圆柱型锂离子电芯规格书

（动力汽车型-EA）

SPECIFICATION OF PRODUCT

for Lithium-ion Rechargeable Cell

电芯型号：INR18650-28E

Model :INR18650-28E

Customer Approval 客户认同	Signature签名	Date日期
	Company Name: 公司名称 ：	
	Company Stamp: 公司印章 ：	

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History of revision修订记录

Revision 修订状态	Date 日期	Originator 拟制人	Reason of Revision 修订记录
A/0	2017-07-19	YUAN JUN	Original Release 初版发行

1. Scope 适用范围

This product specification has been prepared to specify the Cylindrical Lithium-ion Cell to be supplied to the customer by HENGDIAN GROUP DMEGC MAGNETICS Co.,Ltd.

本规格书适用于由横店集团东磁股份有限公司生产的圆柱型锂离子电芯。

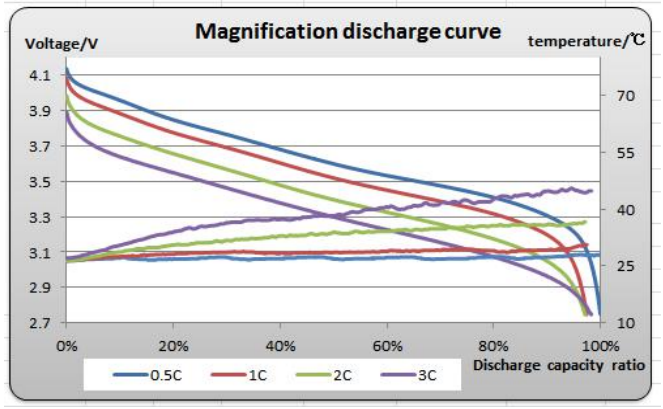
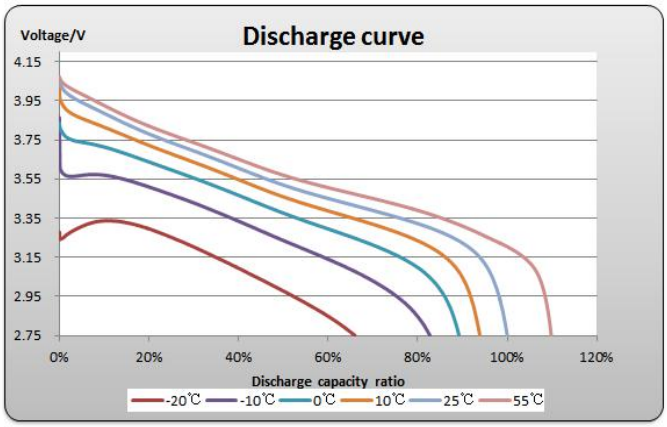
2. Description and Model 型号及说明

2.1 Description 说明 Cell（Cylindrical Lithium-ion Cell）圆柱型锂离子电芯

2.2 Model 电芯型号 INR18650-28E

3. Cell Specification 电芯特性

NO. 序号	ITEMS 项目	SPECIFICATION 参数
3.1	Nominal capacity 标称容量	2800mAh@0.5C
3.2	Min. capacity 最小容量	2750mAh@0.5C (Discharge the cell from 4.2V to 2.75V by 0.5C current) (电芯以 0.5C 从 4.2V 放电至 2.75V)
3.3	Nominal voltage 标称电压	3.65V
3.4	Charge voltage 充电电压	4.2 ±0.05 V
3.5	Discharge cut-off voltage 放电终止电压	2.75±0.05 V
3.6	Standard charge current 标准充电电流	0.5C(1400 mA)
3.7	Standard charge cut-off current 标准充电截止电流	0.05C(140 mA)
3.8	Standard discharge current 标准放电电流	1.0C(2800mA)
3.9	Max. charge current 最大充电电流	1.0C(T≥10℃) 0.3C(10℃>T≥0℃)
3.10	Max. discharge current 最大放电电流	2.0C(T≥0℃) 1.0C(0℃>T≥-20℃)
3.11	Max. recommended charge and discharge cell body temperature 充放电过程中电芯表面的最大推荐温度	Charge:0~ 45℃充电时：0~45℃ Discharge:-20~ 60℃放电时：-20~60℃

3.12	Max. period charge and discharge cell body temperature. Charging and discharging at these conditions will shorten cell cycle life. 周期充放电过程中电芯表面的最大推荐温度（在这些情况下充放电将会导致电池循环寿命很快衰减）	Charge: 50℃ Discharge: 60℃ 充电时：50℃ 放电时：60℃
3.13	Humidity range 湿度范围	0～90%RH(non-condensing 不冷凝)
3.14	Internal resistance 内阻	＜25mΩ(ACIR)
3.15	Cell dimension 电芯尺寸	Height（高度）: 65.05mm±0.15mm Diameter（直径）:18.20mm±0.20mm Refer to the attached drawing 1 参考附图1
3.16	Weight 重量	＜48g
3.17	Rate discharge curve 倍率放电曲线	
3.18	High and low temperature discharge curve 高低温放电曲线	

4. Appearance 外观

There shall be such defect as deep scrath、pits、creck、rust、leakage, which may adversely affect commercial performance of the cell.

电芯外观不存在明显的刮痕、凹坑、裂痕、锈蚀、漏液等影响电池性能的外观不良。

5. Technical characteristics技术要求

5.1 Cell usage conditions 电芯使用环境

Temperature of charge 充电温度： 0～45℃

Temperature of discharge 放电温度： -20～60℃

5.2 Cell testing conditions 电芯试验环境

Unless otherwise specified, all tests stated according to following: Temperature： 25±2.5℃

除非有特殊说明，所有测试的环境条件要求如下：温度： 25±2.5℃

5.3 Requirement of the testing equipment 测量仪表要求

Voltage meter: The voltage tester internal resistance is ≥ 10 KΩ/V

电压仪表要求：测量电压的仪表内阻不小于 10KΩ/V

Temperature meter: The precision is ≥0.5℃

温度仪表要求：测量温度的仪表精度不低于 0.5℃

Electronic performance 电性能

电性能测试方法参见GB/T 31486 及GB/T 31484标准。

Test method refers to GB/T 31486 and GB/T 31484.

NO. 序号	ITEMS 测试项目	Specification 规格
5.4.1	Rate discharge performance 倍率放电性能	Cap(3.0C)/Cap(1.0C)≥90%
5.4.2	Rate charge performance 倍率充电性能	Cap(Charge by 2.0C current)/Cap(Charge by 1.0C current)≥80%
5.4.3	Cycle life 循环寿命	0.5C充/1.0C放：Cap(500th)/Cap(Av10)≥80%； 0.5C charge/1.0C discharge：Cap(500th)/Cap(Av10)≥80%；
5.4.4	High and low temperature discharge performance 高低温放电性能	Cap(-20℃)/Cap(25℃)≥70% Cap(55℃)/Cap(25℃)≥90%
5.4.5	RT， 28 days ， Charge retention and capacity recovery 常温满电 28 天，充电保持与容量恢复能力	Residual Capacity percent: Cap(After)/Cap(before)≥85%； Recovery Capacity percent： Cap(After)/Cap(before)≥90%；
5.4.6	55℃， 7 days ， Charge retention and capacity recovery 55℃满电 7，充电保持与容量恢复能力	Residual Capacity percent: Cap(After)/Cap(before)≥85%； Recovery Capacity percent： Cap(After)/Cap(before)≥90%；

5.4 Environmental characteristics 环境适应性能

NO. 序号	ITEM 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
5.5.1	Vibration 振动性能	There shall be no electrolyte leakage 电解液无泄漏	After standard fully charge, cell shall be attached to a vibration table directly and subjected to vibration that consists of 10 Hz to 55 Hz to 10 Hz at the speed of 1Hz/min in 180-200mins. The total excursion of the vibration is 0.8mm (0.060 inches). The cell shall be vibrated in each direction along axis of the cylinder and the vertical directions of axis of the cylinder. 将满电电芯放在振动实验台上，在 180~200mins 由 10 Hz 到 55 Hz 再到 10Hz 以 1Hz/min 的速率变化，振幅为 0.8mm(0.060 英寸)进行振动实验。电芯在电芯的轴向和与电芯轴向垂直的两个方向上振动。

5.6 Safety characteristics 安全性能

安全性能测试方法参见GB/T 31485标准。Testing method refers to GB/T 31485.

NO. 序号	ITEMS 测试项目	CRITERION 性能标准	TESTING METHOD 测试条件与方法
5.6.1	Overcharge Testing 过充测试	No leakage、No flame、No fire、No explosion 不漏液、不冒烟、不起火、不爆炸	The cell is discharged according to the standard discharge method. Charge at 1 C to more than 6.3V or charge for 1h. 电芯按照标准放电方式放完电后，采用 1C 电流恒流充电，直至电压升至 6.3V 以上时或充电达到 1h 停止。
5.6.2	Over discharge Testing 过放性能测试	No fire, No explosion 不起火、不爆炸	After standard charging, the cell is discharged current 1C for 90mins, and then observe the variation of the cell's appearance for 1h. 电池标准充电后，电池以 1C 电流放电 90min 后对电池状态进行观测 1h。

5.6.3	130℃ Hot oven Testing 130℃热箱测试	No fire, No explosion 不起火、不爆炸	After fully charging the cell following the standard charge method and put it into the oven. And then the oven temperature will be ramped at 5℃ per minute to 130℃ When the temperature of the cell reach 130℃, the cell is maintained in the 130℃ oven for 30 minutes or until fire or explosion is obtained. 电芯按照标准充电方式充满电后，将电芯放进热箱里，然后将热箱按 5℃/min 升温到 130℃，当电芯的温度也达到 130℃时，电芯在热箱 130℃环境下保持 30 分钟或者电芯起火爆炸为止。
5.6.4	Crush Testing 挤压测试	No fire、No explosion 不起火、不爆炸	After fully charging the cell following the standard charge method and Put it between two flat surfaces for a Crush Test. The direction of the crushing force shall be vertical to axis of the cylinder. Using a pressure device which has a 32mm diameter Hydraulic piston with 13 KN Crushing force ,Release the pressure immediately until the maximum is reached。 电芯按照标准充电方式充满电后，放在两个平整的表面进行挤压测试，压力器必须施加一个与圆柱电芯轴向垂直的力，平压于电芯。采用 32 mm 直径的液压活塞，所用压力为 13 KN，一旦达到最大压力值，即释放压力。
5.6.5	Short circuit Testing 短路测试	No fire、No explosion 不起火、不爆炸	Cell shall first be charged according to standard charge method, and then cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 5mΩ. This test is done at room temperature. Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 10℃ less then peak temperature. 电芯按照标准充电方式充满电后，在室温条件下进行短路实验，将接有热电偶的电芯置于通风橱中，用铜线短路其正负极(线路总电阻不大于 5 毫欧)，实验过程中监视电芯温度变化，当电芯温度下降到比峰值低 10℃时，结束实验。
5.6.6	Drop Testing 跌落性能	No flame、No fire 、No explosion 不冒烟、不起火、不爆炸。	After standard charging, measure the initial state of the cell, then the positive and negative terminals of cell is to be dropped from a height of 1.5m to cement floor. 电池标准充电后，测量电池的初始状态，将电池样品由高度为 1.5m 的位置从正负端子向下自由跌落到水泥地面上。

<table>
<tr>
<td>5.6.7</td>
<td>Thermal Cycle Performance
热循环性能</td>
<td>No leakage、No flame、No fire、No explosion
不漏液、不冒烟、不起火、不爆炸</td>
<td>Cell is charged according to standard, put it into the oven at room temperature and follow the table to adjust, cycle 5 times and observe the cell for 1h.
<table>
<tr><th>Temp /℃</th><th>Time increment /min</th><th>Cumulative time/min</th><th>Temperature change rate ℃/min</th></tr>
<tr><td>25</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>-40</td><td>60</td><td>60</td><td>13/12</td></tr>
<tr><td>-40</td><td>90</td><td>150</td><td>0</td></tr>
<tr><td>25</td><td>60</td><td>210</td><td>13/12</td></tr>
<tr><td>85</td><td>90</td><td>300</td><td>2/3</td></tr>
<tr><td>85</td><td>110</td><td>410</td><td>0</td></tr>
<tr><td>25</td><td>70</td><td>480</td><td>6/7</td></tr>
</table>
将电池按标准充电，在室温下稳定后放入温度烤箱，温度箱按下表进行调节，循环 5 次，观察 1h。
<table>
<tr><th>温度℃</th><th>时间增量 min</th><th>累计时间 min</th><th>温度变化率℃ /min</th></tr>
<tr><td>25</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>-40</td><td>60</td><td>60</td><td>13/12</td></tr>
<tr><td>-40</td><td>90</td><td>150</td><td>0</td></tr>
<tr><td>25</td><td>60</td><td>210</td><td>13/12</td></tr>
<tr><td>85</td><td>90</td><td>300</td><td>2/3</td></tr>
<tr><td>85</td><td>110</td><td>410</td><td>0</td></tr>
<tr><td>25</td><td>70</td><td>480</td><td>6/7</td></tr>
</table>
</td>
</tr>
<tr>
<td>5.6.8</td>
<td>Low pressure Testing
低气压</td>
<td>No leakage、No flame、No fire、No explosion
不漏液、不冒烟、不起火、不爆炸</td>
<td>Cell is charged according to standard at 23℃±2℃. In under pressure condition of no higher than 11.6KPa to maintain for 6h.
在 23℃±2℃的环境温度下，电池标准充电完成后，在不高于 11.6KPa 压力条件下保持 6h</td>
</tr>
<tr>
<td>5.6.9</td>
<td>Seawater Immersion Testing
海水浸泡</td>
<td>No fire、No explosion
不起火、不爆炸</td>
<td>Immerse the cell in 3.5% NaCl solution for 2h, and the water should be completely over a single cell.
将单体电池侵入 3.5%NaCl 溶液中 2h；水应完全淹没过单体电池；</td>
</tr>
</table>

Note **备注**	All above safety tests will be conducted at 25℃±3℃ except where specified differently. Use proper ventilation with protective equipment. 除特殊说明，以上所有安全测试均应在 25℃±3℃通风橱中，且附带有保护装置的条件下进行。

6. Warning and cautions in handling the lithium-ion cell

电芯使用时警告事项及注意事项

To prevent the possibility of the cell from leakage, heating, explosion, please observe the following precautions:

为防止电芯可能发生泄露，发热，爆炸，请注意以下预防措施：

Don't immerse the cell in water. Cell should be placed in a cool and dry environment

严禁将电芯浸入水中，保存不用时，应放置在阴凉干燥的环境中。

Don't use and leave the cell near a heat source such as fire or heater.

禁止将电芯在热高温源旁，如火，加热器等旁边使用和留置。

When charging, use a cell charger specifically for that purpose.

充电时请选用锂离子电芯专用充电器。

Don't reverse the positive and negative terminals.

严禁颠倒正负极后使用电芯。

Don't connect the cell to an electrical outlet directly.

严禁将电芯直接插入电源插座。

Don't discard the cell in fire or heater.

禁止将电芯丢入火或加热器中。

Don't connect the positive and negative terminals directly with metal objects.

禁止用金属直接连接电芯正负极，造成短路。

Don't transport and store the cell together with metal objects such as necklaces, hairpins.

禁止将电芯与金属，如发卡、项链等一起运输或存储。

Don't strike, throw or trample the cell.

禁止敲击，抛掷或踩踏电芯等。

Don't directly solder the cell.

禁止直接焊接电芯。

Don't pierce the cell with a nail or other sharp object.

禁止用钉子或其它利器刺穿电芯。

Don't use or leave the cell at very high temperature conditions (for example, strong direct sunlight or a vehicle in extremely hot conditions).

禁止在高温下（直热的阳光下或很热的汽车中）使用或放置电芯，否则可能会引起电芯过热，起火或功能失效，寿命减短。

If the cell leaks and the electrolyte get into your eyes, don't wipe eyes, instead thoroughly rinse the eyes with clean running water, and immediately seek medical attention if necessary. Otherwise, eyes injury can result.

如果电芯发生泄露，电解液进入眼睛，请不要搓揉，应用清水冲洗眼睛，必要时请立即前往医院接受治疗，否则会伤害眼睛。

If the cell gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during usage, recharging or storage, immediately remove it from the device or cell charger and stop using it.

如果电芯发出异味，发热，变色，变形或使用、存储、充电过程中出现任何异常现象，立即将电芯从装置或充电器中移开并停用。

In case the cell terminals get dirty, clean the terminals with a dry cloth before use.

如果电芯弄脏，使用前应用干布抹净。

7. The restriction of the use of hazardous substances 有害物质控制要求

This model of lithium-ion cell is in accordance with our company's request of "environmental substances control standard".

本型号锂离子电芯符合本公司“环境物质控制标准”要求！

8. Guarantee 保证

Cells are guaranteed to be free from defects in workmanship and materials for a period of half a year provided that the manufacturer can confirm such defects are resulted from manufacturing abnormality, not from abusive usage, or else manufacturer will solve the quality problem. DMEGC won’t replace a new cell for free if the defects are not due to the failure of manufacturing process or is due to customer’s abuse or misuse.

电芯正常使用半年内，经确认出现任何制程而非滥用原因造成的质量问题，均由生产厂方予以解决。此期限外，非制程原因而是客户误用造成的电芯质量问题，东磁不承诺免费更换。

8.1.DMEGC will not be responsible for trouble occurred by against the precautions in instructions.

东磁公司对违反安全守则操作所产生的问题不承担任何责任。

8.2.DMEGC will not be responsible for trouble occurred by matching problems with electric circuit, cell pack and charger.

东磁公司对于电路，电池组以及充电器搭配使用所产生的问题不承担任何责任。

8.3.DMEGC will be exempt from warrantee any defect cells during assembling after acceptance.

东磁公司对于出货后客户在电芯组装过程中产生的不良电芯不予以质量保证。

9. Package 包装

100 cells per box, 2 boxes into a case, totally 200 cells. Sketch map refers to attached drawing 2

电芯包装每盒装 100 只电芯，每箱装 2 盒，共 200 只电芯。包装示意图见附图 2。

10. Others 其它

Any matter not included in this specification shall be conferred between the both parties.

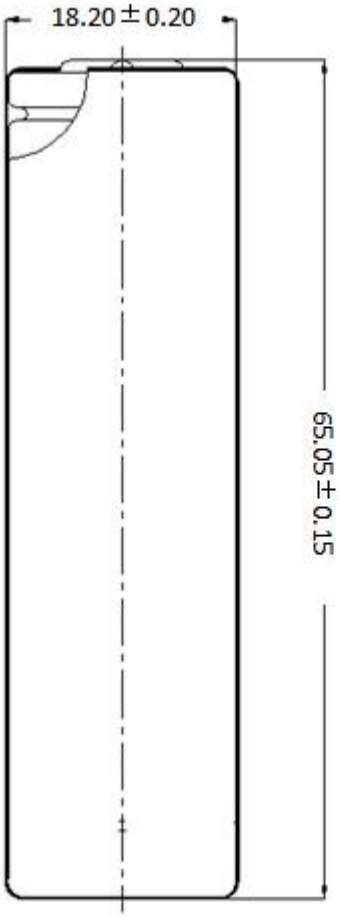
不包含在此产品规格书之内的任何问题，由双方协商解决。

11. Shipping 运输

The capacity of delivery cell is approximately at 20-30% of charging. It is not guaranteed that 20-30% capacity remain when reach customer, because of self-discharge. During transportation, prevent the cell from acutely vibration, impacting, solarization, drenching.

出货电芯处于 20-30%充电状态，由于电芯存在自耗，运送到客户端的电芯无法完全保证 20-30%荷电量。运输过程应防 止剧烈振动、冲击、日晒、雨淋。

Attached drawing1 附图 1 单位：mm



Attached drawing2 附图2