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LFP-86.6Ah 产品规格书

Production Specification Of LFP-86.6Ah

电池型号 Battery Type : 0H9CB081

电池容量 Battery Capacity: 86.6Ah

产品设计 Design	设计审批 Design Approval	销售审批 Sales Approval	工程审批 Process Approval	质保审批 Quality Approval
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签名 Signature	
日期 Date	
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0 术语定义 Terms Definition

术语 Terms	定义 Definition
产品 Product	Zenergy 生产制造的 86.6Ah 3.16V 插电混动车用铁锂锂离子电池 86.6Ah 3.16V LFP Battery For PHEV, Produced By Zenergy.
客户 Custerm	Zenergy 产品销售合同中的买方 Signed Client Of Zenergy.
Zenergy	江苏正力新能电池技术有限公司 Jiangsu Zenergy Battery Technologies Co, Ltd
PN	Zenergy 为可充放电锂电池定义的物料编号, 例如 86.6Ah: 1ACLC0620001。 Zenergy Rechargeable Li-ion Battery Part Number, Such As 86.6Ah: 1ACLC0620001。
环境温度 Ambient Temperature	电池所在环境的温度。 Battery Using Temperature.
电池管理系统 Battery Management System	监测和记录电池在整个服务期限内的运行参数的一种追踪和控制系统。其追踪和记录的参数有且不限于电压、电流、温度等, 用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规格书的规定。 BMS, Monitor And Record Battery Operating Parameter Through Out The Life Cycle, Such As Voltage, Current, Temperature, etc. To Control Battery Operation And Ensure Operating Condition To Follow Rules In This Spec.
电池温度 Battery Temperature	电池自身的温度, 电池测试时一般选择电池大面几何中心位置的温度作为电池温度。 Battery Temperature, Measured In The Center Of Largest Surface.
充电倍率 Charging Rate	电池充电时电流与电池标称容量的比率,通常以字母 C 表示, 例如电池的标称容量是 86.6Ah, 则 86.6A 为 1C, 43.3A 为 0.5C, 以此类推。 Ratio Of Charging Current To Nominal Capacity, Indicated By C. Example, Nominal Capacity Is 86.6Ah, Charging Rate Is 1C If Current Is 86.6A, Charging Rate Is 0.5C If Current Is 43.3A.
放电倍率 Discharging Rate	电池放电时电流与电池标称容量的比率,通常以字母 C 表示, 例如电池的标称容量是 86.6Ah, 则 86.6A 为 1C, 43.3A 为 0.5C, 以此类推。 Ratio Of Discharging Current To Nominal Capacity, Indicated By C. Example, Nominal Capacity Is 86.6Ah, Disharging Rate Is 1C If Current Is 86.6A, Discharging Rate Is 0.5C If Current Is 43.3A.
循环 Cycles	电池进行长期充放电的过程, 是表征电池性能的重要指标之一。 Battery Long Term Charging/Discharging Process, One Of Main Battery Performance.
生产日期 Production Date	电池的生产制造时间。 Battery Manufacturing Date.

标准充电 Standard Charging	用本规格书第 2.2.3 条所述的充电模式进行充电。 Charging According To 2.2.3.
标准放电 Standard Discharging	用本规格书第 2.3.3 条所述的放电模式进行放电。 Discharging According To 2.3.3.
荷电状态 State Of Charge	电池当前的实际容量与电池满电容量的比值，表征电池的荷电状态。例如电池的实际容量 15.01Ah，电池满电容量 86.6Ah，则此时电池的荷电状态为 17% SOC。 Ratio Of Battery Actual Capacity To Max Capacity, Indicating State Of Charge. Example, If Actual Capacity Is 15.01Ah And Max Capacity Is 86.6Ah, Then SOC is 17%
健康状态 SoH	描述电芯的健康状态，通常使用电芯可逆容量保持率来衡量。例如电芯新鲜状态时 SoH 为 100%，当电芯经过使用，可逆容量保持率下降到 80%时，电芯的 SoH 为 80% Describe the health state of the cell, usually measured using the cell reversible capacity retention. For example, when the cell is in a fresh state, the SoH of the cell is 100%, and when the cell is used and the reversible capacity retention drops to 80%, the SoH of the cell is 80%.
测量单位 Measurement Unit	电压 Voltage - V (Volt) 电流 Current - A (Ampere) 功率 Power - W (Watt) 容量 Capacity - Ah (Ampere-Hour) 能量 Energy - Wh (Watt-Hour) 电阻 Resistance - mΩ (MilliOhm) 温度 Temperature - °C (Degree Celsius) 长度 Distance - mm (Millimeter) 时间 Timing - s (Second) 频率 Frequency - Hz (Hertz)
标称容量 Nominal Capacity	电池按照本规格书第 2.2.3 条所述的充电模式充电后，按照第 2.3.3 条所述的放电模式放出的最小容量，例如本电池产品标称容量为 86.6Ah Minimal Battery Capacity Of Discharging (2.3.3), After Charging Process According To 2.2.3. Nominal Capacity Of This Battery Is 86.6Ah.
活化 Activation	以不超过标准充电 2.2.3 和标准放电 2.3.3 的倍率进行 1-3 次充放电循环的过程。 1 To 3 Charging/Discharging Cycles, Less Than Specified Rate In 2.2.3/2.3.3.
BOL	电池全生命周期的起始阶段，通常指未经过耐久性测试或者使用过的电池的状态。 Beginning Of Battery Service Life, No Durability Test Or Usage.

1. 适用范围 Range Of Application

本规格书详细描述了 Zenergy 生产的 86.6 Ah 3.16 V 插电混动车用铁锂锂离子电池的产品性能指标以及产品使用条件及风险警示。

This Spec. Details Product Performance, Operating Condition And Risk Of 86.6Ah LFP Battery (3.16V, For PHEV, Produced By Zenergy).

2. 产品电性能指标 Product Electrical Performance

2.1 概要 General

No.	参数 Parameter	产品规格 Product Spec.	条件 Condition
2.1.1	1C 最小容量（标称容量） Min. Capacity @1C (Nominal Capacity)	86.6 Ah	参考 2.2.3 与 2.3.3 标准充放电模式测试 Test According To 2.2.3 & 2.3.3.
2.1.2	1C 最小容量（参考值） Min. Capacity @1C (For Reference)	86.6 Ah	参考 2.2.4 与 2.3.4 推荐充放电模式测试 Test According To 2.2.4 & 2.3.4.
2.1.3	1C 最小能量（标称能量） Min. Energy @1C (Nominal Energy)	274Wh	参考 2.2.3 与 2.3.3 标准充放电模式测试 Test According To 2.2.3 & 2.3.3.
2.1.4	工作电压 Operating Voltage	2.5~3.65 V 2.0~3.65 V	电池温度 Battery Temp. $T>0^{\circ}\text{C}$ 电池温度 Battery Temp. $T\leq 0^{\circ}\text{C}$
2.1.5	平台电压 Nominal Voltage	3.16 V @ 1C 3.22 V @ 0.33C	2.2.3 与 2.3.3 标准充放电模式测试 Test According To 2.2.3 & 2.3.3. 2.2.4 与 2.3.4 推荐充放电模式测试 Test According To 2.2.4 & 2.3.4.
2.1.6	交流内阻 A-C Resistance	$\leq 0.45\text{ m}\Omega$	新电池状态， 17%SOC （1 kHz, 25°C ）
2.1.7	直流内阻 D-C Resistance	$\leq 0.9\text{ m}\Omega$	活化状态， 50%SOC （4C, 10s, 25°C ）

2.1.8	出货电压 Shipping Voltage	3.244-3.250 V	17% SOC (25°C)
2.1.9	月自放电 Self-discharging	≤3.0%/Month	出货三个月以内的电池，出货充电到 60%SOC，25±2°C 储存 Within 3 Months After Shipping, Shipping SOC - 60%, Storage Temp. 25±2°C
2.1.10	工作温度(充电) Charging Temperature	-20°C ~55°C	参考第 2.2 节。 Refer To 2.2.
2.1.11	工作温度(放电) Discharging Temperature	-30°C ~55°C	参考第 2.3 节。 Refer To 2.3.
2.1.12	电池重量 Weight	1.580 ± 0.03 kg	N.A.
2.1.13	存储温度 Storage Temp.	-40 ~ 60°C	存储环境湿度≤85%RoH，无凝露 Humidity ≤85%RoH, No Condensation.
2.1.14	电池尺寸 Dimension	宽度(W): 210.0±0.5mm 高度(H): 99.0±0.5mm 厚度(T): 35.1±0.3 mm	厚度测试在 300±20kgf 压力下，新鲜电池(详见本技术协议第 8 条) Thickness Measured At 300±20kgf, New Battery. (Refer To Article 8.)
2.1.15	SOC 使用区间 SOC Range	5%-100%	推荐使用的 SOC 区间 Recommended SOC Range
2.1.16	可充放电次数 Cycle Life	≥2500 Cycles	25±2°C 初始夹紧力 300kgf， Step charge/1C95% DOD 充放电测试 25±2°C, Preload 300kgf. Step charge/1C95% DOD.
2.1.17	最大连续充电电流 Max Continue Charging Current	173.2A (2C)	阶梯充电使用，不可用此电流直接满充循环使用 Step Charging Only. No Fully Charging Cycles
2.1.18	最大连续放电电流 Max Continue Discharging Current	259.8A (3C)	不可用此电流满放循环使用 No Fully Discharging Cycles

2.2 充电模式和参数 Charging Mode & Parameter

No.	参数 Parameter	产品规格 Specification	条件 Condition
2.2.1	标准充电倍率 Standard Charging Rate	0.33C	25±2℃
2.2.2	推荐充电倍率 Recommended Charging Rate	0.33C	25±2℃
2.2.3	标准充电模式 Standard Charging Mode	0.33C 恒流充电至 3.65V, 恒压充电至 0.05C (25℃) Charging To 3.65V Using Constant Current 0.33C, Then To 0.05 C With Using Constant Voltage @ (25℃)	
2.2.4	推荐充电模式 Recommended Charging Mode	0.33C 恒流充电至 3.65V, 恒压充电至 0.05C (25℃) Charging To 3.65V Using Constant Current 0.33 C, Then To 0.05 C With Using Constant Voltage @ (25℃)	
2.2.5	标准充电温度 Standard Charging Temp.	25±2℃	电池温度 Battery Temperature
2.2.6	允许充电温度 (电池) Allowable Charging Temp.	-20℃ ~55℃	无论电池处在何种充电模式, 一旦发现电池温度超过允许充电温度范围即停止充电 Stop Charging, Once Temperature Is Higher Than Allowable Charging Temperature, No Matter Which Charging Mode.
2.2.7	充电截止电压 Max Charging Voltage	3.65V	无论电池处在何种充电模式, 一旦发现电池电压超过充电截止电压即停止充电 Stop Charging, Once Voltage Is Higher Than Max Charging Voltage, No Matter Which Charging Mode.

2.2.8 全温度充电条件(快充) Charging Condition In All Temperature (Fast Charging)

快充充电 Map(C) Fast Charging Map (C)														
SOC T-℃	5%	10%	20%	30%	40%	45%	50%	60%	70%	80%	90%	95%	98%	100%
T<-20	/	/	/	/	/	/	/	/	/	/	/	/	/	/

-20≤T<-15	0.09	0.09	0.09	0.09	0.08	0.08	0.07	0.07	0.05	0.02	0.01	0.01	0.01	0.00
-15≤T<-10	0.15	0.15	0.15	0.15	0.13	0.13	0.11	0.11	0.09	0.03	0.02	0.01	0.01	0.01
-10≤T<-5	0.45	0.45	0.40	0.35	0.30	0.30	0.25	0.25	0.19	0.10	0.07	0.05	0.04	0.02
-5≤T<0	0.75	0.75	0.65	0.65	0.55	0.55	0.48	0.48	0.37	0.19	0.13	0.09	0.07	0.05
0≤T<5	1.00	1.00	1.00	1.00	0.84	0.84	0.74	0.74	0.56	0.30	0.20	0.14	0.11	0.07
5≤T<10	1.27	1.27	1.27	1.27	1.08	1.08	0.94	0.94	0.72	0.54	0.31	0.23	0.13	0.09
10≤T<15	1.41	1.41	1.41	1.41	1.20	1.20	1.05	1.05	0.80	0.60	0.35	0.25	0.15	0.10
15≤T<20	1.70	1.70	1.70	1.70	1.44	1.44	1.26	1.26	0.96	0.72	0.42	0.30	0.18	0.12
20≤T<25	2.26	2.26	2.26	2.26	1.92	1.92	1.68	1.68	1.28	0.96	0.56	0.40	0.24	0.16
25≤T<30	2.83	2.83	2.83	2.83	2.40	2.40	2.10	2.10	1.60	1.20	0.70	0.50	0.30	0.20
30≤T<35	2.83	2.83	2.83	2.83	2.40	2.40	2.10	2.10	1.60	1.20	0.70	0.50	0.30	0.20
35≤T<40	2.83	2.83	2.83	2.83	2.40	2.40	2.10	2.10	1.60	1.20	0.70	0.50	0.30	0.20
40≤T<45	2.83	2.83	2.83	2.83	2.40	2.40	2.10	2.10	1.60	1.20	0.70	0.50	0.30	0.20
45≤T<50	0.80	0.80	0.80	0.80	0.60	0.60	0.60	0.60	0.50	0.33	0.33	0.25	0.15	0.10
50≤T<54	0.50	0.50	0.50	0.50	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.25	0.15	0.10
54≤T<55	/	/	/	/	/	/	/	/	/	/	/	/	/	/
T≥55	/	/	/	/	/	/	/	/	/	/	/	/	/	/

2.3 放电模式和参数 Discharging Mode & Parameter

No.	参数 Parameter	产品规格 Specification	条件 Condition
2.3.1	标准放电倍率 Standard Discharging Rate	1C	25±2℃
2.3.2	推荐放电倍率 Recommended Discharging Rate	1C	25±2℃
2.3.3	标准放电模式 Standard Discharging Mode	1C 恒流放电至 2.5 V (25℃) Discharging with Constant Current	
2.3.4	推荐放电模式 Recommended Discharging Mode	1C 恒流放电至 2.5 V (25℃)	

2.3.5	放电截止电压 Max Discharging Voltage	2.5V 2.0V	$T > 0^{\circ}\text{C}$ $T \leq 0^{\circ}\text{C}$
2.3.6	标准放电温度 Standard Discharging Temp.	$25 \pm 2^{\circ}\text{C}$	电池温度 Battery Temperature
2.3.7	允许放电温度 Allowable Discharging Temp.	$-30 \sim 55^{\circ}\text{C}$	无论电池处在持续放电模式或脉冲放电模式， 若电池温度超过允许放电温度，则停止放电 Stop Discharging Once Temperature Is Higher Than Allowable Discharging Temperature, No Matter Which Charging Mode.

2.4 高低温容量 High/Low Temperature Capacity

No.	参数 Parameter	产品规格 Specification	条件 Condition
2.4.1	25°C 的容量 Capacity @ 25°C	$\geq 86.6\text{Ah}(100\%)$	BOL 电池状态，100%SOC， 25°C ，1C DC To 2.5V BOL, 100% SOC, 25°C , 1C DC To 2.5V
2.4.2	45°C 的容量 Capacity @ 45°C	$\geq 86.6\text{Ah}(100\%)$	BOL 电池状态，100%SOC， 45°C ，1C DC To 2.5V BOL, 100% SOC, 45°C , 1C DC To 2.5V
2.4.3	0°C 的容量 Capacity @ 0°C	$\geq 84.5\text{Ah}(95.7\%)$	新电池状态，100%SOC， 0°C ，1C DC To 2.0V New Battery, 100% SOC, 0°C , 1C DC To 2.0V
2.4.4	-20°C 的容量 Capacity @ -20°C	$\geq 80.0\text{Ah}(90.6\%)$	新电池状态，100%SOC， -20°C ，1C DC To 2.0V New Battery, 100% SOC, -20°C , 1C DC To 2.0V

2.5 电池温升 Battery Temperature Increase

本规格书中温升是指电池在充电或放电过程，温度的变化，探测温度的位置为电池表面（大面中心）。电池温升的测量应在环境温度较为稳定的恒温箱进行。

The Battery Temperature Increase Refer To The Temperature Changes During Charging & Discharging Process. Temperature Is Measured In The Center Of Battery Largest Surface. Temperature Increase Should Be Measured In Thermotank Which Can Stabilize Ambient Temperature.

No.	参数 Parameter	产品规格 Specification	条件 Condition
2.5.1	持续放电温升 Temperature Increase (Continue Discharging)	$\leq 10^{\circ}\text{C}$	电池在满电条件下以 2.3.3 标准放电模式进行放电 100% SOC, Discharging According To 2.3.3

2.6 充放电脉冲

本规格书提供的电池脉冲性能为 50%SOC 常温 10s 充电和放电的极限脉冲电流，未指定的 SOC 或温度的脉冲能力根据客户需求由 Zenergy 方单独评估提供。

Pulse Performance Refer To Max Pulse Charging And Pulse Discharging Current At 25 $^{\circ}\text{C}$, 50% SOC. Other Pulse Performance (Costumer Request, Unspecified SOC Or Temperature In This Spec.) Need To Be Provided By Zenergy After Assessment.

No.	参数 Parameter	产品规格 Specification	条件 Condition
2.6.1	10s 脉冲放电电流 Pulse Discharging – 10s	706A	50% SOC, 25 $^{\circ}\text{C}$
2.6.2	10s 脉冲充电电流 Pulse Charging – 10s	353A	50% SOC, 25 $^{\circ}\text{C}$

2.7 安全与可靠性 Safety & Reliability

2.7.1 使用条件说明：安全测试、寿命测试、系统成组设计需要施加预紧力，BOL 电池组装的建议预紧力范围为 2800N~3200kgf，控制公差在 $\pm 200\text{N}$ 范围。

Operating Condition: Apply Preload For Safety Test, Cycle Life Test and Module(Pack) Design. Recommended Preload Range Is 2800N~3200N, Tolerance Is $\pm 200\text{N}$.

2.7.2 存在风险项目：若交付电池为样品，暂未完成工艺冻结或工艺可靠性验证，存在批次稳定性风险。量产阶段产品规格需重新定义，提供正式产品规格书。

Risk: For Samples (Not Production Parts, Manufacturing Process Is Immature Or Unverified), There Are Risk Of Instability For Each Batch. New Specification Will Be Provided For Production Parts.

2.7.3 限制使用规定：若交付电池为样品，可在特定充放电条件下进行循环测试，测试次数少于 500 循环，电池仅供公告、测试等使用，不建议出售至终端客户全生命周期使用。

Limited Usage: For Samples, Cycle Life Test Will Be Ran In Specified Conditions. Cycle Number Should Be Less Than 500. Samples Are Used For Announcement, Test, etc., Not For Full Life Cycle Usage On Customer Side.

2.7.4 产品在使用过程中会产生膨胀力，电池在 15-20mm 铝板测试条件下衰减至 80%时膨胀力不大于 20000N，客户在产品的设计过程中需要考虑结构强度可靠性。

There Will Be Swelling Force Generated During Battery Operating. The Force Is Less Than 20,000 N When SOC Drop To 80% (Test With 15-20mm Aluminum Plate). User Need To Consider The Reliability Of Structural Strength During Product Development.

2.7.5 安全测试项：Safety Test

No.	测试项 Test	要求 Requirement	条件 Condition
2.7.5.1	过放测试 Over Discharging	无泄露 无破裂 无起火 无爆炸 No Leakage No Crack No Fire No Explosion	依据 2.2.3 方式充电后，以 1C 电流放电 90 分钟 Charging According To 2.2.3, Then Discharging With 1C Current For 90 mins
2.7.5.2	过充测试 Over Charging		依据 2.2.3 方式充电后，以 1C 电流充电到 SOC 达到 115%或电压达到充电截止电压的 1.1 倍，以先到者为准。 Charging According To 2.2.3, Then Charging To 115% SOC Or 1.1 Times Cut Off Voltage With 1C Current.
2.7.5.3	外部短路测试 External Short		依据 2.2.3 方式充电后，用总电阻小于 5 mΩ 的外接电阻对电池的正负极短路 10 分钟。 Charging According To 2.2.3, Then Contact Positive And Negative Terminals With 5 mΩ Resistance For 10

			mins.
2.7.5.4	热箱测试 Hot Box		依据 2.2.3 方式充电后，电池放在烘箱中加热，加热速度为 5℃每分钟，达到 130℃后保持 30 分钟，停止加热。 Charging According To 2.2.3, Then Heat The Battery In Oven. Raise The Temperature 5℃ Per Minute, Until To 130℃ And Keep 30 mins.
2.7.5.5	挤压测试 Crush		依据 2.2.3 方式充电后，垂直于电池单体极板方向施压，用半径 75mm 的半圆柱体，挤压速度不大于 2mm/s，电池挤压变形量达到 15%或挤压压力达到 100 kN（或测试对象重量的 1000 倍）或电压达到 0 V 时，测试应当终止。 Charging According To 2.2.3, Then Press With Pole (Semi-cylinder Shaped, R=75mm) On Battery Largest Surface, Loading Speed Is Less Than 2mm/s. If Shape Changed More Than 15%, Press Force Is More Than 100kN, Or Voltage Drop To 0V, Stop Test.
2.7.5.6	温度循环测试 Temperature Cycle		依据 2.2.3 方式充电后，放入温箱，按照 GB 38031-2020 的温度循环流程进行高低温循环测试，循环测试 5 次 Charging According To 2.2.3, Then Put Battery In Temperature Control Cabinet. Run 5 Times of High/Low Temperature Cycles According To GB38031-2020 .

3. 产品寿命终止管理 Battery Service Life Management

3.1 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 Zenergy 共同讨论和双方同意。当使用中的电池的内阻超过这个电池最初内阻的 150%或容量小

于等于标称容量 80% (25°C)，应停止使用电池。违反该项要求，将免除 Zenergy 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。

Battery Service Life Is Limited. The Customer Shall Develop Efficient Tracking System To Monitor And Record The Resistance And Capacity Through Out Service Life. The Measurement And Calculation Method Of Resistance & Capacity Need To Be Aligned Between Zenergy And The Customer. Stop Using Battery, If The Resistance Is Over Original Resistance By 50% Or The Capacity Is Less Than 80% Of Nominal Capacity @ 25°C. Any Violation Of The Requirement Will Excuse Zenergy' Responsibility From Sales Agreement And Quality Warranty In This Specification.

3.2 电池寿命判定条件参考 2.1.16 循环寿命。

Battery Life Definition Should Refer To Cycle Life Test According To 2.1.16.

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 Need To Strictly Comply Below Battery Application Conditions.

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。电池初次使用建议按照 2.2.4 推荐充电模式和 2.3.4 推荐放电模式进行一次充放电活化，以保证后续使用中容量的充分发挥。

Customer Need Prepare Battery Management System To Monitor, Control And Protect Battery. For New Battery, Recommend To Charging (2.2.4) And Discharging (2.3.4) For One Time To Active Battery, So That The Battery Capacity Will Be Fully Utilized.

4.2 建议客户向 Zenergy 提供电池管理系统详细的设计方案、系统特点、框架、系统数据、格式等相关信息，以供 Zenergy 对该系统进行设计评估，并建立电池管理档案。

Recommend Customer To Share BMS Design, Feature, Frame, Data, Format etc. With Zenergy. Zenergy Will Assess BMS And Develop Battery Files Accordingly.

4.3 未经 Zenergy 同意，客户不可擅自修改或者改变电池管理系统的设计和框架，以免影响电池的使用性能。

Customer Shall Not Modify BMS Design Or Frame Without Agreement Of Zenergy, To Avoid Impact On Battery Performance.

4.4 客户应保存完整的电池运转的监测数据，用作产品质量责任划分的参考。不具备完整的电池系统使用期限内的监测数据，Zenergy 不承担产品质量保证责任。

Customer Need To Keep Monitor Data Of Battery, Which Will Be Reference Of Product Quality Responsibility. If No BMS Monitor Data In Service Life, Zenergy Won't Be Responsible For Product Quality.

4.5 电池管理系统需满足以下最基本的检测和控制要求

BMS Need Satisfy Below Basic Measuring And Controlling Requirement.

No.	控制要求	参数	保护措施
4.5.1	充电终止 Stop Charging	3.65V	常温下，电池的电压达到 3.65V 时，限制功率 50% Room Temperature, Limited Power To 50%, Once Voltage Reach To 3.65V.
4.5.2	第一级过充电保护 First Level Overcharging Protection	3.70V	常温下，当电池电压达到 3.70 V，BMS 强制终止充电 Room Temperature, BMS Stop Charging Process, Once Voltage Reach To 3.70V.
4.5.3	第二级过充电保护 Second Level Overcharging Protection	3.75V	常温下，当电池电压达到 3.75 V，BMS 强制终止充电，且BMS 应锁定直到技术人员解决问题 Room Temperature, BMS Stop Charging Process And Lock Battery Until Technician Solve Issue, If Voltage Reach To 3.75V.
4.5.4	放电终止 Stop Discharging	2.5V	常温下，当电池的电压到达 2.5 V，电压限制功率 50% Room Temperature, Limited Power To 50%, Once Voltage Reach To 2.5 V.
4.5.5	第一级过放保护 First Level Over Discharging Protection	2.3V	常温下，当电池的电压到达 2.3 V， BMS 强制终止放电 Room Temperature, BMS Stop Discharging Process, Once Voltage Reach To 2.3V.

4.5.6	第二级过放保护 Second Level Over Discharging Protection	2.1V	常温下，当电池电压低于 2.1 V 时，BMS 强制终止放电，应及时以 0.1C 回充至 50% SOC，且 BMS 应锁定直到技术人员解决问题 Room Temperature, If Voltage Reach To 2.1V, BMS Stop Discharging Process And Need To Charging To 50% SOC With 0.1C Current,.
4.5.7	短路保护 Short-Circuit Protection	不允许短路 Short Circuit Is Not Allowed	发生短路时，由过流保护装置断开电池 When Short Circuited, Overcurrent Protection Will Cut Off Circuit.
4.5.8	过流保护 Over Current Protection	参考第 2.2 和 2.3 条 Refer To 2.2 & 2.3	电池管理系统控制充放电电流符合规格 BMS Ensure Charging & Discharging Process Follow This Spec.
4.5.9	过热保护 Over Heat Protection	参考第 2.5 条 Refer To 2.5	当温度超过本技术协议规定时，终止充电/放电 When Temperature Over Requirement In This Spec, Stop Charging Or Discharging.

备注：以上 No.4.5.2、4.5.3、4.5.5、4.5.6 为警示条款，还请客户注意：当电池达到上述任何一项条款描述的指标和参数状态时，意味着电池已超出本规格书规定的使用条件，客户需依保护措施及本规格书其它相关规定对电池采取保护措施。同时，Zenergy 声明对使用超出规定要求的电池质量不承担任何保证责任，因此而导致的客户及第三方的任何损失不予赔偿。

Note: No.4.5.2、4.5.3、4.5.5、4.5.6 Is Waring List For Customer. When Battery Reach To Any Above Condition, Means Battery Violated Using Condition In This Spec. Customer Need To Protect Battery According To Related Method In This Spec. Zenergy Will NOT Take Responsibility For Battery Quality If Battery Is Used Out Of The Condition In This Spec, Meanwhile Zenergy Will Not Compensate Any Loss Of Customer Or Third Parties.

4.6 避免电池到达过放状态。常温下，电池电压低于 2.5V 时，或在其它温度下，电池电压低于 2.3.5 放电截止电压，电池内部可能会遭到永久性的损坏，此时 Zenergy 的产品质量保证责任失效。根据本规格书 2.3.3，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。

Avoid Over Discharging. When Battery Voltage Below 2.5V At Room Temperature Or Below Cutting Off Voltage At Other Temperature (2.3.3), Battery Will Occur Irremediable Damage. And Quality Warranty Will Be Invalid. When Battery Discharging Cut Off Voltage Is Less Than Standard Discharging Cut Off Voltage, System Internal Energy Consumption Will Decrease To Minimum And Extend Sleep Time According To 2.3.3. Customer Need To Train User To Charging Battery Soon, In Case Of Battery Over Discharging.

4.7 若电池存放 180 天以上, 应定期(每隔 6 个月)补电, 将 SOC 调整为 60%左右。

If Storage Timing Is Over 180 Days, Recommend To Charging To 60% SOC Regularly (Every 6 Month).

4.8 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或性能恶化。电池管理系统应依照最小的充电温度进行控制。禁止在低于本规格书规定的温度条件下充电, 否则 Zenergy 不承担质量保证责任。

Avoid Using Battery In Temperature Lower Than Prohibited In This Spec (Include Standard Charging, Fast Charging, Emergency Charging), Otherwise Capacity Will Decrease And Performance Will Degrade. BMS Should Control Lowest Battery Charging Temperature. Prohibit Charging At Temperature Lower Than Specified In This Spec, Otherwise Zenergy Will NOT Take Responsibility For Battery Quality.

4.9 电池包设计中应充分考虑电池的散热问题, 由于电池包散热设计问题导致的电池过热损坏, Zenergy 不承担质量保证责任。

Must Consider Battery Heat Dissipation During Battery Pack Design Phase. Zenergy Will NOT Take Responsibility For Battery Quality, If Battery Is Damaged Due To Over Heat Which Is Caused By Battery Pack Heat Dissipation System.

4.10 电池包设计中应充分考虑电池的防水、防尘问题, 电池包必须满足 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池损坏(如腐蚀、生锈等), Zenergy 不承担质量保证责任。

Battery Pack Need Consider Waterproof And Dustproof, Complying With UL & IEC Relative Standard. Zenergy Will NOT Take Responsibility For Battery Quality, If Battery Is Damaged (Corrosion, Rust, etc.) Due To Issues Of Waterproof And Dustproof.

4.11 禁止不同 PN 料号电池在同一电池系统中混用, 否则, Zenergy 不承担质量保证责任。

Prohibit Mix Using Of Different Type Batteries, Otherwise Zenergy Will NOT Take Responsibility For Battery Quality.

5. 安全防范 Safety Precaution

5.1 禁止将电池浸入水中。

No Immerse Battery Into Water.

5.2 禁止将电池投入火中或长时间暴露在超过本规格书 2.1.10、2.1.11 和 2.1.13 规定的温度条件的高温环境中。在任何正常的充放电使用情况下，电池温度不能超过 60℃，如果电池温度超过 60℃，电池管理系统需断开电池，停止电池运行。

No Drop Battery Into Fire Or Expose Battery To Temperature Higher Than Specified Temp. (2.1.10, 2.1.11 & 2.1.13) In This Spec. Battery Temperature Must Lower Than 60℃. If Not, BMS Need To Disconnect Battery And Stop Battery Operating.

5.3 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。

No Short Circuit, Otherwise Heavy Current Or High Temperature May Cause Personal Injury Or Fire. Ensure Safety Precautions And Avoid Short Circuit During Battery Assembly Process.

5.4 严格按照标示和说明连接电池正负极，禁止反向充电。

Connect Battery According To Marking And Specification. Reverse Charging Is Not Allowed.

5.5 禁止电池过充。否则可能引起电池过热和火灾事故的发生。在电池安装和使用中，硬件和软件需 实行多重过充失效安全保护，最低保护要求见本规格书 4.5.1、4.5.2、4.5.3。

No Over Charging. Otherwise May Cause Battery Overheat Or Fire. Hardware And Software Over-charging Protection Is Must During Battery Assembly And Working. Minimum Protection Need Refer To This Spec (4.5.1, 4.5.2, 4.5.3).

5.6 客户应将电池安全地固定在固体平面上，并将电源线安全地束缚在合适的位置，以避免摩擦而引起电弧和火花。

Fix Battery On Solid Plane And Power Line On Proper Location Safely To Prevent Electric Arc And Spark Causing By Friction.

5.7 未经 Zenergy 同意严禁私自拆解电池，若因此而产生的任何安全事故或损失，Zenergy 概不负责。

Battery Disassembly Without Permission Of Zenergy Is Prohibited. Any Safety Issue Or Loss Causing By This Action Is Not Responsible By Zenergy.

5.8 严禁用塑料封装电池或用塑料进行电气连接。不正确的电气连接方式可能会造成电池使用过程中发生过热现象。

No Plastic Package Or Plastic Connector. Incorrect Electric Connector May Cause Over Heat Issues During Battery Operating.

5.9 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。

No Contact Electrolyte With Skin Or Eyes. If Happened, Wash Contact Area With Plenty Of Water And Contact Doctor. No Person Or Animal Is Allowed To Ingest Any Part Of Battery.

5.10 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，产生高温和起火。

Protect Battery From Vibration, Crash Or Impact. Otherwise, There Will Be Short Circuit Inside Of Battery And Cause Overheat And Fire.

5.11 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。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起火。当发生以上现象时，电池管理系统应该通过自动锁定功能，禁止后续的充电，并提醒使用者将装载有该电池的交通工具退回到经销商处进行系统维护。该电池只有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、改善后方可恢复使用。

Improper Charging Stop May Happen During Charging Process. Such As Exceed Charging Time Allowed, Exceed Charging Voltage Allowed Or Exceed Charging Current. Improper Charging Stop May Indicate Current Leakage Or Error Of Some Components. If Charging Before Finding Root Cause Or Solving Issues, Battery May Overheat Or Get On Fire. When Improper Charging Stop Happened, BMS Should Lock Battery Automatically, Stop Charging, Notice User To Return Transportation Including Battery To Dealer For Maintaining. Only After Certified Technician Complete Inspection, Find Root Cause And Fix Issue, The Battery Can Be Used Again.

5.12 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。

Improper Operation During Abuse Test May Cause Fire Or Explosion. Abuse Test Need Ran By Specialist Equipped With Special Protective Equipment In Special Lab. Otherwise, It May Cause People Injury And Property Loss.

6. 免责声明 Disclaimer

6.1 如果客户不按本规格书中的规定进行使用，造成社会性影响，并对 Zenergy 的声誉造成影响，Zenergy 将会追究产品需求单位的责任。根据对 Zenergy 造成的影响程度，产品需求单位需向 Zenergy 提供赔偿。

If Customer Use Battery Without Following This Spec, And Cause Social Impact, Damage Zenergy's Reputation, Zenergy Will Claim Battery User's Responsibility. According To Impact On Zenergy, Battery User Need Provide Compensation.

6.2 Zenergy 保留对产品的规格及性能参数修改的权利。买方在订购 Zenergy 产品前，需与 Zenergy 提前确认产品的最新状态。

Zenergy Claim The Right To Change Battery Specification And Performance Data. Customer Need To Align The Latest Status Before Purchasing.

6.3 若样品仍处于样品开发阶段，电池仅供公告、测试等使用，具体测试项目需与 Zenergy 协商确定，若因出售至终端客户而造成损失，Zenergy 对此不予负责。

If Battery Is Still In Sample Development Phase, Battery Is Used For Announcement And Test Only. Test Items Need To Be Aligned With Zenergy. If Battery Is Sold To Customer And Cause Any Loss, Zenergy Will NOT Take Responsibility.

7. 风险警告 Risk Warning

7.1 警示声明 Warning Statement

警告： 电池不当使用存在潜在的危險，在操作和维护时必须采取适当的防护措施！不正确地滥用，可能导致严重的人身伤害和财产损失！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。

**WARNING: IMPROPER OPERATION OF BATTERY IS HIGH RISK.
PRECAUTION IS MUST DURING OPERATION AND MAINTAINING.
INCORRECT OPERATION MAY CAUSE SEVERE PERSONAL INJURY AND
PROPERTY LOSS! PLEASE USE CORRECT TOOL AND PROTECTION
EQUIPMENT TO OPERATE BATTERY. BATTERY MAINTAINING MUST BE
OPERATED BY SAFETY-TRAINED AND WELL KNOWLEDGEABLE BATTERY
SPECIALIST. VIOLATION TO ABOVE WARNING MAY LEAD TO MULTIPLY
DISASTER.**

7.2 危险类型 Type Of Risk

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 Need To Know Below Risk During Using And Operating Battery.

7.2.1 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。

User May Be Injured By Chemicals, Electric Shock, Or Electric Arc During Operating. Although Human Reaction To AC And DC Is Different, All Current With Voltage Bigger Than 50V Will Cause Same Severe Level Injury. So That, Customer Need Take Safety Method To Avoid Electric Damage.

7.2.2 存在来自电池中的电解液的化学风险。

Chemical Hazard Comes From Battery Electrolyte.

7.2.3 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。

During Battery Operating And Personal Protective Device Selecting, Customer And It's Employee Must Consider Above Risk To Prevent Short Circuit, Which Will Cause Electric Arc, Explosion, Or Thermal Propagation.

7.2.4 电池在运输过程需要按照包装运输规范的要求进行，不当的运输可能会对电池造成不可逆的损伤，甚至引发安全事故，具体包装规范参照 Zenergy 内部包装指引文件进行。

Battery Package And Delivery Need Follow Requirement During Transportation. Incorrect Transportation May Damage Battery Irreversibly, Even Lead To Security Incident. Package Specification Need Follow Zenergy Relative Documents.

8. 电池图纸 Mechanical Drawing

