

天溯  
Tian Su



深圳天溯计量检测股份有限公司  
ShenZhen Tiansu Calibration and Testing Co.,Ltd.



中国认可  
国际互认  
检测  
TESTING  
CNAS L5138

Rep.No.:TSZ22110251-P06-R01

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# 检测报告 UN38.3

Name of sample:

LiFePO<sub>4</sub> BATTERY PACK

产品名称:

磷酸铁锂电池组

Model/型号规格:

LP16-48200

Client:

MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,  
LTD.

委托单位:

美世乐(广东)新能源科技有限公司

Classification:

Commission Test

检测类别:

委托测试

Shenzhen Tiansu Calibration and Testing Co.,Ltd

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UN38.3



TS(SZ)-J3-001-001-A1

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Name of samples: LiFePO <sub>4</sub> BATTERY PACK 样品名称: 磷酸铁锂电池组	Trade mark: MUST 商标: MUST
Commissioned by: MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,LTD 委托单位: 美世乐 (广东) 新能源科技有限公司	Commissioner address: 1-5F, 7F, 9F, 10F of No.8 building, No.115, Zhangcha Road 1, Chancheng district, Foshan city, Guangdong Province, P.R.China 委托单位地址: 中国广东省佛山市禅城区张槎一路 115 号八座一层、二层、三层、四层、五层、七层、九层、十层
Manufacturer by: MUST ENERGY (GUANGDONG) TECHNOLOGY CO.,LTD 制造单位: 美世乐 (广东) 新能源科技有限公司	Manufacturer address: 1-5F, 7F, 9F, 10F of No.8 building, No.115, Zhangcha Road 1, Chancheng district, Foshan city, Guangdong Province, P.R.China 制造单位地址: 中国广东省佛山市禅城区张槎一路 115 号八座一层、二层、三层、四层、五层、七层、九层、十层
Manufacturer's Contact Information 制造商联系信息: Phone:15012636534 Email:rd-cp@mustpower.cn	Manufacturer's Web Site 制造商网址: www.mustpower.cn
Type/Model 型号规格: LP16-48200	hape: Approximate Cuboid 样品形状: 近长方体
Appearance color: Black and White 样品颜色: 黑白色	Sample size 样品尺寸: L(580mm)*W(490mm)*H(259mm)
Rated info. 额定信息: 51.2V/200Ah/10.24KWh	Cell quantity 组成电芯数量: 16PCS
Quantity of sample: 30cells+8batteries 样品数量: 30 个电芯+8 个电池	Cell mode 电芯型号: 48173120
Limited charge voltage 充电限制电压: 57.6V	Cut-off voltage 放电截止电压: 44.0V
Standard charge current 标准充电电流: 20A	Max continuous charge current 最大持续充电电流: 50A
Standard discharge current 标准放电电流: 50A	Max continuous discharge current 最大持续放电电流: 100A
Receiving date 接样日期: 2021 年 09 月 19 日	Sample identification 样品标识序号: B1#~B8#, C1#~C30#
Completing date 完成日期: 2021 年 09 月 30 日	Test item: 8 items 测试项目: 8 项
<b>Test conclusion:</b> 检测结论: The LiFePO <sub>4</sub> BATTERY PACK submitted by MUST ENERGY (GUANGDONG) TECHNOLOGY CO., LTD. are tested according to Section 38.3 of the Sixth Revised Edition Amend.1 of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.6/Amend.1/Section38.3). The test results comply with the relevant requirements of the standard. 由美世乐 (广东) 新能源科技有限公司送检的磷酸铁锂电池组, 依据《关于危险货物运输的建议书》试验和标准手册第六修订版 1 第 38.3 节进行检测, 测试结果符合标准相关要求。 <div style="text-align: right;"> <b>Date of issue: Dec-03-2022</b>  <b>签发日期: 2022.12.03</b> </div>	

批准\Approved by  
技术负责人\Technology Supervisor

审核\Reviewed by  
项目工程师\Project Engineer

主检\Tested by  
测试工程师\Test Engineer

谢虎云



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Description and illustration of the sample:

样品说明及描述:

Test item 测试项目	Sample No. 样品编号	State 状态	Remark 备注
T.1~T.5	B1#~B2#	at first cycle in fully charged states; 在第一个循环完全充电;	Battery 电池
	B3#~B4#	after 25 cycles ending in fully charged states; 在第二十五个循环完全充电;	
T.6	C1#~C5#	at first cycle at 50% of the design rated capacity; 在第一个循环充电 50% 的额定容量;	Cell 电芯
	C6#~C10#	after 25 cycles ending in fully charged at 50% of the design rated capacity; 在第二十五个循环充电 50% 的额定容量;	
T.7	B5#~B6#	at first cycle in fully charged states; 在第一个循环完全充电;	Battery 电池
	B7#~B8#	after 25 cycles ending in fully charged states; 在第二十五个循环完全充电;	
T.8	C11#~C20#	at first cycle in fully discharged states; 在第一个循环完全放电;	Cell 电芯
	C21#~C30#	after 25 cycles ending in fully discharged states; 在第二十五个循环完全放电;	

Description of the sampling procedure:

取样程序的说明:

/

Description of report revision: The report on the basis of the original report

TCTTJ20210604222ZB-BR11 company Chinese name "MUST ENERGY (GUANGDONG)

TECHNOLOGY CO., LTD." changed to "MUST ENERGY (GUANGDONG) TECHNOLOGY CO., LTD."

报告修订的说明: 该报告在原报告 TCTTJ20210604222ZB-BR11 的基础上将公司中文名称“美世乐(广东)伺服技术有限公司”修改为“美世乐(广东)新能源科技有限公司”。

Remarks:

备注:

The LiFePO<sub>4</sub> BATTERY PACK by MUST ENERGY (GUANGDONG) TECHNOLOGY CO., LTD. are large batteries.

由美世乐(广东)新能源科技有限公司所送的磷酸铁锂电池组是大电池。

Photos of Battery\电池图片





Photos of Cell电芯图片



38.3.4	Procedure/测试步骤				—		
38.3.4.1	Test 1: Altitude simulation/测试 1：高度模拟				P		
	Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hour at ambient temperature (20℃±5℃) . 将电芯和电池在温度为 20℃±5℃,大气压力为不大于 11.6kPa 的环境中贮存不少于 6 个小时。						
	Requirement/标准要求: 1.Cells and batteries Mass loss limit: ≤0.1% . 样品质量损失≤0.1%。 2.Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 样品试验后开路电压应不低于试验前开路电压的 90%,此要求不适用于完全放完电的电池和电芯。 3.No leakage, no venting, no disassembly, no rupture and no fire. 样品（电池）应无漏液、无排气、无解体、无破裂以及无着火现象的发生。						
	Result 测试结果						
Sample No. 样品编号	Before test 测试前		After Test 测试后		Mass loss 质量损失(%)	Residual OCV 剩余电压(%)	Test result 测试结果
	Mass 样品质量 (kg)	Voltage 开路电压(V)	Mass 样品质量(kg)	Voltage 开路电压(V)			
B1#	85.432	55.258	85.432	55.248	0.00	99.98	P
B2#	85.428	55.263	85.428	55.263	0.00	100.00	P
B3#	85.430	55.264	85.430	55.264	0.00	100.00	P
B4#	85.416	55.265	85.416	55.265	0.00	100.00	P
Other supplements : Test result "P" decides that the test item passes. 其他补充：测试结果“P”代表判定该测试项目通过。							



38.3.4	Procedure/测试步骤					—	
38.3.4.2	Test 2: Thermal test/测试 2： 温度测试					P	
	<p>Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72℃±2℃, followed by storage for at least six hours at a test temperature equal to -40℃ ±2℃, The maximum time interval between test temperature extremes in 30 minutes, This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20℃±5℃).</p> <p>将电芯和电池在温度为 72℃±2℃的条件下贮存不少于 6 个小时，然后，在温度-40℃±2℃条件下贮存不少于 6 个小时，两个温度间的间隔最长为 30min,重复操作上述步骤直到 10 次，然后，将其在环境温度为 20℃±5℃的条件下放置 24 个小时。</p>						
	<p>Requirement/标准要求:</p> <p>1.Cells and batteries Mass loss limit: ≤0.1% . 样品质量损失≤0.1%.</p> <p>2.Open circuit voltage not less than 90%, The requirement relating to voltage is not applicable to test cells and batteries at full discharged states. 样品试验后开路电压应不低于试验前开路电压的 90%,此要求不适用于完全放完电的电池和电芯。</p> <p>3.No leakage, no venting, no disassembly, no rupture and no fire. 样品（电池）应无漏液、无排气、无解体、无破裂以及无着火现象的发生。</p>						
	<p>Result 测试结果</p>						
Sample No. 样品编号	Before test 测试前		After Test 测试后		Mass loss 质量损失(%)	Residual OCV 剩余电压(%)	Test result 测试结果
	Mass 样品质量 (kg)	Voltage 开路电压(V)	Mass 样品质量(kg)	Voltage 开路电压(V)			
B1#	85.432	55.248	85.432	54.942	0.00	99.45	P
B2#	85.428	55.263	85.428	54.952	0.00	99.44	P
B3#	85.430	55.264	85.430	54.964	0.00	99.46	P
B4#	85.416	55.265	85.416	54.952	0.00	99.43	P
<p><b>Other supplements</b> : Test result "P" decides that the test item passes.</p> <p>其他补充：测试结果“P”代表判定该测试项目通过。</p>							

[illegible]



[illegible]

38.3.4	Procedure/测试步骤		—
38.3.4.5	Test 5: External short circuit/测试 5：外部短路		P
	<p>The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 57℃±4℃ and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 57℃±4℃, This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57℃±4℃, the cell or battery must be observed for a further six hour for the test to be concluded.</p> <p>保持试验环境温度稳定在 57℃±4℃，以使电芯或电池样品外表温度达到 57℃±4℃，然后，在此温度下，将其正负极用小于 0.1 欧姆的线路短接，待电芯或电池的外表温度恢复到 57℃±4℃之后再持续 1 小时以上，对电芯或电池必须进一步观察 6 个小时才能下结论。</p>		
	<p>Requirement/标准要求：</p> <p>1.Cells and batteries meet this requirement if their external temperature does not exceed 170℃； 电芯或电池的外壳温度应不超过 170℃；</p> <p>2. No disassembly, no rupture and no fire during the test and within six hours after this test. 试验后 6 小时内无解体、无破裂、无起火。</p>		
	<p>Result</p> <p>测试结果</p>		
Sample No. 样品编号	Max External Temp 样品表面最高温度(℃)		Test result 测试结果
B1#	62.2		P
B2#	60.9		P
B3#	62.5		P
B4#	61.4		P
Other supplements ：Test result "P" decides that the test item passes.			
其他补充：测试结果“P”代表判定该测试项目通过。			



38.3.4	Procedure/测试步骤	—
38.3.4.6	<b>Test 6: Crush\Impact/</b> <b>测试 6: 挤压(适用)</b> <b>撞击(不适用)</b>	P
	<b>Crush</b> <b>挤压</b> <p>A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.</p> <p>(a) The applied force reaches 13kN±0.78kN;</p> <p>(b) The voltage of the cell drops by at least 100 mV;</p> <p>(c) The cell is deformed by 50% or more of its original thickness.</p> <p>Once the maximum pressure has been obtained, the voltage drops by 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.</p> <p>电池芯或组成电池芯在两个平面间挤压。挤压在第一个接触点以约 1.5cm/s 的速度慢慢进行，直到下面三个选项之一达到为止：</p> <p>(a)作用力达到 13kN±0.78kN；</p> <p>(b)电池芯电压降至少达到 100mV；</p> <p>(c)电池厚度和最初比较变形至少 50%。</p> <p>一旦达到最大压力，电压降超过 100 mV 或者电池芯变形超过 50%，压力应该解除。</p>	
	<b>Impact</b> <b>撞击</b> <p>(applicable to cylindrical cells not less than 18mm in diameter)</p> <p>The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ± 0.1 mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg ± 0.1 kg mass is to be dropped from a height of 61cm ± 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.</p> <p>The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm ± 0.1 mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.</p> <p>Cells and component cells meet this requirement if their external temperature does not exceed 170°C and there is no disassembly and no fire during the test and within six hours after this test.</p> <p>(适用于直径不小于 18 毫米的圆柱形电池)将电池或元件电池样品平放在一个平面上，其纵轴平行于测试台面，将一直径为 15.8 mm ± 0.1 mm 的 316 型不锈钢棒横放在电池中心位置。然后，将一质量为 9.1 kg ± 0.1 kg 的物体从 61cm±2.5 cm 的高度落向样品。样品在进行试验时，其外表温度应不超过 170°C。且试验结束后 6 个小时之内，样品应无解体、无起火现象发生。</p>	
	<b>Requirement/标准要求：</b> <p>1.Cells and component cells meet this requirement if their external temperature does not exceed 170°C；          电芯的外壳温度应不超过 170°C；</p> <p>2. No disassembly, no fire during the test and within six hours after this test.</p>	

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试验后 6 小时内无解体、无起火。			
<b>Result</b> 测试结果			
Sample No. 样品编号	OCV prior to test 试验前电压 (V)	Max External Temp 样品表面最高温度(℃)	Test result 测试结果
C1#	3.315	24.2	P
C2#	3.315	23.6	P
C3#	3.302	24.5	P
C4#	3.287	23.3	P
C5#	3.307	24.8	P
C6#	3.309	23.6	P
C7#	3.319	23.1	P
C8#	3.304	23.2	P
C9#	3.325	23.1	P
C10#	3.326	23.2	P
<b>Other supplements:</b> Test result "P" decides that the test item passes. 其他补充: 测试结果"P"代表判定该测试项目通过。			



38.3.4	Procedure/测试步骤	—													
38.3.4.7	<b>Test 7: Overcharge/测试 7: 过度充电</b>  When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the or 22V, whichever is less. When the manufacturer's recommended charge voltage is more than 18V, the charging voltage of the test shall be 1.2 times maximum charge voltage. The charging current is 2 times of the maximum charging current recommended by the manufacturer.  如果厂家推荐的充电电压不超过 18V, 本测试的最小充电电压应该是两倍的厂家标定最大充电电压或者是 22V, 取其中较小者。如果厂家推荐的充电电压超过 18V, 充电电压应该为 1.2 倍的厂家标定最大充电电压。充电电流为厂家推荐的最大充电电流 2 倍。	P													
	<b>Requirements/标准要求:</b>  No disassembly and no fire during the test and within seven days after the test. 试验样品在试验中和试验后 7 天内, 应无解体和无起火现象发生。														
	<b>Result</b> 测试结果														
	<table> <tr> <th>Sample No. 样品编号</th><th>OCV prior to test 试验前电压 (V)</th><th>Test result 测试结果</th></tr> <tr> <td>B5#</td><td>55.248</td><td>P</td></tr> <tr> <td>B6#</td><td>55.253</td><td>P</td></tr> <tr> <td>B7#</td><td>55.254</td><td>P</td></tr> <tr> <td>B8#</td><td>55.245</td><td>P</td></tr> </table>		Sample No. 样品编号	OCV prior to test 试验前电压 (V)	Test result 测试结果	B5#	55.248	P	B6#	55.253	P	B7#	55.254	P	B8#
Sample No. 样品编号	OCV prior to test 试验前电压 (V)	Test result 测试结果													
B5#	55.248	P													
B6#	55.253	P													
B7#	55.254	P													
B8#	55.245	P													
<b>Other supplements : Test result "P" decides that the test item passes.</b> 其他补充: 测试结果"P"代表判定该测试项目通过。															

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38.3.4	Procedure/测试步骤				—
38.3.4.8	<b>Test 8: Forced discharge/测试 8：强制放电</b>				P
	Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C power supply at an initial current equal to the maximum discharge current specified the manufacturer The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell, Each cell shall be forced discharged for a time interval(in hours) equal to its rated capacity divided by the initial test current(in ampere).				
	在 20℃±5℃的环境温度下，将单个电芯连接在 12V 的直流电源上进行强制放电，此直流电源提供每个电芯初始电流为制造厂指定的最大放电电流，放电时间为额定容量除以初始电流。				
	Requirements/标准要求： No disassembly and no fire during the test and within seven days after the test. 试验样品在试验中和试验后 7 天内，应无解体和无起火现象发生。				
<b>Result</b> 测试结果					
Sample No. 样品编号	OCV prior to test 试验前电压（V）	Test result 测试结果	Sample No. 样品编号	OCV prior to test 试验前电压（V）	Test result 测试结果
C11#	2.911	P	C21#	2.894	P
C12#	2.891	P	C22#	2.847	P
C13#	2.931	P	C23#	2.885	P
C14#	2.908	P	C24#	2.879	P
C15#	2.902	P	C25#	2.932	P
C16#	2.854	P	C26#	2.905	P
C17#	2.867	P	C27#	2.841	P
C18#	2.924	P	C28#	2.895	P
C19#	2.921	P	C29#	2.911	P
C20#	2.852	P	C30#	2.857	P
Other supplements：Test result "P" decides that the test item passes.					
其他补充：测试结果“P”代表判定该测试项目通过。					



## STATEMENTS

## 声 明

1. The test report is invalid without the official stamp of Tiansu.  
本报告无检测单位印章无效。
2. This report shall not be copied partly without the written approval of Shenzhen Tiansu Calibration and Testing Co.,Ltd.  
除非全部复制，否则无深圳天溯计量检测股份有限公司书面批准本报告不得部分复制。
3. The test report is invalid without the signatures of Ratifier, Reviewer and Testing engineer.  
本报告无批准人、审核人及鉴定人签名无效。
4. The test report is invalid if altered.  
本报告涂改无效。
5. Objections to the test report must be submitted to Tiansu within 15 days.  
对检测报告若有异议，应于收到报告之日起十五天内向检测单位提出。
6. The test report is valid for the tested samples only.  
本报告仅与送检样品有关。

-----报告结束-----