PRODUCT SPECIFICATION

产 品 规 格 书

锂离子蓄电池

Lithium-ion Battery

型号：QPF50CC

Model：QPF50CC

陕西煤业化工技术研究院有限责任公司
Shaanxi Coal Chemical Industry Technology Research Institute Co., Ltd.

修订记录
Amendment Records

版本 Rev.	修订日期 Effective Date	编制 Author	修订事项 Description of Revision
A0	2021-11-30	高林	新发行

目录
Content

术语定义 Terms & Definitions

术语 Term	定义 Definition
顷刻 QINKUAL	陕西煤业化工技术研究院有限责任公司的电芯品牌。 A cell brand of Shaanxi Coal Chemical Industry Technology Research Institute Co., Ltd.
产品 Product	本规格书中的“产品”是指顷刻的锂离子蓄电池。 The "product" in this specification refers to the lithium-ion battery produced by QINKUAL.
新电池 Fresh Cell	客户收货 10 天以内的电池（限国内）。 The cell within 10 days after the customer received (within China).
周围环境温度 Ambient Temperature	电池所处的周围环境温度。 The ambient air temperature of the environment to which the products are exposed.
电池管理系统 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。 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 battery operating environment and operating conditions meet the requirements of this specification.
电芯温度 Cell Temperature	电芯大面温度。 The temperature of the largest surface of the battery.
初始容量 Initial Capacity	新电池，按照标准充电模式进行充电后，再按照标准放电模式放出的容量。 The capacity of a new factory battery charged in accordance with the standard charging method and then discharged in accordance with the standard discharging method.

充电倍率 C-Rate	充电电流与标准充放电模式下的放电容量值的比率。例如：电池容量为 50Ah，充电电流为 50A 时，则充电倍率为 1C。 The ratio of charging current to the capacity of batteries measured in standard discharge method. For example, when the battery capacity is 50Ah and the charging current is 50A, the charging rate is 1C.
放电倍率 D-Rate	放电电流与标准充放电下的放电容量值的比率。例如：电池容量为 50Ah，放电电流为 100A 时，则放电倍率为 2C。 The ratio of discharging current to the capacity of batteries measured in standard discharge method. For example, when the battery capacity is 50Ah and the discharging current is 100A, the discharging rate is 2C.
循环 Cycle	电池按规定的充放标准充放一次为一个循环。 Batteries are charged and discharged once in a cycle according to the prescribed charging and discharging standards.
开路电压 OCV	没有接入任何负载和电路时测得的电池的电压。 Open circuit voltage.
标准充电 Standard Charge	本规格书第 3.2.4 条所述的充电模式。 The default charging method set out in Item 3.2.4.
标准放电 Standard Discharge	本规格书第 3.3.5 条所述的放电模式。 The default discharging method set out in Item 3.3.5.
荷电状态(SOC) State of Charge	在无负载的情况下，计量电池充电容量状态的形式。如：若将容量为 50Ah 的状态视为 100% SOC，则容量为 0Ah 时，SOC 为 0%。 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 50Ah is regarded as 100% SoC, the SOC is 0% when the capacity is 0Ah.
温度上升 Temperature Rise	在本规格书规定的条件如充电过程或者放电过程中电芯温度的升高。 The increase of cell temperature from one state to another by charging or discharging.

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

1 范围 Scope

本产品规格书描述了陕西煤业化工技术研究院有限责任公司旗下顷刻的 QPF50CC 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 issue of the QPF50CC lithium-ion cells to be supplied by QINKUAL under Shaanxi Coal Chemical Industry Technology Research Institute Co., Ltd.

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：QPF50CC

Specification: QPF50CC

3 产品性能 Product Performance

3.1 技术参数 Technical Parameters

序号 No.	项目 Item	产品规格 Specification	备注 Note
3.1.1	额定容量 Rated Capacity	50Ah	标准放电，新电池 standard discharge, fresh cell
3.1.2	标称电压 Nominal Voltage	3.2V	/
3.1.3	工作电压 Operating Voltage	2.0~3.65V 1.8~3.65V	电芯温度（cell temperature）≥-10℃ 电芯温度（cell temperature）＜-10℃
3.1.4	电池内阻 Impedance	≤0.7mΩ	30% SOC 新电池，AC.1kHz，25±2℃ 30% SOC fresh cell, AC.1kHz, 25±2℃

3.1.5	电池尺寸 Typical Dimension		27*148*134mm	150N~200N，具体见第 9 节电芯图纸 compression force 150N~200N，refer to the attached mechanical drawing
3.1.6	电池重量 Cell Weight		1110±20g	N.A.
3.1.7	月自放电 Monthly Self-discharge Rate		≤3.0%	25±2℃，30% SOC，新电池三个月后 25±2℃, 30% SOC, fresh cell after 3 months
3.1.8	出货状态 Shipment Status		3.275~3.305V	30±3% SOC，25±2℃
3.1.9	标准循环寿命 Cycle Life		≥3000	标准充放电循环 cycle test by standard charge and discharge method
3.1.10	最佳工作温度 Optimal Operating Temperature	充电 Charge	15~+35℃	参考第 3.2 节 refer to Item 3.2
		放电 Discharge	10~+35℃	参考第 3.3 节 refer to Item 3.3
3.1.11	存储温度 Storage Conditions		-20~+60℃	环境湿度≤70%RH storage ambient humidity≤70%RH
3.1.12	大倍率循环寿命 Rate Cycle Life		≥1500	1.5C 充 4C 放 1.5C charge 4C discharge cycle test

3.2 充电模式参数 Charging Parameters

序号 No.	参数 Parameter	产品规格 Specification	条件 Condition
3.2.1	标准充电电流 Standard Charge Current	1C	25±2℃

3.2.2	最大持续充电电流 Maximum Continuous Charge Current	1.5C	25±2℃
3.2.2	最大脉冲充电电流 Maximum Pulse Charge Current	2C	25±2℃，50% SOC，30s
3.2.3	标准充电电压 Standard Charge Voltage	3.65V	单体电池最大电压 cell maximum voltage
3.2.4	标准充电模式 Standard Charge Method	25±2℃； 1C 恒流持续充电至单体电池最大 3.65V，然后在 3.65V 下恒压持续充电直至电流下限 0.05C。 25±2℃; Charge single cell at a constant current of 1C to 3.65 V, then switch to constant voltage charge until charge current declines to 0.05C.	
3.2.5	标准充电温度 Standard Charge Temperature	25±2℃	电芯温度 cell temperature
3.2.6	绝对充电温度 （电芯温度） Absolute Charging Temperature (Cell Temperature)	0~ + 55℃	无论电芯处在何种充电模式，一旦发现电芯温度超过绝对充电温度范围即停止充电。 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 Absolute Charging Voltage	最大 3.65V maximum 3.65V	无论电芯处在何种充电模式，一旦发现电芯电压超过绝对充电电压范围即停止充电。 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 Discharging Parameters

序号 No.	参数 Parameter	产品规格 Specification	条件 Condition
3.3.1	标准放电电流 Standard Discharge Current	1C	25±2℃
3.3.2	最大可持续放电电流 Maximum Continuous Discharge Current	4C	N.A.
3.3.3	最大脉冲放电电流 Maximum Pulse Discharge Current	6C	25±2℃，50% SOC，30s
3.3.4	放电截止电压 Discharge Cut-off Voltage	2.0V 1.8V	电芯温度（cell temperature）≥-10℃ 电芯温度（cell temperature）＜-10℃
3.3.5	标准放电模式 Standard Discharge Method	25±2℃，以 1C 恒流持续放电至单体截止电压 2.0V。 25±2℃, Discharge single cell to 2.0V at a constant current of 1C.	
3.3.6	标准放电温度 Standard Discharge Temperature	25±2℃	电芯温度 cell temperature
3.3.7	绝对放电温度 Absolute Discharge Temperature	-20~+60℃	无论电芯处在持续放电模式或脉冲放电模式，若电芯温度超过绝对放电温度，则停止放电。 Stop discharging once the cell temperature is outside this range regardless of whether continuous or pulse current is adopted.

3.4 电气性能 Electrical Properties

3.4.1 测试条件 Test Conditions

新电池一个月内进行测试，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±2℃及标准湿度 65±20%的条件下进行。除非特别说明，所有测试均需在夹夹板状态下进行，夹板建议尺寸（T*W*L）：10mm*95mm*210mm，建议材质：铝；定位螺丝扭矩：5±2Nm。

Fresh cells shall be tested within a month after delivered, 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±2℃ and standard humidity which is 65±20%RH. Unless otherwise specified, all the tests are to be conducted using cells clamped by plates. Dimensions of plates are suggested to be (T*W*L):10mm*95mm*210mm, and the material of plates are suggested to be aluminum. Torque of positioning screws is about 5±2Nm.

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）测量尺寸的仪器精度应大于等于 0.01mm。

The accuracy of the size measuring instruments shall be greater than or equal to 0.01mm.

（3）万用表测量电压及电流的准确度应不低于 0.5 级，测量电压时内阻不应小于 10k/Ω/V。

The accuracy of the multimeter shall not be less than 0.5 on the Richter scale, and the internal resistance shall not be less than 10k/Ω/V when measuring the voltage.

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

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

（5）测量重量的仪表准确度不应低于 0.001g。

The accuracy of the weight measuring instruments shall not be less than 0.001g.

3.4.3 性能指标 Test Items and Specifications

序号 NO.	项目 Item	测试方法及步骤 Test Method	技术标准 Technical Requirement
1	外观和尺寸 Appearance and Dimension	目测及游标卡尺测量，厚度测试须使用工装夹紧，建议压力 150N~200N，不夹测试夹板。 Appearance and dimension shall be determined by visual inspection and slide caliper measurement. By the thickness test, the cell must be clamped by tooling but without test splint. The pressure shall be 150N~200N.	无明显划痕、无漏液等缺陷，尺寸见第 9 节图纸 There shall be no damage such as scratch and electrolyte leakage. For detailed dimension, refer to the attached mechanical drawing.
2	重量 Weight	电子天平 electronic scale without plates	1110±20g
3	开路电压 Open Circuit Voltage	按 3.2.4 充电后 1 小时内测量开路电压，不夹夹板。 The open circuit voltage shall be measured within 1h after being charged as per 3.2.4 and without plates.	≥3.33V
4	室温放电容量 Discharge Capacity (under room temperature)	按 3.2.4 充电后 1 小时内以 1C 电流放电至放电终止电压 2.0V， 并计算容量。上述循环可以重复 5 次，当有 3 次循环容量不符合要求时，试验即可终止。 Charge the cell as per 3.2.4, then discharge it at a constant current of 1C to the discharge cut-off voltage and measure the capacity within 1h. The above cycle can be repeated 5 times, and the test can be terminated when the capacity does not meet the requirement 3 times.	1C 容量≥额定容量 1C capacity ≥ rated capacity

5	高低温放电性能 Discharge Capacity (under high and low temperatures)	高温放电性能： Discharge Capacity (under high temperature) 按 3.2.4 充电后，在温度 55±2℃的高温箱中放置 5h，然后以 1C 电流恒流放电至 2.0V，并记下容量。 1. Charge the cell as per 3.2.4, and then store it for 5h at 55±2 ℃. 2. Discharge the cell to 2.0V at a constant current of 1C and measure the discharge capacity. 低温放电性能： Discharge Capacity (under low temperature) 按 3.2.4 充电后，在温度-20±2℃的低温箱中放置 24h，然后以 1C 电流恒流放电至 1.8V，并记下容量。 1. Charge the cell as per 3.2.4, and then store it for 24h at -20±2℃. Discharge the cell to 1.8V at a constant current of 1C and measure the discharge capacity.	放电容量： discharge capacity: a) ≥90%初始容量(55℃) ≥90% rated capacity (discharged at 55℃) b) ≥70%初始容量(-20℃) ≥70% rated capacity (discharged at -20℃)

6	荷电保持与恢复能力 Charge Retention & Recoverable Capacity	室温荷电保持与恢复能力： Charge Retention and Recoverable Capacity (under room temperature)： 按 3.2.4 充电后，在环境温度 25±2℃条件下开路搁置 28 天后，以 3.3.5 进行放电，计算荷电保持容量。电池再按 3.2.4 充电，静置 1h，按 3.3.5 进行放电，计算恢复容量。 1. Charge the cell as per 3.2.4, and then store it for 28 days at the environment temperature of 25±2℃. 2. Discharge the cell per 3.3.5 and measure the retention capacity. 3. Charge the cell as per 3.2.4, and then store it for 1h. 4. Discharge the cell as per 3.3.5 and measure the recoverable capacity. 高温荷电保持与恢复能力： Charge Retention and Recoverable Capacity (under high temperature)： 按 3.2.4 充电后，在温度 60±2℃的高温箱中放置 7 天后，以 3.3.5 进行放电，计算荷电保持容量。电池再按 3.2.4 充电，静置 1h，按 3.3.5 进行放电，计算恢复容量。 1. Charge the cell as per 3.2.4, and then store it for 7 days at the environment temperature of 60±2℃. 2. Discharge the cell per 3.3.5 and measure the retention capacity. 3. Charge the cell as per 3.2.4, and then store it for 1h.	荷电保持容量≥90%初始容量 retention capacity≥90% of rated capacity 荷电恢复容量≥91%初始容量 recovery capacity≥91% of rated capacity

		4. Discharge the cell as per 3.3.5 and measure the recoverable capacity.	
7	循环寿命 Cycle Life	电池上好夹板，按照标准充放电进行循环，当电池的容量低于电池额定容量 80%，所完成的循环次数定义为该电池的循环寿命记录次数。 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 battery cycle life when the cell capacity is less than 80% of the rate capacity.	≥3000 次 ≥3000 times
8	大倍率循环寿命 Rate Cycle Life	电池上好夹板，25℃，进行 1.5C 充 4C 放电循环，当电池的容量低于电池额定容量 80%，所完成的循环次数定义为该电池的循环寿命记录次数。 The single cell shall be stabilized between 2 metallic plates and cycled as 1.5C charge and 4C discharge. Record the number of cycles and define it as the battery cycle life when the cell capacity is less than 80% of the rate capacity.	≥1500 次 ≥1500 times

3.5 安全性能 Safety Characteristics

序号 NO.	项目 Item	测试方法及步骤 Test Method	技术标准 Technical Requirement
1	过充电★ Overcharge Test★	按标准充电后，再以 1C 电流充电至充电终止电压的 1.1 倍或 115%SOC 后，停止充电。观察 1h。 The charged cell (with standard charge method) is to be continuously charged to 1.1 times of the charge cut-off voltage specified or 115% SOC, then, stop charging. The observation shall be performed for 1h after overcharge.	电池不起火，不爆炸 no explosion, no fire

2	过放电★ Over-discharge Test★	按标准充电后，在 25±2℃下以 1C 电流放电 90min，观察 1h。 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 25±2℃. The observation shall be performed for 1h after over-discharge.	电池不起火，不爆炸 不漏液 no explosion, no fire, no leakage
3	外部短路★ Short-circuit Test★	标准充电后，将电池正负极经线路电阻小于 5mΩ 的外部电路短路 10 分钟，观察 1h。 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 5mΩ for 10min. The cells are remained on test for 1h.	电池不起火，不爆炸 no explosion, no fire
4	加热★ Thermal Test★	将接有热电偶的电池放入恒温箱中，开启恒温箱加热，监视恒温箱内温度变化（温箱升温速度为 5±2℃/min），箱温达到 130±2℃时保持 30 分钟结束试验。 Place the charged cell (with standard charge method) together with thermocouples into an oven. The oven temperature is raised at a rate of 5±2℃/min to 130±2℃. Remain this temperature for 30min before the test is discontinued.	电池不起火，不爆炸 no explosion, no fire

5	挤压 Crushing Test	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≤2mm/s，挤压程度：电压达到 0V 或者变形量达到 15%或挤压力达到 200kN 后停止挤压，保持 10min；观察 1h。 The charged cell (with standard charge method) is to be crushed. The crush force shall be perpendicular to the battery plates and applied by a semi-cylinder with a radius of 75mm, whose length is greater than the longest cell dimension. crush speed: 5±1mm/s; crush level: until the battery voltage reaches 0V or the relative deformation reaches 30% or the crush force reaches 200kN. Hold on for 10min and the observation shall be performed for 1h.	电池不起火，不爆炸 no explosion, no fire
6	跌落试验★ Drop Test ★	按标准充电后，在 25±2℃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。 The charged cell (with standard charge method) is to be dropped freely from a height of 1500mm onto a flat concrete floor at 25±2℃. Cells shall be dropped with the terminals downward.	电池不起火，不爆炸 不漏液 no explosion, no fire, no leakage
7	振动试验★ Vibration Test ★	按标准充电后，将电池固定在振动台上，以 1/3C 电流恒流放电至 2.0V，振动方向为上下，振动加速度为 30m/s^2，频率 10~55Hz，振动 10 个循环，重复振动 3 小时。 Fix the charged cell (with standard charge method) on a vibration table and discharge it at a constant current of 1/3C to 2.0V. Equipment parameters are as follows: The vibration direction is only up and down; The vibration acceleration is 30m/s^2; The frequency is 10~55 Hz. Sweep	放电过程没有异常现象 no abnormal phenomenon during discharge

		cycle for 10 times and repeat vibration for 3h.	
8	密封性● Airproof Characteristics ●	将电池在进行荷电保持能力试验前和试验后分别用感量为 0.001g 的电子天平称重，计算电池失重量。 The battery was weighed with an electronic scale (which has a scale of at least 0.001g) before and after the charge retention test to calculate the weight loss.	失重<300mg loss of weight <300mg
9	海水浸泡 Seawater Immersing Test	电池标准充电，电池完全没入 3.5% NaCl 溶液（质量百分数）中 2h；水深应完全没过单体电池，观察 1h。 The charged cell (with standard charge method) is entirely submerged into 3.5(wt)% NaCl solution for 2h. The observation shall be performed for 1h.	电池不起火，不爆炸 不漏液 no explosion, no fire, no leakage
10	温度循环 Temperature Cycling Test	电池标准充电，将电池放入温度箱内，温度箱温度按照表 1 进行调节，循环次数 5 次，观察 1h。 Put the charged cell (with standard charge method) into the incubator and adjust the temperature according to Table 1 for 5 times. The observation shall be performed for 1h.	电池不起火，不爆炸 no explosion, no fire
11	低气压 Low Pressure Test	电池标准充电；将电池放入低气压箱内，调节试验箱内气压为 11.6kpa，温度为室温，静置 6h；观察 1h。 Put the charged cell (with standard charge method) into a low-pressure box and set the air pressure at 11.3kPa. Rest for 6h at room temperature and then observe for 1h.	电池不起火，不爆炸 no explosion, no fire

表 1 温度循环试验参数

Table 1: Parameters of Single Temperature Cycle Test

温度/℃ Temperature/℃	时间/min Step Time/min	累计时间/min Total Time/min	温度变化率/℃/min Temperature Change Rate/℃/min
25	0	0	0

-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7

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 batteries from being drained down to over-discharge state. When the battery voltage is less than discharge cut-off voltage, the battery 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 batteries at low temperature conditions prohibited by this specification (including standard charging, fast charging and emergency charging), otherwise accidental capacity reduction and battery overheat may occur.

4.5 电箱设计中应充分考虑电芯的散热问题。

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芯的防水、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.

5 运输注意事项 Precautions for Transportation

电池应在 20~50%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》。

The batteries should be packed in a box with 20%~ 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 1020-2013 Specification for Transport of Lithium Batteries by Air*.

6 贮存注意事项 Precautions for Storage

电池必须在 20~50% SOC 状态下存储，避免光照、热源、火源和危险化学品。如果条件允许，长期存储请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 batteries shall be stored in the state of 20~50% SOC and away from light, heat, fire and hazardous materials. In case of long period storage, please perform a standard charge and discharge every three months. Proper storage and maintenance methods can extend the service life of the battery. It is forbidden to turn the batteries upside down, and the mechanical shock and heavy pressure should be avoided during storage.

7 警示 Warning

7.1 禁止将电池浸入水中。

Do not immerse cells into water.

7.2 禁止将电池投入火中或长时间暴露在超过本规格书第 3.1.10 条和第 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 3.1.10&3.1.11, otherwise fire hazards may present.

7.3 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.

7.4 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.

7.5 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.

7.6 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.

7.7 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 battery.

7.8 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.

7.9 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".

7.10 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。

Battery 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.

7.11 操作者在操作时可能会受到化学品、电击或者电弧的伤害。客户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。

Working with battery can expose the handler to chemical, shock and/or arcing hazards. Customer shall consider potential exposure to these hazards and therefore prevent accidental short-circuit that can result in electrical arcing, explosion, and/or "thermal runaway" of the cells.

8 免责声明 Disclaimer

8.1 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，产品需求单位可向供方提供赔偿。

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.

8.2 顷刻保留对产品的规格及性能参数修改的权利。买方在订购顷刻产品前，需要与顷刻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.

8.3 产品需求单位可提出对电芯的需求并与顷刻沟通，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，顷刻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.

8.4 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 电芯图纸 Mechanical Drawing