

## PRODUCT SPECIFICATION

# 产 品 规 格 书

## 锂离子蓄电池

Lithium-ion Battery

**型号: QPF314CA**

**Model: QPF314CA**

# 目录

## Content

### 目录

|                                                  |    |
|--------------------------------------------------|----|
| 术语定义 Terms & Definitions.....                    | 3  |
| 1 范围 Scope.....                                  | 6  |
| 2 产品类型 Product Type.....                         | 6  |
| 3 产品性能 Product Performance.....                  | 6  |
| 3.1 技术参数 Technical Parameters.....               | 6  |
| 3.2 充电模式参数 Charging Parameters.....              | 8  |
| 3.3 放电模式参数 Discharging Parameters.....           | 9  |
| 3.4 测试及使用说明 Description of Service and Test..... | 10 |
| 3.5 外观尺寸指标 Appearance and Size Index.....        | 11 |
| 3.6 电性能指标 Electrical Performance Index.....      | 12 |
| 3.7 安全性能 Safety Characteristics.....             | 16 |
| 4 应用条件 Application Conditions.....               | 18 |
| 5 产品寿命终止管理 Product End of Life Management.....   | 20 |
| 6 运输注意事项 Precautions for Transportation.....     | 20 |
| 7 贮存注意事项 Precautions for Storage.....            | 21 |
| 8 使用安全防范 Security Precautions.....               | 21 |
| 9 免责声明 Disclaimer.....                           | 23 |
| 10 使用警告 Operation Warning.....                   | 24 |
| 11 电池图纸 Mechanical Drawing.....                  | 25 |

## 术语定义 Terms &amp; Definitions

| 术语<br>Term                                   | 定义<br>Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 产品<br>Product                                | 本规格书中的“产品”是指陕西顷刻能源科技有限公司生产的锂离子蓄电池。<br>The "product" in this specification refers to the lithium-ion battery produced by QINKUAL.                                                                                                                                                                                                                                                                                                                                            |
| QINKUAL                                      | 陕西顷刻能源科技有限公司<br>Shaanxi Qinkual Energy Technology Co.,Ltd                                                                                                                                                                                                                                                                                                                                                                                                                   |
| 新电池<br>Fresh Cell                            | 客户收货 10 天以内的电池（限国内）。<br>The cell within 10 days after the customer received (within China).                                                                                                                                                                                                                                                                                                                                                                                 |
| 环境温度<br>Ambient Environment<br>Temperature   | 电池所处的周围环境温度。<br>The ambient air temperature of the environment which the products are exposed to.                                                                                                                                                                                                                                                                                                                                                                           |
| 电池管理系统<br>Battery Management<br>System (BMS) | 一种能够对电池进行监测和管理的电子装置。通过追踪和记录电压、电流、温度等参数，以控制电池的运行并确保电池运行环境及运行条件符合本规格书的规定。<br>An active tracking and control system to be developed and implemented to monitor and record the operating parameters (including but not limited to voltage, current and temperature, of each product in its entire service life), and to control the operation of each cell and ensure that the cell operating environment and operating conditions meet the requirements of this specification. |
| 电池温度<br>Cell Temperature                     | 由接入电池的温度传感器测量的电池表面中心的温度。<br>Temperature of the cell measured by the temperature sensor installed at the center of cell surface.                                                                                                                                                                                                                                                                                                                                             |
| 初始容量/能量<br>Initial Capacity/Energy           | 新电池，按照本规格书 3.6.1 所述的测试方法测出的容量/能量。<br>Fresh cell, capacity/energy measured in according to the test method described in 3.6.1 of this specification.                                                                                                                                                                                                                                                                                                                         |

|                                       |                                                                                                                                                                                                                                                                                                          |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 额定容量/能量<br>Normal<br>Capacity/Energy  | 以制造商规定的条件测得的并由制造商申明的电池单体的容量/能量值。<br>The capacity/energy value of a fully charged cell under the conditions specified by the manufacturer.                                                                                                                                                                |
| 充电倍率<br>C-Rate                        | 充电功率与电池额定能量值的比率。例如电池额定能量为 1004.8Wh，充电功率为 1004.8W 时，则充电倍率为 1.0P。<br>The ratio of charging power to the rated energy value of the cell. For example, if the cell rated energy is 1004.8Wh and the charging power is 1004.8W, the charging rate is 1.0P.                                                    |
| 放电倍率<br>D-Rate                        | 放电功率与电池额定能量值的比率。例如电池额定能量为 1004.8Wh，放电功率为 1004.8W 时，则放电倍率为 1.0P。<br>The ratio of discharge power to the rated energy value of the cell. For example, if the cell energy is 1004.8Wh and the discharge power is 1004.8W, the discharge rate is 1.0P.                                                       |
| 循环<br>Cycles                          | 电池按规定的充放标准充放一次为一个循环。<br>Cells are charged and discharged once in a cycles according to the prescribed charging and discharging standards.                                                                                                                                                                |
| 开路电压<br>Open Circuit Voltage<br>(OCV) | 没有接入任何负载和电路时测得的电池的电压。<br>Measured cell voltage without any load or circuit.                                                                                                                                                                                                                              |
| 标准充电<br>Standard Charge               | 本规格书第 3.2.4 条所述的充电模式。<br>The default charging method set out in Item 3.2.4.                                                                                                                                                                                                                              |
| 标准放电<br>Standard Discharge            | 本规格书第 3.3.4 条所述的放电模式。<br>The default discharging method set out in Item 3.3.4.                                                                                                                                                                                                                           |
| 荷电状态<br>State of Charge (SoC)         | 在无负载的情况下，计量电池充电容量状态的形式。如：若将额定容量为 314Ah 的状态视为 100% SoC，则容量为 0Ah 时，SoC 为 0%。<br>The current available capacity divided by the maximum available capacity in the case of no load. For example, if the state with a capacity of rated 314Ah is regarded as 100% SoC, the SoC is 0% when the capacity is 0Ah. |

|                       |                                                                                                                                                                                                                             |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 脉冲电流<br>Pulse Current | 以周期重复出现的电流称为脉冲电流，脉冲电流或是以同一方向出现，或是以正、负交替变换方向出现。<br>The current that appears periodically is called pulse current, the pulse current appears either in the same direction or in alternating positive and negative directions. |
|-----------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|                                 |                                                                            |
|---------------------------------|----------------------------------------------------------------------------|
| 测量单位<br>Units of<br>Measurement | “V”(Volt)伏特，电压单位<br>"V" (Volt), unit of voltage                            |
|                                 | “A”(Ampere)安培，电流单位<br>"A" (Ampere), unit of current                        |
|                                 | “Ah”(Ampere-Hour)安时，容量单位<br>"Ah" (Ampere-Hour), unit of capacity           |
|                                 | “Wh”(Watt-Hour)瓦时，能量单位<br>"Wh" (Watt-Hour), unit of energy                 |
|                                 | “mΩ”(Milliohm) 毫欧姆，电阻单位<br>"mΩ" (Milliohm), unit of resistance             |
|                                 | “mm”(millimeter)毫米，长度单位<br>"mm" (Millimeter), unit of length               |
|                                 | “°C”(Degree Celsius)摄氏度，温度单位<br>"°C" (Degree Celsius), unit of temperature |
|                                 | “s”(Second)秒，时间单位<br>"s" (Second), unit of time                            |
|                                 | “Hz”(Hertz)赫兹，频率单位<br>"Hz" (Hertz), unit of frequency                      |

## 1 范围 Scope

本产品规格书描述了陕西顷刻能源科技有限公司生产的锂离子电池的产品性能指标、产品使用条件及安全注意事项。

The product specification covers the performance indexes, technical requirements and safety issues of the lithium-ion battery to be supplied by QINKUAL.

## 2 产品类型 Product Type

### 2.1 产品名称：锂离子蓄电池

Product Name: lithium-ion battery

### 2.2 产品型号：QPF314CA

Specification: QPF314CA

## 3 产品性能 Product Performance

### 3.1 技术参数 Technical Parameters

| 序号<br>No. | 项目<br>Item                |                       | 产品规格<br>Specification  | 备注<br>Note                                                            |
|-----------|---------------------------|-----------------------|------------------------|-----------------------------------------------------------------------|
| 3.1.1     | 额定容量<br>Normal Capacity   |                       | 314Ah                  | 1.0P, 25±2℃, 2.5-3.65V                                                |
| 3.1.2     | 额定能量<br>Rated Energy      |                       | 1004.8Wh               | 1.0P, 25±2℃, 2.5-3.65V                                                |
| 3.1.3     | 标称电压<br>Nominal Voltage   |                       | 3.2V                   | /                                                                     |
| 3.1.4     | 工作电压<br>Operating Voltage |                       | 2.5~3.65V<br>2.0~3.65V | 电池温度 (Cell temperature) >0℃<br>电池温度 (Cell temperature) ≤0℃            |
| 3.1.5     | 交流内阻<br>AC Impedance      |                       | 0.25±0.05mΩ            | 23±2% SoC 新电池, AC.1kHz, 25±2℃<br>23±2% SoC fresh cell, AC.1kHz, 25±2℃ |
| 3.1.6     | 电池尺寸<br>Typical           | 总高<br>Terminal Height | 158.1±0.5mm            | 厚度(250±50Kgf) 压力下, 新鲜电池具<br>体见第 11 节电池图纸                              |

|        |                                          |                       |                              |                                                                                                                                |
|--------|------------------------------------------|-----------------------|------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
|        | Dimension                                | 肩高<br>Shoulder Height | $155.4 \pm 0.5\text{mm}$     | Fresh cell, thickness ( $250 \pm 50\text{Kgf}$ ) Under pressure (Reference to item 11)                                         |
|        |                                          | 宽度<br>Width           | $365.7 \pm 0.5\text{mm}$     |                                                                                                                                |
|        |                                          | 厚度<br>Thickness       | $48.0 \pm 0.8\text{mm}$      |                                                                                                                                |
| 3.1.7  | 电池重量<br>Cell Weight                      |                       | $6250 \pm 300\text{g}$       | N.A.                                                                                                                           |
| 3.1.8  | 月自放电<br>Monthly Self-discharge Rate      |                       | $\leq 3.0\%$                 | $25 \pm 2^\circ\text{C}$ , $23 \pm 2\%$ SoC, 新电池三个月后<br>$25 \pm 2^\circ\text{C}$ , $23 \pm 2\%$ SoC, fresh cell after 3 months |
| 3.1.9  | 标准循环寿命<br>Standard Cycle Life            |                       | $\geq 8000$                  | 参考第 3.6 节<br>Refer to Item 3.6                                                                                                 |
| 3.1.10 | 高温循环寿命<br>High-temperature cycle life    |                       | $\geq 2000$                  | 参考第 3.6 节<br>Refer to Item 3.6                                                                                                 |
| 3.1.11 | 工作温度<br>Operating Temperature            | 充电<br>Charge          | $0 \sim +60^\circ\text{C}$   | 参考第 3.2 节<br>Refer to Item 3.2                                                                                                 |
|        |                                          | 放电<br>Discharge       | $-20 \sim +60^\circ\text{C}$ | 参考第 3.3 节<br>Refer to Item 3.3                                                                                                 |
| 3.1.12 | 推荐存储温度<br>Recommended Storage Conditions |                       | $-10 \sim +35^\circ\text{C}$ | 环境湿度 $\leq 90\%\text{RH}$<br>Storage ambient humidity $\leq 90\%\text{RH}$                                                     |
| 3.1.13 | 应用海拔高度<br>Application Altitude           |                       | $< 5000\text{m}$             | N.A.                                                                                                                           |

## 3.2 充电模式参数 Charging Parameters

| 序号<br>No. | 参数<br>Parameter                                                         | 产品规格<br>Specification                                                                                                                 | 条件<br>Condition                                                                                                                                                                                      |
|-----------|-------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.2.1     | 标准充电功率<br>Standard Charge Power                                         | 1.0P                                                                                                                                  | 25±2°C                                                                                                                                                                                               |
| 3.2.2     | 最大持续充电功率<br>Maximum Continuous Charge Power                             | 2.0P                                                                                                                                  | 25±2°C                                                                                                                                                                                               |
| 3.2.3     | 标准充电电压<br>Standard Charge Voltage                                       | 3.65V                                                                                                                                 | 单体电池最大电压<br>Cell maximum voltage                                                                                                                                                                     |
| 3.2.4     | 标准充电模式<br>Standard Charge Method                                        | 25±2°C; 1.0P 恒功率持续充电至单体电池最大电压 3.65V, 静置 10min。<br>25±2°C; Charge single cell at a constant power of 1.0P to 3.65 V, then rest 10 min. |                                                                                                                                                                                                      |
| 3.2.5     | 标准充电温度<br>Standard Charge Temperature                                   | 25±2°C                                                                                                                                | 电池温度<br>Cell temperature                                                                                                                                                                             |
| 3.2.6     | 绝对充电温度<br>(电池温度)<br>Absolute Charging Temperature<br>(Cell Temperature) | 0~+60°C                                                                                                                               | 无论电池处在何种充电模式, 一旦发现电池温度超过绝对充电温度范围即停止充电。<br>Regardless of the charging method of the cell, once the cell temperature is beyond the absolute charging temperature range, the charging shall be stopped. |
| 3.2.7     | 绝对充电电压<br>Absolute Charging Voltage                                     | 最大 3.65V<br>maximum 3.65V                                                                                                             | 无论电池处在何种充电模式, 一旦发现电池电压超过绝对充电电压范围即停止充电。<br>Regardless of the charging method of the cell, once the cell voltage is beyond the absolute                                                                |

|  |  |  |                                                        |
|--|--|--|--------------------------------------------------------|
|  |  |  | charging voltage range, the charging shall be stopped. |
|--|--|--|--------------------------------------------------------|

## 3.3 放电模式参数 Discharging Parameters

| 序号<br>No. | 参数<br>Parameter                                 | 产品规格<br>Specification                                                                                                             | 条件<br>Condition                                                                                                                                                              |
|-----------|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.3.1     | 标准放电功率<br>Standard Discharge Power              | 1.0P                                                                                                                              | 25±2°C                                                                                                                                                                       |
| 3.3.2     | 最大可持续放电功率<br>Maximum Continuous Discharge Power | 2.0P                                                                                                                              | N.A.                                                                                                                                                                         |
| 3.3.3     | 放电截止电压<br>Discharge Cut-off Voltage             | 2.5V<br>2.0V                                                                                                                      | 电池温度 (Cell temperature) >0°C<br>电池温度 (Cell temperature) ≤0°C                                                                                                                 |
| 3.3.4     | 标准放电模式<br>Standard Discharge Method             | 25±2°C, 以 1.0P 恒功率持续放电至单体截止电压 2.5V, 静置 10 min.<br>25±2°C, Discharge single cell to 2.5V at a constant power of 1.0P, rest 10 min. |                                                                                                                                                                              |
| 3.3.6     | 标准放电温度<br>Standard Discharge Temperature        | 25±2°C                                                                                                                            | 电池温度<br>cell temperature                                                                                                                                                     |
| 3.3.7     | 绝对放电温度<br>Absolute Discharge Temperature        | -20~+60°C                                                                                                                         | 无论电池处在持续放电模式或脉冲放电模式, 若电池温度超过绝对放电温度, 则停止放电。<br>Stop discharging once the cell temperature is outside this range regardless of whether continuous or pulse current is adopted. |
| 3.3.8     | 绝对放电电压<br>Absolute Discharge Voltage            | 2.0V                                                                                                                              | 无论电池处在何种放电模式, 若电池电压超过绝对放电电压, 则停止放电。<br>Stop discharging once the cell voltage is                                                                                             |

|  |  |  |                                                                                  |
|--|--|--|----------------------------------------------------------------------------------|
|  |  |  | outside this range regardless of whether continuous or pulse current is adopted. |
|--|--|--|----------------------------------------------------------------------------------|

### 3.4 测试及使用说明 Description of Service and Test

#### 3.4.1 环境条件 Environmental Conditions

使用新电池进行测试，测试前循环充放电次数不得超过五次。试验和测量须在标准温度  $25\pm 2^{\circ}\text{C}$  及相对湿度 10%~90%RH，大气压力为 86kPa~106kPa 的环境中进行。

The test is conducted with fresh batteries, with no more than five cycles of charge and discharge before the test. Unless noted otherwise, all tests are to be conducted at standard temperature which is  $25\pm 2^{\circ}\text{C}$  and relative humidity which is 10%~90%RH, and an atmospheric pressure of 86 kPa to 106 kPa

#### 3.4.2 测试仪表精度要求 Requirements of Measuring Instrument and Facilities

(1) 检验测试的所有仪表、设备（包括监控和监视试验参数的试验设备和仪器）应按国家有关计量检定规程或有关标准经检定或计量合格，并在有效期内。

All the measuring instruments and facilities (including the equipments which monitor the test parameters) shall be verified and calibrated according to relevant calibration regulation or certain standards within the valid date.

(2) 测量尺寸的仪器准确度： $\pm 0.01\text{mm}$ ，温度测量装置准确度： $\pm 0.5^{\circ}\text{C}$ 。

The accuracy of the size measuring instruments:  $\pm 0.01\text{mm}$ , Temperature measuring device:  $\pm 0.5^{\circ}\text{C}$ .

(3) 测量电压的仪器准确度： $\pm 0.1\%$ ，测量内阻的仪器分辨率： $\pm 0.01\text{m}\Omega$ 。

The accuracy of the voltage measuring instruments:  $\pm 0.1\%$ , The accuracy of the impedance measuring instruments:  $\pm 0.01\text{m}\Omega$ .

(4) 电池测试系统的电流精度应在 $\pm 0.1\%$ 以上，恒压精度 $\pm 0.5\%$ ，计时精度不低于 $\pm 0.1\%$ 。

The accuracy of the current measurement instruments shall be more than  $\pm 0.1\%$ , the constant voltage accuracy shall be  $\pm 0.5\%$ , and the timing accuracy shall not be less than  $\pm 0.1\%$ .

(5) 测量重量的仪表准确度： $\pm 0.1\%$ 。

The accuracy of the weight measuring instruments:  $\pm 0.1\%$ .

#### 3.4.3 测试夹具准备 Testing Plate Preparation

(1) 寿命测试、系统成组设计需要施加预紧力，新电池的预紧力范围为 500N~5000N，建议大面的预紧力控制公差为 $\pm 200\text{N}$ 。测试夹具需要采用表面绝缘处理的铝夹板（厚度 $\geq 20\text{mm}$ ），将电池置于夹具中间，夹板之间采用 6 个 M8 螺栓固定，安装示意图如下所示：

Preload force is required for cycle life test and pack design, the range of preload force for fresh cell is 500N~5000N, and the recommended preload force is  $\pm 200\text{N}$ . The test fixture is required to be an aluminum splint with surface insulation (thickness  $\geq 20\text{mm}$ ). Place the cell in the middle of the splint which is fixed by 6 M8 bolts as follows:

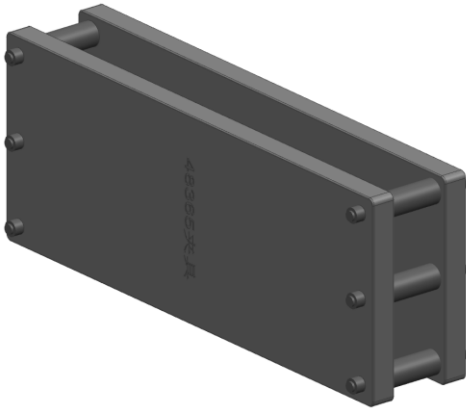


图 1 电芯夹具示意图

Fig.1 Schematic diagram of cell clamp



图 2 电芯轴测图

Fig.2 Side view of cell shaft

(2) 电池厚度随 SoC 增加会有所增加, 随着使用时间产品在使用过程中会产生膨胀力。客户在产品设计中需要考虑结构强度可靠性, 建议电池成组预留一定的膨胀空间。

The cell will generate swelling force during attenuation. The customer needs to consider the reliability of structural strength in the product design process. It is suggested that Gap (which would provide space for swelling while the using of cell) be reserved for the cell assembly module.

#### 3.4.4 电池盖板参数 Cell-Cover Parameters

电池极柱的可焊接区域为  $\Phi 2\sim\Phi 24\text{mm}$  (不包含正负极极柱与标识) (可焊接位置见第 11 节电池图纸)。最大熔深为 3.0mm, 焊接时极柱与塑胶接触边缘温度不超过  $100^{\circ}\text{C}$ , 时间  $\leq 10\text{s}$ 。焊接前后密封圈压缩量的变化量  $\leq 10\%$ ,  $\sigma \leq 0.05$ 。焊接过程中不允许出现极柱塑胶熔融现象。极柱可承受挤压力、剪切力规格 Max500N, 承受扭力要求  $\leq 6\text{N}\cdot\text{m}$ , 电池顶盖可承受的压力规格 Max 1200 N。

The weldable area of the cell pole is  $\Phi 2\sim\Phi 24\text{mm}$  (see the drawing of the 11th cell for the weldable position). The maximum penetration depth is 3.0mm, the temperature at the edge of contact between the pole and the plastic does not exceed  $100^{\circ}\text{C}$  during welding, and the time is  $\leq 10\text{s}$ . The change in the compression of the sealing ring before and after welding  $\leq 10\%$ ,  $\sigma \leq 0.05$ . During the welding process, the polar plastic melting phenomenon is not allowed. The pole can withstand extrusion force, shear force specifications Max500N, torsion requirements  $\leq 6\text{N}\cdot\text{m}$ . The pressure specification of the cell top cover is Max 1200 N.

## 3.5 外观尺寸指标 Appearance and Size Index

| 序号<br>NO. | 项目<br>Item       | 测试方法及步骤<br>Test Method                                                                                                                                                                                                                                                                     | 技术标准<br>Technical Requirement                                                                                                   |
|-----------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| 1         | 外观<br>Appearance | 目测<br>Appearance be determined by visual inspection                                                                                                                                                                                                                                        | 无明显裂痕、锈渍、变色或<br>电解液泄露。<br>The cell should have no<br>obvious cracks, rust strains,<br>discoloration, or electrolyte<br>leakage. |
| 2         | 尺寸<br>Dimension  | 使用游标卡尺测量电池宽度与高度。在 $250 \pm 50\text{kgf}$ 的测试压力下采用测厚工装而非测试夹板对厚度进行测试。<br>Length and width dimensions shall be determined by sliding caliper measurements. By the thickness test, the cell must be clamped by tooling but without test splint. The pressure shall be $250 \pm 50\text{kgf}$ . | 尺寸见第 11 节图纸<br>For detailed dimension, refer to the attached mechanical drawing                                                 |
| 3         | 重量<br>Weight     | 电子天平<br>electronic scale without plates                                                                                                                                                                                                                                                    | $6250 \pm 300\text{g}$                                                                                                          |

## 3.6 电性能指标 Electrical Performance Index

| 序号<br>NO. | 项目<br>Item                                      | 测试方法及步骤<br>Test Method                                                                                                                                                                                                                                                                                                                                                     | 技术标准<br>Technical Requirement                                                                                                                                                                                |
|-----------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1         | 初始充放电性能<br>Initial Charge/discharge Performance | 新电池，按3.2.4充电后1小时内以1.0P恒功率放电至放电终止电压2.50V，并记录放电能量作为初始放电能量。<br>Charge the fresh cell as per 3.2.4, then discharge it at a constant current of 1.0P to the 2.50V within 1h, record the discharge energy as the initial energy.<br>在 $25 \pm 2^\circ\text{C}$ 下，电池按照3.2.4、3.3.4完成初始充放后，将电池分别在 $25 \pm 2^\circ\text{C}$ / $45 \pm 2^\circ\text{C}$ / $5 \pm 2^\circ\text{C}$ 下静置 | 1.0P 初始能量 $\geq$ 额定能量<br>1.0P initial energy $\geq$ rated energy<br>25℃ 充放电能量效率 $\geq 93\%$<br>25℃ Charge and Discharge Energy Efficiency $\geq 93\%$<br>45℃ 充放电能量效率 $\geq 93\%$<br>45℃ Charge and Discharge |

|   |                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                              |
|---|-------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                 | <p>10min/16h/20h, 以1.0P恒功率充电至3.65V, 静置10min, 以1.0P恒功率放电至2.50V, 静置10min。记录放电能量。</p> <p>After the initial charging and discharging of the cell is performed in according to 3.2.4 and 3.3.4 at <math>25 \pm 2^\circ \text{C}</math>, the cell is left to stand at <math>25 \pm 2^\circ \text{C}/45 \pm 2^\circ \text{C}/5 \pm 2^\circ \text{C}</math> for 10min/16h/20h. The cell is charged to 3.65 V at constant power with 1.0P and left to stand for 10 min, and discharged to 2.50 V at constant power with 0.5 and left to stand for 10 min. Record the energy of discharging.</p>                          | <p>Energy Efficiency <math>\geq 93\%</math></p> <p><math>5^\circ \text{C}</math> 充放电能量效率 <math>\geq 80\%</math></p> <p><math>5^\circ \text{C}</math> Charge and Discharge Energy Efficiency <math>\geq 80\%</math></p>                                                                                                       |
| 2 | 倍率充放电性能<br>Rate performance                     | <p>电池按照3.2.4、3.3.4进行初始充放后, 静置10min; 以2.0P恒功率充电至3.65V, 静置10min; 以2.0P恒功率放电至2.50V, 静置10min; 记录能量。</p> <p>The cell is initially charged and discharged according to 3.2.4 and 3.3.4, leave it for 10min; charge to 3.65V with 2.0P constant power and leave it for 10min; discharge to 2.50V with 2.0P constant power and leave it for 10min; and record the energy.</p>                                                                                                                                                                                                                                           | <p>2.0P充放电能量效率 <math>\geq 90\%</math></p> <p>2.0P charging and discharging energy efficiency <math>\geq 90\%</math></p>                                                                                                                                                                                                      |
| 3 | 高低温适应性<br>High and Low Temperature Adaptability | <p>高低温适应性:</p> <p>High temperature adaptability:</p> <p>将电池初始充电后, 分别放入 <math>50 \pm 2^\circ \text{C}/-30 \pm 2^\circ \text{C}</math> 中, 静置 24h; 后将电池移至 <math>25 \pm 2^\circ \text{C}</math> 中搁置 12h; 以 1.0P 放电至 2.50V, 静置 10min; 以 1.0P 充电至 3.65V, 静置 10min, 以 1.0P 放电至 2.50V, 静置 10min, 记录放电能量。</p> <p>After the initial standard charging of the cell, the cell is put into <math>50 \pm 2^\circ \text{C}</math> and left to stand for 24h; after that, the cell is moved to <math>25 \pm 2^\circ \text{C}</math> and left to stand for 12h; the cell is discharged to 2.50V under 1.0P and left to stand</p> | <p>室温恢复能量:</p> <p>a) 充电能量 <math>\geq</math> 额定充电能量</p> <p>Charging energy <math>\geq</math> rated charging energy</p> <p>b) 放电能量 <math>\geq</math> 额定放电能量</p> <p>Discharging energy <math>\geq</math> rated discharging energy</p> <p>c) 能量效率 <math>\geq 93.0\%</math></p> <p>Energy efficiency <math>\geq 93.0\%</math></p> |

|   |                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                                                                                    |
|---|----------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                | for 10min; the cell is charged to 3.65V under 1.0P and left to stand for 10min; the cell is discharged to 2.50V under 1.0P and left to stand for 10min, and the energy of the discharged cell is recorded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                    |
| 4 | 能量保持<br>与恢复能力<br>Charge<br>Retention&<br>Recoverable<br>Energy | <p>电池按 3.2.4 充电后, 在环境温度 <math>45\pm 2^{\circ}\text{C}</math> 条件下开路搁置 30 天后, 在 <math>25\pm 2^{\circ}\text{C}</math> 下静置 5h, 以 1.0P 恒功率放电至 2.50V, 静置 10min; 以 1.0P 恒功率充电至 3.65V, 静置 10 min; 以 1.0P 恒功率放电至 2.50V; 记录放电能量, 计算能量保持率、能量恢复率。</p> <p>After the cell is charged according to 3.2.4, rest it at <math>45\pm 2^{\circ}\text{C}</math> for 30 days, then rest it at <math>25\pm 2^{\circ}\text{C}</math> for 5 h. Discharge it to 2.50V at constant power with 1.0P and rest it for 10 min; charge it to 3.65 V at constant power with 1.0P and rest it for 10 min; discharge it to 2.50V at constant power with 1.0P; and record the energy of discharge.</p>                                                                                                                   | <p>能量保持率<math>\geq 95\%</math>初始能量<br/>Retention energy<math>\geq 95\%</math> initial energy</p> <p>充电能量恢复率<math>\geq 95\%</math>初始充电能量<br/>Charging recovery energy<math>\geq 95\%</math> initial charging energy</p> <p>放电能量恢复率<math>\geq 95\%</math>初始放电能量<br/>Discharging recovery energy<math>\geq 95\%</math> initial discharging energy</p> |
| 5 | 耐久性测试<br>Durability<br>Test                                    | <p>将电池按标准流程进行初始充电后, 以 1.0P 放电至初始放电能量的 50%, 放入 <math>50\pm 2^{\circ}\text{C}</math> 中, 静置 30d; 后将电池移至 <math>25\pm 2^{\circ}\text{C}</math> 中搁置 5h; 以 1.0P 放电至 2.50V, 静置 10min; 以 1.0P 充电至 3.65V, 静置 10min, 以 1.0P 放电至 2.50V, 静置 10min, 记录放电能量。</p> <p>After charging the cell according to the standard process, the cell is discharged to 50% of the initial discharge energy by using 1.0P, and then put into <math>50\pm 2^{\circ}\text{C}</math> and leave it for 30d; after that, the cell is moved to <math>25\pm 2^{\circ}\text{C}</math> and leave it for 5h; the cell is discharged to 2.50V by using 1.0P and leave it for 10min; the cell is charged to 3.65V by using 1.0P and leave it for 10min, and then discharged to 2.50V by using 1.0P and leave it for 10min,</p> | <p>充电恢复能量<math>\geq 96.5\%</math>初始充电能量<br/>Charging recovery energy<math>\geq 96.5\%</math> initial charging energy</p> <p>放电恢复能量<math>\geq 96.5\%</math>初始放电能量<br/>Discharging recovery energy<math>\geq 96.5\%</math> initial discharging energy</p>                                                                                            |

|   |                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                              |
|---|-------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                                                                                                 | then the discharged energy is recorded.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                              |
| 6 | 高海拔初始<br>充放电性能<br>试验<br>High Altitude<br>Initial<br>Charge/Disch<br>arge<br>Performance<br>Test | <p>将电池按标准流程进行初始放电后,放入低气压试验装置,并设置相应气压值,在 <math>25\pm 2^{\circ}\text{C}</math> 下静置 6h,以 1.0P 恒功率充电至 3.65V,静置 10min;以 1.0P 恒功率放电至 2.50V,静置 10min,记录能量数据。</p> <p>After discharging the cell according to the standard process, it is put into the low air pressure test device and keep the corresponding air pressure value, and rest for 6h at <math>25\pm 2^{\circ}\text{C}</math>, then charge to 3.65V with 1.0P constant power, and rest for 10min, discharge to 2.50V with 1.0P constant power, and rested for 10min, and record the energy data.</p> | <p>初始充电能量<math>\geq</math>额定充电能量<br/>Initial charging energy<math>\geq</math> rated<br/>discharging energy<br/>初始放电能量<math>\geq</math>额定放电能量<br/>initial discharging energy<math>\geq</math> rated<br/>discharging energy<br/>能量效率<math>\geq 93.0\%</math><br/>Energy efficiency<math>\geq 93.0\%</math></p> |
| 7 | 标准循环寿<br>命<br>Standard<br>Cycle Life                                                            | <p>电池上好夹板,按照标准充放电进行循环,当电池的能量低于这个电池额定能量 70%,所完成的循环次数定义为该电池的循环寿命记录次数。</p> <p>The single cell shall be stabilized between 2 metallic plates and cycled as per standard charge and discharge method. Record the number of cycles and define it as the cell cycle life when the cell energy is less than 70% of the rated cell energy.</p>                                                                                                                                                                                                                    | <p><math>\geq 8000</math> 次<br/><math>\geq 8000</math> Cycles</p>                                                                                                                                                                                                                                            |
| 9 | 高温循环寿<br>命<br>High-<br>temperature<br>cycle life                                                | <p>电池上好夹板,在 <math>45\pm 2^{\circ}\text{C}</math> 下,按照标准充放电进行循环,当电池的能量低于这个电池额定能量 70%,所完成的循环次数定义为该电池的循环寿命记录次数。</p> <p>The single cell shall be stabilized between 2 metallic plates, and cycled as per standard charge and discharge method at <math>45\pm 2^{\circ}\text{C}</math>. Record the number of cycles and define it as the cell cycle life when the cell energy is less than 70% of the rated cell energy.</p>                                                                                                                                  | <p><math>\geq 2000</math> 次<br/><math>\geq 2000</math> Cycles</p>                                                                                                                                                                                                                                            |

## 3.7 安全性能 Safety Characteristics

| 序号<br>NO. | 项目<br>Item                   | 测试方法及步骤<br>Test Method                                                                                                                                                                                                                                                                                                                      | 技术标准<br>Technical Requirement                                                    |
|-----------|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 1         | 过充电<br>Overcharge            | <p>电池按标准充电后，再以 1C 电流充电至电压达到其充电截止电压的 1.5 倍或充电至 115%SoC 后停止充电，观察 1h。</p> <p>The charged cell (with standard charge method) is to be continuously charged until the voltage reaches 1.5times its charging cut-off voltage or to 115% SoC at 1C current. The observation shall be performed for 1h after overcharge.</p>                        | <p>电池不起火，不爆炸</p> <p>No fire, no explosion</p>                                    |
| 2         | 过放电<br>Over-discharge        | <p>电池按标准充电后，在 <math>25\pm 2^{\circ}\text{C}</math> 下以 1C 电流放电，放电 90min，观察 1h。</p> <p>The charged cell (with standard charge method) is subjected to a forced discharge at a constant current of 1C for a test period of 90 min at <math>25\pm 2^{\circ}\text{C}</math>. The observation shall be performed for 1h after over-discharge.</p> | <p>电池不起火，不爆炸</p> <p>No fire, no explosion</p>                                    |
| 3         | 外部短路<br>Short-circuit        | <p>标准充电后，将电池正负极经线路电阻小于 <math>5\text{m}\Omega</math> 的外部电路短路 10 分钟，观察 1h。</p> <p>The charged cell (with standard charge method) is to be short-circuited by connecting the positive and negative terminals with a total external resistance of less than <math>5\text{m}\Omega</math> for 10min. The cell is remained on test for 1h.</p>    | <p>电池不起火，不爆炸</p> <p>No fire, no explosion</p>                                    |
| 4         | 过载性能<br>Overload performance | <p>电池按标准模式放电，在 <math>25\pm 2^{\circ}\text{C}</math> 下，以 4 倍额定充电功率充电至电池截止电压，静置 10min，以 4 倍额定放电功率放电至电池单体的放电截止电压，观察 1h，记录测试过程中功率、时间、电压、温度。</p> <p>The cell is discharged according to the standard mode, charged to the upper limit voltage with 4 times rated charging</p>                                                                    | <p>电池不起火，不爆炸，<br/>不漏液，不冒烟</p> <p>No fire, no explosion, no leakage, no smoke</p> |

|   |                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                             |
|---|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
|   |                          | power at $25 \pm 2^{\circ}\text{C}$ , rest for 10min, then discharged to the lower limit voltage of the cell with 4 times rated discharging power, observed for 1h, and recorded the power, time, voltage, and temperature during the test.                                                                                                                                                                                                                                                                                                                |                                                                             |
| 5 | 热失控性能<br>Thermal runaway | <p>电池标准充电后，以 1C 恒流充电，同时启动加热。直到触发热失控的判定条件或温度达到 <math>300^{\circ}\text{C}</math> 或试验时间达到 4h，停止充电和加热，观察 1h。测试方法参照 GB/T 36276-2023。</p> <p>After standard charging of the cell, charge at 1C constant current and start heating at the same time. Until the judgement condition of thermal runaway is triggered or the temperature reaches <math>300^{\circ}\text{C}</math> or the test time reaches 4h, stop charging and heating, and observe for 1h. The test method refers to GB/T 36276-2023.</p>                                                         | <p>电池不起火，不爆炸</p> <p>No fire, no explosion</p>                               |
| 6 | 挤压<br>Crushing           | <p>电池标准充电，垂直于电池极板方向施压，挤压板形式：半径 75mm 半圆柱体，半圆柱体的长度大于被挤压电池的尺寸，挤压速度：<math>5 \pm 1\text{mm/s}</math>，挤压程度：挤压力达到 50kN 后停止挤压，保持 10min；观察 1h。</p> <p>The charged cell (with standard charge method) is to be crushed. The crush force shall be perpendicular to the cell plates and applied by a semi-cylinder with a radius of 75mm, whose length is greater than the longest cell dimension. crush speed: <math>5 \pm 1\text{mm/s}</math>; crush level: until the crush force reaches 50kN. Hold on for 10min and the observation shall be performed for 1h.</p> | <p>电池不漏液，不冒烟，不起火，不爆炸</p> <p>No leakage, no smoke, no fire, no explosion</p> |
| 7 | 跌落<br>Drop               | <p>按标准充电后，在 <math>25 \pm 2^{\circ}\text{C}</math> 下，从 1.5m 高度处自由跌落水泥地面上，要求跌落前正负端子向下。</p> <p>The charged (with standard charge method) is to be dropped freely from a height of 1500mm onto a flat concrete floor at</p>                                                                                                                                                                                                                                                                                                                                    | <p>电池不爆炸，不起火，不冒烟</p> <p>No explosion, no fire, no smoke</p>                 |

|  |                                                            |  |
|--|------------------------------------------------------------|--|
|  | 25±2°C. Cell shall be dropped with the terminals downward. |  |
|--|------------------------------------------------------------|--|

#### 4 应用条件 Application Conditions

客户应当确保严格遵守以下与电池相关的应用条件：

Customer shall ensure that the following application conditions in connection with the products are strictly observed:

4.1 客户应配置电池管理系统，严密监控、管理与保护每个电池。

Customer shall procure that each product shall be used under the strict monitor, control and protection by the BMS.

4.2 客户应保存完整的电池使用时的监测数据。

Customer shall keep relevant records of the BMS monitoring data throughout the entire service life of each product.

4.3 避免电池到达过放状态。电池电压低于放电截止电压时，电池内部可能会遭到永久性的损坏。客户需要培训使用者在最短的时间内重新充电，防止电池进入过放状态。

Prevent the cells from being drained down to over-discharge state. When the cell voltage is less than discharge cut-off voltage, the cell interior may be permanently damaged. Customer needs to train users to recharge batteries in the shortest time to avoid over-discharge.

4.4 电池避免在本规格书禁止的低温条件下充电（包括标准充电，快充，紧急情况充电），否则可能出现意外的容量降低现象及安全隐患。

Avoid charging the cells at low temperature conditions prohibited by this specification (including standard charging, fast charging and emergency charging), otherwise accidental capacity reduction and cell overheat may occur.

4.5 电箱设计中应充分考虑电池的散热问题。

The heat dissipation problem of the cell shall be fully considered in the design of the electric box.

4.6 电箱设计中应充分考虑电池的防水、防尘问题，电箱必须满足 UL 和 IEC 有关标准规定的防水、防尘等级。

In the design of the electric box, the waterproof and dustproof problems shall be fully considered. The electric box must meet the waterproof and dustproof grades stipulated by the relevant standards of UL and IEC.

4.7 电箱设计应充分考虑电池泄压问题，电池的泄压方式为防爆阀泄压。

The design of the box should give full consideration to the cell pressure relief problem, the cell pressure relief method for the explosion-proof valve at the pressure relief.

#### 4.8 电池管理系统需要在以下情况中触发保护动作

The BMS should trigger the protective action in the following cases

| 序号<br>No. | 参数<br>Parameter                                                        | 产品规格<br>Specification | 保护动作<br>Action                                                                                                           |
|-----------|------------------------------------------------------------------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------|
| 1         | 电池单体充电电压一级报警值<br>First level alarm value for cell charging voltage     | $\geq 3.80V$          | 电池电压达到 3.80V，BMS 强制终止充电且锁定电池<br>When the cell voltage reaches 3.80V, the BMS force stops charging and locks the cell.    |
| 2         | 电池单体充电电压二级报警值<br>Second level alarm value for cell charging voltage    | $\geq 3.70V$          | 电池电压达到 3.70V，BMS 强制终止充电。<br>When the cell voltage reaches 3.70V, the BMS force stops charging.                           |
| 3         | 电池单体充电电压三级报警值<br>Third level alarm value for cell charging voltage     | $> 3.65V$             | 电池电压超过 3.65V 时，BMS 申请终止充电<br>When the voltage of the cell exceed 3.65V, the BMS applies to stop the charging.            |
| 4         | 电池单体放电电压一级报警值<br>First level alarm value for cell discharging voltage  | $\leq 1.80V$          | 电池电压达到 1.80V，BMS 强制终止放电且锁定电池<br>When the cell voltage reaches 1.80V, the BMS force stops discharging and locks the cell. |
| 5         | 电池单体放电电压二级报警值<br>Second level alarm value for cell discharging voltage | $\leq 2.00V$          | 电池电压达到 2.00V，BMS 强制终止放电<br>When the cell voltage reaches 2.00V, the BMS force stops discharging.                         |

|   |                                                                       |          |                                                                                                                                                    |
|---|-----------------------------------------------------------------------|----------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 6 | 电池单体放电电压三级报警值<br>Third level alarm value for cell discharging voltage | <2.50V   | 电池电压达到 2.50V，BMS 申请终止放电。<br>When the cell voltage exceed 2.50V, the BMS applies to terminate the discharge.                                        |
| 7 | 过温保护<br>Overtemperature protection                                    | -20℃~60℃ | 如果电池使用温度超过安全温度范围，电池停止充放电。<br>If the operating temperature of the cell exceeds the safe temperature range, the cell stops charging and discharging. |

## 5 产品寿命终止管理 Product End of Life Management

电池使用期限是有限的，客户应建立有效的跟踪系统检测并记录每个使用期限内电池的内阻和容量。内阻以及容量的测量方法和计算方法需要客户和陕西顷刻能源科技有限公司共同讨论和双方同意。当使用中电池的内阻超过这个电池最初内阻的 150%或者容量小于额定容量的 70%，应停止使用电池。违反该项要求，将免除陕西顷刻能源科技有限公司的依据产品销售协议以及本规格书所应承担的产品质量保证责任。

The service life of the cell is limited, the customer should set up an effective tracking system to detect and record the internal resistance and capacity of the cell within each service life. The method of measuring and calculating the internal resistance and capacity should be discussed and agreed between the customer and QINKUAL. When the internal resistance of the cell in use exceeds 150% of the initial internal resistance of the cell or the capacity is less than 70% of the rated capacity, the cell should be stopped. Failure to comply with this requirement shall exempt QINKUAL from its responsibility for product quality assurance in accordance with the product sales agreement and this specification.

## 6 运输注意事项 Precautions for Transportation

电池应在 15~50%的荷电状态下包装成箱进行运输，在运输过程中应防止剧烈振动、冲击或挤压、防止日晒雨淋，不得倒置。适用于汽车、火车、轮船等交通工具运输。航空运输请参照 MH/T 1020-2018 《锂电池航空运输规范》。顷刻目前的出货 SoC 状态是 23±2%。

The cells should be packed in a box with 15%~ 50% SoC for transportation. Avoid violent vibration, shock, extrusion, sun-scorched and rain-drenched. The products could be delivered by vehicles, trains, ships, etc. For air

transportation, please refer to *MH/T 1020-2018 Specification for Transport of Lithium Batteries by Air*. Delivery SoC state of the QINKUAL is  $23 \pm 2\%$ .

## 7 贮存注意事项 Precautions for Storage

若电池需要长期存储，则需要在推荐的存储温度 and 低 SoC 态（10~50%）下进行存储。建议每三个月进行一次标准充放电维护一次。适当的存储和维护方法，可以延长电池的使用寿命。在存放过程中禁止将电池倒置并避免机械冲击和重压。

the cells shall be stored for a long period of time, it needs to be stored at the recommended storage temperature and low SoC state (10~50%). Standard charge/discharge maintenance is recommended once every three months. Proper storage and maintenance practices can extend the life of your batteries. It is forbidden to turn the batteries upside down, and the mechanical shock and heavy pressure should be avoided during storage.

## 8 使用安全防范 Security Precautions

### 8.1 禁止将电池浸入水中。

Do not immerse cells into water.

8.2 禁止将电池投入火中或长时间暴露在超过本规格书第 3.1.11 条规定的温度条件的高温环境中，否则可能会导致火灾。

Do not drop cells into fire or expose them to any high temperature environment exceeding the operation temperature as set out in Item 3.1.11, otherwise fire hazards may present.

8.3 禁止电池正负极短路，否则强电流和高温可能导致人身伤害或者火灾。在电池系统组装和连接时，应有足够的安全保护，以避免短路。

Do not short-circuit cell terminals, otherwise high current and temperature may cause personal injury or fire hazards. Ample safety precautions should be implemented to avoid short-circuiting them during system integration or connection.

### 8.4 严格按照标示和说明连接电池正负极，禁止反向充电。

Always connect cell terminals according to its label(s) in right polarity. Reverse charging is strictly prohibited.

### 8.5 禁止拆解或修整电池。

Do not disassemble or modify the cell.

### 8.6 禁止电池过充。否则，可能引起电池过热和火灾事故的发生。

It is extremely dangerous to overcharge a cell which may cause overheating and fire hazards.

8.7 当温度超过本规格书规定温度时，应结束正常充电。当持续充电时间超过合理的时间限制，电池会出现过热现象，可能会引起热失控和火灾。

Stop charging and discharging when the temperature exceeds the regulated range in this specification. Charging out of recommended time limit might cause thermal runaway and fire.

8.8 存在来自电池中的电解液的化学风险。当电解液泄露时，应避免皮肤和眼睛接触电解液。如有接触，应使用大量的清水清洗接触到的区域并向医生寻求帮助。禁止任何人或动物吞食电池的任何部件或电池所含物质。

Cells expose its handler to chemical hazards associated with the electrolyte used in the cell. When the electrolyte leaks, skin and eye contact with the electrolyte should be avoided. In case of contact, use a large amount of clean water to clean the contact area and seek help from the doctor. It is forbidden for any person or animal to swallow any part or substance contained in the cell.

8.9 尽力保护电池，使其免受机械震动、碰撞及压力冲击，否则电池内部可能短路，产生高温和火灾。

Protect cells from mechanical shock, impact and pressure, otherwise internal short-circuit may occur, which may cause high temperature and fire hazards.

8.10 电池充电过程中可能发生不适当的终止充电现象。如：超出允许的充电时间充电，充电电压过高而终止充电或充电电流过强而终止充电。上述现象被定义为“不适当的终止充电”。当发生以上现象时，可能意味着电池系统出现漏电或某些部件出现故障。在没有找到根本原因并彻底解决之前继续对该电池充电，可能会引起电池过热或发生火灾。当发生以上现象时，禁止后续的充电，并经过有认证资格的技术人员全面检查，确定根本原因并彻底解决、改善后方可恢复充电。

When cells charging is terminated improperly for reasons such as exceeding allowable charging time, cut-off due to exceeding charging voltage or cut-off due to exceeding charging current, all these events are defined as "improper charge termination". Such event may indicate that there is current leaking within a cell system, or some components have started to malfunction. Subsequent charging of such cell system without finding and fixing root cause of problem may cause potential overheat or fire hazards. When such event occurs, the subsequent charging should only be resumed after the system has been thoroughly checked by qualified technician who can identify and fix the root cause attributed to the "improper charge termination".

8.11 在进行滥用测试实验时如操作不当可能会引起电池起火或者爆炸。该测试实验只能由配备适当的防护装备的专业人员在专业的实验室进行。否则，可能会导致严重的人身伤害和财产损失。

Cell fire or explosion may be caused by improper operation during abuse test. The test can only be carried out

in a professional laboratory by professionals equipped with appropriate protective equipment. Otherwise, it may lead to serious personal injury and property loss.

8.12 如果电池发出异味、发热、变色、变形或电池在使用、贮存、充电过程中出现任何异常，应立即将电池从装置或充电器中移离并停用。

If the cell emits a strange odour, becomes hot, discoloured, deformed, or if any abnormality occurs during use, storage, or charging, the cell should be immediately removed from the unit or charger and stopped.

## 9 免责声明 Disclaimer

9.1 如果由于产品需求单位不按本规格书中的规定进行使用，造成的一切损失，供方将追究产品需求单位的责任。根据对供方造成的损失，产品需求单位需向供方提供赔偿。

If the product demand unit does not use the product according to the provisions of this specification, causing all the related loss, the supplier will investigate the responsibility of the product demand unit. According to the damage on the supplier, the product demander should provide compensation to the supplier.

9.2 陕西顷刻能源科技有限公司保留对产品的规格及性能参数修改的权利。买方在订购陕西顷刻能源科技有限公司产品前，需要与陕西顷刻能源科技有限公司提前确认产品的最新状态。

QINKUAL reserves the right to modify the specifications and performance parameters of the product. Before ordering QINKUAL products, the buyer needs to confirm the latest status of the products with QINKUAL in advance.

9.3 产品需求单位可提出对电池的需求并与陕西顷刻能源科技有限公司沟通，如客户有一些特别的应用或者操作条件不同于此文件所描述的，陕西顷刻能源科技有限公司可根据客户的特别要求进行产品的设计和生产。

The customer is requested to write down its information and contact QINKUAL in advance, if and when the customer needs applications or operating conditions other than those described in this document. QINKUAL could design and build such products according to customized special request.

9.4 英文规格释义仅供参考，请以中文版技术规格要求为准。

English specifications are for reference only. Please refer to the technical specifications of the Chinese version.

9.5 此样品仍处在样品开发阶段，电池仅供公告、测试等使用，具体测试项目需与陕西顷刻能源科技有限公司协商确定，禁止出售至终端客户。

This sample is still in development stage. The cell is only used for announcement, testing, etc. The specific test items need to be negotiated with the QINKUAL and prohibited from being sold to the customer.

## 10 使用警告 Operation Warning

### 10.1 警示声明 Warning Statement

#### 警告 Warning

电池存在潜在危险，在操作和维护时必须采取适当的防护措施！

必须使用正确的工具和防护装备操作电池。

电池的维护必须由具有电池专业知识并经过安全培训的人士执行。

不遵守上述警告可能造成多种灾难。

**Cells are potentially dangerous and must be operated and maintained with appropriate precautions!**

**Cells must be installed and used with the correct tools and protective equipment.**

**Cell maintenance must be carried out by specialized personnel with cell expertise and safety training.**

**Failure to observe the above warnings may result in various disasters.**

### 10.2 危险类型 Types of Hazards

客户知悉电池在使用和操作过程中存在以下潜在危险：

The customer is aware of the following potential hazards in the use and operation of the batteries:

10.2.1 操作者在操作时可能会受到化学品、电击或者电弧的伤害。尽管人体对遭受直流电与交流电的反应不同，但是高于 50V 的直流电压与交流电对人体的伤害是同样严重的，因此客户必须在操作中采取保守的姿势以避免电流的伤害。

The operators may be injured by chemicals, electric shock, or electric arcs during operation. Although the human body reacts differently to direct current and alternating current, DC voltage. Although the human body reacts differently to being exposed to DC and AC current, DC voltages higher than 50V are just as damaging to the human body as AC current. Therefore, customers must adopt a conservative posture during operation to avoid injury from electric current.

10.2.2 存在来自电池中的电解液的化学风险。

There is a chemical risk from the electrolyte in the cell.

10.2.3 在操作电池和选择个人防护装备时，客户及其雇员必须考虑到以上潜在的风险，防止发生意外短路，造成电弧、爆炸或热失控。

When operating cells and selecting personal protective equipment, customers and their employees must consider the above potential risk to prevent accidental short circuiting that could result in electrical arcing, explosion, or

thermal runaway.

## 11 电池图纸 Mechanical Drawing

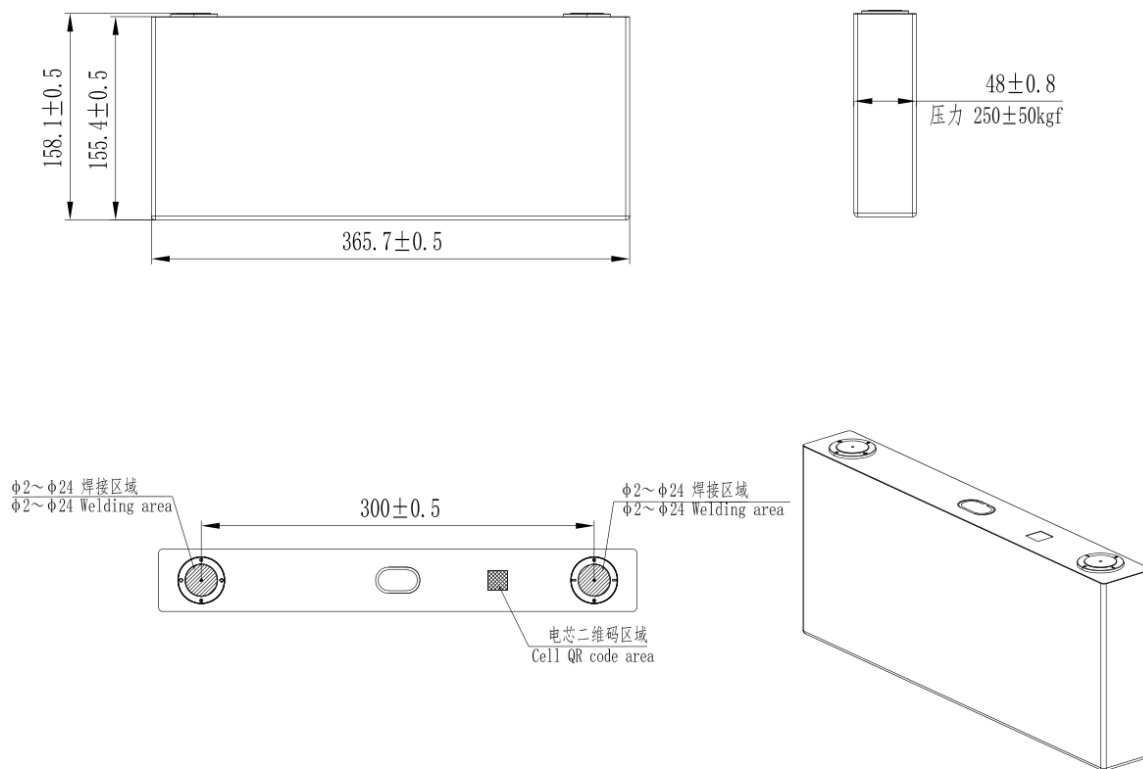


图 3 电池图纸及尺寸/mm

Fig.3 cell drawings and dimensions/mm