**河南乾坤太阳能**

太阳能储能路灯用电池产品规格书

Power Lithium-Ion battery Specification

**型 号/Model : QK-11.1V60Ah**

**客户名称/ Customer :**

**文件编号/Document NO.:**

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| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
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|  |  |
| --- | --- |
| 目录/Contents | Page |
| 封面 Cover |  |
| 目录 Catalogue---------------------------------------------------------------------- | 1 |
| 1、 适用范围 Scope------------------------------------------------------------- | 2 |
| 2、 电池组特性 Battery group specifications------------------------------------ | 2 |
| 3、 单体电池性能 Cell Performance--------------------------------------------------------- | 3 |
| 4、 环境适应性 Environmental Function------------------------------------------------- | 6 |
| 5、 安全性 Safety tests------------------------------------------------------------------------------ | 7 |
| 6、 测试条件 Test Conditions-------------------------------------------------------- | 9 |
| 7、 储存及其它事项 Storage and Others----------------------------------------- | 9 |
| 8、 警告 Caution------------------------------------------------------------------------ | 10 |
| 9、 免责声明 Free-responsibility declaration------------------------------------ | 11 |
| 10、 附录 Appendix---------------------------------------------------------------------- | 12 |

|  |  |  |  |
| --- | --- | --- | --- |
| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

# 1、适用范围 Scope

本规格书描述的环保型镍钴锰酸锂三元体系软包电池组产品适用于需要采用电池组供电的太阳能储能路灯。

2、电池组特性 Battery group specifications

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| 电池组  PACK | 规格型号 model | | QK-11.1V60Ah |
| 电池材料 Battery material | | 镍钴锰酸锂三元体系 |
| 组合方式 Combination method | | 3P6S |
| 最小容量 Minimal capacity（0.2C） | | 60Ah |
| 额定容量 Minimal capacity（0.2C） | | 60Ah |
| 额定电压 Nominal voltage | | 11.1V |
| 最大充电电压 Max. charge voltage | | 12.6V |
| 放电截止电压 Discharge cut-off voltage | | 9.0V |
| 最大充电电流 Max Charge current | | 15A |
| 最大放电电流 Max Working current | | 10A |
| 标准充电电流 Standard charge current | | 5A |
| 标准放电电流 Standard charge current | | 5A |
| 电池组内阻标准 Pack Impedance standard | | ≤400 m |
| 参考电池重量 Weight (Approx.) | | ≈4.2Kg |
| 最大外形尺寸 Max. dimension（L×W×H）(mm) | | 225\*70\*143 |
| 适用温度  Operating temperature | 充电 Charge temperature | -10℃～55℃ |
| 放电 Discharge temperature | -10℃～55℃ |
| 本电池正极采用镍钴锰酸锂三元体系材料制作，绿色环保，无需加酸，无异味，安全性好，高温性好，使用寿命长(同比使相同规格铅酸电池，用寿命是铅酸电池的 3 倍以上)，具有较高的密封性能，机械强度高，重量轻，方便搬运和安装。 | | | |

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| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

3、电池组性能Battery Pack Performance

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| 项目Items | 测试方法 Test Methods | 合格标准  Acceptance criteria |
| 3.1 低温放电容量Discharge capacity at -10 °C | 电池按照6.1 规定方法充电后，在-10℃±2℃下贮存  16h~24h，然后在-10℃±2℃ 下，以 0.2 C 放电至终止电压。  Step 1- The battery shall be charged in accordance with  6.1。Step 2 - The battery shall be stored， in an ambient temperature of −10 °C ± 2 °C， for not less than 16 h and not more than 24 h 。 Step 3 - The battery shall be discharged， in an ambient temperature of −10 °C ±  2 °C， at a constant current of 0.2 C，until its voltage is equal to the specified end-of-discharge voltage。 | 放电容量/标称容量  ×100%  Discharge Capacity/Nominal capacity×100%）  0.2C：≥60% |
| 3.2 高温放电容量Discharge capacity at 55 °C | 电池按照6.1 规定方法充电后，在35℃±2℃下贮存  5h，然后在45℃±2℃ 下，以 0.2 C 放电至终止电压 。 Step 1- The battery shall be charged in accordance with 6.1。Step 2 - The battery shall be stored， in an ambient temperature of 35℃ ± 2 °C。Step 3 - The battery shall be discharged， in an ambient temperature of 45℃ ± 2 °C， at a constant current of 0,2C， until its voltage is equal  to the specified end-of-discharge voltage。 | 0.2C: ≥95% |
| 3.3倍率性能  High rate discharge performance at 20 °C | 电池按照6.1 规定方法充电后，在20°C±5°C 搁置1~4 小时，然后在 20±5℃的环境下，以0.1C/ 0.2 C /放电至终止电压。  Step 1 –The cell or battery shall be charged in accordance with 6.1。Step 2 –The cell or battery shall be stored， in an ambient temperature of 20°C ± 5°C， for not less than 1 h and not more than 4 h。  Step 3 –The cell or battery shall be discharged， in an ambient temperature of 20°C ± 5°C， at a constant current of 0.1C/ 0.2 C， until its voltage is equal to the  specified end-of-discharge voltage。 | 0.1C: ≥100%  0.2C :≥95% |

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| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
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| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

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| 3.4荷电保持/恢复能力Charge retention and recovery | 电池按照6.1 规定方法充电后，在 25±2℃的环境下贮存 28 天。再以0.5C 放电至终止电压。放电后的电池在24h内按照6.1充电，然后在 25±2℃的环境下保存  1~4小时，再以0.2 C 放电至终止电压。  Step 1- The battery shall be charged in accordance with  6.1。Step 2 - The battery shall be stored in an ambient temperature of 20°C ± 5°C， for 28 days。Step 3 - The battery shall be discharged， in an ambient temperature  of 20°C ± 5°C， at a constant current of 0.5 C， until its voltage is equal to the specified end-of-discharge  voltage。  Step 4 – The battery shall then be charged in accordance with 6.1， within 24 h following the discharge of step  3 。 Step 5 – The cell or battery shall be stored， in an ambient temperature of 20°C ± 5°C， for not less than 1 h and not more than 4 h 。 Step 6 – The cell or battery shall be discharged， in an ambient temperature of 20°C  ± 5°C， at a constant current of 0.2 C， until its voltage is equal to the specified end-of-discharge voltage。 | 0.2C: ≥95% |
| 3.5存储性能  Charge recovery after storage | 电池按照6.1 规定方法充电后，在 25℃±2℃下，以  0.5 C 放电60分钟，然后在 25℃±2℃下贮存 60 天。电池按4.1方法充电，搁置1~4小时，然后在 25±2℃ 下，以0.2 C 放电终止电压。充放电循环允许进行5 次。  The battery shall be charged in accordance with 6.1。The battery shall be discharged， in an ambient temperature of 20°C ± 5°C， at a constant current of 0.5 C， for 60min 。  The battery shall be stored in an ambient temperature of 20°C ± 2°C， for 90 days 。  The battery shall be charged， in an ambient temperature of 20°C ± 5°C， in accordance with 6.1 。The battery shall be stored， in an ambient temperature of 20°C ± 5°C， for not less than 1 h and not more than 4 h。  The battery shall be discharged， in an ambient temperature of 20°C ± 5°C， at a constant current of 0.2C， until its voltage is equal to the specified  end-of-discharge voltage。 Charge-discharge cycle may be repeated up to four additional times， as necessary to | 0.2C: ≥95% |

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| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

4、环境适应性 **Environmental Function**

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| 项目Items | 测试方法 Test Methods | 合格标准  Acceptance criteria |
| 4.1温度循环Temperature cycling | 电池充满电后，按照下述步骤在强制通风箱中做温度循环（-20℃~75℃）。  步骤 1：电池在 62℃±2℃的环境温度下搁置 4 小时。步骤 2：在 30min 内将温度降低到 20℃±5℃，并保持 2 小时。  步骤 3：在 30min 内将温度降低到-10℃±2℃，并保持 4 小时。  步骤 4：在 30min 内将温度升高到 20℃±5℃，并保持至少 2 小时。  步骤 5：再重复上述步骤 4 个循环。步骤6：第5次循环后，储存7天。  Fully charged batteries are subjected to temperature cycling (- 10℃~+62℃) in forced draught chambers， according to the following  procedure 。 Step 1: Place the batteries in an ambient temperature of 62℃ ± 2℃ for 4 h。Step 2:  Change the ambient temperature to 20℃ ± 5℃ with in 30 min and maintain at this temperature for a minimum of 2 h。Step 3: Change the ambient  temperature to - 10℃± 2℃ within 30 min andmaintain at this temperature for 4 h 。 Step 4: Change the ambient temperature to 20℃± 5℃ within 30 min and maintain at this temperature for a minimum of 2 h。Step 5: Repeat steps 1 to 4 for a  further four cycles。After the fifth cycle， store the  batteries for seven days prior to examination。 | 不漏液不起火  不爆炸  no fire， no explosion， no leakage |

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| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document editio | n R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

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|  | maintain at this temperature for 4 h 。 Step 4: Change the ambient temperature to 20℃± 5℃ within 30 min and maintain at this temperature for a minimum of 2 h。Step 5: Repeat steps 1 to 4 for a  further four cycles。After the fifth cycle， store the  batteries for seven days prior to examination。 |  |
| 4.2振动Vibration | 电池充满电后，确认电池电压为满电状态。然后将电池固定在振动台上，施加振幅为0.76mm的简谐振动， 总的最大偏移为1.52mm。电池以1Hz的速率，在频率10Hz~55Hz~10 Hz间往复振动，总时间为  90±5min。电池在三个垂直的安装位置（振动方向） 上，分别振动一次。测试完成后，搁置1小时。 Fully charged batteries are vibration-tested under the following test conditions。  Simple harmonic motion is applied to the batteries with amplitude of 0.76mm， and a total maximum excursion of 1.52mm 。 The frequency is varied at the rate of 1 Hz/min between the limits of 10 Hz  and 55 Hz。The entire range of frequencies (10 Hz to 55 Hz) and return (55 Hz to 10 Hz) is traversed in 90 min ± 5 min for each mounting position  (direction of vibration) 。 The vibration is applied in  each of three mutually perpendicular directions， in the sequence specified below。  Step 1: Verify that the measured voltage is typical of the charged product being tested。  Steps 2-4: Apply the vibration as specified in  Table。  Step 5: Rest battery for 1 h 。 then make a visual  inspection。 | 不漏液  不起火、不爆炸no fire， no explosion， no leakage |
| 4.3低压  Low pressure | 电池充满电后，放置到20 ℃± 5 ℃的真空箱中。将真空箱的压力逐渐降低到11.6 kPa，保持6小时。Each fully charged is placed in a vacuum chamber in an ambient temperature of 20 ℃± 5 ℃ 。 Once  the chamber has been sealed， its internal pressure is gradually reduced to a pressure equal  to or less than 11.6 kPa held at that value for 6 h。 | 不漏液  不起火、不爆炸  no fire， no explosion no leakage |

5、电芯安全性 cell **Safety tests**

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| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

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| 5.1 外部短路  External short circuit | 充满电的电池放置在 20℃±5℃环境中，用电阻不超过 5mÙ 的线将正负极端子直接短接 10Min。  Fully charged batteries are stored in an ambient temperature of 20℃±5℃，battery is then short-circuited by connecting the positive and  negative terminals with a total external resistance of less than 5mÙ。 The batteries remain on test for  10Min。 | 不爆炸 不起火  no fire，no explosion |
| 5.2 自由跌落 Free fall | 充满电的电池从 1.0m 高度自由跌落到水泥地面上 3  次，方向随机。  Each fully charged battery is dropped three times from a height of 1.0 m onto a concrete floor 。 The batteries are dropped so as to obtain impacts in  random orientations。 | 不爆炸 不起火  no fire，no explosion |
| 5.3 机械冲击  Mechanical shock | 将充满电的电池固定在测试机器上进行冲击测试。电池要承受等值的三次冲击，在相互垂直的三个方向上各进行一次。其中至少有一个方向应当和电池的最大平面垂直。电池承受冲击的加速方式：在最初 3ms 内，最小平均加速度为 75 gn，峰值加速度应在 125 gn 和 175 gn 之间。电池应在 20℃±5℃的环境下进行测试。  The fully charged battery is secured to the testing machine by means of a rigid mount which will support all mounting surfaces of the battery 。 The  battery is subjected to a total of three shocks of equal magnitude。 The shocks are applied in each of three mutually perpendicular directions。At least  one of them shall be perpendicular to a flat face。For each shock the battery is accelerated in such a manner that during the initial milliseconds the  minimum average acceleration is 75 gn。 The peak  acceleration shall be between 125 gn and 175 gn。Batteries are tested in an ambient temperature of  20 °C ± 5 °C。 | 不爆炸 不起火  no fire，no explosion |
| 5.4 加热  Thermal abuse | 将充满电的单体电池放置在空气循环烘箱中，烘箱温度以 5 °C/min ± 2 ℃/min 升高到 130℃ ± 2℃，在此温度下保留 10min。  Each fully charged cell， stabilized at room  temperature is placed in a gravity or circulating | 不爆炸 不起火  no fire，no explosion |

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| --- | --- | --- | --- |
| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

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|  | air-convection oven 。 The oven temperature is raised at a rate of 5 °C/min ± 2 ℃/min to a  temperature of 130℃ ± 2℃。 The cell remains at this temperature for 10 min before the test is  discontinued。 |  |
| 5.5 挤压  Crushing of cells | 将充满电的单体电池放置在 20℃±5℃条件下， 挤压方向：垂直于蓄电池极板方向施压；  挤压头面积：不小于 20c ㎡ ；  挤压程度：直至蓄电池壳体破裂或内部电路（蓄电池电压为 0V）。  Put the fully charged single cell in the condition of 20℃  ±5℃.  Extrusion direction: Pressure on the direction of perpendicular to the battery plate  Extrusion size: not less than 20 c ㎡;  Extrusion Level: until the battery case rupture or the internal circuit (battery voltage is 0V) | 不爆炸 不起火  no fire，no explosion |
| 5.6 过充电  Overcharge | 单体电池以 0.3 C 放电到终止电压，然后使用 5 V 的充电器，以 0.2C 电流充电 12.5 小时。  The cell is discharged with 0.5 C to the  end-of-discharge voltage， then charged from a power supply of 5 V， at the charging current 0.2 C for 12,5 h。 | 不爆炸 不起火  no fire，no explosion |
| 5.7 过放电  Forced discharg | 电池在 20℃±5℃下，以 0.3C 电流放电（如果有电子保护线路，应暂时除去放电电子保护线路），直至某一单体电池电压达到 0V 结束试验。  20 ℃± 5 ℃ ,0.3C discharge.( (If has electronic protection circuits, the electronic discharge protection circuit should be temporarily removed), tests ends until a single battery voltage reaches 0V. | 不爆炸 不起火  no fire，no explosion |
| 5.8 针刺 | 用ö 3mm-ö 8mm 的耐高温钢针、以 10mm/s-40mm/s 的速度，从垂直于蓄电池极板的方向贯穿（钢针停留在蓄电池中）。  Prong it by direction of perpendicular to the battery, with φ3mm-φ8mm high thermal resistant needle by the speed of 10mm/s-40mm/s.(the steel needle stay | 不爆炸 不起火  no fire，no explosion |

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| --- | --- | --- | --- |
| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

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|  | on the battery) |  |

6、 测试条件Test Conditions

除非另有说明，所有测试都应在静止空气中进行。Unless otherwise stated， all tests that are described in this clause shall be performed in still air。

* 1. 充电方法 Charge procedure

充电前，电池应在27±1℃的初始温度下以8A恒流放电到放电终止电压。除非另有说明， 电池应在27±1℃初始温度下，以8A恒流充电到25.2V，然后以25.2V恒压充电到电流降至0.02 C，停止充电。

Prior to charging， the battery shall be discharged at 27°C ±1°C at a constant current of 8A， down to the specified end-of-discharge voltage。

Unless otherwise stated， the battery shall be charged at constant current 8A to 25.2V， then maintain at 25.2V until the current down to 0.02 C。

* 1. 环境 ambient

温 度/Temperature：20±5℃ 湿 度/Humidity：25-85﹪RH

大气压/Air pressure：86KPa～106 kPa

7、 储存及其它事项 Storage and Others

* 1. 长期储存 long time storage

长期储存的电池（超过 3 个月）须置于干燥、凉爽处，每 3 个月对电池进行一次充放电。

If the cell is stored for a long time(exceed three months)，the cell should be stored in drying and cooling place The cell should be charged and discharged each three

months。

* 1. 其它事项 others

本规格书中未提及的事项，须经双方协商确定。

Any matters that this specification does not cover should be covered between the customer and our.

8、 保质期及产品责任 Warranty Period& Product Liability

* 1. 保质期是从出厂日期（喷码/标示）开始起，质保期在销售合同中另定；

Warranty period begins from the delivery date， and is exclusively made in the sale

contract。

* 1. 若不按说明书中的预防措施操作而引发事故，本公司将不承担责任。

We will not be responsible for any accidents caused by not following the precaution methods or directions。

* 1. 如果保质期内发生的问题不是由于本公司的生产过程造成的或是由于客户本身滥用或使用不当造成的，本公司将不会无偿包换。

Problems arise not caused by our production process， but due to customers’

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| --- | --- | --- | --- |
| 文件名称/Document name | **QK-11.1V60Ah 规格书** | 版本/Document edition | R0 |
| 文件编号/Document No. |  | 页版/Page edition︰ | 0 |
| 发行日期/Date | 2018-7-25 | 页码/Page︰ |  |

negligence or improper usage， we will not be responsible for any replacements。

* 1. 当本规格书版本更新时，河南乾坤太阳能不做另行通知。

When the specification is modified， We does not inform the customer。

9、警告 Caution

* 1. 不要拆解电池。Do not dismantle， open or shred the batteries。
  2. 电池应远离热源、火源，避免阳光直射。Do not expose batteries to heat or fire。 Avoid storage in direct sun light。
  3. 不要短路电池，避免将电池放置在容易引起短路的地方。Do not short-circuit the battery，Do not store batteries haphazardly in a box or drawer where they may be short-circuited by other metal objects。
  4. 充电口和放电口绝对不能混用，否则有可能发生安全事故。

Forbid confusedly using the charge socket and discharge socket， or accidents may

occurred。

* 1. 避免电池受到冲击。Do not subject batteries to mechanical shock。
  2. 电池发生泄漏时，避免电解液接触皮肤和眼睛。如果发生接触，立即用大量水冲洗；情况严重时应及时就医。In the event of a cell leaking， do not allow the liquid to come in contact with the skin or eyes 。 If contact has been made， wash the affected area with copious amounts of water and seek medical advice。
  3. 连接时确保电池正负极和用电器正负极一致，避免反接。Observe the plus (+) and minus (-) marks on the battery and equipment and ensure correct use。
  4. 将电池放置在儿童不宜接触的地方。Keep batteries out of the reach of children。
  5. 电池应保持清洁、干燥。Keep batteries clean and dry。
  6. 电池端子变脏时，可用干布擦拭。Wipe the battery terminal s with a clean dry cloth if they become dirty。
  7. 电池使用前要先进行充电，应采用厂家指定的充电器按照用户手册说明充电。Batteries need to be charged before use 。 Always use the correct charger and refer to the manufacturer’s instructions or equipment manual for proper charging instructions。
  8. 电池不使用时，不要长时间充电。Do not leave a battery on prolonged charge when not in use。
  9. 电池经长时间储存后，经过几次充电和使用，性能会恢复最好。After extended periods of storage， it is necessary to charge and discharge the batteries several times to obtain maximum performance。
  10. 电池在室温(25°C ±2 °C)下性能最好。The batteries give their best performance when they are operated at normal room temperature (25 °C ± 2 °C)。
  11. 保留说明书以作后续使用参考。Retain the original product literature for future

reference。

* 1. 电池不能作别的用途使用。Use only the battery in the application for which it was

intended。

* 1. 电池长时间不用时，需要从用电器上取下。When possible， remove the battery from

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the equipment when not in use。

* 1. 电池不要随意丢弃。Dispose of properly。

10、免责声明Free-responsibility declaration

Before using the battery， you should read the specifications，usage instruction and some attentionscarefully to learn its application method and areas 。 If the phenominon such as error using methodwrong circuit connection，or input power data，working index are inconsisted with the specifcations happen and cause damage to production，circuit and its accessories， we are not responsible for it 。

产品使用前，请用户说细阅读产品规格书、使用说明书及使用注意事项等，了解产品的使用方法及应用范围；若出现产品使用方法错误、电路连接不对或采用的输入电源、负载功能参数与产品规格书所标性能参数不符等现象均属使用不当，由使用不当造成产品、负载及周边连接件的损坏，本公司均不承担任何责任。