■循環壽命試驗 cycle life test (80DOD %)

蓄電池在20℃±5℃下，以 0.5CA 電流恒流充電,LYP電壓到達4.0V時轉恒壓充電，LTHP類電壓到達4.5V時轉恒壓充電，直至充電電流降至起始值的5%時停止充電擱置1h。

Place the cell under 20℃±5℃ condition and charge the cell with 0.5CA constant current, when the voltage of LYP battery reaches 4.0V, and LTHP battery reaches to 4.5v turn to constant voltage charge until the charging current drops to the 5% of initial value and place the cell for 1 hour.

蓄電池在20℃±5℃條件下，以 0.5CA 電流放電，直至放電容量達到額定容量的80%。充放電轉換時，可以擱置三十分鐘或一小時。共計進行100次，電池標稱容量下降率小于千分之一安時。

Place the cell under 20℃±5℃ condition and discharge the cell with 0.5CA current until the discharge capacity reaches 80% of rated capacity. There can be a 30 minutes to 1h interval between the charge and discharge of the cell. Repeat 100 times and the cell nominal capacity decrease rate should be less than 1‰ AH.

■簡單模擬工況 Simulated working condition

蓄電池充電後，在20℃±5℃條件下擱置1h，然後在同一温度下進行脉衝放電，以 0.3CA 放電8min後以1C1(A)脉衝放電1min爲第一階段;

Place the cell under 20℃±5℃ condition for 1h after charging the cell as the charging test method instructed and then pulsed discharge the cell in the same temperature, in the first stage discharge the cell with 0.3CA current for 8 minutes and change to 1C1 (A) pulsed discharge for one minute;

以 0.3CA 脉衝放電8min後以2C A 脉衝放電1min爲第二階段;

In the second stage pulsed discharge the cell with 0.3CA current for 8 minutes and discharge to 2C A pulsed discharge current for 1 minute;

以 0.3CA 放電8min以後3C A 脉衝放電1min爲第三階段;

In the third stage discharge the cell with 0.3CA current for 8 minutes and change to 3C A pulsed discharge for one minute;

以 0.3CA 放電8min後10C1(A)脉衝放電8秒爲第四階段；階段之間擱置0.5h,總計進行4個階段的脉衝放電，然後以 0.3CA 放電至100DOD%。放電過程中記錄單體蓄電池電壓。在某個脉衝放電階段單體蓄電池電壓低于2.7V則停止放電。

In the fourth stage discharge the cell with 0.3CA current for 8 minutes and discharge by pulsed discharge current at 10C1(A) for 8 seconds; place the cell for 30 minutes between each stages and discharge the cell with 0.3CA current until 100DOD%. Record the voltage of single cells during discharging. Stop discharging if in some stage the volt age of single cells gets lower than 2.7V.

■ 耐振動試驗 Vibration test

蓄電池充電後，紧固到振動試驗臺上，按下述條件進行試驗：

Fasten the cell to vibration test machine after charging as the charging test method instructed, test as follows:

a)振動方向：上下單振動；
Vibrate direction: rack vibration up and down;

b)振動頻率：10～55HZ；
Vibrate frequency: 10～55HZ;

c)最大加速度：30m/S2；
Maximal acceleration: 30m/S2;

d)振動時間：2h；
Vibration duration: 2h;

e)放電：以 0.3CA 電流放電至蓄電池電壓達到3.0V停止放電。
Discharge: discharge the cell with 0.3CA current until the voltage reaches 3.0V.

不允許出現放電電流銳變、電壓异常、電池殼變形、電解液溢出等現象。

There should not be significant discharge current transformation, abnormal voltage, case distortion and electrolyte leakage.

WB-LP類電池的檢驗規則
Testing Instructions for WB-LP cell

單體電池檢驗項目
Testing items of single cell

■ 常規項目 Conventional items

外觀、極性、重量及尺寸，20℃放電容量，高倍率放電容量，-25℃放電容量、85℃放電容量、蓄電保持及恢復能力，脉衝充放電循環壽命，瞬間放電能力。

Exterior condition, terminals, weight and size, discharge capacity at 20℃, high-rate discharge capacity, discharge capacity at -25℃, discharge capacity at 85℃, retention and restorability, cycle life of impulsive charge and discharge, spark capacity.

■ 安全性項目 Items of safety

短路、過充過放電、火燒、槍擊、水浸

Short circuit,overcharge/overdischarge,fire test, shooting test, water immersion test,

■ 蓄電池的要求 Requirement of the cell

單體 電池的正負極應能承受檢驗方法中規定的最大放電倍率的放電而不損壞的連接片。

Positive/negative terminal of singe cell must apply connector that could bear the maximum rate of current in accordance with Testing Method.

0.3C爲3h率額定容量,0.1C爲1h率額定容量。

0.3C is the rated capacity of 3h rate; 0.1C is the rated capacity of 1h rate.

常規試驗方法
Conventional Test Methods

■ 試驗條件 Test condition

環境條件Environment condition
試驗 温度爲15℃～35℃、相對濕度爲25%～85%。
Laboratory room temperature 15℃～35℃, humidity 25%～85%

■ 測量儀器、儀表 Measuring equipment and instrument

量程 Instrument range
所有儀表量程應隨被測電壓值或電流值改變，指會或儀表讀數應在量程的後三分之一範圍内。
Measurement range accordingly changes with voltage and current fluctuation; instrument value should fall in last 1/3 range of measurement instrument.

精度 Accuracy
a)測量電壓用的儀表應是不大于0.5級的電壓表，電壓表内阻至少應 1KΩ/V;
Accuracy level of voltage meter ≥ 0.5 class; resistance of voltage meter: 1kΩ/v;
b)測量電流用的儀表是不低于0.5級的電流表;
Accuracy level of current meter ≥ 0.5 class;
c)測量温度用的温度計應具有適當的量程，其他度值不應大于1℃;
Thermometer has applicable measurement range; scale value of thermometer ≤1℃
d)測量時間用的儀表應按時、分、秒分度，至少應該具有±1%的準確度。
Time measuring instrument can record scale values of hour, minute and second; accuracy deviation: ±1%;
e)測量蓄電池外形尺寸的量具，其分度值不應大于1mm;
Scale value ≤1mm for instruments of measuring external dimension.

f)稱量蓄電池重量的衡器，應具有±0.5%的精度。
Accuracy deviation of weighing machine: ±0.5%

■ 外觀 Appearance

目視檢查蓄電池表面是否平整、幹燥、有無外傷等。
Visual examination: whether the cell surface is dry, flat, no-damage;
目視檢查蓄電池標志是否齊全、清晰。
Visual examination: whether the cell identifications are complete and clear;

■ 極性 Terminal

用電壓表檢測蓄電池的端壓，是否與端子的析性一致。
To detect if I/O voltage of the cell is consistent with terminals by voltage meter

■ 重量及尺寸 Weight & Dimension

用量具測量蓄電池的外形尺寸。
Measure external dimension of the cell by measuring tools
用衡器稱量蓄電池的重量。
Measure weight of the cell by weighing machine

■ 充電 Charge

在20℃±5℃條件下，蓄電池以 0.3CA 電流放電，至蓄電池電壓達到11V時停止放電，然後20℃±5℃條件下以 0.3CA 恒流充電，至電池電壓達16V時轉恒壓充電，充電電流降至起始值的5%時停止充電。
At 20℃±5℃ the cell is discharged at a current of 0.3CA till voltage of the cell reach 11V, and then start to perform constant current charge at a current of 0.3CA under 20℃±5℃ till voltage of the cell reaches 16V and simultaneously switches to constant voltage charge. When charging current value decreases to 5% of initial value, charging completes.

低温充電 Low temperature charging

在−45℃±5℃條件下，蓄電池以 0.3CA 電流放電，至蓄電池電壓達到 8V時停止放電，然後−45℃±5℃條件下以 0.3CA 恒流充電，至電池電壓達到17V時轉恒壓充電，當恒壓階段充電時間達1h時轉爲恒壓17V涓流充電，充電電流降至起始值的5%時停止充電。

At −45℃ ± 5℃ the cell is discharged at a current of 0.3CA till voltage of the cell reaches 8 V, and then start to perform constant current charge at a current of 0.3CA under −45℃ ± 5℃ till voltage of the cell reaches 17V and simultaneously switches to constant voltage charge and duration is 1 hours. After that,trickle charge will begin. Charging completes when charging current value decreases to 5% of initial value.

■ 20℃放電容量 (能量密度)20℃ Discharge Capacity (Energy Density)

蓄電池在充電後，在20℃±5℃條件下擱置1h，然後在同一温度下以 0.3CA 恒流放電至電池電壓11V。如果放電容量達不到額定容量，此項試驗允許重得3次。

After charging according to the charging test method, set aside the cell for 1h at 20℃ ± 5℃, then discharge by 0.3CA current at the same temperature, until voltage of the cell drop to 11V. If discharge capacity cannot reach the rated capacity, this test can be repeated 3 times.

■ 高倍率放電容量 High−rate discharge capacity

蓄電池在充電後，在20℃±5℃條件下擱置1h，然後在同一温度下以1C A 電 流放電至電池電壓11V時終止。

After charging according to the charging test method, set aside the cell for 1h at 20℃ ± 5℃, then discharge by 1CA current at the same temperature, until voltage of the cell arrives at 11V, and stop.

■ −45℃放電容量 Discharge capacity at −45℃

蓄電池在充電後，在−45℃±2℃條件下貯存下4h。然後在同一温度下，以 0.3CA 恒流放電至終止電壓(8V)。計算放電容量 (以Ah計)。

After charging according to the charging test method, set aside the cell for 4h at −45℃ ± 2℃, then

discharge by 0.3CA current at the same temperature, until voltage of the cell drops to final voltage (8V). Calculate the discharge capacity (by Ah)

■ 55℃放電容量 Discharge capacity at 55℃

蓄電池在充電後，在55℃±2℃條件下貯存3h，然後在同一温度下，以 0.3CA 恒流放電至終止電壓(11V)。計算放電容量 (以Ah計)。

After charging according to the charging test method, set aside the cell for 3h at 55℃±2℃, then discharge by 0.3CA current at the same temperature, until voltage of the cell drops to final voltage (11V). Calculate the discharge capacity (by Ah)

■ 荷電保持和恢復能力 Retaining Ability and restorability

荷電保持能力：蓄電池在充電後，在20℃±5℃條件下，以開路狀態貯存30天,然後在同一温度下以1/3C3(A)恒流放電至終止電壓(11V)。計算放電容量 (以Ah計)。

Retaining Ability: after charging according to the charging test method, set aside the cell by open circuit for 30days at 20℃ +5℃, then discharge by 1/3C3 (A) constant current at the same temperature, until voltage of the cell drops to final voltage (11V). Calculate the discharge capacity (by Ah).

容量恢復能力：蓄電池在充電後，在20℃±5℃條件下以 0.3CA 恒流放電至11V。計算放電容量 (以Ah計)。

Restorability: after charging according to the charging test method,then discharge by 0.3CA constant current at 20℃ ± 5℃condition, until voltage of the cell arrives at final voltage (11V). Calculate the discharge capacity (by Ah).

安全試驗方法
Safety test method

■ 短路試驗Short circuit test

蓄電池充電後，在20℃±5℃條件下擱置1h。將蓄電池經外部短路10min，外部綫路和電阻應小于或等于10mΩ。

After charging according to the charging test method, set aside the cell for 1h at 20℃±5℃, and short-circuit the cell by external for 10min, external circuit and resistance should be less than 10mΩ.

試驗過程中，蓄電池不得爆炸、冒烟。

The cell must not explode, smoke during the test.

■ 擠壓試驗 Extrusion test

蓄電池在充電後，在20℃±5℃條件下擱置1h。按下列條件進行試驗。

After charging according to the charging test method, set aside the cell for 1h at 20℃±5℃, test according to following conditions.

a)擠壓方向：垂直于蓄電池析板方向施壓；

Extrusion direction: press perpendicularly upon the cell plates

b)擠壓面積：垂直于施壓方向的外表面；

Extrusion area: outside surface of pressing direction

c)擠壓程度：直至蓄電池殼體破裂或内部短路爲止。

Extrusion level: until the cell case is broken or internal short circuit occurs

試驗過程中，蓄電池不得爆炸、冒烟。

The cell must not explode,smoke during the test.

■ 針刺試驗 Nail test

蓄電池在充電後，在20℃±5℃條件下擱置1h。用Φ3mm~Φ8mm 的鋼釘從垂直于蓄電池極板的方向迅速貫

After charging according to the charging test method, set aside the cell for 1h at 20℃ ± 5℃. Using Φ 3mm~Φ8mm steel nail that runs through quickly along the perpendicular direction (steel nail must not stay in the cell), this test must be carried out under full environment protection condition.
試驗過程中，蓄電池不得爆炸、冒烟。
The cell must not explode, smoke during the test.

■ 過充和過放電實驗 Overcharge and overdischarge test

過充電：蓄電池在充電後，在20℃ ± 5℃條件下擱置1h。蓄電池在20℃ ± 5℃下，以 0.3CA 電流充電，直到電池電壓達到20V時停止。
Over charge: After charging according to the charging test method, set aside the cell for 1h at 20℃ ± 5℃, then charge by 0.3CA current at the same temperature, until the voltage arrives at 20V.
過放電：蓄電池在率電後，在20℃ ± 5℃條件下擱置1h。蓄電池在20℃ ± 5℃下，以 0.3CA 電流放電，直到電池電壓下降至零伏時即停止實驗。
Over discharge: After charging according to the charging test method, set aside the cell for 1h at 20℃ ± 5℃, then discharge by 0.3CA current at the same temperature, until the voltage drops to 0V.
過充、過放電試驗過程中，蓄電池應不漏液、不爆炸、不起火。
The cell must not leak, explode and burn during the test.

■ 火燒實驗 Fire test

蓄電池充電後，在20℃ ± 5℃條件下，擱置1h，然後將該電池置于烈火中焚燒，直至該電池燒成餘灰爲止。
After charging according to the charging test method, set aside the cell for 1h at 20℃ ± 5℃, and then burn it in the blaze, until the cell is laid into ashes.
實驗過程中，蓄電池不得爆炸。
The cell must not explode during the test.

■ 循環壽命試驗(80DOD%) Cycle life test (80D0D %)

蓄電池在20℃±5℃下，以 0.3CA 電流恒流充電，至電壓到達16V時轉恒壓充電，直至充電電流降至起始值的5%時停止充電擱置1h。蓄電池在20℃±5℃條件下，以 0.3CA 電流放電，直至放電容量達到額定容量的80%。充放電轉換時，可以擱置三十分鐘或一小時。共計進行200次，電池容量下降率小于千分之二安時。
The cell charges by 0.3CA constant current at 20℃±5℃. Once the voltage reaches 16V, it will switch to constant voltage charge, until charging current drops to 5%of the initial value, then set it asides for 1h. The cell discharges by 0.3CA current at 20℃±5℃ until discharge capacity reaches 80% of the rated capacity. During the charge and discharge converting, the cell can be set aside for 30 to 60 minutes. After 200 times, decline rate of the cell capacity is less than 0.2% Ah.
循環25次爲一個周期，第25次循環進行一次全放電，然後再進行下一周期循環試驗。若某個周期的第25次循環的放電容量小于額定容量的80%，則停止循環壽命試驗。
25 times a cycle, carry out full discharging in the 25th circulation, then go to next cycle test. When the 25th circulation discharge capacity is less than 80% of the rated capacity in some cycle, stop the cycle life test.

■ 簡單模擬工況 Simulated working condition

蓄電池充電後，在20℃±5℃條件下擱置1h，然後在同一温度下進行脉衝放電，以 0.3CA 放電6min後以1C1(A)脉衝放電1min爲第一階段；
After charging according to the charging test method, set aside the cell for 1h at 20℃±5℃, then discharge by impulse at the same temperature, after 6min discharge by 0.3CA current, turn to 1 min 2 C1 (A) current impulse discharge as the first phase;

以 0.3CA 脉衝放電6min後以2CA 脉衝放電1min爲第二階段；
After 6min discharge by 0.3CA current, turn to 1min 2 CA current impulse discharge as the second phase;

以 0.3CA 放電6min以後3CA 脉衝放電1min爲第三階段；
After 6min discharge by 0.3CA current, turn to 1min 3C A current impulse discharge as the third phase;

以 0.3CA 放電6min後10C A 脉衝放電1min爲第四階段;
After 6min discharge by 0.3CA current, turn to 1min 10C A current impulse discharge as the fourth phase;

階段之間擱置0.5h,總計進行4個階段的脉衝放電，然後以 0.3CA 放電至100DOD%。放電過程中記録單體蓄電池電壓。在某個脉衝放電階段内蓄電池電壓低于8V則停止放電。
0.5h between each two phases, carry out four phases impulse discharge in total, then discharge by 0.3CA current to 100D0D%. Record the voltage of single the cell during the discharging. When the voltage of the single cell is less than 8V in any phase, stop discharging.

■ 耐振動試驗Vibration proof tests

蓄電池充電後，緊固到振動試驗臺上，按下述條件進行試驗:
After charging according to the charging test method, the cell should be fastened to vibration test stand, and be tested according to following conditions:

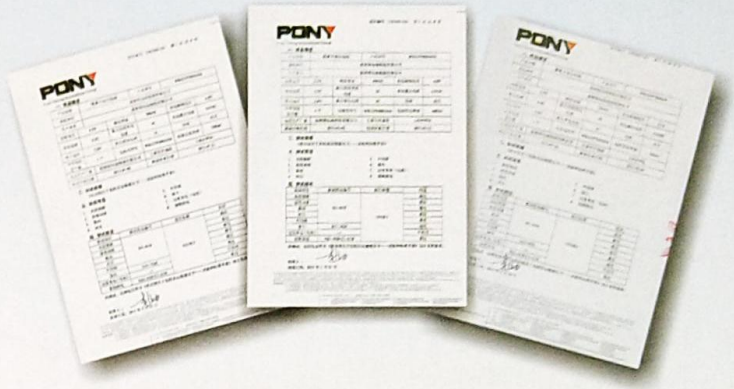
a)振動方向：上下單振動;
Vibration direction: single up and down vibration
b)振動頻率：10~55HZ;
Vibration frequency: 10~55Hz
c)最大加速度：30m/S2;
Maximal acceleration: 30m/S2
d)振動時間：2h;
Vibration duration: 2hours
e)放電：以 0.3CA 電流放電至蓄電池電壓達到10V停止放電。
Discharge: discharge by 0.3CA current, until voltage reaches 10V

不允許出現放電電流鋭變、電壓异常、電池殼變形、電解液溢出等現象。
Discharge current metamorphosis, voltage abnormality, case distortion, electrolyte spillover etc are not allowed.

質量認證
Quality Certificate

通過標準質量體系認證
Quality System Certification

通過 "PONY" 權威認證
Authoritative PONY Certification



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