雷天能源集團
Thunder Sky
Energy Group

Thunder Sky Industrial Base, NO.3 Industrial Zone,
Lisonglang Village,Gongming Town, Bao'an District,
Shenzhen P.R.C
Post Code: 518106
TEL: 86-755-8602 6789
FAX: 86-755-8602 6678
Http: //www.thunder-sky.com
E-mail: thunder@thunder-sky.com
Technical Inquiry: ts@thunder-sky.com

地址: 中國廣東省深圳市寶安區公明鎮
李鬆朗第三工業區雷天工業園
郵政編碼: 518106
熱綫: 86-755-8602 6789
傳真: 86-755-8602 6678
網址: http: //www.thunder-sky.com
電郵: thunder@thunder-sky.com
技術垂詢: ts@thunder-sky.com

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使用説明書

LFP / LCP / LMP/ LP 雷天鋰離子動力電池
LFP/LCP/LMP/LP Li-ion Power battery User Manual

Http://www.thunder-sky.com
E-mail:thunder@thunder-sky.com

ENGLISH/繁體中文

非常感謝您信任雷天品牌，選購雷天牌LFP、LCP、LMP、LP系列鋰離子動力電池。
在使用之前，請仔細閱讀本説明書，確保正確使用電池，并請妥善保存此手册，以備隨時查閱。

Thank you to trust Thunder–Sky and purchase LFP, LCP, LMP and LP series lithium ion power battery of Thunder–Sky.
Before using the battery, please read this user manual carefully to ensure the correct operation of battery. Please keep this manual properly for momentarily consults.

版 權 Copyright

商 標 Trademark

Thunder Sky®
Lithium Power Battery

若本公司因生産技術提升導致本手册的内容和圖解説明變更，恕不另行通知。
If the contents and illustrations in this manual changed for the technology improvements of the company, it won't be noticed.

拆封開箱以后
After opening the box

確認物品是您所訂購的産品
Make sure the goods are what you ordered

請認准銘牌
Please recognize the accurate trademark

Thunder Sky®
Lithium Power Battery

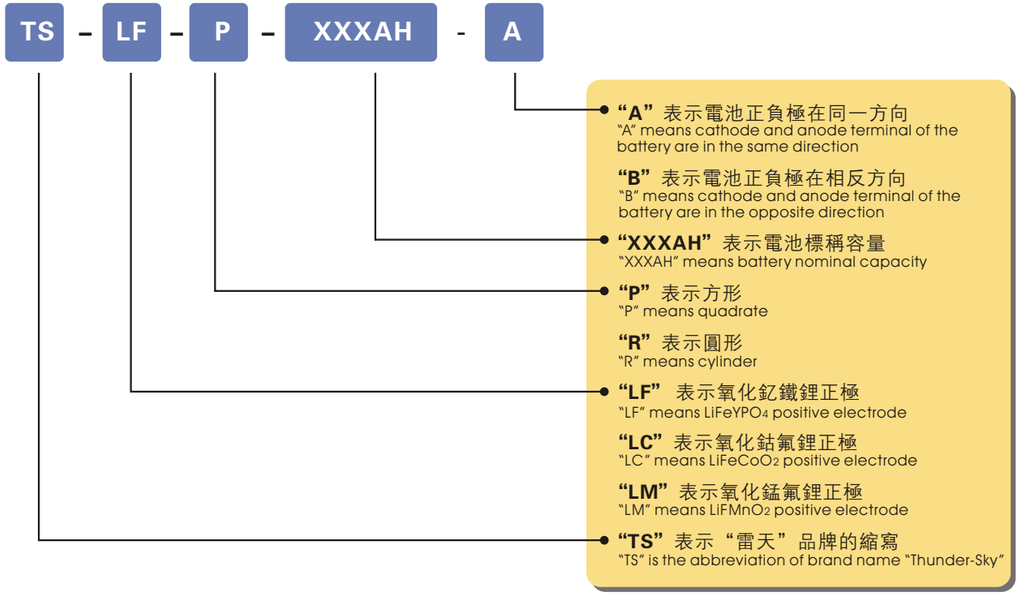
注意 Notice

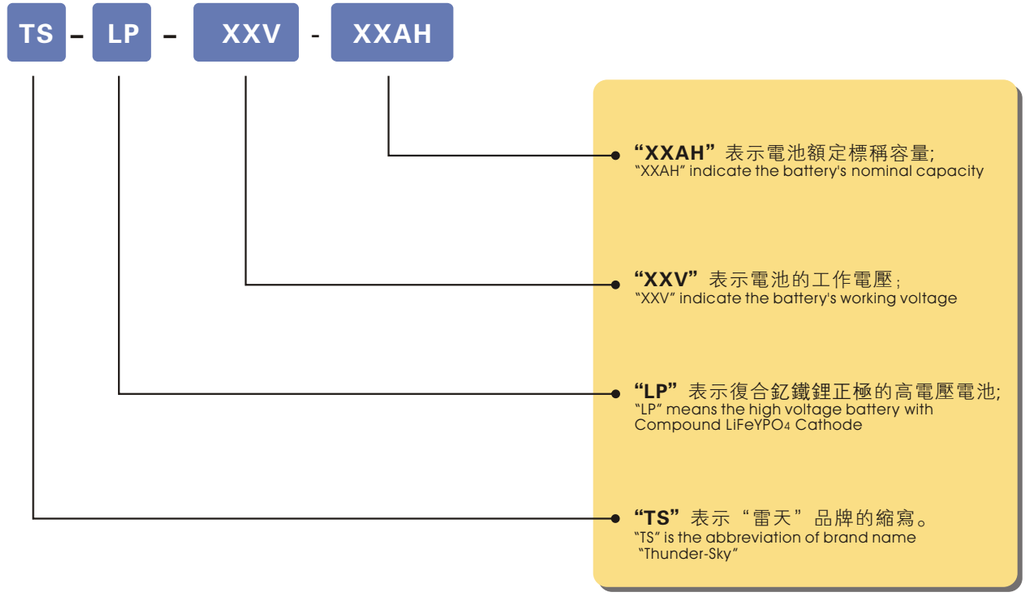
檢查産品在運輸途中是否有損壞。
Check whether the product is damaged during shipment.

如産品型號、規格、數量不符合，或已經損壞，請與我公司聯系。
Please contact us if there is any defective or inconsistent items with what you ordered.

使用說明書

LFP / LCP / LMP/ LP 雷天鋰離子動力電池
LFP/LCP/LMP/LP Li-ion Power battery User Manual


TS – LF – P – XXXAH - A
“A” 表示電池正負極在同一方向
“A” means cathode and anode terminal of the battery are in the same direction
“B” 表示電池正負極在相反方向
“B” means cathode and anode terminal of the battery are in the opposite direction
“XXXAH” 表示電池標稱容量
“XXXAH” means battery nominal capacity
“P” 表示方形
“P” means quadrate
“R” 表示圓形
“R” means cylinder
“LF” 表示氧化釔鐵鋰正極
“LF” means LiFeYPO4 positive electrode
“LC” 表示氧化鈷氟鋰正極
“LC” means LiFeCoO2 positive electrode
“LM” 表示氧化錳氟鋰正極
“LM” means LiFMnO2 positive electrode
“TS” 表示“雷天”品牌的縮寫
“TS” is the abbreviation of brand name “Thunder-Sky”


TS – LP – XXV - XXAH
“XXAH” 表示電池額定標稱容量;
“XXAH” indicate the battery's nominal capacity
“XXV” 表示電池的工作電壓;
“XXV” indicate the battery's working voltage
“LP” 表示復合釔鐵鋰正極的高電壓電池;
“LP” means the high voltage battery with Compound LiFeYPO4 Cathode
“TS” 表示“雷天”品牌的縮寫。
“TS” is the abbreviation of brand name “Thunder-Sky”

電池短路
Battery short circuit

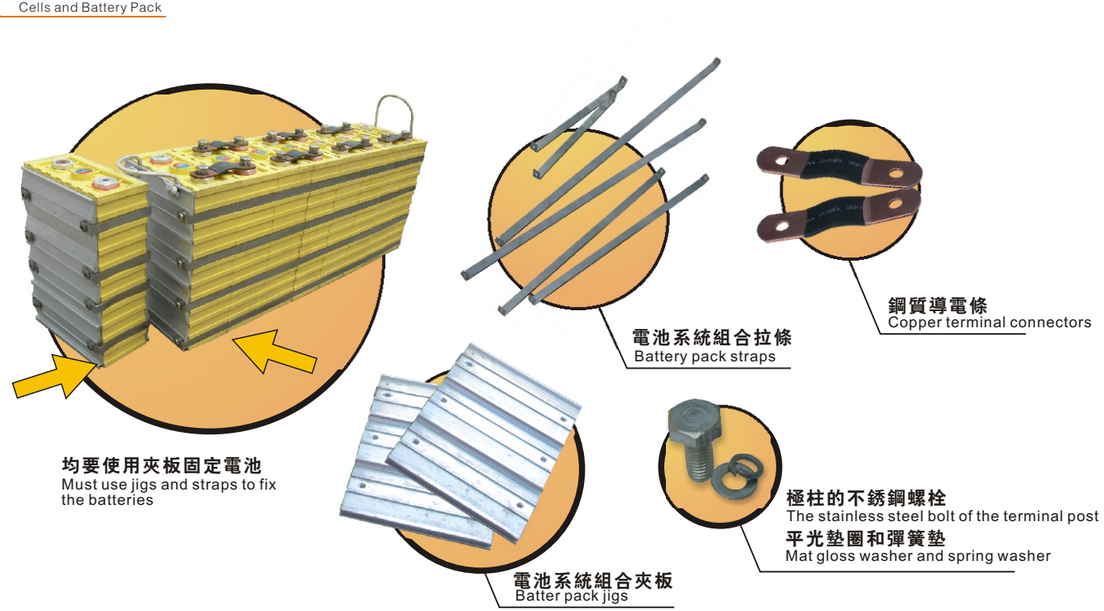
新出廠的電池切勿直接進行放電
Do not discharge the new battery directly

- 任何情况下不得將電池短路。
  Do not make the battery short-circuit in any situation.
- 新出廠的電池，切勿進行放電！必須先充滿電。
  Do not discharge the new battery! It must be fully charged at first.

不得掀開電池安全閥！
Do not open the battery safety valve!

切忌猛力扭動電池極柱上端的螺絲
Do not violently wrest the screw on the terminal!

- 任何情况下不得掀開電池安全閥！
  Do not open the battery safety valve in any situation!
- 安裝導電條時，切忌猛力以免損壞電池極柱上端的螺紋！
  Do not install the terminal connector with violent force to prevent the damage of terminal screw!

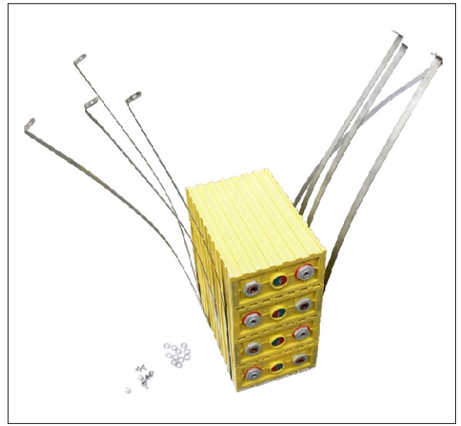


- 正式使用前應該檢查電池配件（各型號有少許偏差，配件以實物爲準）
  Please check the accessories before using the battery (The pictures are for reference only. The accessories are subject to their actual features).
- 正常使用，不管單體或系統組合，均要使用夾板將電池固定，以防止鼓脹!
  Please use jigs and straps to fix the single cell or battery pack to avoid swelling for normal use!

七個串聯爲一組
Assemble 7 cells in series as one battery pack

要將多個單體電池系統組合，必須采用串聯或并聯的方式完成。一般理想的系統組合，應該衹有串聯，串聯系統組合對匹配安裝電池管理系統(BMS)較爲妥善。

If you want to assemble one battery pack you will have to put cells in series or put them in parallel connection, however, the optimum battery systems should be connected in series only which is better for the installation of BMS.

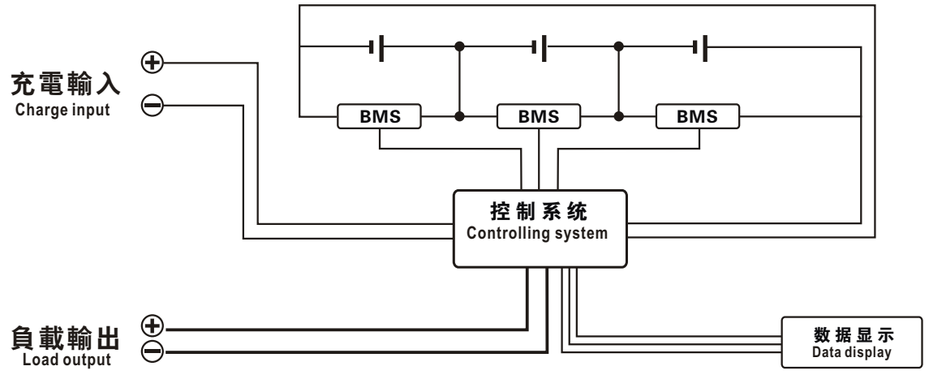


配置一些拉條，螺絲等輔件
Collocate accessories including straps, bolts and etc.

如果要將多個電池串聯系統組合時，還要配置一些拉條，緊固件，螺栓和螺母等輔件才能完成。不管系統組合成多大功率的電池堆，衹要配置好這些主要輔件便可進行。

You will need the accessories such as straps, bolts or screws to fix the battery when you assemble several pieces of cells in series. It is very important to make sure all accesoosies are fixed whatever battery power you are looking for.

●电池管理系统
Battery Management System



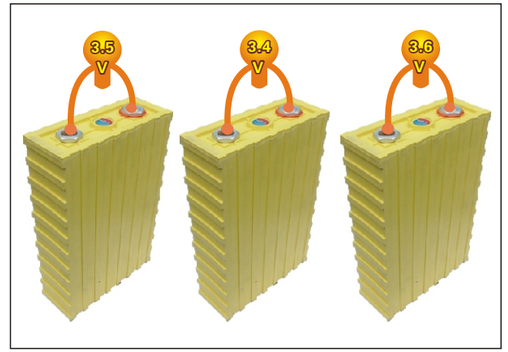
任何蓄電池通過串聯或并聯充放電使用，都要安裝一些電子綫路或監測綫路，對每個單體電池進行有效的監測與保護，以免有部分電池出現過充電或過放電的不良現象而損傷電池。

Any storage cell to be used by parallel or in series connection, there must be electronic circuit or monitor circuit installed so as to monitor and prevent the cells from damage caused by overchaged or over discharged.

不正常
Abnormal

●同一批電池中，有個別電池電壓明顯相差1V以上屬不正常電池

In the same batch, it is abnormal that some battery's voltage is differing above 1V.



正常
Normal

●一般同一批次出廠的同型號電池電壓相差0.1V屬正常

In the same batch, it is normal that the voltage of the same model is differing 0.1V.

電池是一種儲能裝置，日常使用時必須遵循正確的使用方法，按規定操作及貯存，祇有這樣，使用任何一種電池才能得心應手。

Battery is kind of energy storage device. It should be right used and well maintained.

操 作 Operation

不得拆卸分解、擠壓、刺穿電池，不得將電池正負極短接，不得加熱電池，不得將電池擲入火中，不得將不同品牌（如我司電池與其他公司電池）、不同類型（如LCP與LFP）、不同容量以及新舊電池混用。

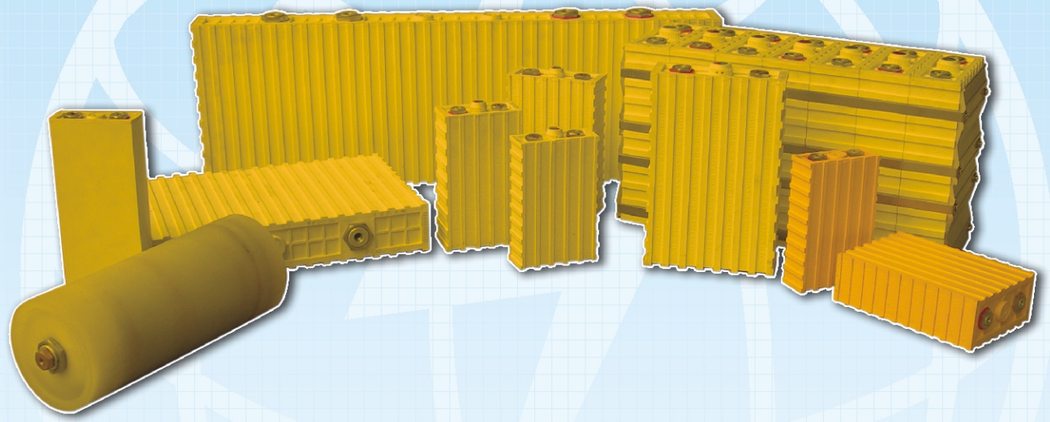
Do not disassemble, squeeze or pierce the battery, Do not make the cathode and anode short circuit,Do not heat the battery, Do not throw it into the fire, Do not use together the battery of different brand (for example, Thunder Sky battery and other company's battery), different type (for example, LCP and LFP), different capacity as well as the new and old.

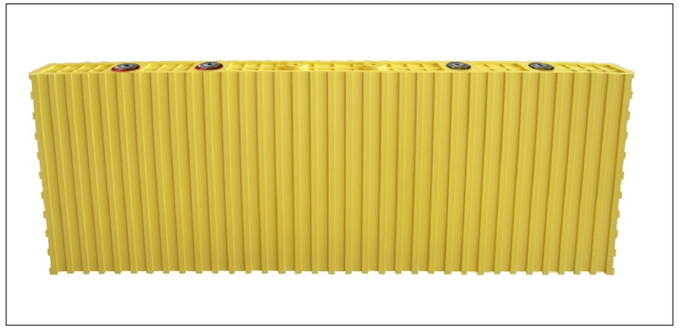
貯 存 Storage

電池需貯存在凉爽通風的地方（最佳温度爲20±5°C），電池放置需與墻壁保持適當距離，遠離潮濕、熱源。將電池保持在初始包裝中直至使用。需長期貯存的電池，不能倒置儲存，首先 將電池充電至荷電的40–60%。以後需每月檢查電池的開路電壓，確定貯存的同批電池的電壓一致，或相差不大，如發現電壓低于3.0V應盡快補充充電，條件允許可先將電池充放電一至兩次在充電至相同荷電狀態。一般正常電池每月自放電率在3%左右，每半年補充充電一次即可。

The battery must store in the cool and ventilated place (optimum temperature at 20±5 ℃). Battery must maintain an appropriate distance from the wall and keep away from moist and heat. Keep the battery in the original package until it is used. Never store the battery upside–down. Battery that needs to be stored in a long term should be charged to 40%–60% at first. Later, the battery's open–circuit voltage need to be inspected every month to make sure the voltage in the same batch to be consistent, or in small difference; if the battery's voltage is lower than 3.0V, it should be charged as soon as possible；if it is possible, the battery should be discharged then charged to the same charged state for once or twice. The regular self–discharge rate is about 3% every month. Please charge once per half year.

LFP 類電池的特性
Characteristics of LFP Battery





TS–LFP800AHA

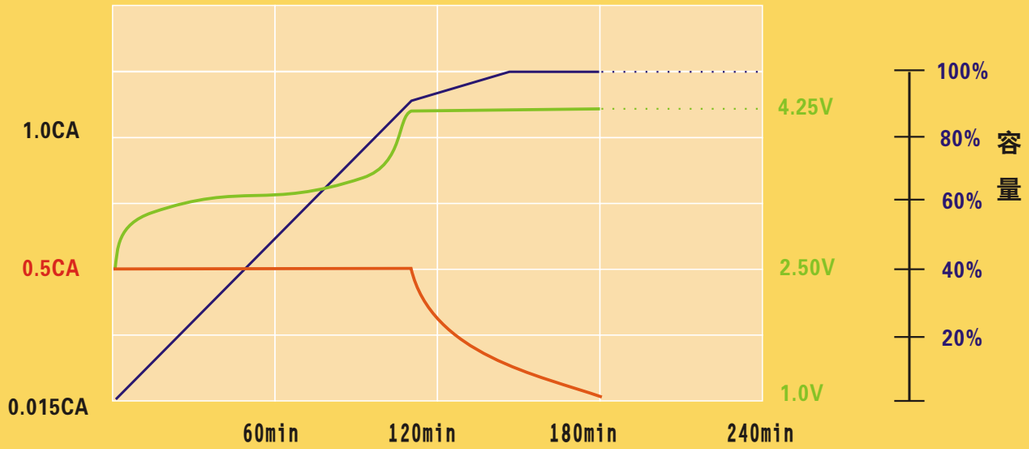
- 最大充電電流爲2400A(3CA)
  The maximum charging current is 2400A(3CA)
- 常規充電電流爲400A(0.5CA)
  The regular charging current is 400A(0.5CA)

TS–LFP90AHA

- 最大充電電流爲270A(3CA)
  The maximum charging current is 270A(3CA)
- 常規充電電流爲45A(0.5CA)
  The regular charge current is 45A(0.5CA)

- LFP 類電池具有極佳的安全性能，極佳的循環壽命。
  LFP battery has best safety performance and longest cycle life.
- 充電時電池外殼温度若低于85℃，該類電池允許采用3CA以下電流進行快速充電。
  It is only allowed to charge the LFP battery by fast charge mode with current lower than 3C when the battery case temperature is not higher than 85℃.

LFP類電池的最佳充電圖
Chart of Best Charge of LFP Battery



LFP類電池適應快速充電 LFP battery is suitable for fast-charge

該類電池能有效地進行快速充電，充放電電壓範圍爲2.5~4.25V;
LFP battery can be charged by fast-charge mode. The charging and discharging voltage range is 2.5~4.25V;
最佳的充電電流是0.5CA左右。
The best charging current is about 0.5CA..

■ 該類電池的最高充電電壓爲4.25V，平均工作電壓爲2.8–3.3V。最低放電電壓爲2.5V。
The highest charge voltage of LFP battery is 4.25V; the average working voltage is 2.8-3.3V. The lowest discharge voltage is 2.5V.

■ 該類電池放電電壓低至2.0–2.5V，不會損壞電池。但建議截至電壓高于2.5V。
The discharge voltage can be low to 2.0–2.5V, which will not damage the battery. But it is recommended that the cut–off voltage is higher than 2.5V.

■ 一般在常規環境中保持充電電壓≤4.25V；放電電壓≥2.5V，該類電池的循環壽命可大于3000次以上。并適應–25℃至75℃環境温度下使用。
Generally speaking, the cycle life is more than 3000 times if charge voltage ≤4.25V and discharge voltage ≥2.5V is kept in the normal environment. The battery is suitable to be used at the temperature between – 25℃ to 75℃

■ 該類電池不會因過充電或過放電而發生意外，但仍會造成電池性能下降或失效。除非將電池作破壞性實驗，否則該類電池不會因内部短路而起火燃燒。
LFP battery would not cause accident when it is over charged or orver discharged, but the performance would fall down or get invalid. It won't cause fire when short circuit unless the user destroy it on purpose.

■ 該類電池是用作移動式動力源最理想的電池。
LFP battery is an optimum mobile power source.

■ 該類電池再組合使用時，如未安裝BMS，并進行長期使用，個別單體電池仍會出現過充電過放電的現象，即過充時單體電壓達到5V或10V，過放時電壓低至1.5V或0V。這種情形下雖不會出現冒烟、起火燃燒等意外，但電池性能會下降或失效。
If the batter pack is used without BMS for a long time, some cell may be over charged or over discharged. When over charged, the cell's voltage will reach 5V or 10V. When over discharged, it will go down to 1.5V or 0V. Though it would not emit smoke or cause fire, the performance of battery will fall down or get invalid.

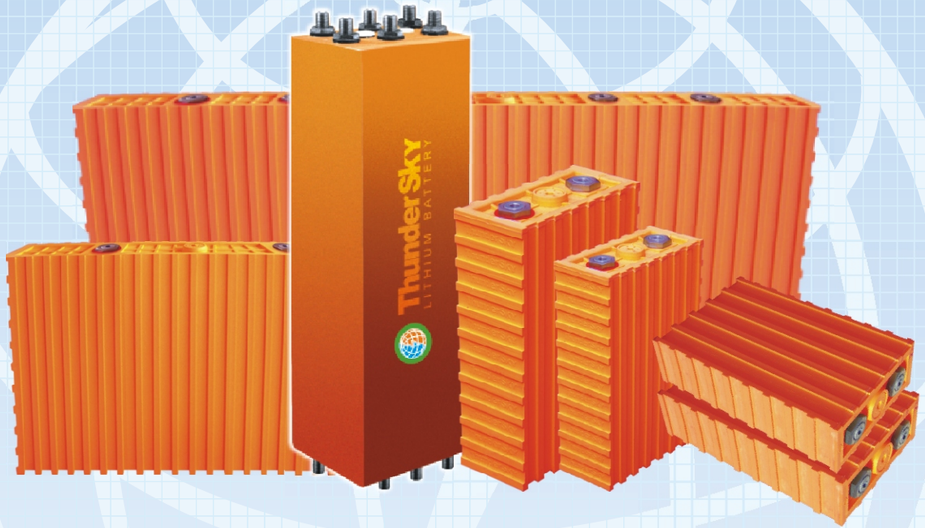
■ 匹配的BMS是在電池系統組合中，最能保護每個單體電池防止過充電和過放電的有效裝置。
The matched BMS is the most effective device in the battery system to protect each single cell from over charging or over discharging.

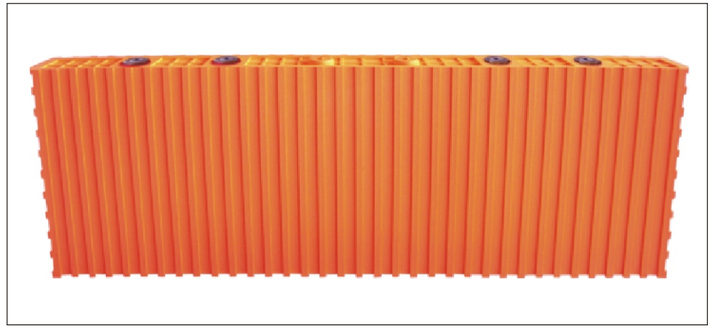
由于LFP類電池正極活性物質采用氟化合物與稀土混合燒制而成，而負極活性物質則采用納米碳素纖維與人造石墨，所以在接受大電流充電中，始終能保持其固有分子結構不變，晶格牢固，耐衝擊，壽命長等特點。

The LFP battery's cathode active material is maded by the mixture of fluorine compound and rare earth, and the anode active material is made by nanometer carbon fiber and artificial graphite. Therefore in the large current charge, it can maintain the characteristics of invariable inherent molecular structure, solid crystal lattice, impact resistence, and long life.

■LFP 類電池最大充電電流爲3CA，祇需要20分鐘便可給電池充滿80%。
LFP battery's maximum charging current is 3CA. It only takes 20 minutes to charge the battery to 80% capacity.
■LFP 類電池能在長期大電流充放電中，保持壽命2000次以上。
LFP battery can maintain a cycle life of above 2000 times when they are charged and discharged by large current for a long time.
■LFP 類電池在反復充放電中，會不斷地提高容量，屬正常現象。
LFP battery may unceasingly enhance the capacity during repeated charging and discharging, which is normal phenomenon.
■LFP 類電池是理想的移動式動力源。
LFP battery is the ideal mobile power source.

LCP 類電池的特性
Characteristics of LCP Battery





TS–LCP1200AHA

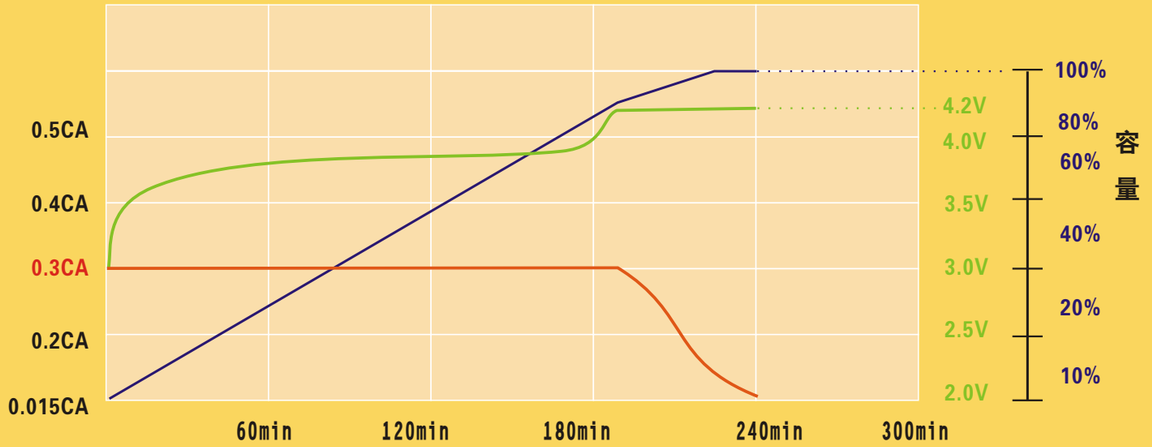
- 最大充電電流600A(0.5CA)
  The maximum charging current is 600A(0.5CA)
- 常規充電電流爲400A(約0.3CA)
  The regular charge current is 400A(about 0.3CA)

TS–LCP200AHA

- 最大充電電流爲100A(0.5CA)
  The maximum charging current is 100A(0.5CA)
- 常規充電電流爲 60A(0.3CA)
  The regular charge current is 60A(0.3CA)

LCP 類電池具有較高的工作電壓，較高的能量密度，該類電池嚴禁用0.5CA以上電流充電!
LCP battery has higher working voltage and higher energy density. It is strictly prohibited to charge with current larger than 0.5CA!
該類電池被濫用會引起冒烟着火燃燒!
LCP battery will emit smoke and cause fire when it is used in an improper way!

L C P類 電 池 最 佳 充 電 圖
Chart of Best Charge of LCP Battery



LCP類電池不適應大電流充電 LCP battery is not suitable to be charged by large current.

該類電池祇允許采用在0.5CA以下電流充電，充放電電壓範圍爲3.0V~4.20V;
LCP battery only can be charged by a 0.5CA current. The charging and discharging voltage range is 3.0V~ 4.20V;

最佳的充電電流是0.3CA以下進行充電。
The best charging current is below 0.3CA.

■ 該類電池放置至3.0V以下會减少其循環壽命
LCP battery will reduce its cycle life when it is stored at voltage below 3.0V

■ 一般在常温下，充放電限制電壓分别爲4.2V 和3V時，該類電池的循環壽命大于3000次。
Generally, LCP battery's cycle life is longer than 3000 times if the charging and discharging limited voltage is 4.2V and 3V respectively under the normal temperature.

■ 該類電池在–30℃以下的環境温度充放電，其内阻會增大，但當電池外殼温度升高時則會自然恢復正常。
When LCP battery charged and discharged in the ambient temperature below – 30℃, its internal resistance will increase; but when the temperature of battery case goes up, it will become normal.

■ 該類電池在75℃以下環境温度充放電，電池會隨着充放電電流的大小變化而産生不同的升温，一般來説外部温度越高，而電池放電電流越大，電池内部的温度也越高，也會影響電池的輸出功率。超過75℃環境下該類電池不適合長時間放電。
The temperature of LCP battery will rise accordingly with the current when charged and discharged at high temperature below 75℃. Regularly, the discharge current will rise while the ambient temperature is high, and the internal temperature will rise accordingly, which will affect the output power of battery. Please do not discharge the battery for long time at temperature higher than 75℃.

■ **该电池最容易发生意外的原因是：**
The situations that the battery most likely causes of accidents are:

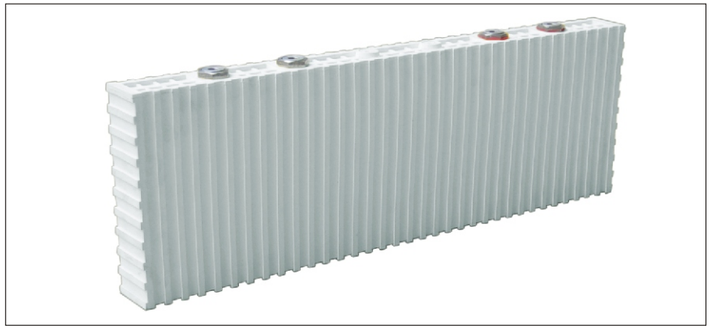
a.過放電（0V）又過充電（＞4.5V），造成電池電極內部結構破壞，使電池自放電率變高，嚴重時電池內部短路，產生熱能，熔化電池外殼，冒出濃烟，甚至會燃燒。
When user over–discharge the battery to 0V and then over charge it higher than 4.5V, it will result in internal short circuit and increase the battery self–discharge rate. There will be heat that comes from internal to melt the battery case, and then the battery will emit smoke, or even cause fire.

b.將電池組合使用時，未按規定使用BMS（電池管理系統），長期使用，組合中任一單體電池可能過充電和過放電，同樣會出現上述意外。
If there is no battery management systems (BMS) used with battery pack, the cells may be over charged or over discharged during the long time use, which will result in the same accident as above.

c.電池在長期貯存或長期不用時，未按時檢測電壓及補充充電，在使用時也會引起上述意外。
If people put aside the battery for long time without checking the voltage and charging them, it will result in the same accident as above when use the battery again.

■ 組合使用的電池，必須强制安裝ＢＭＳ（電池管理系統），可有效避免電池過充電和過放電以及可能產生的意外，有效延長電池的使用壽命。
Please do use battery management systems (BMS) for the battery pack to effectively avoid the overcharge and over–discharge and other possible accidents, in order to lengthen the cycle life of battery.

LMP 類電池的特性
Characteristics of LMP Battery



TS-LMP800AHA

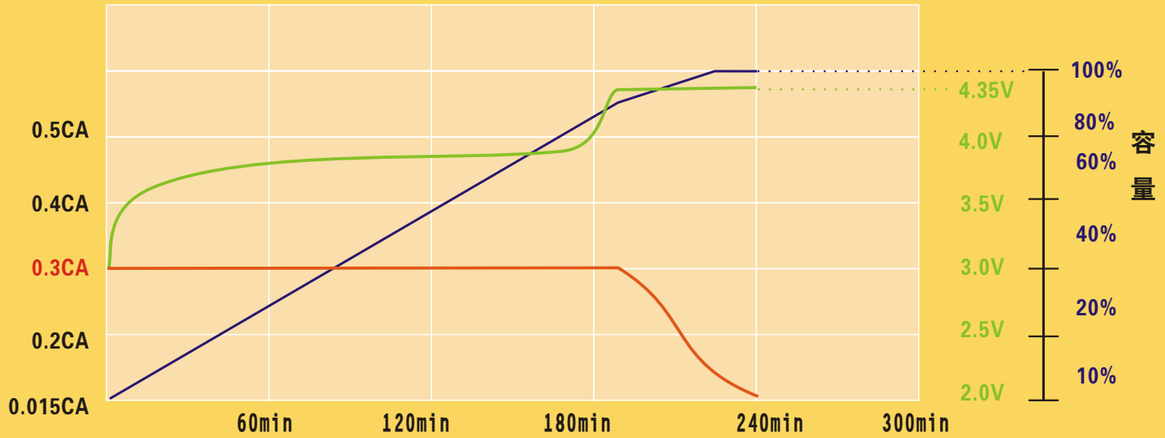
- 最大充電電流爲800A(1CA)
  The maximum charging current is 800A(1CA)
- 常規充電電流爲240A(0.3CA)
  The regular charge current is 240A(0.3CA)

TS-LMP90AHA

- 最大充電電流爲90A(1CA)
  The maximum charging current is 90A(1CA)
- 常規充電電流爲30A(約爲0.3CA)
  The regular charge current is 30A(about 0.3CA)

- LMP類類電池循環性能稍差，但價格便宜。
  The cycle performance of LMP battery is not so good, but it is cheap
- 該類電池過充或過放電嚴重時會發生冒烟，燃燒等意外。
  LMP battery will emit smoke, and even cause fire when it is seriously overcharged or over discharged.

LMP類電池最佳充電圖
Chart of Best Charge of LMP Battery



LMP類電池不適應大電流充電 LMP battery is not suitable to be charged by large current.

該類電池祇允許采用0.5CA以下電流充電，充放電電壓範圍爲2.8～4.35V;
LMP battery only can be charged under a 0.5CA current. The charging and discharging voltage range is 2.8V~ 4.35V;
最佳的充電電流是在0.3CA以下進行充電。
The best charging current is below 0.3CA.

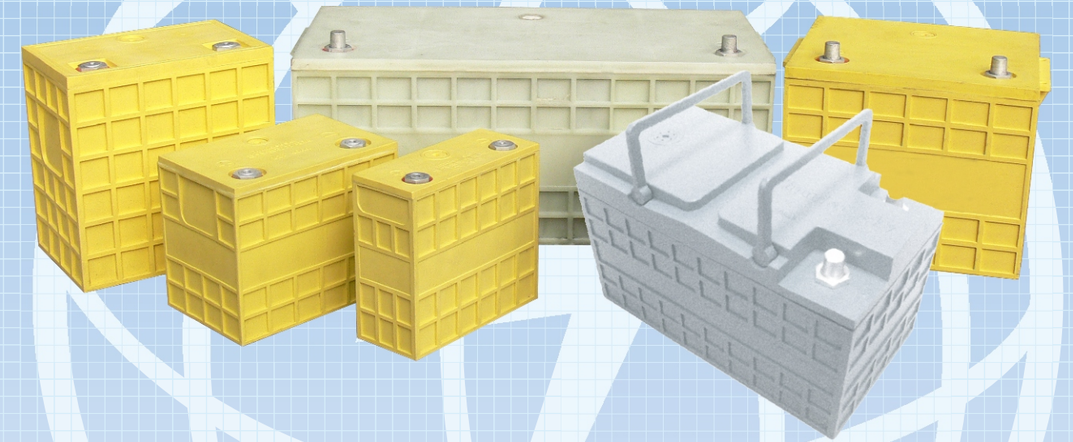
■ 常温環境下，該類電池的充電電壓祇允許在4.30V~4.35V之間，不會損傷電池。在常温環境中保持充電電壓≤4.35V，放電電壓≥2.8V時，該類電池循環壽命應大于1000次以上。
LMP battery's charging voltage only can be between 4.30V~4.35V at normal temperature. LMP battery's cycle life should be longer than 1000 times if the charging voltage ≤4.35V and discharge voltage ≥2.8V at normal temperature.

■ 該類電池適應–25℃至75℃環境温度下使用。
LMP battery can be used at temperature at – 25℃ to 75℃.

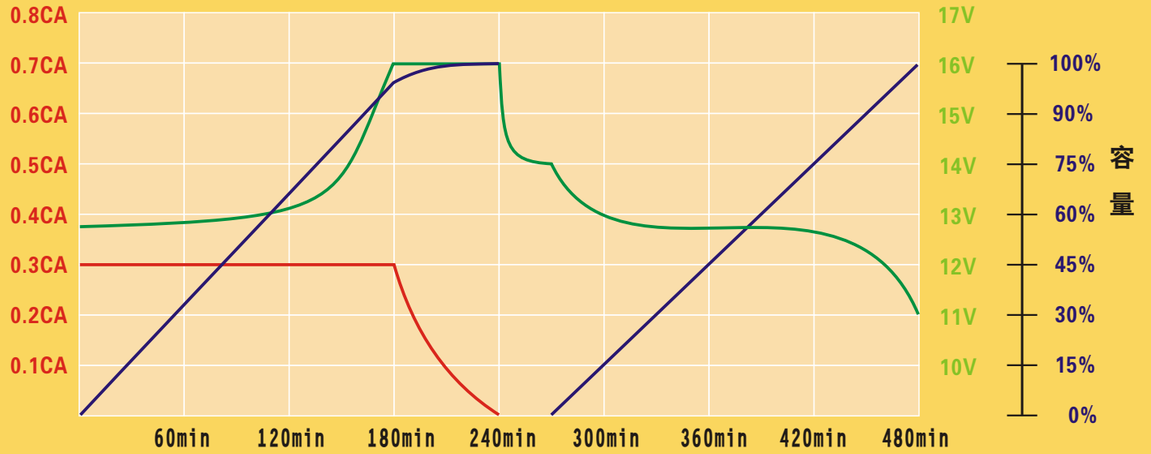
■ 該類電池單體容量大于100Ah時，會與LCP類電池一樣因過充電或過放電造成内部短路、冒烟、燃燒等意外。
LMP battery with capacity more than 100Ah may smoke or burn when internal circuit short caused by over–charging and over–discharging like LCP battery.

■ 該類電池組合使用時，須强制安裝電池管理系統(BMS)。
Assembled battery pack must be used with battery management system (BMS).

LP 類電池的特性
Characteristics of LP Battery



L P類 電 池 最 佳 充 電 圖
Chart of Best Charge of LP Battery



LP類電池不適應大電流充電 LP battery is not suitable to be charged by large current.

LP類電池衹允許采用0.5CA以下電流充電，充放電最佳電壓範圍爲11V~16V，
LP battery only can be charged under a 0.5CA current. The best charging and discharging voltage range is 11V~ 16V;

最佳的充電電流是在0.3CA以下進行充電。
The best charging current is below 0.3CA.

■ 該類電池的工作電壓爲10V–17V，可直接替代鉛酸電池用作燃油車的起動電池，長期使用壽命大于10年。
LP battery's working voltage is 10–17V. It can substitute the lead–acid battery directly in the fuel car as start–up battery. The life is more than 10 years.

■ 一般在常規環境中保持充電電壓≤17V; 放電電壓≥10V時, 該類電池的循環壽命應大于2000次以上或10年。
Generally, LP battery's cycle life should be longer than 2000 times or 10 years when the charging voltage ≤17V and discharge voltage ≥10V at normal environment.

■ 該類電池適應–25℃至75℃環境温度下使用。
It can be used at temperature between – 25℃ to 75℃.

■ 該類電池不會因過充或過放電而發生意外，但仍會造成電池性能下降或失效。除非將電池作破壞性實驗，否則該類電池不會因內部短路而起火燃燒。
LP battery would to cause accident when it is over charged or orver discharged, but the performance would fall down or get invalid. It won't cause fire when short circuit unless the user destroy it on purpose.

首次充放電 Charge/discharge setup

新出廠的電池處于半荷電狀態，切勿直接使用！首次使用時必須將每個單體電池依照各類電池的特性設定充電標準，對電池充電，必須選擇匹配的專用充電器進行充電。
The new battery is in half electric charge condition, which can not to be used directly! Before use the new battery for the first time, each new battery must charge according to each kind of battery's charge standard that set by their characteristic. The battery must use the match battery charger to charge.

LCP類電池 LCP Battery

■ 充電最高電壓 The highest charge voltage:	4.20V
■ 充電最佳電流 The best charge current:	0.3CA
■ 放電最低電壓 The lowest discharge voltage:	3.00V
■ 放電最佳電流 The best discharge current:	0.3CA

LFP類電池 LFP Battery

■ 充電最高電壓 The highest charge voltage:	4.25V
■ 充電最佳電流 The best charge current:	0.5CA
■ 放電最低電壓 The lowest discharge voltage:	2.50V
■ 放電最佳電流The best discharge current:	0.5CA

LMP類電池 LMP Battery

■ 充電最高電壓 The highest charge voltage:	4.35V
■ 充電最佳電流 The best charge current:	0.3CA
■ 放電最低電壓 The lowest discharge voltage:	2.20V
■ 放電最佳電流 The best discharge current:	0.3CA

LP類電池 LP Battery

■ 充電最高電壓 The highest charge voltage:	17V
■ 充電最佳電流 The best charge current:	0.3CA
■ 放電最低電壓 The lowest discharge voltage:	10.0V
■ 放電最佳電流 The best discharge current:	0.3CA

當電池經過首次充放電后，可依照各類別電池特性設定充放電電壓。
After initial charge and discharge, the user could set up the charge and discharge voltage according to each kind of battery's characteristics.

●常温環境下單體電池的充放電電流電壓標準（表一）
Single cell's charge and discharge current and voltage standard at normal temperature (Chart 1)

溫度 Temperature	標準 Standard / 類別 Category	最大充電電流 The highest charge current	最高充電電壓 The highest charge voltage	最大放電電流 The highest discharge current	最低放電電壓 The highest discharge voltage
25℃	LFP	3CA	4.25V	恒流 Constant current 3 CA 脉衝 Pulse 10CA	2.5V
	LCP	0.5CA	4.20V	恒流 Constant current 3 CA 脉衝 Pulse 10CA	3.0V
	LMP	1CA	4.35V	恒流 Constant current 3 CA 脉衝 Pulse 10CA	2.2V
	LP	1CA	17V	恒流 Constant current 1 CA 脉衝 Pulse 10CA	10V

●低温環境下單體電池的特殊充放電電流電壓（表二）
Single cell's special charge and discharge current and voltage at low temperature (Chart 2)

溫度 Temperature	標準 Standard / 類別 Category	最大充電電流 The highest charge current	最高充電電壓 The highest charge voltage	最大放電電流 The highest discharge current	最低放電電壓 The lowest discharge voltage
-35℃	LFP	0.1CA~1CA	4.6V	恒流 Constant current 1CA 脉衝 Pulse 9CA	1.5V
	LCP	0.1CA~0.3CA	4.3V	恒流 Constant current 1 CA 脉衝 Pulse 9CA	2.0V
	LMP	0.1CA~0.3CA	4.6V	恒流 Constant current 1CA 脉衝 Pulse 9CA	2.0V
	LP	0.1CA~1CA	18V	恒流 1CA 脉衝 Pulse 5CA	6.0V

特別注意：當環境温度或電池温度升高時，所有指標應回復到（表一）常温充電標準！
Special Notice: When the ambient temperature or battery's temperature increases, all the index should go back to (Chart 1) the charge standard at normal temperature!

●常温環境下電池系統組合的標準充放電電流電壓（表三）
Battery Pack's standard charge and discharge current and voltage at normal temperature (Chart 3)

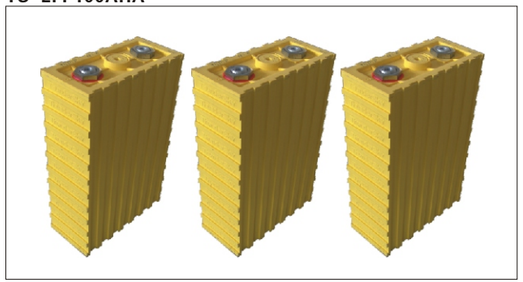
溫度 Temperature	標準 Standard / 類別 Category	最大充電電流 The highest charge current	最高充電電壓 The highest charge voltage	最大放電電流 The highest discharge current	最低放電電壓 The lowest discharge voltage
25℃	LFP	3CA	N×4.25V	恒流 Constant current 3 CA 脉衝 Pulse 10CA	N×2.5V
	LCP	0.5CA	N×4.2V	恒流 Constant current 3 CA 脉衝 Pulse 10CA	N×3.0V
	LMP	1.5CA	N×4.3V	恒流 Constant current 3CA 脉衝 Pulse 10CA	N×2.8V
	LP	1CA	N×17V	恒流 Constant current 1 CA 脉衝 Pulse 10CA	N×10V

●低温環境下電池系統組合的特殊充放電電流電壓（表四）
Battery Pack's standard charge and discharge current and voltage at low temperature (Chart 4)

溫度 Temperature	標準 Standard / 類別 Category	最大充電電流 The highest charge current	最高充電電壓 The highest charge voltage	最大放電電流 The highest discharge current	最低放電電壓 The lowest discharge voltage
-35℃	LFP	0.1CA~1CA	N×4.3V	恒流 Constant current 1CA 脉衝 Pulse 5CA	N×1.5V
	LCP	0.1CA~0.3CA	N×4.3V	恒流 Constant current 1 CA 脉衝 Pulse 5CA	N×2.0V
	LMP	0.1CA~0.3CA	N×4.5V	恒流 Constant current 1CA 脉衝 Pulse 5CA	N×2.0V
	LP	0.1CA~1CA	N×18V	恒流 Constant current 1CA 脉衝 Pulse 5CA	N×6.0V

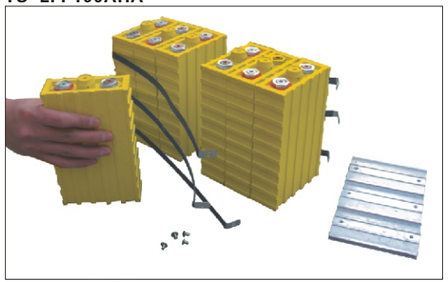
特別注意： 當環境温度或電池温度升高時，所有指標應回復到（表三）常温充電標準！
Special Notice: When the ambient temperature or battery's temperature increase, all the index should go back to (Chart 3) the charge standard at normal temperature!

TS-LFP100AHA



同型號及同容量電池
Cells with same capacity and same model

TS-LFP100AHA



拆開拉條，更換同容量電池
Release the straps and replace the cell with same capacity

爲什么有個別電池會産生零電壓或低電壓?
Why is the voltage of some battery 0V or low voltage?

電池在使用中，會産生內阻變化，當個別電池內阻增大時，該電池在系統組合中與其他內阻小的電池一起串聯或并聯使用，會出現欠充和過放，這種現象最終會導致該電池內部出現短路或微短路，使電池電壓爲零或低于正常電壓範圍。

The impedance of cells may rise duiring using. If you put any cell of which impedance increased with other cells in series or parallel connection, it will cause unsaturated charging or over-discharging, which will make the internal circuit short or capacity decreased or voltage reduce to 0V.

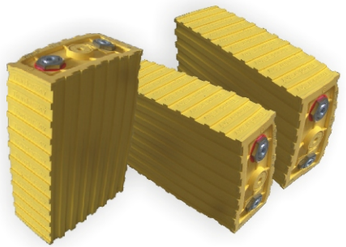
對檢查出系統組合電池中有0V電池怎么辦?
What to do if the voltage of the cell is 0V among the battery pack?

首先將系統組合電池放電至最低電壓標準，然後拆開拉條，更換同容量電池便可。（如圖）

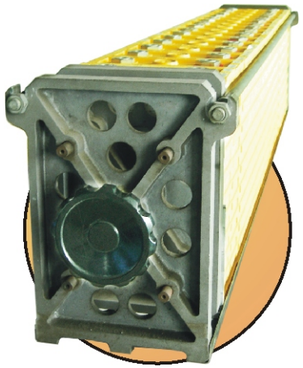
Discharge the battery pack to its standard minimum voltage and release the straps to replace the cell with new one of same capacity as the above picture.

電池殼體是 PP塑料制成，一般正常使用不會發生鼓脹。
如過充電，或過放電才會導致電池鼓脹。鼓脹的電池其內阻、容量、電壓均正常，則可以按圖恢復其原型，如不正常，則應及時從組合中更換。

The battery case is made of plastic (PP) and it will not swell during normal use.
The battery swelling usually happens when it is overcharged or over-discharged. If it happens, please replace the swelled one as soon as possible. If you check the impedance, capacity and voltage are normal, please use the renewer as the picture shows to make the case back to normal shape.



電池鼓脹
Swelling Battery



電池恢復機器
Battery Renewer

電池殼體破裂，或極柱周圍或安全閥漏液怎么辦?

What to do with battery case split or electrolyte leakage through the terminals or safety valve?

電池使用時，受激烈碰撞或振動產生殼體破裂，電池不會發生任何危險。此時，可以采用充分放完電後再拆下來更換新的電池便可。

There is no danger if the battery case split caused by strong impact or shock during operation. But when it happens, please completely discharge the battery and replace it.

電池因工作環境温度過高或放電電流過大，導至極柱周圍或安全閥處會有少量液體滲出，此時可采用吸綿或幹布清潔便可。

If the ambient temperature is too high or discharging current is too big, the internal electrolyte will leak from safety valve. Please wipe up by dry duster cloth or absorptive sponge.

電池在放電中極柱、殼體發熱正常嗎?

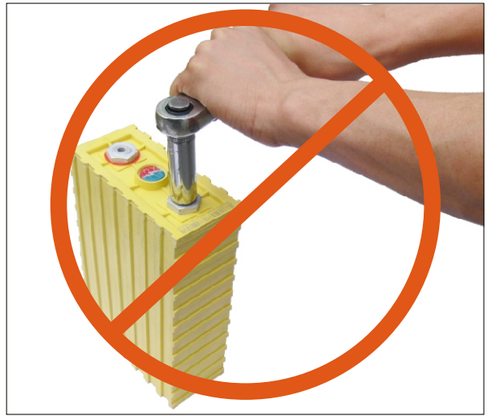
Is it normal that the terminal and case give out heat during discharging?

電池外殼一般在正常放電時會發熱，大電流充放電其温度升高有時會達到80℃~100℃以上，此時應降低充放電電流，以達到温度下降爲正常。正常使用時，電池外殼温度不得高于85℃，而且特別注意，當電池 外殼在150℃~250℃範圍内，可能會溶化。

The battery case may give out heat during normal discharging and especially the temperature will rise to 80℃~100℃ and discharged by big current. Since it happens please reduce the charging and discharging current until the temperature gets back to normal. Make sure the case temperature will not be over 85℃ during normal use. Please pay special attention that the case may be melt at temperature of 150℃~250℃.

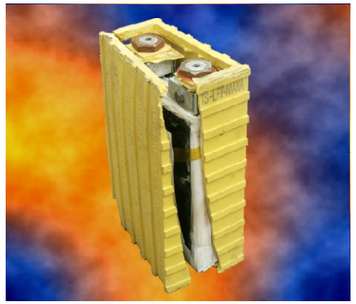
電池極柱是鋁或銅金屬制成，當不慎用力過猛地擰緊導電條中的固定螺絲，會引起極柱中間螺絲滑牙，這時應采用專用開螺紋工具重新開牙。

The battery terminal is usually made of Aluminum or Copper material. If you use too hard power to fix the bolt of terminal connector, it will cause the thread of screw in the terminal damaged and become less crowded. At this time, Please remake the screw thread with special tool



電池極柱中間螺絲滑牙
Terminal screw thread damaged and become less crowded

用專用開螺紋工具重新開牙
Please remake the screw thread with special tool

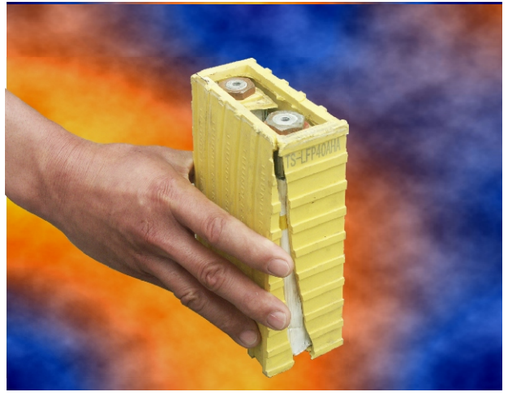


裸露的電池
Uncovered cell

將裸露的電池泡入水中
Put the uncovered cell into water

裸露的電池被水完全浸泡
Uncovered cell get fully soaked by water

裸露電池與水接觸不會發生任何危險!
There is no danger when uncovered cell contact with water!



不小心接觸
Carelessly Touch

立即用大量清水及肥皂清洗干净便可
Immediately clean with massive clean water and soap

用大量清水及肥皂清洗干净便可!
Wash contacted skin with soap and plenty of water!

誤吞食怎么辦?

What to do if swallow the battery material incautiously?

誤吞食電池部分物質，不會造成即時危險。在確保感染者没有使用催吐劑，確保黏液没有阻隔呼吸道時，建議到醫院就醫。

It will not cuase immediate danger if sawllow some battery material incautiously. Since this situation happens, please make sure the infected person not use emetic and then seek immediate medical attention.

接觸到眼睛怎么辦?

What to do if battery material contact with eyes?

不小心被裸露電池的電解液或粉末傷害眼睛時，立刻用大量清水洗眼睛至少15分鐘或立即到醫院就醫。

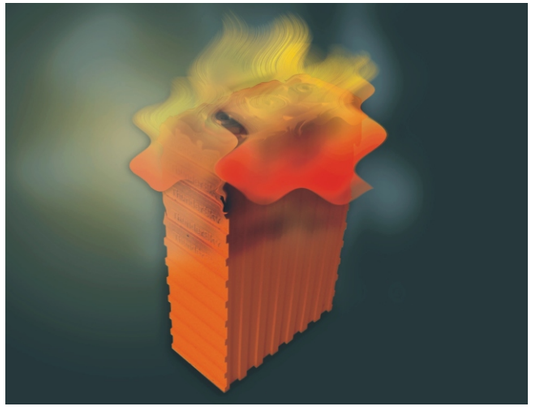
If the uncovered materil such as electrolyte or power hurt your eyes, please open your eyes and wash them by plenty of water for at least 15 minutes and seek immediate medical attention.

電池衹有在濫用的情况下才有可能出現泄漏或冒烟燃燒等意外。

The internal material will leak or get fire only when the battery is misused!

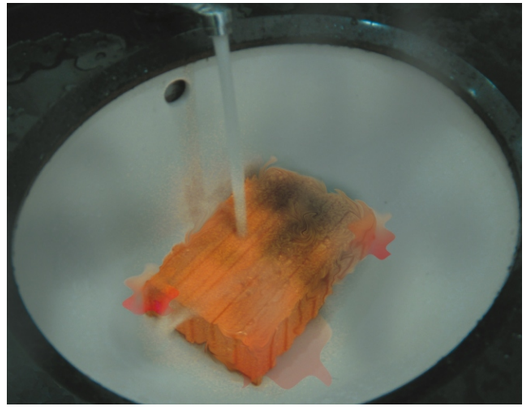
在電池破裂冒烟或燃燒燃燒的情况下，首先應疏散危險區人員并提供烟氣的通風口，同時立即用水噴淋或將燃燒冒烟的電池浸泡在水池中。

If the battery break, smoke or burn, please firstly evacuate the people in dangerous area and provide smoke intake, and put out the fire by water or put the smoking battery into water.



濫用引起

Burning cause by misuse



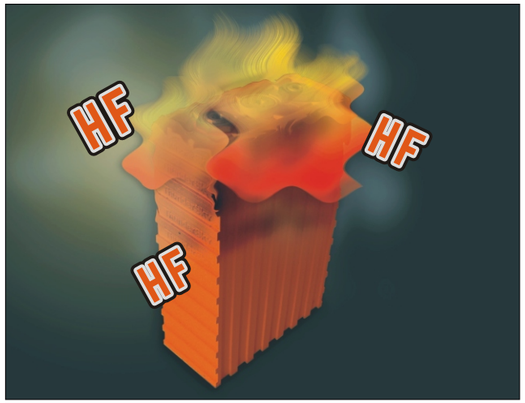
用水噴淋或將燃燒冒烟的電池浸泡在水池中

Spray the battery with water or put the smoking or burning battery into water.

電池在150℃情况下使用或濫用會導致泄漏，蒸發、分解、釋放易燃電解物質。在燃燒中可能會形成氟化物（HF）與磷氧化物，電解質中的LiPF6與水發生的化學反應將產生氟氧化物及二氧化碳。

If the battery used at temperature of 150℃ or misused in other ways, the internal composition may leak, vaporize or decompose and the flammable electrolytic material will release. While battery burning, there may be fluoride (HF) and phosphide coming into being, and if the LiPF6 in the electrolyte contact with water, it will produce fluorin–oxide and carbon dioxide.

電池在150℃情况下使用或濫用會導致泄漏
The battery is used at temperature of 150℃ or misused in other way



在燃燒中可能會形成氟化物（HF）與磷氧化物
Fluoride (HF) and phosphide may come into being while battery burning

如電池冒烟或燃燒，最好的解決方法是采用水噴淋或將冒烟燃燒的電池浸入到水中。

If the battery smoke or get fire, the best solution is to spray the smoking or burning battery with water or put them into water.

也可使用D型滅火器，CO_2 幹燥化學物質。

The alternative solutions are Type D fire extinguisher, CO_2 chemical desiccations.

將冒烟燃燒的電池浸入到水中
Put the battery into water

也可使用D型滅火器，CO_2干燥化學物質或泡沫滅火器
Type D fire extinguisher, CO2 chemical desiccations

- 使用呼吸設備避免吸入刺激性氣體
  Please use aerophore to prevent breathing bad air.
- 穿上防護衣或用其他裝置來避免身體接觸到電解質液
  Put on protection cloths or other devices to keep your body away from electrolyte.

呼吸保護: 正常情況下不需使用，在電池破損的情況下，可用面罩呼吸工具來保護。
Breathing protection: Not necessary at normal situation. If the battery is broken please use aerophore.

手 防 護 : 正常情況下不需使用，如接觸處理已泄漏的電池，可以帶橡膠手套作爲防護。
Hands protection: Not necessary at normal situation. If to hande the leaked battery please put on rubber gloves.

眼睛保護: 正常情況下不需使用，如接觸取處理已泄漏的電池，可戴側面有防護的安全護目鏡或眼鏡。
Eyes protection: Not necessary at normal situation. If to handle the leaked battery please put on protection glasses.

皮膚保護: 正常情況下不需使用，如接觸取處理已泄漏的電池，可穿橡膠圍裙以做防護。
Skin protection: Not necessary at normal situation. If to handle the leaked battery please put on rubber apron.

材料安全數據表（根據 EEC Directive 93/112/EC 制定）
MATERIAL SAFETY DATA SHEET(According to EEC Directive 93/112/EC))

1 名稱：鋰離子充電電池 Name: Li-ion rechargeable battery

1.1 產品： 鋰離子動力電池
Product: Li-ion power battery
IEC 名稱:
IEC Name:

型號 Model: TS-LCP、TS-LFP、TS-LMP、TS-LP
電池化學系統：摻雜鋰、磷、鐵、錳、鈷、氟化合物
Electrochemical system : Lithium , Phosphor , Iron , Fluorine Compound

電極 Electrode	負極 Negative electrode 碳 / 石墨Carbon / Graphite 納米纖維素Nano cellulose	正極positive electrode LiFCoO2 LiFeYPO4 LiFNiMnCoO2	粘結劑 Binder 水溶性 Solvent
電解液 Electrolyte	在混合的有機溶液中溶解 Solution of Lithium hexaflu orophosphate (LiPF 6) In a mixture of organic solvents**		
額定電壓 Rated voltage	3.6 伏 (V)		

** 碳酸乙烯（EC）+ 碳酸二乙基（DMC）+ 碳酸二乙基（DEC）+ 醋酸乙荃（EA）.
** Ethylene Carbonate (EC) + DiEthyl Carbonate (DMC) + DiEthyl Carbonate (DEC) + Ethyl Acetate (EA).

1.2 供應商Supplier:
名稱：雷天電源技術有限公司 Thunder-Sky Battery Limited
地 址: 中國深圳公明李鬆朗第三工業區
Address: NO.3 Industrial Zone,Lisonglang Village, Gongming Twon,Shenzhen City,China
電話 Tel: +86-755-8602 6789　傳真 Fax:+86-755-8602 6678
緊急聯系人: CHEMTREC　電話 Tel:1-800-424-9300

2 成分（主要原材料的百分比成分）
Ingredient (Composition percentage of main material)

LCP		LFP/LP		LMP	
化學元素 Chemical element	化學指標 Chemical index	化學元素 Chemical element	化學指標 Chemical index	化學元素 Chemical element	化學指標 Chemical index
鈷Co	18%	稀土釔Y	40.5%	錳Mn	38.2%
錳Mn	17%	碳酸鋰Lic	16%	鈣Ca	0.3%
鎂Mg	0.7%	錳Mn	4.4%	聚乙烯PE	3.3%
鈉Na	4%	鈣Ca	0.3%	鎳Ni	1.7%
碳C	8.8%	石墨Graphite	5%	鈉Na	1.6%
鉀K	1.7%	鈉Na	1.5%	碳C	5.1%
銅Cu	12%	碳C	3.1%	鉀K	1.9%
鋁Al	7.5%	鐵Fe	3.4%	銅Cu	10%
聚乙烯PE	4.3%	聚乙烯PE	3.3%	鋁Al	6%
石墨Graphite	7.1%	銅Cu	10%	石墨Graphite	6%
鎳Ni	8.1%	鋁Al	6%	鐵Fe	2.1%
鋰Lix	6%	鉀K	1.7%	碳酸鋰Lix	19%
氟F	3.3%	氟F	3.3%	氟F	3.3%
鍶Sr	1.5%	鍶Sr	1.5%	鍶Sr	1.5%

3 物理化學性質 Hazards Identification

3.1 物理性質 Physical properties:

在此材料安全數據表中所提及的鋰離子充電電池均爲密封的單體，當按照生産者建議使用時并不危險。
The Lithium–Ion rechargeable batteries described in this Material Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer.

在正常情況下使用,若電池體及其密封保持完整性，則固態電極和液態電解液不會發生化學 反應。
Under normal conditions of use, the solid electrode materials and liquid electrolyte they contain are non– reactive provided the battery integrity is maintained and seals remain intact.

衹在濫用電池， 導致安全閥移位或電池破裂的情況下才有起火燃燒的危險。
There is Risk of fire only in cases of abuse (mechanical, thermal, electrical), which leads to the activation of the safety valve and/or the rupture of the battery container.

當電解液泄漏時,在潮濕或有水的情況下電極物質可能發生反應或引發電池冒烟/着火，視具體情況而定。
Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/fire may follow, depending upon the circumstances.

在内部壓力過大或温度過低、過高影響的情況下，雷天電池有一個安全通風口以防止電池殼 破裂。
In case of excessive internal pressure and/or temperature Thunder Sky batteries are fitted with a safety vent for protection and/or rupture of the cell case.

3.2 化學性質 Chemical Properties

物質 Substance		融化點 Melting point	沸點 Boiling point	分類 Classification			
CASNO	化學式 Chemical formula			爆炸極限 Explosion limit	危險指示 Indication of Danger	特殊風險(1) Special Risks	安全指示(2) Safety advice (2)
12190–79–3	$LiFCoO_2$ $LiFeYPO_4$ $LiFMn_2CO_4$	> 1000 ℃	N/A			R22 R43	S2 S22 S24 S26 S36 S37 S43 S45
EC: 96–49–1 DMC: 616–38–6 DEC: 105–58–8 EA: 141–78–6	有機溶液 Organic solution (DC–DMC DEC–EA)	EC: 38 ℃ DMC: 4 ℃ DEC:–43 ℃ EA: –84 ℃	EC: 24 ℃ DMC: 90 ℃ DEC: 127 ℃ EA: 77 ℃	未建立的 Unfound OSHA	易燃的 Inflammable	R21 R22 R41 R42/43	S2 S24 S26 S36 S37 S45
21324–40–3	$LiPF_6$	N/A(分解于 160℃) N/A(Decomposing in160℃)	N/A	未建立的 UnfoundOSHA	刺激物 腐蝕 Stimulator Corrosion	R14 R21 R22 R41 R43	S2 S8 S22 S24 S26 S36 S37 S45

根據 67/548/EEC 指示的産品中含有的危險物分類
Classification of dangerous substances contained into the product as per directive 67/548/EEC

安全建議 Safety Suggestion

■ **特殊風險性質:**
Nature of Special Risks

- 與水起反應;
  Reacts with water.
- 與皮膚接觸有害;
  Harmful in contact with skin.
- 吞食有害;
  Harmful if swallowed.
- 對眼睛造成嚴重傷害的危險;
  Risk of serious damage to the eye
- 在吸入和皮膚接觸的情況下可能會過敏
  May cause sensitization by inhalation and skin contact.

■ **安全建議:**
Safety Suggestion

- 放在兒童不可觸到的地方;
  Keep out of touch from children.
- 防止潮濕、不要吸入灰塵;
  Keep away from moisture. Do not breathe dust.
- 避免皮膚接觸;
  Avoid contact with skin.
- 若不慎接觸到眼睛, 立即用大量的水清洗并立刻就醫;
  In case of contact with eyes, rinse immediately with plenty of water and seek medical attention.
- 戴好適宜的手套。
  Wear suitable glove.

■急救措施
First Aid Measures

在電池破裂冒烟或起火燃燒的情況下，疏散危險區人員并提供烟 / 氣的通風口，并立即用水噴淋或將着火、冒烟的電池浸泡在水池中。
In case of battery rupture, fume or fire, evacuate personnel from contaminated area and provide maximum ventilation to clean out fumes/gases. Meantime, spray the battery with water or put the smoking battery into basin at once

燃燒或冒烟危險:除 LFP 類電池外，LCP 、LMP 電池若被不當使用的情況下或受環境影響，在150 ℃的情況下會泄漏/蒸發或分解及釋放易燃電解物質。在火燒中可能會形成氟化氫(H F)與磷氧化物，電解液中的 LiPF 6 與水發生的化學反應將産生氟化物及二氧化碳。
Fire and fume hazard: Except LFP series batteries, LCP and LMP batteries can leak and/or spout vaporized or decomposed and combustible electrolyte fumes in case of exposure above 150℃ Resulting from inappropriate use, abuse, or from the environment. Possible formation of hydrogen fluoride (HF) and phosphorous oxides during fire. LiPF 6 salt contained in the electrolyte releases hydrogen fluoride (HF) in contact with water.

滅火媒介:用水噴淋或將冒烟的或起火燃燒的電池浸泡在水中。可使用D 型 滅火器 , Co2, 幹燥化學物或泡沫滅火器
Extinguishing media: spray the battery with water or put the smoking battery into basin at once. Can be used : Type D extinguishers , Co2, Dry chemical extinguishers

特殊危險:由于外部影響或不當使用導致的電池過熱，電解液泄漏，或電池破裂可能會導致泄漏電池内部成分到外界。
Special hazards : Following cell overheating due to external source or due to improper use, electrolyte leakage or battery container rupture may occur and release inner component/material in the environment.

接觸眼睛:電池内部的電解液對眼睛會産生刺激，不慎接觸，用大量清水清洗至少 15 分鐘 (打開眼睛)。
Eye contact: The eyes can be irritant by the electrolyte in the battery, if the eyes incautiously contact with the electrolyte. Flush with plenty of water (eyelids held open) for at least 15 minutes. open the eye and clean it with massive clear water for at least 15 minutes.

接觸皮膚:電池内部的電解液可能會導致皮膚感染，不慎接觸，脱下被污染的衣物并用大量清水及肥皂清洗感染處至少 15 分鐘。 不要搽藥膏。
Skin contact: Incautious skin contact of the electrolyte may cause the skin irritation. Remove all contaminated clothing and flush affected areas with plenty of Water and soap for at least 15 minutes Do not apply greases or ointments.

吞食:吞食電解液可能會導致喉嚨或呼吸道感染，不慎吞食，喝入大量食水并立刻就醫。確保感染者没有使用催吐劑。確保粘液没有阻隔呼吸道,不要給無意識的人吃其他東西。
Ingestion: Incautious ingestion of the electrolyte may cause the throat or respiratory infections. Dilute by giving plenty of water and get immediate medical attention. Assure that the victim does not aspirate vomited material by use of positional drainage. Assure that mucus does not obstruct the airway. Do not give anything by mouth to an unconscious person.

吸入:電池泄漏或破裂時，其内部成分可能會導致呼吸道産生粘液，水腫等問題，不慎吸入，到空氣清新的地方并使污染區通風。如果必要的話，輸氧或進行人工呼吸。
Inhaling: Contents of a leaking or ruptures battery can cause respiratory tract, mucus, membrane irritation and edema. Remove to fresh air and ventilate the contaminated area. Give oxygen or artificial respiration if needed.

特殊保護工具:使用呼吸設備來避免吸入刺激性氣體。穿防護衣或用其他裝置來避免身體接觸到電解液。
Special protection: Use self–contained breathing apparatus to avoid breathing irritant fumes. Wear protective clothing and equipment to prevent body contact with electrolyte.

■意外發生時處理方法
Accidental Release Measures

電池内部成分衹有在濫用的情况下才有可能被泄漏。若不慎泄漏，請將電池浸泡在水中或用大量的水衝洗，放置在合適的容器中(如條件許可，最好先經過冷却之後)，根據當地規定處理。
The material contained within the batteries would only be expelled under abusive conditions. Soak under water or spray with copious amounts of water , place in approved container (after cooling if necessary) and dispose in accordance with local regulations.

■操作與貯藏
Handling and Storage

電池不可以被打開，損壞和燒弃，因爲其可能會泄漏裏面含有的化學成分。
The batteries should not be opened, destroyed nor incinerate since they may leak or rupture and release in the environment the ingredients they contain.

操作:不要壓擠，刺破及將電池(+)(–)電極用可傳導的材料連接（例如金屬）。不要直接加熱或焊接。不要扔進火中. 不要隨意連接不同型號和品牌的電池。 不要將新舊型號的電池混合使用。將電池放在不導電的容器中。（例如塑料）
Handling: Do not crush, pierce, short (+) and (–) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non–conductive (i.e. plastic) trays.

貯藏:需貯存在凉爽通風的地方(最好是低于30℃)，遠離潮濕，熱源，火源，食物及飲料。電池放置需與墻壁保持適當距離。温度高于 100℃ 可能會導致電池泄漏或破裂。 由于短路可能會引起殼體破裂燃燒，泄漏與破損，所以應將電池保持在初始包裝内直至使用。
Storage: Store in a cool (preferably below 30℃) and ventilated area away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 100℃ may result in battery leakage and rupture. Since short circuit can cause burn, leakage and battery container rupture hazard, keep batteries in original packaging until use and do not jumble them.

其他:依照生産商關于最大電流，工作温度範圍的建議使用。
Other: Follow manufacturer recommendations regarding maximum recommended currents and operating temperature range.

■燃燒應對 / 人身保護
Fire Controls / Personal Protection

呼吸保護:在正常情况下不需使用，在電池破損的情况下，可用面罩呼吸工具來保護。
Breathe protection: Not necessary under normal use. In case of battery rupture, use self– contained full–face respiratory equipment.

手防護:在正常情况下不需使用，如接觸處理已泄漏的電池，可以帶橡膠手套作爲防護。
Hand protection: Not necessary under normal use. Use Vison rubber gloves if handling a leaking battery.

眼睛保護:在正常情况下不需使用，如接觸處理已泄漏的電池，可戴側面有防護的安全護目鏡或眼鏡。
Eye Protection: Not necessary under normal use. Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery.

皮膚保護:在正常情况下不需使用，如接觸處理已泄漏的電池，可穿橡膠圍裙以做防護。
Skin protection: Not necessary under normal use. Use rubber apron and protective working in case of handling of a ruptured battery.

■物理與化學外觀 Physical and Chemical properties

外觀:白色，黃色，橙色條紋狀外殼，密封并且裝有金屬電極 / 連接器。温度範圍：

Appearance : (Physical shape and color as supplied)White/Yellow/Orange Plastic Prismatic cases with ribs, hermetically sealed and fitted with a metallic terminals/connections.

	持續的 Sustained	偶爾的Occasional
貯藏時 Storage	+ 30 ℃ max	-30/+ 80 ℃
放電時 Discharging	30/+ 80 ℃	-30/+ 80 ℃
充電時 Charging	0/+ 75 ℃	0/+ 75 ℃

特殊功率:(Note: Wh = 額定電壓 x 額定 Ah kg = 平均電池重量);
Specific energy: (Note: Wh = Rated voltage x rated Ah kg = Average battery weight);
特殊脉衝功率:600w–1200w/kg 根據電池型號而定 ;
Specific pulse power: 600w–1200w/kg （ Varies depending upon size ）;
電阻:如相關的IEC標準所規定 ;
Resistance: As defined in relevant IEC standard

■穩定性與反應 Stability and Reactivity

避免的情況:温度高于80℃或燒弃使其變形，毀傷, 擠壓，刺破，分解，短路，持續暴露在潮濕的環境中。
Conditions to avoid: Heat above80℃ or incinerate. Deform, mutilate, crush, pierce, disassemble. Short circuit. Prolonged exposure to humid conditions.

避開的材料 Materials to avoid: N/A
危險分解物:腐蝕性 / 刺激性的氟化氫(HF)會在 LiPF6 與水的反應中産生。氟化氫(HF)與磷氧化物將會在火燒中産生。
Hazardous decomposition products: Corrosive/Irritant Hydrogen fluoride (HF) is produced in case of reaction of lithium hexafluorophosphate (LiPF 6) with water. Combustible vapors and formation of Hydrogen fluoride (HF) and phosphorous oxides during fire.

■有毒物信息
Topological Information

雷天鋰離子充電電池不含有毒物。
Thunder Sky Battery Ltd. Lithium–Ion rechargeable batteries do not contain toxic materials.

■可循環再造
Disposal Considerations

在正確使用至電池壽命終止時，可回收再造，雷天鋰離子充電電池不會帶來環境污染。
When properly used or disposed, Thunder Sky Battery Ltd Lithium–Ion rechargeable batteries can be recycled and do not present environmental hazard during their life time.

■處理事項
Processing Item

根據可適用的規則處理，因各國法律而异。
Dispose in accordance with applicable regulations, which vary from country to country.
鋰離子電池的電極必須保持絶緣并且最好在使用前用獨立塑料包裝袋包裝。
Lithium–Ion batteries should have their terminals insulated and be preferably wrapped in individual plastic bags prior to disposal.
焚燒:使用者不可焚燒電池，衹能由權威的機構合理處理。
Incineration : Incineration should never be performed by battery users but eventually be trained professionals in authorized facilities with proper gas and fumes treatment.
回收:交給權威的回收機構處理。
Recycling : Send to authorized recycling facilities.

■運輸信息
Transportation Information

聯合國:UN° 3090
United Nations: UN° 3090
類別:危險品 9類 包裝
Classification: Class 9 Packaging
空運 ICAO 903
Aerial transport: ICAO 903
海運 IMDG 903
Sea transportation: IMDG 903

■國際慣例
International convention:

空運 IATA
Aerial transport IATA
海運 IMDG
Sea transportation IMDG
陸地運輸 ADR
Land transportation ADR
鐵路運輸 RID
Railway transportation RID

■其他: Other

在美國:聯邦法律法規代碼 (49 CFR Ch. 1 § 173–185)
In the USA : Code of Federal Regulations (49 CFR Ch. 1 § 173–185)

■運輸規則
Regulation Information

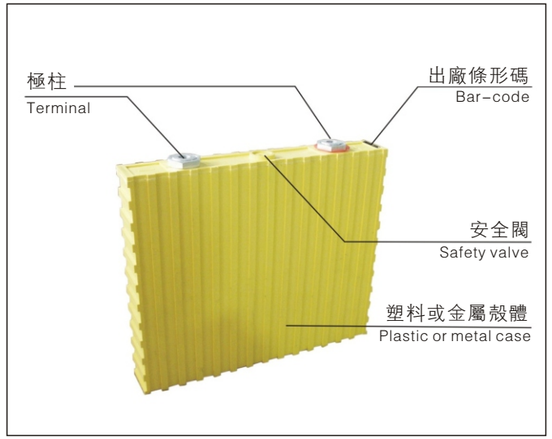
鋰離子充電電池的運輸規則根據美國“危險品運輸規則 2003 年第十三次修改版本 – Ref. STSG/AC.10/1 Rev.1 3”由多方制定(IATA, IMO, ADR, US–DOT)。根據鋰離子電池的重量，成分，設計，通過聯合國“危險品運輸–測試標準手册–第三次修改版本–2002–Ref.Ref.STSG/AC.1 0/11R ev.3修訂版1《鋰電池》”的安全測試的能力，鋰離子電池與其電池組依照UN No 3090第9類之規定來判定其可或不可運輸.單體的鋰電池與電池組若分別含有少于1.5克與8克通過U N –制定的安全測試的鋰金屬成分，則不在運輸限制範圍之内。(1.0 Ah 額定容量 =0.3克鋰成分)

The transport of rechargeable lithium–ion batteries is regulated by various bodies (IATA, IMO, ADR, US– DOT) that follow the United Nations “ Recommendations on the Transport of Dangerous Goods, Model Regulations, 13 th Revised edition 2003 Ref. STSG/AC.10/1 Rev. 13 ”.

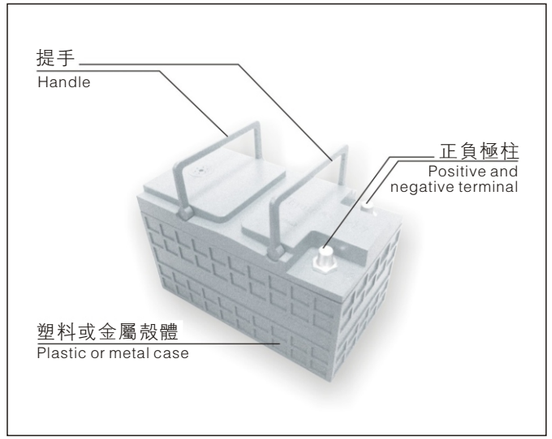
Depending on their lithium metal equivalent weight content, design, and ability to pass safety tests defined by the UN in the “ Recommendations on the Transport of Dangerous Goods Manual of Tests and Criteria 3 rd Revised edition 2002 Ref. Ref. STSG/AC.10/11 Rev. 3 Amendment 1 <Lithium Battery> ” , the lithium–ion cells and the battery packs may or may not be assigned to the UN No 3090 Class–9, that is restricted for transport.

Individual lithium–ion cells and battery packs with respectively less than 1.5 and 8 grams of equivalent Lithium metal content that pass the UN–defined safety tests, are not restricted for transport (1.0 Ah of declared nominal capacity = 0.3 gram of Li equivalent weight content).

單體電池的結構
Structure of single cell



TSLFP300AHA



TSLP12V100AH

TS–LFP類電池的檢驗規則
Testing instructions for TS – LFP Cell

單體電池檢驗項目
Testing items for 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 、75℃放電容量、荷電保持及恢復 能力、循環壽命。
Appearance, terminals (anode and cathode), weight & size, discharge capacity at 20℃ ,discharge capacity at–75℃, discharge capacity at –25℃, high rate discharge capacity, energy retain ability and restorability, cycling life.

■ 安全性項目Safety items

短路、槍擊、過充過放電、水浸、火燒。
Short circuit, shooting test, overcharge/overdischarge, water immersion test, fire test

■ 蓄電池的要求 Requirement of cell

單體蓄電池的正負極應有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。
The terminals of single cell must use connector that could bear the maximum current in accordance with Testing Methods.

C3爲3h率額定容量，C1爲1h率額定容量。
C3 is the rated capacity of 3 hours, and C1 is the rated capacity of 1 hours.

常規試驗方法
Conventional test methods

■ 試驗條件Test conditions

環境條件Environment condition

試驗環境温度爲15℃～35℃、相對濕度爲25%～85%。

Laboratory room temperature 15℃～35℃，humidity25%～85%

■ 測量儀器、儀表 Instrument

量程Measurement range of instrument

所有儀表量程應隨被測電壓值或電流值改變，指針或儀表讀數應在量程的後三分之一範圍内。

Measurement range accordingly change with voltage and current fluctuation; instrument value should fall in the last 1/3 range of measurement instrument.

精度Accuracy

a)測量電壓用的儀表應是不低于0.5級的電壓表，電壓表内阻至少應是1KΩ/V;

Accuracy level of voltage meter ≥ 0.5 class; resistance of voltage meter: 1kΩ/v;

b)測量電流用的儀表應是不低于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，其分度值不應大于1℃;

Thermometer has applicable measurement range; dividing value of thermometer ≤1℃

d)測量時間用的儀表應按時、分、秒分度，至少應具有±1%的準確有度;

Time measuring instrument can record dividing 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;

Dividing 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，是否與端子的極性一致。

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Charging**

在20℃±5℃條件下，蓄電池以1/3C3(A)電流放電，至蓄電池電壓達到3.0V時停止放電，然後20℃±5℃條件下以1/3C3(A)恒流充電，至電池電壓達4.2V時轉恒壓充電，充電電流降至超始值的5%時停止充電。
At 20℃±5℃, the cell is discharged at a current of 1/3C3 till voltage of the cell reach 3.0V, and then start to perform constant current charge at a current of 1/3C3 under 20℃±5℃ till voltage of the cell reach 4.2V and simultaneously switch to constant voltage charge. When charging current value decreases to 5% of initial value, charging completes.

低温充電 Low temperature charging

在–18℃±5℃條件下，蓄電池以1/3C3(A)電流放電，至蓄電池電壓達到2.2V時停止放電，然後–18℃±5℃條件下以1/3C3(A)恒流充電，至電池電壓達到4.3V時轉恒壓充電，當恒壓階段充電時間達2.5h時轉爲恒壓4.3V涓流充電，充電電流降至起始值的5%時停止充電。
At –18℃±5℃, the cell is discharged at a current of 1/3C3 till voltage of the cell reach 2.2V, and then start to perform constant current charge at a current of 1/3C3 under –18℃±5℃ till voltage of the cell reach 4.3V and simultaneously switch to constant voltage charge and duration is 2 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)Discharge capacity (energy density) at 20℃**

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1/3C3(A)電流放電至电池電壓3.0V。如果放電容量達不到額定容量，此項試驗允許重復3次。
When the charging test is finished the cell will standby 1 hour at 20℃±5℃, temperature, and then discharges at current of 1/3C3 (A) till voltage of the cell reach 3.0V. If value of discharge capacity does not reach the standard of rated capacity, this test is allowed to repeat 3 times.

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

蓄電池充電後，在20℃±5℃條件下擱置1h，然後在同一温度下以1C1(A)電流放電至電池電壓 2.5V時終止。
When the charging test item is finished, the cell will standby 1 hour at 20℃±5℃ temperature, and then discharges at current of 1C1 (A) till voltage of the cell reach 2.5V.

■ **–25℃放電容量Discharge capacity at –25℃**

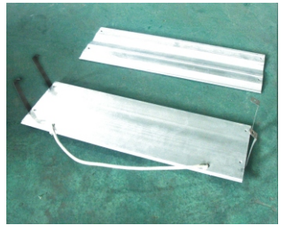
蓄電池充電後，在–25℃±2℃條件下貯存12h。然後在同一温度下，以1/3C3(A)恒流放電至終止電壓(2.5V)。計算放電容量 (以Ah爲計)。
When the charging test is finished, the cell will standby 12 hours at –25℃±2℃ temperature, and then performs constant current discharge at current of 1/3C3 (A) till voltage of the cell reach 2.5V. Calculate discharge capacity.

■ **75℃放電容量 Discharge capacity at 75℃**

蓄電池充電後，在75℃±2℃條件下貯存5h，然後同一温度下，以1/3C3(A)恒流放電至終止電壓(3.0V)。計算放電容量 (以Ah計)。
When the charging test is finished, the cell will standby 5 hours at 75℃±2℃ temperature, and then performs constant current discharge at current of 1/3C3 (A) till voltage of the cell reach 3V. Calculate discharge capacity.

■ **快速充放電能力Quick charge and discharge capacity**

①將塑料殼體的蓄電池按如下圖示安裝夾板固緊，(金屬殼體不需要)
Fastens the plastic casing of the cell according to the graph below. (Except metal case)



②將夾緊的電池充好電後，用2CA(標稱容量的2倍電流)對電池恒電流放電，至電池電壓下降到2.5V時停止(計算容量)。第一階段將電池静止三十分鐘或一小時後，用2CA(標稱容量的2倍電流)對電池恒電流充電，至電池電壓上升到4.2V時，静止三十分鐘或一小時後，用3CA(標稱容量的3倍電流)對電池恒電流放電，至電池電壓下降到2.5V時終止(計算容量)。第二階段將電池静止三十分鐘或一小時後，用3CA(標稱容量的3倍電流)對電池恒電流充電，至電池電壓上升至4.2V時，静止三十分鐘或一小時後，用3CA(標稱容量的3倍電流)對電池恒電流放電，至電池電壓下降到2.5V時停止放電(計算容量)。
After the cell is charged, discharge by 2CA (twice nominal capacity current) constant current until voltage drops to 2.5 V (calculate the capacity). At first phase, keep the cell for 30 to 60 minutes, then charge by 2CA(twice nominal capacity current) constant current, until the voltage reach 4.2V, then after resting the cell for 30 to 60 minutes, discharge it by 3CA(3 times of nominal capacity current) constant current, until the voltage drops to 2.5 V (calculate the capacity). At second phase, after keeping the cell still for 30 to 60 minutes, charge by 3CA(3 times of nominal capacity current) constant current, until the voltage reach 4.2V, then after resting the cell for 30 to 60 minutes, discharge by 3CA(3 times of nominal capacity current) constant current, until the voltage drops to 2.5V (calculate the capacity).

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

荷電保持能力： 蓄電池充電後，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(3.0V)。計算放電容量 (以Ah計)。
Retaining Ability: after charge according to the charging test method, the cell is stored under open circuit condition at 20℃±5℃, and then discharge by 1/3C3 (A) constant current at the same temperature, until the voltage reach final voltage (3.0V). Calculate the capacity (by Ah)
容量恢復能力： 蓄電池充電結束後，静止三十分鐘後在20℃±5℃條件下以1/3C3(A)恒流放電至3.0V。計算放電容量(以Ah計)。
Restorability: after charge according to the charging test method, keep it still for 30min at 20℃±5℃, and then discharge by 1/3C3 (A) constant current, until the voltage reach 3.0V. Calculate the capacity (by Ah).

安全試驗方法
Safety testing methods

■ **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，外部綫路電阻應小于或等于10mΩ。
Place the cell under 20℃ ± 5℃ condition for 1h after charging the cell as the charging test method instructed, the cell remain situation of external short circuit for 10 minutes, external circuit resistance should be less than or equal to 10mΩ.
試驗過程中，蓄電池不得爆炸或起火、允許冒烟。
The cell should not get fire or explode during the test, but smoke is acceptable.

■ 槍擊 Shooting test

蓄電池在充電後，在20℃±5℃條件下擱置1h。用AK47或手槍從垂直于蓄電池極板方向開槍，子彈迅速穿透電池，該試驗應在有充分環境保護的條件下進行。

Place the cell under 20℃±5℃ condition for 1h after charging the cell as the charging test method instructed, shoot the cell with AK47 or pistol from the direction vertical to the cell, the bullet goes through the cell immediately, the test should only be conducted under condition with sufficient protection.

試驗過程中，蓄電池不得爆炸、允許冒烟。

The cell should not explode in the test, but smoke is acceptable.

■ 過充和過放電實驗 Overcharge /Forced discharge 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1/3C3(A)電流充電，直到電池電壓達到10V即停止。

Overcharge test: Place the cell under 20℃±5℃ condition for 1h after charging the cell as the charging test method instructed, charge the cell with 1/3C3 (A) current under 20℃±5℃ condition until the cell voltage reach 10V.

過放電：蓄電池在充電後，在20℃±5℃條件下擱置1h，蓄電池在20℃±5℃下，以1/3C3(A)電流放電，直到電池電壓下降至零伏時即停止。

Forced discharge test: Place the cell under 20℃±5℃ condition for 1h after charging the cell as the charging test method instructed, discharge the cell with 1/3C3 (A) current under 20℃±5℃ condition until the cell voltage reach 0V.

過充、過放電試驗過程中，蓄電池應不漏液、不爆炸、不起火，允許冒烟。

The cell should not leak, explode or get fire in the test, but smoke is acceptable.

■ 水浸實驗 Water immersion test

蓄電池在按充電後，在20℃±5℃條件下，擱置1h，然後將該電池放在裝滿自來水或海水、河水的池子裏浸泡1h。

Place the cell under 20℃±5℃ condition for 1h after charging the cell as the charging test method instructed, put the cell in pool full of tap water, seawater or river water for 1h.

實驗過程中，蓄電池不得爆炸、不得起火燃燒。

The cell should not get fire or explode in 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。

Place the cell under 20℃±5℃ condition for 1h after charging the cell as the charging test method instructed, put the cell in a fire until the cell turn to ash.

實驗過程中，蓄電池不得爆炸。

The cell should not explode in the test.

■ 循環壽命試驗 cycle life test (80DOD %)

蓄電池在20℃±5℃下，以1/3C3(A)電流恒流充電，至電壓到達4.2V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 1/3C3 (A) constant current, when the cell voltage reach 4.2V, 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1/3C3(A)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 1/3C3 (A) current until the

discharge capacity reach 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1/3C3(A)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 1/3C3 (A) current for 8 minutes and change to 1C1 (A) pulsed discharge for one minute;

以1/3C3(A)脉衝放電8min後以2C1(A)脉衝放電1min爲第二階段；
in the second stage pulsed discharge the cell with 1/3C3 (A) current for 8 minutes and change to 2C1(A) pulsed discharge current for 1 minute;

以1/3C3(A)放電8min以後3C1(A)脉衝放電1min爲第三階段；
In the third stage discharge the cell with 1/3C3 (A) current for 8 minutes and change to 3C1(A) pulsed discharge for one minute;

以1/3C3(A)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1/3C3(A)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單體蓄電池電壓低于2.0V則停止放電。
in the fourth stage discharge the cell with 1/3C3 (A) current for 8 minutes and change to 10C1(A) pulsed discharge current for 8 seconds; place the cell for 30 minutes between each stages and discharge the cell with 1/3C3 (A) current until 100DOD%. Record the voltage of single cells during discharging. Stop discharging if in some stage the voltage of single cells gets lower than 2.0V.

■ 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;
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1/3C3(A)電流放電至蓄電池電壓達到2.5V停止放電。
Discharge: discharge the cell with 1/3C3 (A) current until the voltage reach 2.5V.

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

TS–LP類電池的檢驗規則
Testing instructions for TS–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 –20℃, discharge capacity at 80℃, 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, shooting test, overcharge/overdischarge, water immersion test, fire 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.

C3爲3h率額定容量，C1爲1h率額定容量。

C3 is the rated capacity of 3h rate; C1 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℃ ~ ℃, humidity 25%～85%

■ 測量儀器、儀表 Instrument range

量程 Measuring equipment and instrument

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 change 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代于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; dividing 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 dividing 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;
Dividing 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1/3C3(A)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1/3C3(A)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 1/3C3 (A) till voltage of the cell reach 11V, and then start to perform constant current charge at a current of 1/3C3 (A) under 20℃±5℃ till voltage of the cell reach 16V and simultaneously switch to constant voltage charge. When charging current value decreases to 5% of initial value, charging completes.

低温充電 Low temperature charging
在-18℃±5℃條件下，蓄電池以1/3C3(A)電流放電，至蓄電池電壓達到10V時停止放電，然後-18℃±5℃條件下以1/3C3(A)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 -18℃±5℃ the cell is discharged at a current of 1/3C3 (A) till voltage of the cell reach 10V, and then start to perform constant current charge at a current of 1/3C3 (A) under -18℃±5℃ till voltage of the cell reach 17V and simultaneously switch 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1/3C3(A)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 1/3C3 (A) 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1C1(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 1C1 (A) current at the same temperature, until voltage of the cell arrive at 11V, and stop.

■ –25℃放電容量 Discharge capacity at –25℃

蓄電池在充電後，在–25℃±2℃條件下貯存下10h。然後在同一温度下，以1/3C3(A)恒流放電至終止電壓(10V)。計算放電容量 (以Ah計)。
After charging according to the charging test method, set aside the cell for 10h at –25℃±2℃, then discharge by 1/3C3 (A) current at the same temperature, until voltage of the cell drop final voltage (10V). Calculate the discharge capacity (by Ah)

■ 85℃放電容量 Discharge capacity at 85℃

蓄電池在充電後，在85℃±2℃條件下貯存3h，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)。
After charging according to the charging test method, set aside the cell for 3h at 85℃±℃, then discharge by 1/3C3 (A) current at the same temperature, until voltage of the cell drop 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 drop 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1/3C3(A)恒流放電至11V。計算放電容量 (以Ah計)。
Restorability: after charging according to the charging test method, set aside the cell by open circuit for 30days at 20℃±5℃ condition, then discharge by 1/3C3 (A) constant current at the same temperature, until voltage of the cell arrive 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、允許微火燃燒或冒烟。
The cell must not explode, low fire burning during the test is allowed.

■ 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、允許微火燃燒或冒烟。

The cell must not explode, low fire burning during the test is allowed.

■ 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穿(鋼針不得停留在蓄電池中)，該試驗應在有充分環境保護的條件下進行。

After charging according to the charging test method, set aside the cell for 1h at 20C±5C. Using Φ3mm~Φ8mm steel nail run 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、允許微火燃燒或冒烟。

The cell must not explode, low fire burning during the test is allowed.

■ 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1/3C3(A)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 1/3C3 (A) current at the same temperature, until the voltage arrive 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1/3C3(A)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 1/3C3 (A) 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 burns 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1/3C3(A)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1/3C3(A)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 1/3C3 (A) constant current at 20℃±5℃. Once the voltage reach 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 1/3C3 (A) current at 20℃±5℃ until discharge capacity reach 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1/3C3(A)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 1/3C3 (A) current, turn to 1 min 2 C1 (A) current impulse discharge as the first phase;

以1/3C3(A)脉 衝放電6min後以2C1(A)脉衝放電1min爲第二階段；
After 6min discharge by 1/3C3 (A) current, turn to 1min 2 C1 (A) current impulse discharge as the second phase;

以1/3C3(A)放電6min以後3C3(A)脉衝放電1min爲第三階段；
After 6min discharge by 1/3C3 (A) current, turn to 1min 2 C1(A) current impulse discharge as the third phase;

以1/3C3(A)放電6min後10C1(A)脉衝放電1min爲第四階段；
After 6min discharge by 1/3C3 (A) current, turn to 1min 2 C1 (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1/3C3(A)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單體蓄電池電壓低于8V則停止放電。
0.5h between each two phases, carry out four phases impulse discharge in total, then discharge by 1/3C3 (A) current to 100D0D%. Record the voltage of the 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，紧固到振動試驗臺上，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1/3C3(A)電流放電至蓄電池電壓達到10V停止放電。
Discharge: discharge by 1/3 C3 (A) current, until voltage reach 10V

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。
Discharge current metamorphosis, voltage abnormality, case distortion, electrolyte spillover etc are not allowed.

DECLARATION OF CONFORMITY

CTS

CENTRE OF TESTING SERVICE
OPERATE ACCORDING TO ISO/IEC 17025

EC DECLARATION OF CONFORMITY

This declares that the following designated product

LITHIUM ION BATTERY
Model No.: TS-LFP-LCP-LMP Brand Name : THUNDER SKY
(Product identification)

Complies with the essential protection requirements of Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility.
This declaration applies to all specimens manufactured in accordance with the attached manufacturing drawings which form part of this declaration.
Assessment of compliance of the product with the requirements relating to electromagnetic compatibility was based on the following standards, Only the EMC part referring of the listed standard EN 61960 has been considered.:

EN 61960 – 2 / 2001 , EN 61000-4-2
(Identification of regulations / standards)

This declaration is the responsibility of the manufacturer / importer
THUNDER SKY BATTERY LIMITED
LISHONGLANG NO. 3 INDUSTRY ZONE, GONGMING TOWN,
BAOAN DIST., SHENZHEN, P.R.C
(Name / Address)

CE

THIS DOC IS ONLY VALID IN CONNECTION WITH TEST REPORT NUMBER : CTSGZ061228-04094-E

MANUFACTURER / IMPORTER

(Date)

(Surname, forename)
(Company stamp)

TEST LABORATORY

This is the result of test, that was carried out from the submitted type-samples of a product in conformity with the specification of the respective standards.
The declaration holder has the right to fix the CE-mark for EMC on the product complying with the inspection sample.

December 31. 2006
(Date)

(Company stamp)

CENTRE OF TESTING SERVICE

002277

對應的CE認證
CE Certificate

BCC

CERTIFICATE OF QUALITY MANAGEMENT SYSTEM CERTIFICATION
Certificate No. 01608Q11659R0S
This is to Certify that the Quality Management System of

THUNDER SKY BATTERY LIMITED
THUNDER SKY GREEN POWER SOURCE (SHENZHEN) CO., LTD.

BUILDING 15 & 17, NO.3 INDUSTRIAL ZONE, LISONGLANG VILLAGE, GONGMING TOWN, BAO'AN DISTRICT, SHENZHEN, GUANGDONG PROVINCE, P. R. CHINA
Post Code:518106
is in conformity with
GB/T19001-2000 idt ISO9001:2000 Standard

This certificate is valid to the following product(s)/service(s)

DESIGN, MANUFACTURING AND SERVICE OF LITHIUM-ION POWER BATTERIES

Issue Date: 8-6-2008
Reissue Date: 8-6-2008
Valid Until: 8-5-2011

Beijing New Century Certification Co., Ltd.
General Manager:

Please consulting the website:www.bcc.com.cn

CNAS
MANAGEMENT SYSTEM
CNAS C016- Q

ISO 質量體系認證(英文)
ISO Certificate(English)

BCC

质量管理体系认证证书
注册号： 01608Q11659R0S

兹证明

深圳市雷天电源技术有限公司
雷天绿色电动源（深圳）有限公司

广东省深圳市宝安区公明街道李松蓢社区第三工业区15栋、17栋
邮政编码：518106
质量管理体系符合
GB/T19001-2000 idt ISO9001:2000标准
该组织质量管理体系适用于

锂离子动力电池的设计、制造及服务

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总经理：

BCC地址：北京市西城区西直门内南小街国英1号11层
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