

PRODUCT SPECIFICATION

产 品 规 格 书

锂离子蓄电池

Lithium-ion Battery

型号: QPF40CB

Model: QPF40CB

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	2020-5-28	胡春妮	新发行
A1	2021-06-10	李婵睿	电池出货状态由 30%±2%变为 35%±5%
A2	2022-10-08	李婵睿	电池重量变更, 由 1070±20g 变为 1085±20g
A3	2023-12-06	李婵睿	增加最大可持续放电极柱限制温度说明
A4	2024-06-17	张弛	规格书模板变更; 出货 SOC 变更为 23±3%
A5	2024-07-12	张弛	工作电压区间由 1.8~3.65V & 2.0~3.65V 变更为 2.0~3.65V & 2.5~3.65V; 厚度由 $27^{+1.0}_{-0.5}$ mm 变更为 26.7±0.6mm; 厚度测试条件由 140~200N 变更 200~300kgf
A6	2025-02-27	肖凯迪	工作电压温度条件变更; 厚度测试条件由 200~300kgf 变更为 20~30kgf; 厚度由 26.7±0.6mm 变更为 $27^{+1.0}_{-0.5}$ mm; 删除出货状态; 删除应用海拔高度; 绝对放电电压变更; 增加倍率性能; 高低温放电性能变更; 存储性能变更; 电池管理系统保护参数变更; 规格书模板变更

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.....	7
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.....	15
4 应用条件 Application Conditions.....	17
5 产品寿命终止管理 Product End of Life Management.....	19
6 运输注意事项 Precautions for Transportation.....	20
7 贮存注意事项 Precautions for Storage.....	20
8 使用安全防范 Security Precautions.....	20
9 免责声明 Disclaimer.....	22
10 使用警告 Operation Warning.....	23
11 电池图纸 Mechanical Drawing.....	24

术语定义 Terms & Definitions

术语 Term	定义 Definition
产品 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。 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 Shaanxi Qinkual Energy Technology Co.,Ltd
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).
环境温度 Ambient Environment Temperature	电池所处的周围环境温度。 The ambient air temperature of the environment which the products are exposed to.
电池管理系统 Battery Management 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。 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 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。 Temperature of the cell measured by the temperature sensor installed at the center of cell surface.
初始容量 Initial Capacity	新电池，按照本规格书 3.6.1 所述的测试方法测出的容量。 Fresh cell, capacity measured in according to the test method described in 3.6.1 of this specification.

额定容量 Normal Capacity	以制造商规定的条件测得的并由制造商声明的电池单体的容量值。 The capacity value of a fully charged cell under the conditions specified by the manufacturer.
充电倍率 C-Rate	充电电流与电池额定容量值的比率。例如：电池容量为 40Ah，充电电流为 40A 时，则充电倍率为 1C。 The ratio of charging current to the rated capacity value of cell. For example, when the cell capacity is 40Ah and the charging current is 40A, the charging rate is 1C.
放电倍率 D-Rate	放电电流与电池额定容量值的比率。例如：电池容量为 40Ah，放电电流为 80A 时，则放电倍率为 2C。 The ratio of discharging current to the rated capacity value of cell. For example, when the cell capacity is 40Ah and the discharging current is 80A, the discharging rate is 2C.
循环 Cycles	电池按规定的充放标准充放一次为一个循环。 Cells are charged and discharged once in a cycles according to the prescribed charging and discharging standards.
开路电压 Open Circuit Voltage (OCV)	没有接入任何负载和电路时测得的电池的电压。 Measured cell voltage without any load or circuit.
标准充电 Standard Charge	本规格书第 3.2.5 条所述的充电模式。 The default charging method set out in Item 3.2.5.
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 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 40Ah 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 rated 40Ah is regarded as 100% SoC, the SoC is 0% when the capacity is 0Ah.

脉冲电流 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。 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 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，容量单位 "Ah" (Ampere-Hour), unit of capacity
	“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
	“°C”(Degree Celsius)摄氏度，温度单位 "°C" (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：QPF40CB

Specification: QPF40CB

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 Normal Capacity		40Ah	1C, 25±2℃, 2.5~3.65V
3.1.2	标称电压 Nominal Voltage		3.2V	/
3.1.3	工作电压 Operating Voltage		2.5~3.65V 2.0~3.65V	电池温度 (Cell temperature) >0℃ 电池温度 (Cell temperature) ≤0℃
3.1.4	交流内阻 AC Impedance		≤0.7mΩ	23±2% SoC 新电池, AC.1kHz, 25±2℃ 23±2% SoC fresh cell, AC.1kHz, 25±2℃
3.1.5	电池尺寸 Typical Dimension	总高 Terminal Height	132.7±0.6mm	厚度(20~30kgf) 压力下, 新鲜电池具体 见第 11 节电池图纸 Fresh cell, thickness (20~30kgf) Under
		肩高	129.5±0.6mm	

		Shoulder Height		pressure (Reference to item 11)
		宽度 Width	148.4±0.5mm	
		厚度 Thickness	27 ^{+1.0} _{-0.5} mm	
3.1.6	电池重量 Cell Weight		1085±20g	N.A.
3.1.7	月自放电 Monthly Self-discharge Rate		≤3.0%	25±2°C, 23±2% SoC, 新电池三个月后 25±2°C, 23±2% SoC, fresh cell after 3 months
3.1.8	标准循环寿命 Standard Cycle Life		≥4000	参考第 3.6.5 节 Refer to Item 3.6.5
3.1.9	工作温度 Operating Temperature	充电 Charge	0~+60°C	参考第 3.2 节 Refer to Item 3.2
		放电 Discharge	-20~+60°C	参考第 3.3 节 Refer to Item 3.3
3.1.10	推荐存储温度 Recommended Storage Conditions		-10~+35°C	环境湿度≤90%RH Storage ambient humidity≤90%RH

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°C
3.2.2	最大持续充电电流	6C	25±2°C

	Maximum Continuous Charge Current		
3.2.3	最大脉冲充电电流 Maximum Pulse Charge Current	8C	25±2°C, 50% SoC, 10s
3.2.4	标准充电电压 Standard Charge Voltage	3.65V	单体电池最大电压 Cell maximum voltage
3.2.5	标准充电模式 Standard Charge Method	25±2°C; 1C 恒流持续充电至单体电池最大电压 3.65V, 然后在 3.65V 下恒压持续充电直至电流下限 0.05C, 静置 30min. 25±2°C; 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, rest 30 min.	
3.2.6	标准充电温度 Standard Charge Temperature	25±2°C	电池温度 Cell temperature
3.2.7	绝对充电温度 (电池温度) Absolute Charging Temperature (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。 Regardless of the charging method of the cell, once the cell temperature is beyond the absolute charging temperature range, the charging shall be stopped.
3.2.8	绝对充电电压 Absolute Charging Voltage	最大 3.65V 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。 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 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°C
3.3.2	最大持续放电电流 Maximum Continuous Discharge Current	6C	25±2°C
3.3.3	最大脉冲放电电流 Maximum Pulse Discharge Current	10C	25±2°C, 50% SoC, 30s
3.3.4	放电截止电压 Discharge Cut-off Voltage	2.5V 2.0V	电池温度 (Cell temperature) >0°C 电池温度 (Cell temperature) ≤0°C
3.3.5	标准放电模式 Standard Discharge Method	25±2°C, 以 1C 恒流持续放电至单体电池截止电压 2.5V, 静置 30 min。 25±2°C, Discharge single cell to 2.5V at a constant current of 1C, rest 30 min.	
3.3.6	标准放电温度 Standard Discharge Temperature	25±2°C	电池温度 cell temperature
3.3.7	绝对放电温度 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。 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 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。 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 10*15mm（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℃，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 10*15mm (see the drawing of the 11th cell for the weldable position). The Tel / Fax 029-8588 2671 11 / 24 Add: 陕西省西安市国家民用航天产业基地航天东路 88 号
URL: <http://qinkual.sxccti.com> No. 88 East Hangtian Road, National Civil Aerospace Industry Base, Xi'an, Shaanxi
Province

maximum penetration depth is 3.0mm, the temperature at the edge of contact between the pole and the plastic does not exceed 100°C during welding, and the time is $\leq 10s$. 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 $\leq 6N \cdot m$. 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 NO.	项目 Item	测试方法及步骤 Test Method	技术标准 Technical Requirement
1	外观 Appearance	目测 Appearance be determined by visual inspection	无明显裂痕、锈渍、变色或电解液泄露。 The cell should have no obvious cracks, rust strains, discoloration, or electrolyte leakage.
2	尺寸 Dimension	使用游标卡尺测量电池宽度与高度。在 20~30kgf 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。 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 20~30kgf.	尺寸见第 11 节图纸 For detailed dimension, refer to the attached mechanical drawing.
3	重量 Weight	电子天平 electronic scale without plates	1085±20g

3.6 电性能指标 Electrical Performance Index

序号 NO.	项目 Item	测试方法及步骤 Test Method	技术标准 Technical Requirement
-----------	------------	------------------------	-------------------------------

1	初始容量 Initial Capacity	新电池按照标准充放电模式进行充放电测试5次，当连续3次试验结果的极差小于额定容量的3%时，提前结束试验，取最后3次试验结果平均值。 The fresh cell is tested with 5 standard charge-discharge cycles, and when the extreme difference of 3 consecutive test data is less than 3% of the rated capacity, end the test and take the average of the last 3 test data as the initial capacity.	初始容量$\geq$额定容量 initial capacity $\geq$ rated capacity 初始容量$\leq$110%额定容量 initial capacity $\leq$ 110% rated capacity
2	倍率性能 Rate Discharge Performance	电池按标准放充电后，在温度 $25\pm 2^{\circ}\text{C}$ 下以最大持续放电电流恒流放电至 2.5V，并记下放电容量。 After standard discharge and charge cycles, the cell undergoes constant-current discharging at its maximum rated current (to 2.5V cutoff) under $25\pm 2^{\circ}\text{C}$, with discharge capacity measurements documented.	放电容量$\geq$95%初始容量 discharge capacity$\geq$95% initial capacity
3	高低温放电性能 Temperatures Capacity Performance	a) 高温放电性能: Discharge Capacity (under high temperature) 电池按标准充电后，在温度 $55\pm 2^{\circ}\text{C}$ 的高温箱中放置 5h，然后以 1C 恒流放电至 2.5V，并记下放电容量。 The cell standard charge and then store it for 5h at $55\pm 2^{\circ}\text{C}$, discharge the cell to 2.5V at a constant current of 1C and measure the discharge capacity. b) 低温放电性能: Discharge Capacity (under low temperature) 电池按标准充电后，在温度 $-20\pm 2^{\circ}\text{C}$ 的低温箱中放置 24h，然后以 1C 恒流放电至 2.0V，并记下放电容量。 The cell standard charge and then store it for 24h at $-20\pm 2^{\circ}\text{C}$, discharge the cell to 2.0V at a constant current of 1C and measure the discharge capacity.	放电容量: discharge capacity: a) $\geq 99\%$初始容量(55°C) $\geq 99\%$ initial capacity (discharged at 55°C) b) $\geq 70\%$初始容量(-20°C) $\geq 70\%$ initial capacity (discharged at -20°C)

4	存储性能 Storage Performance	室温荷电保持与恢复能力: Charge Retention and Recoverable Capacity (under room temperature): 电池按标准充电后, 在环境温度 $25\pm 2^{\circ}\text{C}$ 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 3.2.5 充电后, 按 3.3.5 进行放电, 计算恢复容量。 The cell standard charge and then store it for 28 days at the environment temperature of $25\pm 2^{\circ}\text{C}$, discharge the cell per 3.3.5 and measure the retention capacity, then charge the cell as per 3.2.5, and 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): 电池按标准充电后, 在温度 $60\pm 2^{\circ}\text{C}$ 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 3.2.5 充电后, 按 3.3.5 进行放电, 计算恢复容量。 The cell standard charge and then store it for 7 days at the environment temperature of $60\pm 2^{\circ}\text{C}$, discharge the cell per 3.3.5 and measure the retention capacity, then charge the cell as per 3.2.5, and discharge the cell as per 3.3.5 and measure the recoverable capacity.	室温荷电保持容量$\geq 95\%$初始容量 retention capacity$\geq 95\%$ of initial capacity 室温荷电恢复容量$\geq 97\%$初始容量 recovery capacity$\geq 97\%$ of initial capacity 高温荷电保持容量$\geq 93\%$初始容量 retention capacity$\geq 93\%$ of initial capacity 高温荷电恢复容量$\geq 94\%$初始容量 recovery capacity$\geq 94\%$ of initial capacity
5	循环性能 Cycling Performance	电池上好夹板, 按照标准充放电进行循环, 当电池的容量低于这个电池额定容量 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	≥ 4000 次 ≥ 4000 cycles

		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 capacity is less than 80% of the rated cell capacity.	
--	--	---	--

3.7 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	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 1.1 倍或充电至 115%SoC 后停止充电，观察 1h。 The charged cell (with standard charge method) is to be continuously charged until the voltage reaches 1.1 times its charging cut-off voltage or to 115% SoC at 1C current. The observation shall be performed for 1h after overcharge.	电池不起火，不爆炸 No fire, no explosion
2	过放电 Over-discharge	电池按标准充电后，在 25±2℃下以 1C 电流放电，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 No fire, no explosion
3	外部短路 Short-circuit	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 cell is remained on test for 1h.	电池不起火，不爆炸 No fire, no explosion

4	加热 Thermal	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 $5\pm 2^{\circ}\text{C}/\text{min}$），箱温达到 $130\pm 2^{\circ}\text{C}$ 时保持 30 分钟结束试验，观察 1h。 Place the charged cell (with standard charge method) together with thermocouples into an oven. The oven temperature is raised at a rate of $5\pm 2^{\circ}\text{C}/\text{min}$ to $130\pm 2^{\circ}\text{C}$. Remain this temperature for 30min before the test is discontinued, then the observation shall be performed for 1h.	电池不起火，不爆炸 No fire, no explosion
5	挤压 Crushing	电池标准充电，垂直于电池极板方向施压，或与电池单体在整车布局上最容易受到挤压的方向相同；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：不大于 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 100kN 或 1000 倍试验对象重量后停止挤压，保持 10min；观察 1h。 The cell is charged according to the standard, and the pressure is applied perpendicular to the direction of the cell pole plate, or in the same direction as the cell monomer is most likely to be extruded on the whole vehicle layout. Extrusion plate shape: radius 75mm half cylinder, the length of the half cylinder is greater than the size of the cell to be extruded, extrusion speed: no more than 2mm/s, extrusion degree: the voltage reaches 0V or deformation amount reaches 15% or extrusion pressure reaches 100kN or reaches 1,000 times the weight of the test object to stop the extrusion, hold for 10min, observe for 1h.	电池不起火，不爆炸 No fire, no explosion
6	温度循环 Temperature Cycling	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	电池不起火，不爆炸 No fire, no explosion

		incubator and adjust the temperature according to Table 1 for 5 times. The observation shall be performed for 1h.	
--	--	---	--

表 1 温度循环试验参数

Table 1: Parameters of Single Temperature Cycle Test

温度 (°C) Temperature (°C)	时间 (min) Step Time (min)	累计时间 (min) Total Time (min)	温度变化率 (°C/min) Temperature Change Rate (°C/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 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 No.	参数 Parameter	产品规格 Specification	保护动作 Action
1	电池单体充电电压一级报警值 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 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 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。 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 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 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 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 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 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 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 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。 When the cell voltage exceed 2.50V, the BMS applies to terminate the discharge.
7	过温保护 Overtemperature protection	$-20^{\circ}C \sim 60^{\circ}C$	如果电池使用温度超过安全温度范围, 电池停止充放电。 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》。

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*.

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 3.1.10 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, 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.

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

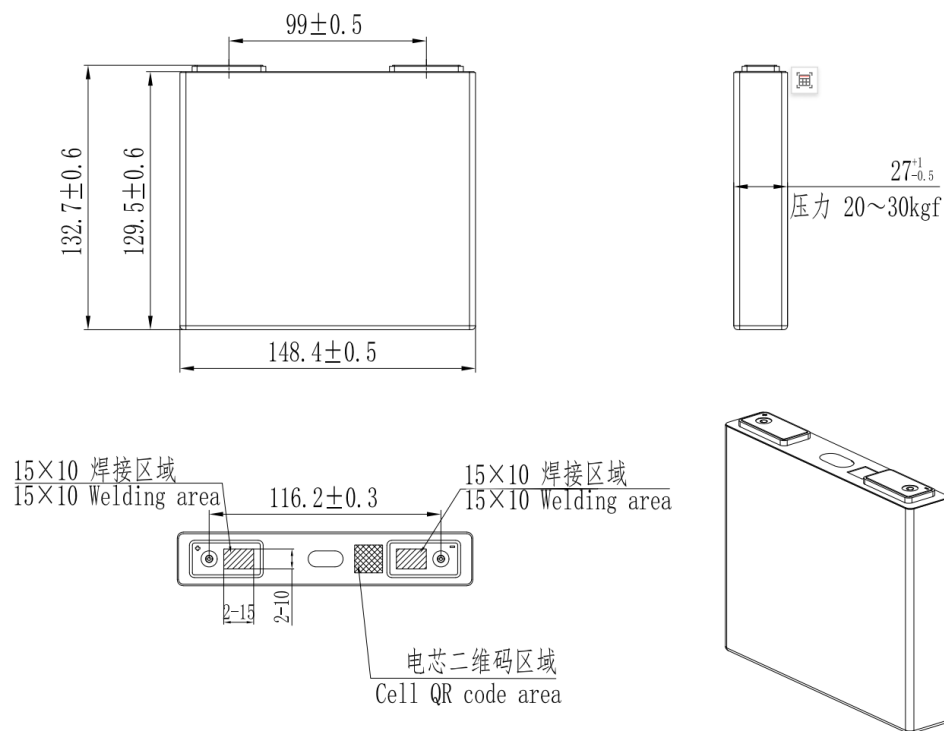


图 3 电池图纸及尺寸/mm

Fig.3 cell drawings and dimensions/mm