

SPECIFICATION

(承认书)

NO:

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|-----------------------------------|------------------------------------------------------------------------------|--|--|
| CUSTOMER 客户 | | | |
| BFN PART NO. 博富能产品编号 | H450 5/4AAAA | | |
| TYPE 类型 | 1.2V 5/4AAAA450mAh Ni-MH Cylindrical battery 1.2V 5/4AAAA450mAh 镍氢圆柱型充电电池 | | |
| DATE SUBMITTED 呈交日期 | | | |
| REMARK 备注 | | | |
| APPROVAL SIGNATURE & CHOP 核准签章 | | | |
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深圳市博富能电池有限公司

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1. 参数规格 SPECIFICATIONS:

| APPROVED BY 批准 | CHECKED BY 核查 | PREPARED BY 准备 |
|-------------------|------------------|-------------------|
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H450 5/4AAAA

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| 单体电池类型 | 密封圆型镍氢电池 |
| Type | Sealed Ni-MH Cylindrical Battery cell |
| 型号 | H450 5/4AAAA |
| Size | |
| 尺寸 | 5/4AAAA (HR8.5/52.0) |
| Model | |
| 标称电压 | 1.2V |
| Nominal Voltage | |
| 标称容量(20°C, 标准充电, 0.2CA 放电至 1.0V) | 450mAh |
| Nominal Capacity (20°C, Standard Charge , 0.2CA discharge to 1.0V) | |
| 典型容量 | 450mAh |
| Typical Capacity | |
| 最小容量 | 430mAh |
| Minimum Capacity | |
| 平均重量(约) | 11.0g |
| Typical Internal Impedance(at 1 kHz) | |
| 内阻 | ≤40mΩ |
| Internal Impedance At 1000 Hz | (充电后 After Charge) |
| 电池尺寸(包括 PVC 管) | |
| Dimensions(including PVC tube) | |
| 直径 Diameter (D) | Max: 8.5mm |
| 高度 Height (H) | Max: 52.0mm |
| 充电方法(20°C) | |
| Charging Method: (20°C) | |
| 标准充电 | 0.1CA(45mA)充电 14~16 小时 |
| Standard Charge: | Charge with 0.1CA (45mA) for 14~16 h |
| 快速充电 | 0.3CA(135mA)充电 4.5 小时 |
| Quick Charge | Charge with 0.3CA(135mA) for 4.5 h |
| 急速充电 | 1.0CA(450mA)充电 1.2 小时, -Δ=10mV 控制 |
| Fast Charge: | Charge with 1.0CA(450mA) for 1.2 h (Under -ΔV=10mV) |
| 最大过充电电流 | 0.1CA(45mA) 时间不大于 100 小时 |
| Max Overcharge Current | 0.1CA(45mA)charge(No longer than 100 h) |
| 微电流充电电流 | 13~22mA |
| Trickle Current | |
| 使用温度(参考) | |
| Operating Temperature(reference only): | |
| 存放 | -20°C~+35°C |
| Storage | |
| 放电 | -20°C~+60°C |
| Discharge | |
| 标准充电 | 0°C~+45°C |
| Standard Charge | |
| 快速充电 | +10°C~+45°C |
| Fast Charge | |



2. 性能测试 Performance:

| 测试项目 Testing Item | 测试条件 Testing Conditions | 要 求 Standard |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
| 标准测试条件 Standard Testing Condition | 以下测试如未特别规定, 均应在 20±5℃, 相对湿度 65±20% 条件下进行。电压表、电流表的精度±1%。 If not specially described, Temperature 20℃±5℃ Relative Humidity: 65±20%。Parapet measuring instruments: ±1% for voltage/current/capacity; ±2℃ for temperature; ±0.1% for time。 | |
| (1) 标准充电 Standard Charge | 以 0.2CA 放电至 1.0V, 再以 0.1CA 恒流充电 14~16 小时。 0.2CA discharge to 1.0V, then 0.1CA charge for 14~16h (Constant Current) | |
| (2) 急速充电 Fast Charge | 以 0.2CA 放电至 1.0V, 再以 1.0CA 的电流恒流充电 1.2 小时, -ΔV=10mV 控制。 0.2CA discharge to 1.0V, then 1.0CA charge for 1.2 h (Under -ΔV controlled 10mV) | |
| (3) 开路电压 Open Circuit Voltage | 标准充电后, 14 天内进行测试。 test within 14 days after standard charge | ≥1.25V |
| (4) 额定容量 Nominal Capacity | 标准充电, 搁置 1~4 小时, 0.2CA 放电至 1.0V, 允许循环三次。 Have 1-4 h of rest after standard charge, then 0.2CA discharge to 1.0V, 3 cycles permitted | ≥300 分钟 ≥300 min |
| (5) 高倍率放电容量 High Rate Discharging Capacity | 快速充电, 搁置 1~4 小时, 1.0CA 放电至 1.0V, 允许循环三次。 Have 1-4 h of rest after fast charge, Then 1.0CA discharge to 1.0V, 3 cycles permitted | ≥54 分钟 ≥54 min |
| (6) 循环寿命 Cycle Life | 按 GB/T 22804.2-2008/IEC61951-2: 2003(7.4.1.1) ※for GB/T 22804.2-2008/IEC61951-2: 2003(7.4.1.1) | ≥500 次 ≥500 cycles |
| (7) 过充特性 Overcharge | 按 (4) 额定容量测试后, 0.1CA 充电 48 小时, 检查电池外观, 0.2CA 放电至 1.0V; After (4) testing, The cell shall be charge, in an ambient temperature of 20℃±5℃, at a constant current of 0.1CA for 48 h, After this charging operation, the cell shall be stored, in an ambient temperature of 20℃±5℃, for not less than 1 h and not more than 4 h. The cell shall then be discharge, at 20℃±5℃ at a constant current of 0.2CA to a final voltage of 1.0V | 无变形、无漏液 ≥270 分钟 ≥270 min |
| (8) 过放电 Over-Discharge | 以 0.2CA 强制放电至 0V, 然后将电流增至 1.0CA 放电 60 分钟。 The cell shall undergo a forced discharge in an ambient temperature 20℃±5℃, at a constant current of 0.2CA, to a final voltage of 0V. The current shall then be increased to 1.0CA and the forced discharge continued in the same | 电池不爆炸, 但允许有漏液或变形。 The cell shall not disrupt or burst, Leakage of electrolyte and deformation of the |



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| | ambient temperature of 20°C±5°C,for 60min. | cell are acceptable |
| (9)温度 Temperature | <p>电池在 20±5°C 下按 (2) 快速充电后, 在下面温度下存放 3 小时, 1.0CA 放电至 1.0V。</p> <p>a) 放电温度: 0°C b) 放电温度: 20°C c) 放电温度: 40°C</p> <p>Fast charged as (2) under 20±5°C,stored 3 h under following temperatures, then 1.0CA discharge to 1.0V:</p> <p>a) Discharging Temperature: 0°C b)Discharging Temperature: 20°C c)Discharging Temperature: 40°C</p> | <p>放电时间 ≥ 50 分钟 ≥ 54 分钟 ≥ 45 分钟</p> <p>Discharging Time ≥ 50 min ≥ 54 min ≥ 45min</p> |
| (10)荷电保持能力(自放电) Charge(capacity) retention(Self-discharge) | <p>1) 电池在标准充电后, 在 20±5°C, 开路存放 28 天。0.2CA 放电至 1.0V。</p> <p>After standard charge, stored for 28 days under 20±5°C,then 0.2CA discharged to 1.0V</p> | <p>放电时间 ≥200 分钟</p> <p>Discharging Time ≥200min</p> |
| (11)贮存 Storage | <p>电池以 (1) 标准充电中规定的充电态, 在 20±5°C 及相对湿度 65±20% 的条件下, 开路存放 6 个月, 按 (4) 进行额定容量测试。</p> <p>Standard Charged as (1) condition and stored for 6 months under 20°C±5°C,then tested as (4)condition</p> | <p>放电时间 ≥240 分钟</p> <p>无变形, 漏液</p> <p>Discharging Time≥240 min</p> |
| (12)抗震性、跌落 Mechanical test: bump test、Free falling(drop) | <p>1) 跌落试验: 电池自 100cm 高度自由落体至 10mm 硬质木板上, 任意方向自由跌落 3 次 The battery shall be subjected to drop from the height of 1 m to an oak board more than 1 cm thick, the test should be carried for 3 times at each direction of the battery axis.</p> <p>2) 抗震条件: 震幅 4mm, 频率 1000 次/分钟, 任意方向震动 60 分钟 The ability of the cell to withstand mechanical Shock shall be checked by means of bump test carried out in accordance with IEC 60068-2-29. After standard charge, The bump test shall be changed carried out in an ambient temperature of 20±5°C, under the following conditions:</p> <ul style="list-style-type: none"> -peak acceleration(A) 98m/s² (10gn) -corresponding duration to pulse(D) 16ms -corresponding velocity charge 1,00ms -number of bumps 1000±10 <p>When the bump test has been completed, each cell shall be stored for not less then 1 h and mot more then 4 h in an ambient temperature of 20°C±5°C,It shall then be discharge in the same ambient temperature with a constant current of 0.2CA to a final voltage of 3.0V</p> | <p>电池保持电气性能, 允许有机机械变形或损伤 The battery maintains the electrical specification, the mechanical distort or damage is permitted</p> |

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| (13)绝缘电阻 Insulation resistance | 用兆欧表测量电池外包装及电极之间的绝缘度。 In use Megger measuring battery packaging and between the electrode and the insulation degree | 大于 10MΩ。 Greater than 10M ohm |
| (14)密封性测试 Sealing test | 将电池标准充电后, 在温度 33±3℃, 湿度 80±5%的环境中放置 14 天。 Standard charge the battery, at a temperature of 33 ± 3 °C , humidity of 80 ± 5% of the environment in place for 14 days. | 肉眼观察无漏液现象。 naked eye without leakage phenomenon. |
| (15) 安全阀启动性能 (过放电) Safety valve start-up performance Over-Discharge | 将电池以 1CmA 放电 5 小时。 1CmA discharge the battery to 5 hours | 安全阀必须正常启动, 电池无破裂现象, 允许有漏液、变形及外包装破裂现象。 safety valve must start, the battery no rupture phenomena, allowing leakage, deformation and rupture of outer phenomena. |
| 16) 安全阀启动性能 (过充电) safety valve start-up performance Overcharge | 将电池以 1CmA 充电 5 小时。 1CmA charge the battery to 5 hours. | 安全阀必须正常启动, 电池无破裂现象, 允许有漏液、变形及外包装破裂现象。 The battery no rupture phenomena, allowing leakage, deformation and rupture of outer phenomena. |
| (17)安全性 safety | 将电池标准充电后, 放置 1 个小时, 然后用导线使正负极短路, 导线截面在 0.75mm ² 以上, 导线长度为正负极间最短距, 短路时间 1 小时。 Standard charge the battery, place 1 hour, then with a wire to the positive and negative short-circuit, wire cross-section in 0.75mm ² above, positive and negative wire length between the short, short time of 1 hour. | 电池无破裂现象, 允许有漏液、变形及外观包装破裂现象。 The battery no rupture phenomena, allowing leakage, deformation and rupture of outer phenomena. |

3.外观 Appearance:

3.1 电应无裂痕、断口、灰尘、变色、漏液及变形。

The battery should not have the fissure, the fracture, the dust, the color deterioration, to leak the fluid and the distortion.

4.注意事项 note:

4.1 请勿将电池投入火中及试图拆开;

Do not dispose of cell into fire or be dismantled under any condition.

4.2 请勿与其它种类电池或旧电池混合使用;

Do not mix different cell types and capacities in the same battery assembly.

4.3 请勿超过博富能规格书电流充放电。

Charge and discharge under specified ambient temperature recommended to BFN



specification.

4.4 请勿将电池短路，以免电池永久性损坏；

Short circuit leading to cell venting must be avoided .

4.5 请勿直接焊接电池以免损坏密封圈及安全伐；

Never solder onto cell directly.

4.6 请勿将电池的正、负反接，以免电池过充电或过放电而损坏；

Cell reversal should be avoided.

4.7 如果电池在极限条件下使用，可能会减短电池使用寿命,如：极限温度、深度循环、极度过充电及过放电；

Use batteries in extreme condition may affect the service life, such as: extreme temperature, deep cycle, extreme overcharge and over discharge.

4.8 电池应于储存在阴冷干燥环境中；

Batteries should be stored in a cool dry place.

4.9 电池在使用时发现异常或问题，立即停止使用，联络当地电池经销商处理；

Once problems be found, stop using, send batteries to local dealer.

5. 贮存 Storage

5.1 保证电池维持容量水平，建议镍氢电池及电池组在-20~25℃、低温度、无腐蚀剂气体条件下贮存
It is strongly recommended to store Ni-MH batteries and cells in the temperature range from -20 to 25℃ ,and in low humidity and no corrosive gas environment, to maintain a reasonably high capacity recovery level.

5.2 镍氢电池避免在较高温度或较高湿度下贮存，否则将导致电池漏液、生锈，以及容量降低。
Avoid storage higher (e.g.35℃),lower temperature than -20℃ ,or higher humidity which would result in deterioration or damage to the cells and batteries such as follows:

5.3 长期存放将可能导致镍氢电池及电池组容量降低，并需 1~3 个充电/放电循环后才能达到最高放电容量。

Up to three full cycles of charge /discharge after long-termed storage may need to obtain highest capacity.

7. 保质期限：12 个月。

Quality assurance period:12 months.

※ GB/T 22084.2-2008/IEC61951-2: 2003(7.4.1.1)循环寿命测试方法：

| 循环数 | 充电 | 充电状态下静置 | 放电 |
|------|---------------------------|---------|--------------------------|
| 1 | 0.1CA(45mA)14~16 小时 | 无 | 0.25CA(112.5mA)2 小时 20 分 |
| 2-48 | 0.25CA(112.5mA)3 小时 10 分钟 | 无 | 0.25CA(112.5mA)2 小时 20 分 |
| 4 | 0.25CA(112.5mA)3 小时 10 分钟 | 无 | 0.25CA(112.5mA)到 1.0V |
| 50 | 0.1CA(45mA)14~16 小时 | 1-4 小时 | 0.2CA(90mA)到 1.0V |

- 1) 每两个 50 次循环之间间隔时间不大于 14 天，以相同的顺序进行第 50、100、150、200、250、300、350、400、及 450 次循环。
- 2) 测试过程中电池放电电压，下降到 1.0V 时,停止放电。
- 3) 当第 50 次循环的放电持续时间达不到 3 小时（额定容量的 60%）时，用 0.1CA(45mA)充电 16



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小时, 0.2CA(90mA)放电至 1.0V, 然后循环 3 次合格后再进行下一个 50 次循环。

※for GB/T 22084.2-2008/IEC61951-2: 2003(7.4.1.1) Endurance in cycles

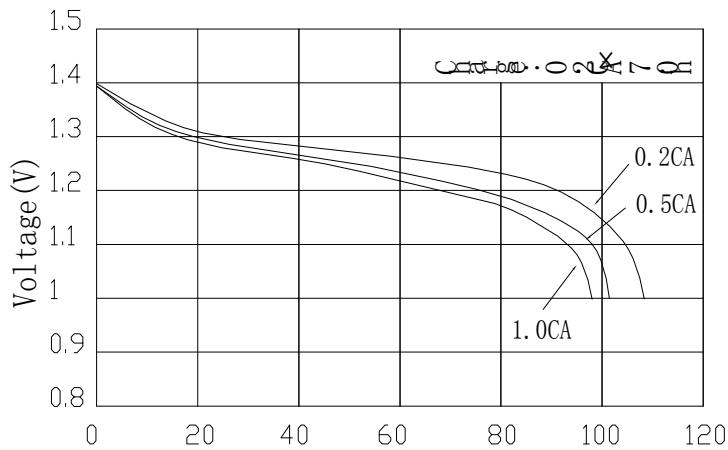
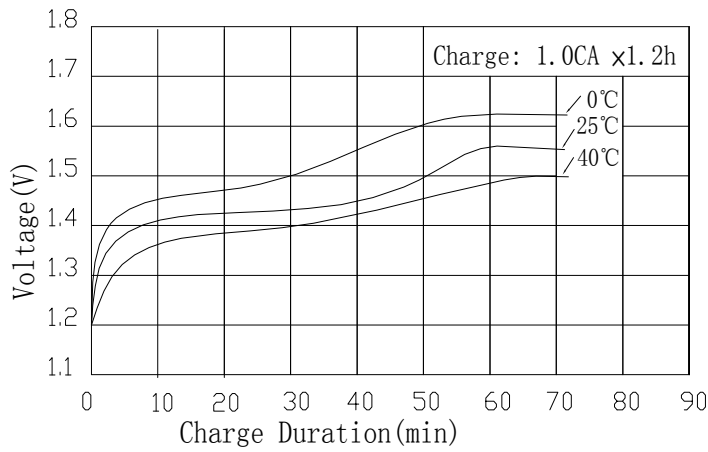
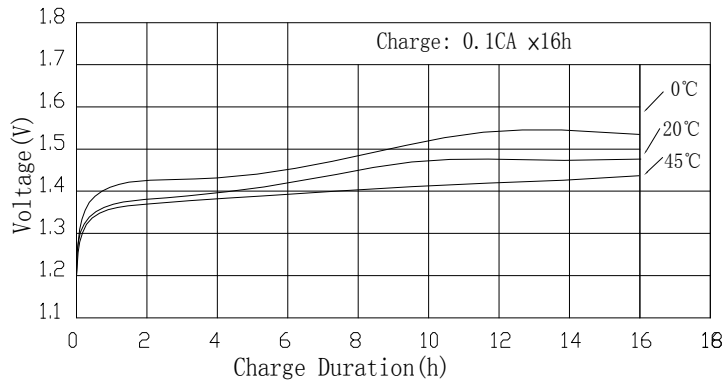
| Cycle number | Charge | Stand in charged condition | Discharge |
|--------------|--------------------------------|----------------------------|-------------------------------|
| 1 | 0.1CA (45mA) for 14~16h | none | 0.25CA (112.5mA) for 2h20 min |
| 2-48 | 0.25CA (112.5mA) for 3h 10 min | none | 0.25CA (112.5mA) for 2h20 min |
| 49 | 0.25CA (112.5mA) for 3h 10 min | none | 0.25CA (112.5mA) to 1.0 V |
| 50 | 0.1CA (45mA) for 16h | 1 h to 4 h | 0.2CA (90mA) to 1.0 V |

1 The interval time between every 50 cycles is less than 14 days, with the same way to do the 50th, 100th, 150th, 200th, 250th, 300th, 350th, 400th and 450th cycles

2. Stop discharging once the voltage is down to 1.0V on the testing procedure of discharge voltage.

3.If the discharge time of the 50 cycles can not reach 3 hours(60% of the nominal capacity), charge with current 0.1CA(45mA) for 16 hours, then discharge with 0.2CA(90mA) to 1.0V, if the first three cycles pass, then continue the next 50 cycles.

电池外形图 Battery appearance graph:



以上为单体电池充放电曲线。 Discharge Capacity (%)

The above is single battery charging and discharging curve