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Lithium iron Phosphate Battery Specification

MODEL: IFM72-66E3 (73.6V 6.6Ah)

Prepared By/Date	Checked By/Date	Approved By/Date

Customer Approval	Signature/Date
	Company Name
	Company Stamp

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Amendment Records

Edition	Description	Prepared by	Approved by	Date
A	First Edition	Li Xuan		2013-08-28

1. Scope

This specification is applied to the LiFePO4 battery pack with communication distributed by Master Instruments Pty Ltd.

2. Product Specification

Table 1

No.	Item	General Parameter	Remark
1	Rated Capacity (额定容量)	6.6Ah	Standard discharge (0.2 C ₅) after standard charge (0.2 C ₅) (0.2C 标准充电后 0.2 C ₅ 标准放电)
2	Minimal Rated Capacity (最小容量)	5.94Ah	
3	Nominal Voltage (标称电压)	73.6V	
4	Cycle Life (循环寿命)	Higher than 60% of the Initial Capacity of the Cells (初始容量的 60%)	<ul style="list-style-type: none"> ◆ Charge: CC@0.2C to 84V, then CV till current to 0.05C ◆ Rest: 30min. ◆ Discharge: 0.2C to 46.0V ◆ Temperature: 20±5°C ◆ Carry out 1000cycles ◆ 先以 0.2 C₅ 恒流充电至 84V, 再恒压充电至电流小于 0.05C ◆ 搁置: 30min. ◆ 放电: 0.2 C₅ 放至 57.5V ◆ 温度: 20±5°C ◆ 循环 1000 次
5	Discharge cut-off voltage (放电截止电压)	46V	Module itself no protection 模块没有保护
6	Charging cut-off voltage (充电截止电压)	84V	
7	Cell and assembly method (电芯和组装方式)	IFR26650EC-3.3AH	23S2P
8	Housing material (外壳材料)	ABS+PC housing/ ABS+PC 塑胶外壳	

Continuous the table 1

No.	Item	General Parameter	Remark
9	Standard charge (标准充电)	0.2C constant current(CC) charge to 84V,then constant voltage (CV) 84V charge till charge current decline to $\leq 0.05C$ 0.2C 恒流充电至 84V, 再 恒压 84V 充电直至充电电 流 $\leq 0.05C$	Charge time : Approx 7h (充电时间:大约 7 个小时)
10	Standard discharge (标准放电)	Constant current 0.2C Cut-off voltage 57.5.0V (持续电流: 0.2C 截止电压:57.5.0V)	
11	Maximum Charge Current (最大充电电流)	4.5A	
12	Continuous Discharge Current (持续放电电流)	6A	
13	Operation Temperature Range (工作温度范围)	Charge (充电) : 0~45°C	60±25%R.H.
		Discharge (放电) : -10~60°C	
14	Storage Temperature Range (储存温度范围)	Less than 1 year : 0~25°C (小于一年: 0~25°C)	60±25%R.H. at the shipment state (出货态时的湿度范围)
		Less than 3 months:-5~35°C (小于 3 个月:-5~35°C)	
15	Weight (重量)	Approx/大约:5.204 Kg	
16	Max. Dimension (最大尺寸)	High/高度: 79mm	
		Width/宽度: 350mm	
		Length/长度: 190mm	

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17	Charge protection 充电保护	When the Battery modules are charged to full, MOSFET disconnect the charger. 一旦电池模块充满电，MOSFET 会断开。
18	Balancing 均衡电路	The intra-module balancing circuit is used to compensate slight capacity imbalance among the 23 cell blocks within a battery module. 模块内部均衡电路用于补偿 23 个电池 block 之间的轻微容量不平衡。
19	State of Charge(SOC) Measurement SOC (荷电状态) 测量	Individual cell block voltage and charge/discharge current will be used to monitor the state of charge (SOC) of the battery module. The estimated capacity used for the calculations will be adjusted to meet the capacity of the lowest capacity cell block when the battery system is fully cycled. The state of charge will be adjusted for normal self discharge of the battery system when the unit is not on charge. 每个电池块电压和充放电电流将用于计算电池模块的荷电状态 (SOC)。当模块完成循环后，电池模块 SOC 的值为 23 个电池块最小的 SOC 值。当模块静置时，SOC 会按模块的正常自放电进行调整。
20	I2C Communication I2C 通信	I2C Communications will be used to communicate with the SEGWAY. I2C 用于与 SEGWAY 车通信。
21	Status LED 状态 LED 显示	A Dual LED on module to indicate working status. One is green and the other one is red. Blinking of the green LED indicates that the module is working properly. Blinking of the red LED indicates that the module has failure and needs service. 模块上的双色 LED 显示电池模块的工作状态。亮绿灯表示模块工作正常，亮红灯表示模块故障，需要维护。

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3. Performance And Test Conditions

3.1 Standard Test Conditions

Test should be conducted with new batteries within one week after shipment from our factory and the batteries shall not be cycled more than five times before the test. Unless otherwise specified, test and measurement shall be done under temperature of $20\pm 5^{\circ}\text{C}$ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30°C and humidity 25~85%RH.

3.2 Measuring Instrument or Apparatus

3.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

3.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/\text{V}$

3.2.3 Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω .

3.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

3.3 Standard Charge/Discharge

3.3.1 Standard Charge : 0.2C

Charging shall consist of charging at a 0.2C constant current rate until the battery reaches 84V. The battery shall then be charged at constant voltage of 84V volts while tapering the charge current. Charging shall be terminated when the charging current has tapered to $0.05 C_5\text{A}$. Charge time: Approx 7.0h, The battery shall demonstrate no permanent degradation when charged between 5 °C and 45 °C.

3.3.2 Standard Discharge : 0.2C

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Battery shall be discharged at a constant current of 0.2C to 57.5.0V @ 20° ± 5C

3.3.3 If not otherwise specified, the rest time between charging and discharging is 30min.

3.4 Appearance

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

4. Handling of battery

4.1 Prohibition short circuit

Never short circuit battery. It generates very high current which causes heating of the battery and may cause electrolyte leakage, gassing or explosion that is very dangerous.

The poles may be easily short-circuited by putting them on conductive surface.

Such outer short circuit may lead to heat generation and damage of the battery.

An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

4.2. Mechanical shock

Falling, hitting, bending, etc. may cause degradation of battery characteristics.

5. Others

Prevention of short circuit within a battery pack

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection.

The battery pack shall be structured with no short circuit internally, which may cause generation of smoke or firing.

6. Period of Warranty

The period of warranty is 12 months from the date of INVOICE. Master Instruments guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse.

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7. Storing the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity. We recommend that batteries be charged about once per three months to prevent over-discharge.

8. Other Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

9. Photo:



10. Any other items which are not covered in this specification shall be agreed by both parties.