2C to 2.75 volts. Cells shall be stored for 4 hours at the test temperature prior to discharging and then shall be discharged at the test temperature. The capacity of cell at each temperature shall be compared to the capacity at 25 ºC and the percentage shall be calculated. Each cell shall meet or exceed the requirements of Table 4.

电池按 5.3.1 规定充电。按表 4 的温度中放电，电池必须先在该试验温度中放置 4 个小时。在每个温度下储存 4 个小时后的放电容量应不小于表 4 的要求。

Table 4（表 4）

Discharge Temperature 放电温度	-20℃	25℃	60℃
Capacity maintaining ratio 容量保持率	60%	100%	95%

5.6.2 Cycle Life 循环性能

The rest time is 10min after standard charge. Then the cell will be discharged to 2.75V using 0.5C, The rest time is 10min after discharging. The test shall be terminated when discharging capacity ≤80% of initial capacity in three consecutive cycles. Temperature of standard charge and discharge is 25±2℃.

电池使用0.5 C充电，搁置10min，使用1 C放电，搁置10min，作充放电循环测试，直至电池放电容量连续3次小于初始容量的80%，测试温度为25±2℃（影响电池循环性能的重要参数），要求为：

Cycle time≥500 times 循环次数≥500次

The rest time is 10min after standard charge. Then the cell will be discharged to 2.75V using 3C, The rest time is 15min after discharging. The test shall be terminated when discharging capacity ≤80% of initial capacity in three consecutive cycles. Temperature of standard charge and discharge is 25±2℃.

电池使用0.5 C充电，搁置10min，使用3 C放电，搁置15min，作充放电循环测试，直至电池放电容量连续3次小于初始容量的80%，测试温度为25±2℃（影响电池循环性能的重要参数），要求为：

Cycle time≥300 times 循环次数≥300次

5.6.3 Capacity retention ability 容量保持能力

Table 5（表 5）

Item 项目			
Storage Characteristics 贮存特性	A1	The cell is charged and discharged using 0.5 C. The discharge capacity is C1. The cell is stored for 30 days in 25 ±2℃ after fully charged and then is discharged using 0.5 C. The capacity is defined as C2. 电池按 0.5 C 电流充放电，放电容量为 C1，满电电池在 25±2℃的温度下储存 30 天后，使用 0.5 C 电流放电，容量为 C2。	Capacity maintaining ratio C2/C1≥85% 容量保持率≥85%
	A2	The cell is cycled for 3 times using 0.5 C after A1 stage. The maximum discharge capacity is C3. 0.5 C 循环3次，测试恢复容量（3周循环的最大放电容量C3）	Capacity recoverable ratio C3/C1≥95% 容量恢复率≥95%
	B1	The cell is charged and discharged using 0.5 C. The discharge capacity is C4. The cell is stored for 7 days in 60 ±2℃ after fully charged and then is discharged using 0.5 C. The capacity is defined as C5. 电池按0.5 C电流充放电，放电容量为C4，满充电池在60±2℃的环境中贮存7天后，测试0.5 C 放电容量C5	Capacity maintaining ratio C5/C4≥85% 容量保持率≥85%
	B2	The cell is cycled for 3 times using 0.5 C after B1 stage. The maximum discharge capacity is C6. 0.5 C 循环 3 次，测试恢复容量（3 周循环的最大放电容量C6）	Capacity recoverable ratio C6/C4≥95% 容量恢复率≥95%

5.6.4 Long Time Storage Characteristics 长期贮存性能

The experimental battery is less than 3 months from the date of production. The battery of 50% SOC after a period of storage at 25±2℃ for one year (365 days). The available recovery capacity is more than 85% of C1 with 0.5C charge and discharge. The capacity is the maximum capacity of preceding three cycles.

进行该项实验的电池应选生产日期到实验日期不足3个月的电池，贮存实验前给电池充入50%的容量，然后开路搁置365天，在25±2℃的环境条件下用0.5C的电流连续充放电循环3次，最大的放电容量为恢复容量，容量的恢复率大于85%。

5.7 Environmental adaptability 环境适应性

Table 7（表 7）

No. (序号)	Items （项目）	Test Method and Condition （测试方法及条件）	Criteria （标准）
1	Vibration Test 振动测试	A full-charged battery is to be subjected to simple harmonic motion with an amplitude of 1.6 mm total maximum excursion. The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz. The cell shall be vibrated for 45 minutes along vertical axis to each other. 将满充电后的电芯固定在振动台上，沿相互垂直的两个轴各振动45分钟，振幅1.6mm，振动频率为10Hz~55Hz，每分钟变化1Hz。	No leakage 不泄漏 No fire 不起火 No explosion 不爆炸
2	Crush test 挤压测试	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram with a 32 mm diameter piston. The crushing is to be continued until a pressure reading of 17.2mPa is reached on the hydraulic ram, applied force of 13kN. Once the maximum pressure has been obtained it is to be released. 将电池放在平板间进行挤压，其压力通过一个直径为Φ32mm的液压缸进行施压，直到压力达到17.2Mpa，施加的压力为13KN，当达到压力后泻压。	No fire 不起火 No explosion 不爆炸
3	Impact （冲击试验）	A test sample battery is to be placed on a flat surface. A 15.8 mm diameter bar is to be placed across the center of the sample. A 9.1 kg weight is to be dropped from a height of 610±25 mm onto the sample. sample. （用一条直径为15.8mm的圆棒放置在电池中央，将一9.1Kg的重锤从610mm的高度垂直落下在电池的中心位置）	No explosion, No fire (无起火无爆炸)
4	Altitude Simulation) Test 高空低压模拟	The full-charged batteries are to be stored for 6 hours at an absolute pressure of 11.6 kPa and a temperature of 25 ±2 ℃. 将电池放入真空箱中，逐渐抽真空至气压小于或等于11.6KPa，并在此气压下保存6H。	No leakage 不泄漏 No fire 不起火 No explosion 不爆炸

5.8 Safety performance 安全性能

Table 8（表 8）

Item （项目）	Battery Condition （电池要求）	Test Method （测试方法）	Requirements （要求）
Short Circuit （短路试验 25℃和 60℃）	Fresh, Fully charged （充满电的新电池）	Each test sample battery, in turn, is to be short-circuited by connecting the positive and negative terminals of the battery with a Cu wire having a maximum resistance load of 0.1ohm. Tests are to be conducted at 25℃ and 60℃. 分别在 25℃and 60℃的环境温度下，依次用最大内阻不超过 0.1Ω 的铜线连接电池的正负极。	No explosion, No fire The Temperature of the surface of the Cells are lower than 150℃ (无起火无爆炸电池表面温度应低于 150℃)
Over Discharge （过放试验）	Fresh, Fully charged （充满电的新电池）	Discharge at a current of 1 C for 2.5h. （以 1C 的电流放电 2.5 小时）	No explosion, No fire (无起火无爆炸)
Over charge (过充试验)	Fresh, Fully charged （充满电的新电池）	Charge at a current of 3 C until the voltage of cell reaches 10V. （以 3C 的电流充电至 10V）	No explosion, No fire (无起火无爆炸)
Heating test 热冲击测试	Fresh, Fully charged （充满电的新电池）	A battery is to be heated in a gravity convection or circulating air oven with an initial temperature of 25±2 ℃. The temperature of the oven is to be raised at a rate of 5±2°C per minute to a temperature of 130±2°C and remain for 10 minutes. The sample shall return to room temperature (25 ±2 ℃) and then be examined. 电池放置于热箱中，温度以（5±2）℃/min 的速率升至（130±2）℃并保温 10min	No explosion, No fire (无起火无爆炸)

6. Using guidance of battery 电池使用指南

Please read the manual carefully before using it in order to ensure proper use of the battery.
（为确保正确使用电池，使用前请仔细阅读本细则）

6.1 Do not expose to, dispose of the battery in fire.（不要靠近和放置电池于火中）

6.2 Do not put the battery in a charger or equipment with wrong terminals connected.
（在充电器或设备仪器中不要把电池接错电极）

6.3 Avoid short circuit of the battery（避免电池短路）

6.4 Avoid excessive physical shock or vibration.（避免电池过多的物理撞击和震动）

6.5 Do not disassemble or deform the battery.（不要解剖和使电池变形）

6.6 Do not immerse the battery in water.（不要把电池浸泡在水中）

6.7 Do not use the battery mixed with different kinds of batteries.
（不要和其它不同类型的电池混和使用）

6.8 Keep out of the reach of children.（放置电池于儿童不易接触的地方）

6.9 Charge and discharge（充电和放电）

6.9.1 Charging（充电）

Charging current：Do not surpass the biggest charging current which is in this specification 。
（充电电流：不能超过规格书上规定的最大充电电流）

Charging voltage：Do not surpass the highest voltage which is in this specification。
（充电电压：不能超过规格书上规定的最大充电电压）

Charge temperature：The charge temperature is in according to this specification.
（充电温度：电池充电必须符合规格书中规定的温度范围）

6.9.2 Discharge（放电）

Discharging current：Do not surpass the biggest discharging current which is in this specification 。
（放电电流：不能超过规格书上规定的最大放电电流）

Discharging voltage：Do not be less than the lowest voltage which is in this specification。
（放电电压：不能低于规格书上规定的最大充电电压）

Discharging temperature：The discharge temperature is in according to this specification.
（放电温度：电池充电必须符合规格书中规定的温度范围）

6.9.3 Electric discharge temperature（放电温度）

The battery discharge must carry on in the ambient temperature which this specification stipulates.
（电池放电必须在本规格书规定的环境温度范围）

6.10 Disposal（电池处理）

Dispose battery in accordance with local regulations.（电池处理要符合当地的规定）

6.11 The storage of battery（储存电池）

The battery should be stored in a cool, dry and well-ventilated area.

（应把电池置于凉爽、干燥及通风良好的区域）

The battery should be stored in the ambient temperature according to specification. The battery should be charged again if the storage time is over six months.（电池应在本产品规格书中规定的温度范围内储存。如果储存时间超过六个月，建议对电池进行额外充电。）

7. Period of warranty（保质期）

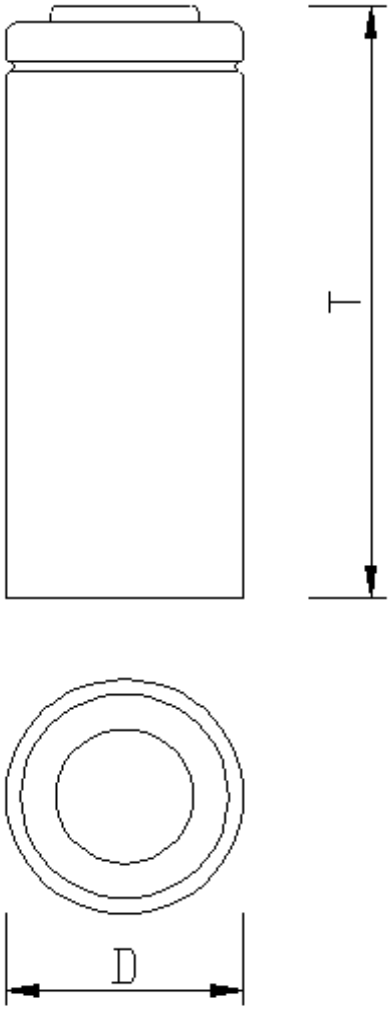
The period of warranty is a year from the date of shipment. K-Tech company guarantees the battery can be replaced due to quality problem of battery instead of the customer's abuse and misuse.

（保质期从出货之日起一年。如果是电池本身的缺陷而不是用户错用滥用造成的质量问题，本公司确保更换）

8. Note: Any other items which are not contained in this specification shall be agreed by both parties.

（备注：任何本产品规格书未包含的其它条款，应由双方协议确定。）

9. Initial Dimension（初始尺寸）：



Units/单位: mm

D	18.4±0.2	T	65.1±0.2	Date 日期	
Drawer 绘图		Checked 审核		Approved 批准	
K-TECH			INR18650P -1700-2500 DRAWING		
			Drawing ID/图号		