

产 品 规 格 书

Product Specification

型号名称 E36130200LFP-100Ah1C-D

Model Name: (锁螺丝盖板)

产品代码

Product code: 100Ah1C (锁螺丝盖板)

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0 术语定义 Terms Definition

术语 Terms	定义 Definition
产品 Product	本规格书中的“产品”是指雄韬电源科技股份有限公司制造的 100Ah 3.2V 可充电磷酸铁锂体系电池。 The term "Product" in this specification refers to the 100Ah 3.2V rechargeable lithium iron phosphate battery manufactured by Vision.
客户 Customer	指《雄韬产品销售合同》中的买方 Means the customer in the 《Vision product sales contract》
雄韬 Vision	深圳市雄韬电源科技股份有限公司 Shenzhen Center Power Tech Co., Ltd.
电池管理系统(BMS) Battery Management System	客户用于监测和记录产品在整个服务期限内的运行参数的一种有效的追踪和控制系统。其追踪和记录的参数包括但不限于电压、电流、温度等，以控制产品的运行并确保产品运行环境及运行条件符合本技术协议的规定。 Means an active tracking and control system to be developed and implemented by Vision 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 product to ensure a safe operation of product.
环境温度 Ambient temperature	电池所处的环境温度。（本规格书中的“室温”指 $25\pm 2^{\circ}\text{C}$ 的环境温度） Ambient temperature of the battery. ("Room temperature" in this specification means ambient temperature of $25\pm 2^{\circ}\text{C}$)
电池温度 Temperature of cell	电池表面温感器测量的温度。 The temperature measured by the battery surface temperature sensor.
新电池状态 Fresh State	是指电池自产品的制造日期或交付客户后算起 7 天以内的状态 Means the state within 7 days after customer received the product (domestic only) .
充放电倍率(P) P-Rate	充电/放电功率占电芯能量的比例。例:电芯能量为 320Wh，充电/放电功率为 160W 时,则充电/放电倍率为 0.5P；当电芯能量衰减为 300Wh，充电/放电功率为 150W 时，则充电/放电倍率为 0.5P。 The ratio of charge/discharge power to cell energy. Example: When the cell energy is 320 Wh and the charge/discharge power is 160W, the charge/discharge ratio is 0.5P. When the cell energy decays to 300Wh and the charge/discharge power is 150W, the charge/discharge ratio is 0.5P.

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倍率 (C) C-Rate	充电/放电电流占额定容量的比例, 与小时率成反比。例: 100Ah 电池以 50A 电流充放电, 则倍率为 $50A/100Ah=0.5C$, 恒流充放电时间为 $1/0.5h=2h$。 The ratio of charge/discharge current to rated capacity, inversely proportional to the hourly rate. For example, if a 100Ah battery is charged and discharged at a current of 50A, the multiplier is $50A/100Ah=0.5C$, and the constant charging and discharging time is $1/0.5h=2h$.
荷电状态 (SOC) State of charge	表示在无负载的情况下, 电池剩余可用容量占额定容量的百分数。 Indicates the percentage of the available battery capacity to the rated battery capacity without load.
放电深度 (DOD) Depth of Discharge	表示通过放电从满电态放出的容量占额定容量的百分数。 Represents the percentage of the capacity discharged from the full charge state to the rated capacity by discharge.
满电态 Fully Charged	按标准充电方式充满电的电池状态。该状态下 SOC 为 100%, DOD 为 0%。The state of a fully charged battery with a standard charge. In this state, SOC is 100% and DOD is 0%.
开路电压 Open circuit voltage	没有接入任何负载或电路时测得的电池的电压。 The voltage of the battery measured when no load or circuit is connected.
标称电压 Nominal voltage	电池在标准放电条件下的平台中心电压。 The platform center voltage of the battery under standard discharge conditions.
工作电压 Operating voltage	接通负载或电路时测得的电池的电压 The voltage of the battery measured when the load or circuit is switched on.
测量单位 Unit of measurement	“V” (Volt) 伏特, Unit of voltage 电压单位 “A” (Ampere) 安培, Unit of current 电流单位 “Ah” (Ampere-Hour) 安培-小时, Unit of capacity 容量单位 “Wh” (Watt-Hour) 瓦特-小时, Unit of energy 能量单位 “Ω” (Ohm) 欧姆, Unit of resistance 电阻单位 “mΩ” (Milliohm) 毫欧姆, Unit of resistance 电阻单位 “°C” (Degree Celsius) 摄氏度, Unit of temperature 温度单位 “mm” (Millimeter) 毫米, Unit of length 长度单位 “s” (Second) 秒, Unit of time 时间单位 “Hz” (Hertz) 赫兹, Unit of frequency 频率单位

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1 适用范围 Scope

本规格书适用于本书中所提及的雄韬电源科技股份有限公司制造的电池。

This specification is applied to this kind of battery in this Specification that manufactured by Vision.

2 产品种类及型号 Product type and model

2.1 产品种类 Product type

方形磷酸铁锂电池

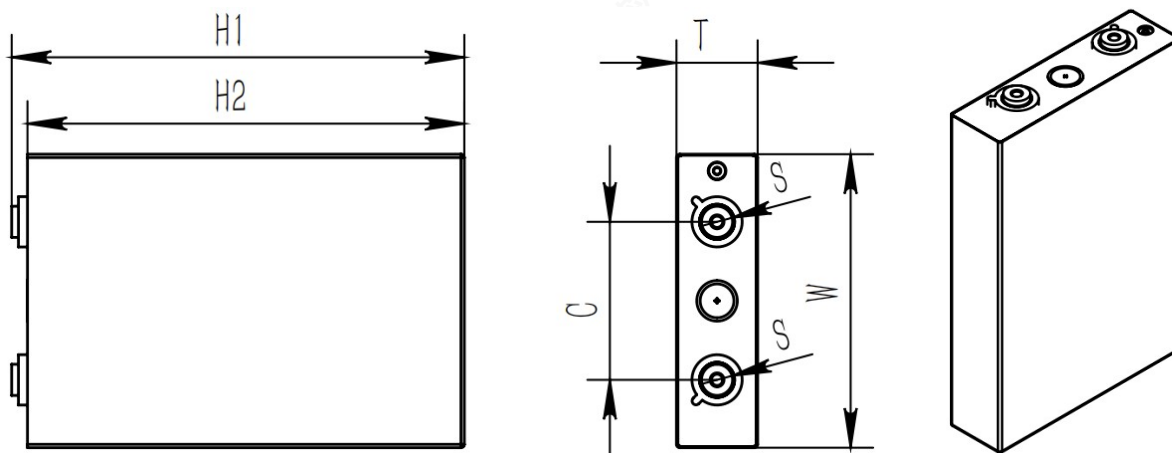
Prismatic LFP cell

2.2 产品型号 Product model

E36130200LFP-100Ah1C-D

3 尺寸及外观 The dimension and appearance

3.1 尺寸 Dimension



项目 Item	描述 Description	尺寸数据 Dimension
W	宽度(含绝缘膜)Width	130.0±1.0mm
T	厚度(含绝缘膜)Thickness	36.5±1.0mm
H1	总高度(含极柱、含绝缘膜)Total Height	201.0±1.0mm
H2	壳体高度(不含极柱、含绝缘膜、含不干胶)Shell Height	194.0±1.0mm
C	极柱中心距 Center distance of terminals	70.0±0.5mm

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3.2 外观 Appearance

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

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

4 技术参数 Technical Parameter

在本规范中，标有“*”的数字标准意味着此类标准仅适用于雄韬交付后未使用的新电池状态，客户和/或其客户使用或存储产品的时间超过 15 天，其数值参数可能低于该标准。客户同意，此类问题不构成不符合规范。

Throughout this specification, numeric criteria annotated by ‘*’ means such criteria are only applicable to fresh unused product from delivery by Vision. Products either have been used or stored for a period longer than 15 days by Client and/or its customer may exhibit an inferior numeric parameter than such criteria. Client agrees that such occurrence does not constitute nonconformance of specification.

编号	项目 Item	常规参数 General Parameter	备注 Remark
1	额定容量 Rated Capacity	*100Ah	参考第 5.4.1 节 Refer to section 5.4.1
2	额定能量 Rated energy	*320Wh	
3	能量密度 Rated density	*160Wh/kg	
4	标称电压 Nominal voltage	3.2V	
5	工作电压 Operation Voltage	2.5V-3.65V	0°C<T≤60°C
		2.0V-3.65V	-20°C≤T≤0°C
6	内阻 Internal Impedance	≤0.5mΩ	参考第 5.5 节 Refer to section 5.5
7	标准充电 Standard charge	0.5C	参考第 5.4.1 节 Refer to section 5.4.1
8	标准放电 Standard discharge	0.5C	
9	最大持续充电电流 Maximum Continuous Charge Current	100A (1C)	参考第 5.4.3 节 Refer to section 5.4.3
10	最大持续放电电流 Maximum Continuous Discharge Current	100A (1C)	
11	最大脉冲充电电流 Maximum Pulse Charge Current	200A (2C) @10s	参考第 5.4.4 节 Refer to section 5.4.4
12	最大脉冲放电电流 Maximum Pulse Discharge Current	200A (2C) @10s	
13	自放电 Self-discharge	≤3%/月 ≤3%/month	新电池出货 3 个月后，20%SOC 室温储存。Fresh cell after 3month, 20%SOC, 25±2°C storage.
14	可充放电次数 Cycle performance	*≥1500 次 (0.5C/0.5C) *≥2000 次 (0.2C/0.2C)	参考第 5.6.4 节 Refer to section 5.6.4

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15	推荐工作环境温度范围 Recommend Operation Temperature Range	充电 Charge : 0~60°C	参考第 5.4.1 节 Refer to section 5.4.1
		放电 Discharge : -20~60°C	
16	推荐储存环境 Recommend Storage Temperature Range	温度 temperature: -20~45°C	参考第 6.2 节 Refer to section 6.2
		湿度 humidity: ≤85%RH	
17	电池尺寸 Cell Dimension	宽度(Width): 130.0±1.0mm 高度(Height): 201.0±1.0mm 厚度(Thickness): 36.5±1.0mm	参考第 3.1 节 Refer to section 3.1
18	电池重量 Cell Weight	1.85±0.2kg	

5 产品测试规范 Product Testing Specification

5.1 标准测试条件 Standard test conditions

除非其它特殊要求, 本产品规格书规定的测试条件为: 温度 $25\pm2^{\circ}\text{C}$, 相对湿度 45%~75%。在此条件下进行实验, 测试结果不会受到明显影响。

Unless other special requirements, the test conditions specified in this product specification are: temperature $25\pm2^{\circ}\text{C}$, relative humidity 45%~75%, the test results will not be significantly affected.

5.2 测试设备 Measuring instrument

测试仪器 Measuring instrument	要求 Requirements
尺寸测量工具 Dimension measuring instrument	测量尺寸的仪器精度应大于等于 0.01mm。 The dimension measurement shall be implemented by instruments with equal or more precious scale of 0.01mm.
万用表 Voltmeter	测量电池电压时万用表内阻应大于 10 MΩ。 Inner impedance of voltmeter is more than 10 MΩ when battery voltage is measured.
内阻仪 Impedance meter	内阻测试仪测量原理应为交流阻抗法 (1kHz ACR)。 Impedance shall be measured by a sinusoidal alternating current method (1kHz ACR meter).
安培计 Ammeter	电流表及电线在内的总外阻应<0.01Ω。 Total external resistance including ammeter and wire is less than 0.01Ω.

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5.3 汇流排的焊接参数 Welding parameters of busbar

序号	项目	标准	备注
1	熔深 Depth of fusion	0.7-1.5mm	
2	极柱承受最大压力 The pole column bears the maximum pressure	700N	极柱承受最大垂直力不发生变形 The pole column does not deform under the maximum vertical force.
3	极柱承受最大扭矩 The pole column bears the maximum torque	6N·m	极柱承受最大扭矩不发生松动 The maximum torque of the pole column does not loosen.
4	汇流排最小拉拔力 Minimum pull force of busbar	700N	
5	极柱塑胶件温度 Temperature of pole plastic parts	200°C持续 30s	极柱承受最大温度，塑胶件不变形 The pole column bears the maximum temperature, and the plastic parts are not deformed.

5.4 充放电模式 Charge\Discharge model

5.4.1 标准充放电 Standard charge/discharge

项目 Item	测试方法及条件 Test Method and Condition	电池温度 Cell Temperature
标准充电 Standard charge	室温下，以 0.5C 恒流持续充电至电压 3.65V，然后在 3.65V 下恒压持续充电直至电流 $\leq 0.05C$ 。 At room temperature, charge at 0.5C constant current to voltage 3.65V, then at 3.65V until current 0.05C.	25 $\pm$ 2°C
标准放电 Standard discharge	室温下，以 0.5C 恒流持续放电至电压 2.5V。 At room temperature, discharged to 2.5V at a constant current of 0.5C.	25 $\pm$ 2°C
放电截止电压 Discharge cut-off voltage	2.5V	0°C<T $\leq$ 60°C
	2.0V	-20°C $\leq$ T $\leq$ 0°C
绝对充电温度 Absolute charging temperature	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。 No matter what the charging model is, once the temperature of the cell is above the absolute charging temperature, charging should be stopped.	0~60°C

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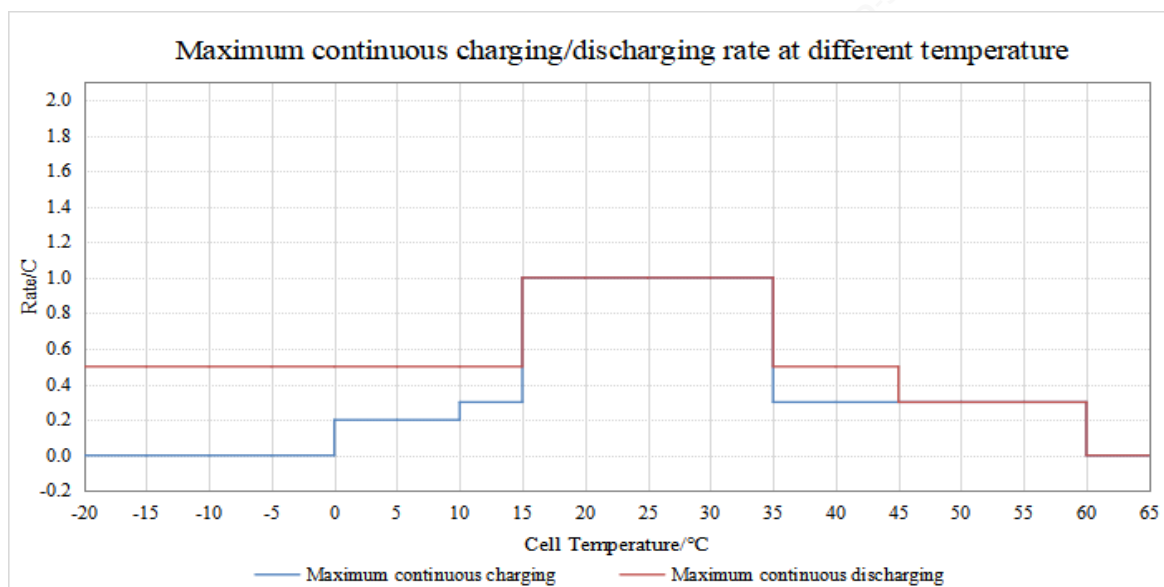
绝对放电温度 Absolute discharging temperature	无论电池处在何种放电模式，一旦发现电池温度超过绝对放电温度范围，即停止放电。 No matter what the discharging model is, once the temperature of the cell is above the absolute discharging temperature, discharging should be stopped.	-20~60°C
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5.4.2 如果没有特别说明，电池充放电间隔时间为 30 分钟。

If there is no special instruction, the rest time between charge and discharge is 30min.

5.4.3 不同温度下允许最大持续充电/放电电流

Maximum continuous charging/discharging current allowed at different temperature



不同 SOC 下最大持续充电倍率如下表:

The maximum continuous charge ratio under different SOC is shown in the table below:

温度 倍率 SOC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
$T < 0^{\circ}\text{C}$	0	0	0	0	0	0	0	0	0	0	0
$0^{\circ}\text{C} \leq T \leq 10^{\circ}\text{C}$	0.2C	0.2C	0.2C	0.2C	0.2C	0.2C	0.2C	0.2C	0.2C	0.2C	0
$10^{\circ}\text{C} < T \leq 15^{\circ}\text{C}$	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0
$15^{\circ}\text{C} < T \leq 35^{\circ}\text{C}$	1C	1C	1C	1C	1C	1C	1C	1C	1C	1C	0
$35^{\circ}\text{C} < T \leq 45^{\circ}\text{C}$	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0
$45^{\circ}\text{C} < T \leq 60^{\circ}\text{C}$	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0
$T > 60^{\circ}\text{C}$	0	0	0	0	0	0	0	0	0	0	0

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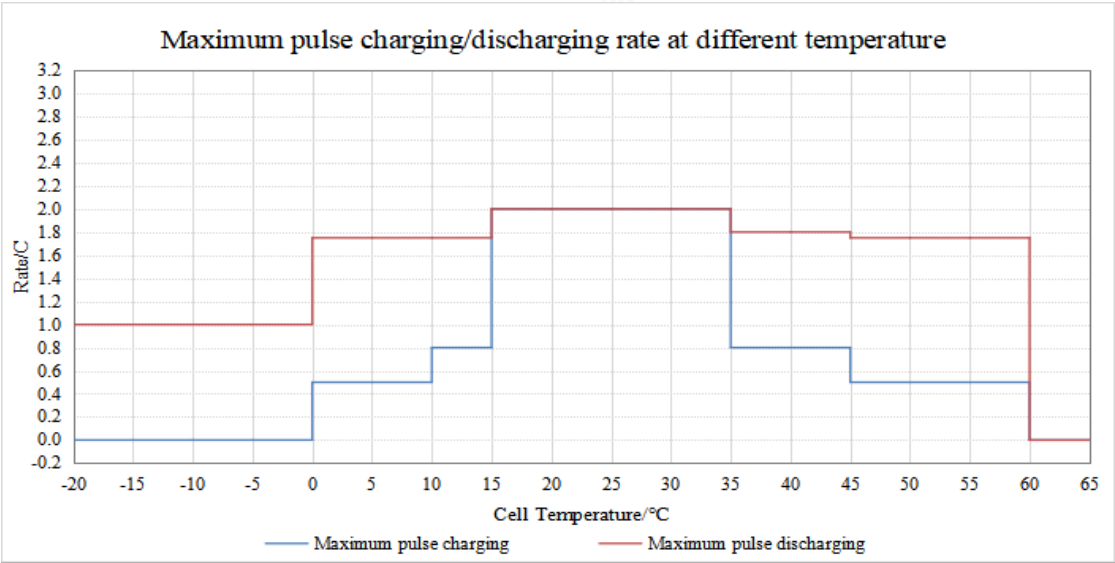
不同 SOC 下最大持续放电倍率如下表:

The maximum continuous discharge ratio under different SOC is shown in the table below:

温度 倍率 SOC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
T<-20℃	0	0	0	0	0	0	0	0	0	0	0
-20℃≤T≤0℃	0	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C
0℃<T≤15℃	0	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C
15℃<T≤35℃	0	1C	1C	1C	1C	1C	1C	1C	1C	1C	1C
35℃<T≤45℃	0	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C
45℃<T≤60℃	0	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C	0.3C
T>60℃	0	0	0	0	0	0	0	0	0	0	0

5.4.4 不同温度下允许最大脉冲充电/放电电流

Maximum pulse charging/discharging current allowed at different temperature



不同 SOC 下最大脉冲充电倍率（10s）如下表:

The maximum pulse charging rate under different SOC is shown below:

温度 倍率 SOC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
T<0℃	0	0	0	0	0	0	0	0	0	0	0
0℃≤T≤10℃	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0
10℃≤T≤15℃	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0

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15°C<T≤35°C	2C	2C	2C	2C	2C	2C	2C	2C	2C	2C	0
35°C<T≤45°C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0.8C	0
45°C<T≤60°C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0.5C	0
T > 60°C	0	0	0	0	0	0	0	0	0	0	0

不同 SOC 下最大脉冲放电倍率 (10s) 如下表:

The maximum pulse discharge rate under different SOC is shown below:

温度 倍率 SOC	0%	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
T<-20°C	0	0	0	0	0	0	0	0	0	0	0
-20°C≤T≤0°C	0	0.5C	0.5C	1C	1C	1C	1C	1C	1C	1C	1C
0°C<T≤15°C	0	0.5C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C
15°C<T≤35°C	0	1C	2C	2C	2C	2C	2C	2C	2C	2C	2C
35°C<T≤45°C	0	0.5C	1.8C	1.8C	1.8C	1.8C	1.8C	1.8C	1.8C	1.8C	1.8C
45°C<T≤60°C	0	0.5C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C	1.75C
T > 60°C	0	0	0	0	0	0	0	0	0	0	0

5.5 初始性能测试 Initial performance test

项目 Item	测试方法及条件 Test Method and Condition	要求 Requirements
开路电压 Open-Circuit Voltage	标准充电后 24 小时内测量开路电压 The open-circuit voltage shall be measured within 24 hours after standard charge.	≥3.29V
初始内阻 Internal impedance	50%SOC 充电状态下, 测量其 AC 1KHz 下的交流阻抗 Internal resistance measured at AC 1KHz after 50% charge.	≤0.5mΩ
最小额定容量 Minimal Rated Capacity	标准充电后, 搁置 30min, 使用 0.5C 电流放电至 2.5V。 The rest time is 30min after full-charge, and then battery is discharged to 2.5V using 0.5C .(0.5C=50A)	放电容量 Discharge Capacity ≥100Ah

5.6 电性能 Electrical performance

5.6.1 倍率放电性能 Multiplier discharge performance

项目 Item	测试方法及条件 Test Method and Condition	要求 Requirements
倍率放电性能 Multiplier discharge performance	a) 电池标准充电; Standard charge. b) 室温下, 电池以 200A 电流放电至终止电压; Under room temperature, charge with 200A to cut-off voltage 2.5V. c) 计算放电容量 (以 Ah 计)。Calculate recovery capacity (in Ah).	容量≥95%额定容量 Capacity≥95% initial Capacity

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5.6.2 高低温放电性能 Discharge performance at low and high temperature

项目 Item	测试方法及条件 Test Method and Condition	要求 Requirements
低温性能 Low Temp. Performance	电池标准充电; Standard charge. 在-20±2°C条件下搁置 20h; Put aside for 20h at -20±2°C. 在-20±2°C条件下以 0.5C 放电至终止电压 2.0V, 计算放电容量(以 Ah 计). Discharging the battery to 2.0V with 0.5C at -20±2°C, calculate the capacity(in Ah).	-20°C时≥60%额定 容量 Discharged at -20°C ≥60% initial capacity
高温性能 High Temp. Performance	电池标准充电; Standard charge. 在 55±2°C条件下搁置 4h; Put aside for 4h at 55±2°C. 在 55±2°C条件下以 0.5C 放电至终止电压 2.5V, 计算放电容量 (以 Ah 计)。 Discharging the battery to 2.5V with 0.5C at 55±2°C, calculate the capacity(in Ah).	55°C时≥95%额定 容量 Discharged at 55°C≥95% initial capacity

5.6.3 容量保持能力 Capacity retention ability

项目 Item	测试方法及条件 Test Method and Condition	要求 Requirements
常温贮存特性 Storage characteristics at 25±2°C	A1 电池标准充电; Standard charge; 以 0.5C 放电至终止电压 2.5V, 放电容量为 C1; Discharging the battery to 2.5V with 0.5C ,discharge capacity is C1; 电池标准充电, 然后在 25±2°C的温度下储存 30 天; Standard charge, then storage for 30 days in 25 ±2°C 以 0.5C 放电至终止电压 2.5V, 放电容量为 C2。 Discharging the battery to 2.5V with 0.5C ,discharge capacity is C2;	容量保持率≥90% Capacity maintaining rate C2/C1≥90%
	A2 0.5C 充电, 0.5C 放电, 循环 3 次, 测试恢复容量 (3 周循环的最大放 电容量 C3) Charge current 0.5C, discharge current 0.5C, then Cycle 3 times after A1 stage. The maximum discharge capacity is C3.	容量恢复率≥95% Capacity recovery rate C3/C1≥95%
高温贮存特性 Storage characteristic at 60±2°C	B1 电池标准充电; Standard charge. 以 0.5C 放电至终止电压 2.5V, 放电容量为 C4; Discharging the battery to 2.5V with 0.5C ,discharge capacity is C4. 电池标准充电, 然后电池在 60±2°C的温度下储存 7 天; Standard charge, then storage for 7 days in 60±2°C 在 25±2°C条件下搁置 4h, 以 0.5C 放电至终止电压 2.5V, 放电容量 为 C5。Put aside for 4h at 25±2°C,then discharging the battery to 2.5V with 0.5C ,discharge capacity is C5.	容量保持率≥90% Capacity maintaining rate C5/C4≥90%

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	B2	0.5C 充电, 0.5C 放电, 循环 3 次, 测试恢复容量 (3 周循环的最大放电容量 C6) Charge current 0.5C, discharge current 0.5C, then Cycle 3 times after A1 stage. The maximum discharge capacity is C6.	容量恢复率 $\geq 95\%$ Capacity recovery rate $C6/C4 \geq 95\%$
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5.6.4 循环寿命 Cycle Life

项目 Item	测试方法及条件 Test Method and Condition	要求 Requirements
循环寿命 Cycle Life (0.5C/0.5C)	电芯采用 15mm 铝板夹紧大面, 夹具力为 (300 ± 20) kgf, 在 $25 \pm 2^\circ\text{C}$ 的高低温箱中测试。The battery cell is clamped with a large surface with a 15mm aluminum plate, the clamping force is (300 ± 20) kgf, tested in a high and low temperature box at $25 \pm 2^\circ\text{C}$. a) 电池进行标准充电, 搁置 30min; Standard charge, shelved for 30min. b) 0.5C 恒流放电至终止电压, 搁置 30min; Discharged at 0.5C to the cut-off voltage, shelved for 30min. c) 重复 a) ~b), 至容量衰减为额定容量的 80%止, 所完成的循环次数定义为该电池的循环寿命。Repeating steps of a) ~ b), until the discharge capacity reached the 80% of rated capacity, the number of cycles completed is defined as the cycle life of the cell.	≥ 1500 次 ≥ 1500 cycles
循环寿命 Cycle Life (0.2C/0.2C)	电芯采用 15mm 铝板夹紧大面, 夹具力为 (300 ± 20) kgf, 在 $25 \pm 2^\circ\text{C}$ 的高低温箱中测试。The battery cell is clamped with a large surface with a 15mm aluminum plate, the clamping force is (300 ± 20) kgf, tested in a high and low temperature box at $25 \pm 2^\circ\text{C}$. a) 以 20A 恒流持续充电至电压 3.65V, 然后在 3.65V 下恒压持续充电直至电流 $\leq 0.05\text{C}$, 搁置 30min; Charged to 3.65V at a constant current of 20A, and then, changed continuously with constant voltage of 3.65V until the current was not more than 0.05C, shelved for 30min; b) 以 20A 恒流放电至终止电压, 搁置 30min; Discharged at 20A to the cut-off voltage, shelved for 30min. c) 重复 a) ~b), 至容量衰减为额定容量的 80%止, 所完成的循环次数定义为该电池的循环寿命。Repeating steps of a) ~ b), until the discharge capacity reached the 80% of rated capacity, the number of cycles completed is defined as the cycle life of the cell.	≥ 2000 次 ≥ 2000 cycles

5.7 环境适应性 Environmental adaptability

项目 Items	电池要求 Battery Condition	测试方法及条件 Test Method and Condition	标准 Criteria
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振动测试 Vibration Test	充满电的新电池 Fresh, Fully charged	将满充电后的电池固定在振动台上,沿两个相互垂直的轴方向各振动 45 分钟, 振幅 1.6mm, 振动频率为 10Hz~55Hz, 每分钟变化 1Hz。 The fully charged battery was fixed on the vibration table, with each vibration along the two mutually vertical axis directions for 45 minutes, with an amplitude of 1.6mm, a vibration frequency of 10Hz~55Hz, and a change of 1Hz per minute.	不爆炸、不起火、不漏液 No explosion. No fire.No leakage.
挤压测试 Crush test	充满电的新电池 Fresh, Fully charged	将电池放在平板间进行挤压, 其压力通过一个直径为 $\Phi 32\text{mm}$ 的液压缸进行施压, 直到压力达到 17.2Mpa, 施加的压力为 13KN, 当达到压力后泄压。 The cells is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram with a 32 mm diameter piston. The crushing is to be continued until a pressure reading of 17.2MPa is reached on the hydraulic ram, applied force of 13kN. Once the maximum pressure has been obtained it is to be released.	不爆炸、不起火 No explosion. No fire.
高空低压模拟 Altitude Simulation Test	充满电的新电池 Fresh, Fully charged	将电池放入真空箱中, 逐渐抽真空至气压小于或等于 11.6KPa, 并在此气压下保存 6h。 The full-charged cells are to be stored for 6 hours at an absolute pressure of 11.6 KPa and a temperature of $25\pm 3^{\circ}\text{C}$	不爆炸、不起火、不漏液 No explosion. No fire. No leakage
海水浸泡 Immersing in seawater	充满电的新电池 Fresh, Fully charged	电池(组)完全没入 3.5% NaCl 溶液(质量分数)中 2 h; 水深应完全没过单体电池。 The cell(battery module) is submerged into 3.5(wt)% NaCl solution for 2h entirely.	不爆炸、不起火 No explosion. No fire.

5.8 安全性能 Safety performance

项目 Item	电池要求 Battery Condition	测试方法 Test Method	要求 Requirements
短路试验 Short Circuit (25°C和 60°C)	充满电的新电池 Fresh, Fully charged	分别在 25°C and 60°C的环境温度下, 依次用最大内阻不超过 $5\text{m}\Omega$ 的铜线连接电池的正负极。 Each test sample cell, in turn, is to be short-circuited by connecting the positive and negative terminals of the cell with a Cu wire having a maximum resistance load of $5\text{m}\Omega$ Tests are to be conducted at 25°C and 60°C .	不爆炸、不起火 No explosion. No fire.

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过放试验 Over Discharge	充满电的新电池 Fresh, Fully charged	以 0.5C 的电流放电 2.5 小时 Discharge with the current of 0.5C for 2.5h.	不爆炸、不起火 No explosion. No fire.
过充试验 Over charge	充满电的新电池 Fresh, Fully charged	以 3C 的电流充电至 10V Charge with the current of 3C until the voltage of cell reaches 10V.	不爆炸、不起火 No explosion. No fire.
冲击试验 Impact	充满电的新电池 Fresh, Fully charged	用一条直径为 15.8mm 的圆棒放置在电池中央, 将一 9.1kg 的重锤从 610mm 的高度垂直落下在电池的中心位置 The test sample cell is to be placed on a flat surface. A 15.8 mm diameter bar is to be placed across the center of the sample. A 9.1 kg weight is to be dropped from a height of 610±25 mm onto the sample.	不爆炸、不起火 No explosion. No fire.
跌落 Drop Test	充满电的新电池 Fresh, Fully charged	电池(组)正负端子朝下, 自 1.5 米高度处自由 跌落至水泥地面上, 观察 1h。 The cell(battery module) drops with two terminals down from a height of 1.5 meters, observation for 1h	不爆炸、不起火 No explosion. No fire.
加热 Heating	充满电的新电池 Fresh, Fully charged	电池(组)放入温箱中, 以 5°C/min 速率由室温至 130±2°C, 并保持 30min 后停止加热, 观察 1h。 Put the battery(module) into the incubator, the temperature is up from room to 130±2°C at the speed of 5°C/min, and stop heating after lasting for 30min, observation for 1h.	不爆炸、不起火 No explosion. No fire.

6 使用说明 Instructions

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:

6.1 电池管理系统需求 Battery management system requirements

电池管理系统需满足以下最基本的检测和控制要求:

The BMS shall include the following monitoring and control features as a minimum requirement:

参数 Paramete	要求 Requirements	保护动作 Action
充电终止	≤3.65V	当电池的电压达到 3.65V 时终止充电。

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Stop charging		Stop charging when cell voltage reaches 3.65V.
第一级过充电保护 1st Overcharge protection	最大 Max: 3.7V	当电池电压达到 3.7V 终止充电。 Stop charging when cell voltage reaches 3.7V.
第二级过充电保护 2nd Overcharge protection	最大 Max: 3.8V	当电池电压达到 3.80V 终止充电,并锁定电池管理系统直到技术人员解决问题。When cell voltage reaches 3.80V, lock up BMS until technical trouble shooting.
放电终止 Stop discharging	最小 Min: 2.5V(T>0°C) 2.0V(T≤0°C)	终止放电当电池的电压到达 2.50V(T>0°C)或 2.0V(T≤0°C),将电流降到最小。 When cell voltage falls lower than 2.50V(T>0°C)or2.0V(T≤0°C), decrease the current to a minimum.
第一级过放保护 1st Over discharge protection	最小 Min: 2.4V(T>0°C) 1.9V(T≤0°C)	终止放电当电池的电压到达 2.40V(T>0°C)或 1.9V(T≤0°C),将电流降到最小。When cell voltage falls lower than 2.40V(T>0°C)or1.9V(T≤0°C), decrease the current to a minimum.
第二级过放保护 2nd Over discharge protection	最小 Min: 2.0V(T>0°C) 1.85V(T≤0°C)	终止放电当电池的电压到达 2.0V(T>0°C)或 1.85V(T≤0°C),锁定电池管理系统直到技术人员解决问题。 Terminate discharge When the battery voltage reaches 2.0V(T>0°C) or 1.85V(T≤0°C), lock the battery management system until the technician can resolve the problem.
短路保护 Short circuit protection	不允许短路 No short circuit allowed	发生短路时, 由过流器断开电池(电路)。Disconnect cell terminals by over-current protector or internal fuse when short circuit occurs.
过流保护 Over current protection	参考第 5.4 节 Refer to section 5.4	电池管理系统控制放电电流符合规格。 Limit discharge current by BMS to values within specification.
过热保护 Over temperature Protection	参考第 5.4 节 Refer to section 5.4	当温度超过本规格书规定时, 终止充电/放电。Stop charging and discharging when temperature exceeds specification.
低温保护 Low temperature protection	参考第 5.4 节 Refer to section 5.4	当温度低于本规格书规定时, 终止充电/放电。Stop charging and discharging when the temperature is below specification.

6.2 贮存环境 Storage environment

电池贮存在环境温度为-20°C~45°C、相对湿度不高于 85%的可防水、防腐、防尘的仓库中, 远离火源及热源, 电池 SOC 调整为 20%。-10°C~30°C 建议补电周期为 6 个月, 30°C~45°C 建议补电周期为 3 个月; 以上补电周期为建议, 实际存储 SOC 不得低于 20%。存储周期不考虑 BMS 或其他除单体电池以外的自耗电影响。

The battery is stored in a warehouse with -20°C~45°C ambient temperature and a relative humidity that is not higher than 85%, far away from the fire source and heat source. Store the battery in the state of 20% SOC. For cell, the recommend period to recharge is 6 months at -10°C~30°C; the recommend period to recharge is 3 months at 30°C~45°C. The recharge period is for reference, and the SOC cannot be less than 20% for storage. The storage considers the self-discharge of cells

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only.

6.3 产品寿命终止管理 Product end of life management

(一) 电池的使用期限是有限的。客户应该建立有效的跟踪系统监测并记录每个使用期限内电池的容量。当使用中的电池容量小于等于标称容量 60%(25°C), 应停止使用电池。违反该项要求, 将免除雄韬依据产品销售协议以及本技术协议所应承担的产品质量保证责任。This cell is designed to service with a finite life time. The customer shall develop and implement an active tracking system to monitor and record impedance of each Product in its entire service life. Vision and/or its customer shall stop using any of the capacity fading to 60% of typical capacity @25°C. Failure to comply with this requirement shall render Vision's warranties under the Contract inapplicable, thereby releasing Vision from any liability in connection therewith.

(二) 电芯寿命判定条件参考 5.6.4 循环寿命。The cell life determination conditions can refer to paragraph 5.6.4 cycle life.

6.4 电箱设计 Electric box heat dissipation design

(一) 电箱设计中应充分考虑电芯的散热问题, 由于电箱散热设计问题导致的电芯或电池过热损坏, 雄韬不承担质量保证责任。The design of the electric box must fully consider the heat dissipation problem of the cell. Vision does not take the responsibility due to the overheating of the cell or batteries caused by the thermal design problem of the electric box.

(二) 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。由于防水、防尘问题而导致的电芯或电池的损坏(如腐蚀、生锈等), 雄韬不承担质量保证责任。The design of the electric box must fully consider the waterproof and dustproof problems of the cells. The electric box must meet the waterproof and dustproof grade stipulated by the relevant national standards. The Vision does not take the responsibility due to damage to the cell or batteries (such as corrosion, rust, etc.) caused by water and dust.

6.5 单体电池充电和放电 Single battery charging and discharging

电池使用过程中禁止在超出本规格书规定的充/放电电压限制、电流限制、温度限制范围, 否则雄韬不承担质量保证责任。During the use of the battery, it is forbidden to exceed the voltage, current and temperature limits specified in this specification. Otherwise, Vision shall not undertake the responsibility of quality assurance.

6.5.1 低温充电 Low temperature charging

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

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低现象。电池管理系统应依照最小的充电温度进行控制。禁止在低于本技术协议规定的温度条件下充电，否则雄韬不承担质量保证责任。Batteries should avoid charging at low temperatures prohibited by this Technical Agreement (including standard charging, fast charging and emergency charging), otherwise accidental capacity reduction may occur. Battery management system should be controlled according to the minimum charging temperature. It is forbidden to charge under the temperature stipulated in this technical agreement. Otherwise, Vision will not undertake the responsibility of quality assurance.

6.5.2 过放电 Overdischarge

避免电池到达过放状态。电池电压低于 2.0V 时，电池内部可能会遭到永久性的损坏，此时雄韬的产品质量保证责任失效。根据本规格书第 5.4 条，当实际放电截止电压低于标准放电截止电压时，系统内部能耗降低到最小，并在重新充电之前延长休眠时间。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 draining any product down to over discharge state. A product may be permanently damaged internally when the cell voltage is lower than 2.0 V and which shall be strictly prohibited, failing what Vision's warranties under the contract shall cease to apply, thereby releasing the Vision from any liability in connection therewith. After discharge cut-off in accordance with paragraph 5.4, internal power consumption of the system should be reduced to a minimum to prolong the idle time before recharge. Customer undertakes to educate the users of the products or other parties who may come to handle the products to recharge the cells at minimum time intervals to prevent reaching the over-discharge state.

7 包装、运输 Packaging, Transportation

电池应在荷电态(20%SOC)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。The battery shall be packed in boxes under charge (20%SOC), preventing violent vibration, shock or extrusion and sun and rain during transportation.

8 保质期 Shelf life

保质期从出货之日起一年。如果是电池本身的缺陷而不是用户错用滥用造成的质量问题，本公司确保更换。The period of warranty is a year from the date of shipment. Vision company guarantees the battery can be replaced due to quality problem of battery instead of the customer's abuse and misuse.

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9 安全注意事项 Safety Precautions

为确保电池使用安全，使用前请仔细阅读本细则。Please read the manual carefully before using it in order to ensure proper use of the celll.

- (一) 不要靠近和放置电池于火中。Do not expose to, dispose of the battery in fire.
- (二) 任何情况下不允许电极反接。No electrode reverse is allowed under any circumstances.
- (三) 避免电池短路。Avoid short circuit of the cell.
- (四) 避免电池过多的物理撞击和震动。Avoid excessive physical shock or vibration.
- (五) 不要解剖和使电池变形。Do not disassemble or deform the cell.
- (六) 不要把电池浸泡在水中。Do not immerse the battery in water.
- (七) 不要和其它不同类型的电池混和使用。Do not use the cell mixed with different kinds of batteries.
- (八) 放置电池于儿童不易接触的地方。Keep out of the reach of children.
- (九) 电池处理：电池处理要符合当地的规定。Dispose battery in accordance with local regulations.

10 免责声明 Disclaimer

(一) 如果由于产品需求单位不按本说明书中的规定进行使用，造成社会性影响，并对雄韬的声誉造成影响的，雄韬将会追究产品需求单位的责任。 If the product demand unit does not use the product according to the provisions of this specification, causing social impact and affecting the reputation of Vision, Vision will investigate the responsibility of the product demand unit.

(二) 买方在订购雄韬产品前，需要与雄韬提前确认产品的最新状态。Before ordering Vision products, the buyer needs to confirm the latest status of the products in advance with Vision.

(三) 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.

11 风险警告 Risk Warning

11.1 警示声明 Waring statement

- (一) 电池存在潜在的危险，在操作和维护时必须采取适当的防护措施！

Cells are potentially dangerous and proper precautions must be observed in handling and maintenance.

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(二) 不正确地滥用测试实验，可能导致严重的人身伤害和财产损失！

Running tests on the cells improperly may result in severe personal body injury or property damages.

(三) 必须使用正确的工具和防护装备操作电池。

Work on cells must be performed only with proper tools and protective equipment must be used.

(四) 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。

Cell maintenance must be carried out by personnel knowledgeable of cells and trained in the safety precautions involved.

(五) 不遵守上述警告可能造成多种灾难。

Failure to observe the above may cause various hazards.

11.2 危险类型 Types of Hazards

客户知悉在电池使用和操作过程中存在以下潜在的危险:

Customer acknowledges the following potential hazards in connection with the usage and handling of the Products:

(一) 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。Working with battery can expose the handler to chemical, shock and/or arcing hazards. Although a person's body might react to contact with direct current voltage differently than from contact with alternate current voltage, Customer shall take a conservative position and consider the risk of shock or electrocution to be the same for both alternate current and direct current exposures greater than 50 V.

(二) 存在来自电池中的电解液的化学风险。Cells expose its handler to chemical hazards associated with the electrolyte used in the cell.

(三) 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 selecting work practices and personal protective equipment, customer and its employees should 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.

12 附录 Appendix

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12.1 不同温度放电曲线 Discharge curves at different temperatures

单体电池不同温度 50A 放电典型曲线图

A typical curve of single battery discharged with 50A at different temperature

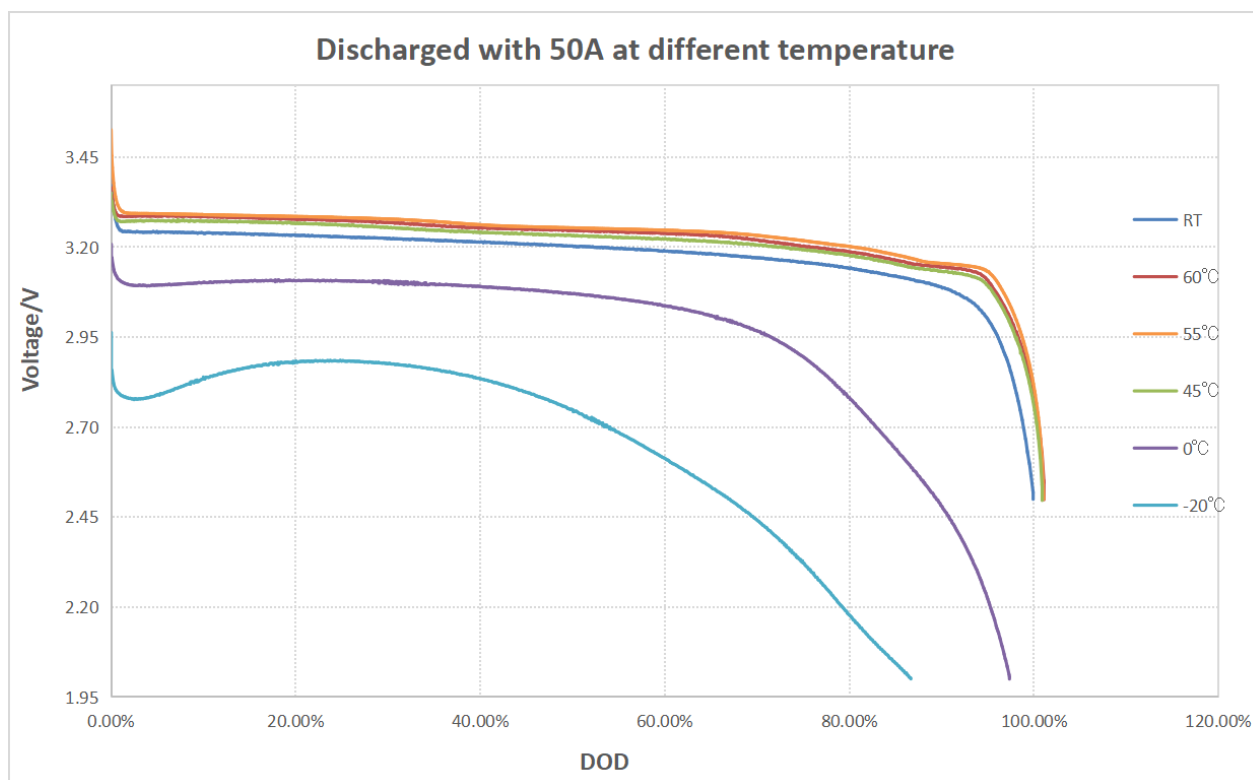


图 2. Prismatic 100Ah LFP cell 不同温度放电曲线

Graph2. Discharge curves of Prismatic 100Ah LFP cell at different temperatures