



## Specification Approval Sheet

Name: LiFePO4 Cylindrical Battery

Model: 30225

SPEC: 14500 3.2V 400mAh

Approved By	Checkup	Make

Customer Confirmation	Signature	Date
	Company Name :	
	Stamp :	

436 Kato Terrace, Fremont, CA 94539 U.S.A.

Tel: 510.687.0388 Fax: 510.687.0328

[www.TenergyBattery.com](http://www.TenergyBattery.com)



## Tenergy Corporation

436 Kato Terrace

Fremont, CA 94539

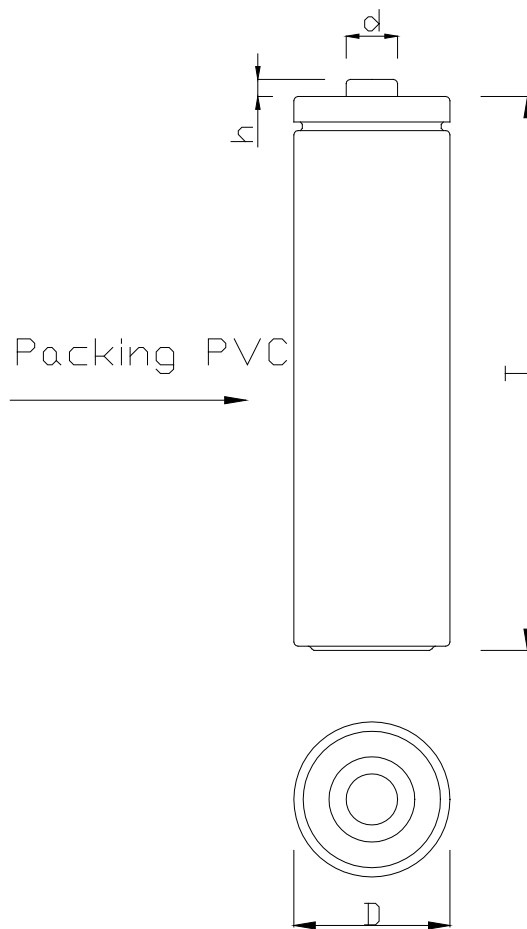
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[www.TenergyBattery.com](http://www.TenergyBattery.com) email: sales@tenergybattery.com

## 2 .Scope

This specification describes the basic performance, technical requirement, testing method, warning and caution of the LiFePO4 cylindrical rechargeable battery. The specification only applies to Tenergy Co.

## 3. Initial dimension



	$d$	5~7	$h$	$>1.0$
T	$49.5 \pm 0.5$	D	$14.2 \pm 0.2$	UNIT
				mm



#### 4.Specification

NO.	Item	Specifications		
4.1	Nominal capacity	400mAh    0.2C Discharge		
4.2	Nominal voltage Fully charge voltage(FC) Fully discharge voltage(FD)	3.2 V 3.8 V            Defined in this DOC: FC = 3.8 V 2.0 V            Defined in this DOC: FD = 2.0 V		
4.3	Charge current	Standard Charge : 0.5C Rapid charge : 1.0C		
4.4	Standard charging method	0.5C CC（constant current）charge to FC, then CV(constant voltage FC)charge till charge current decline to ≤0.01C		
4.5	Charging time	Standard Charge Approx 5 hours Rapid charge Approx 2 .5hours		
4.6	Max.charge current	Constant current 1C constant Voltage FC 0.01 C cut-off		
4.7	Max.discharge current	Constant current 1C end voltage FD		
4.8	Standard discharge current	Constant current 0.2C end voltage FD		
4.9	Discharge lower limit voltage	FD		
4.10	Charge upper limit voltage	FC		
4.11	Initial Impedance	≤80mΩ		
4.12	Weight	Approx: 16g		
4.13	Operating temperature	Charging: 0°C~45°C Discharging: 0°C~60°C		
4.14	Storage temperature	0°C~60°C	≤1 month	Percentage of recoverable capacity no less than 80% of the initial capacities
		0°C~45°C	≤3 month	
		0°C~20°C	≤1 year	
4.15	Recoverable capacity	Constant current 0.5C charge to FC then constant voltage charge to current declines to 0.01C, rest for 10min, constant current 0.5C discharge to FD, rest for 10min.Repeat above steps 3 times, recording the maximum capacity		
4.16	Storage humidity	≤75% RH		
4.17	Appearance	Without scratch,distortion,contamination and leakage		
4.18	Standard environmental condition	Temperature : 23±5°C Humidity : 45-75%RH Atmospheric Pressure: 86-106 Kpa m		



Remark: 1.From 4.1 to 4.12, the testing condition is following 4.18(standard testing condition)

2.Operating temperature: charging 0°C~45°C; Discharging: 0°C~60°C

If the working condition is out of 4.18, the performance will be some shift.

## 5 General performance

No.	Item	Test methods and condition	Criteria
5.1	0.2C Capacity	After standard charging, rest for 10min, then discharging at 0.2C to voltage FD, recording the discharging time.	≥300min
5.2	1C Capacity	After standard charging, rest for 10min, then discharging at 1C to voltage FD, recording the discharging time.	≥54min
5.3	Cycle life	Constant current 0.5C charge to FC then constant voltage charge to current declines to 0.01C, rest for 10min, constant current 0.5C discharge to FD, rest for 10min. Repeat above steps till continuously discharging capacity Higher than 90% of the Initial Capacities of the cells.	≥1000 times
5.4	Capability of keeping electricity	23±5°C, After standard charging, rest for 28days, discharging at 0.2C to voltage FD, recording the discharging time.	≥291min

## 6 Environment Performance

No.	Item	Test methods and condition	Criteria
6.1	Discharge at high temperature	After standard charging, rest for 4h at 60±2°C, then discharging at 1C to voltage FD at the same time, recording the discharging time.	≥54min
6.2	Thermal shock	Put the battery in the oven. the temperature of the oven is to be raised at 5±2°C per minute to a temperature of 130±2°C and remains 30 minutes.	No fire, no smoke

## 7 Safe characteristic

No.	Item	Test methods and condition	Criteria
7.1	Over charge testing	At 23±5°C, charging cells with constant current 3C to voltage 5V, then with constant voltage 5V till current decline to 0A, charging time no less than 8h.	No smoke or fire



7.2	Over discharge testing	At 23±5°C, According to the requirements of standard charge, the cells will be discharge to cut-off voltage, then connect with external load of 30 ohm for 24 hours.	No fire, no smoke, no leakage.
7.3	Short-circuit testing	At 23±5°C, After standard charging, connect cells anode and cathode by wire which impedance less than 50mΩ, keep 6h.	No smoke or fire

※ Above testing of safe characteristic must be with protective equipment.

## 8. Battery Protection

The battery shall be with the over-charging prevention, over-discharging prevention, and over-current prevention during use. Protective circuit shall have protective functions as follows:

### 1) Over-charging protection

Overcharging prevention stops charging if any cell of the battery pack reaches 3.85V.

### 2) Over-discharging protection

The Over-discharging protection monitors the voltage of every cell in the pack and works to avoid a drop in the cell voltage to FD or less.

### 3) Over-current protection

The cell shall be discharged at less than the maximum discharge current specified in the Specification Approval Sheet. A high discharging current may reduce the discharge capacity significantly or cause overheating.

## 9. Cautions in use

To ensure proper use of the battery please read the manual carefully before using it. Handling

- Do not expose to, dispose of the battery in fire.
- Do not put the battery in a charger or equipment with wrong terminals connected.
- Avoid shorting the battery
- Avoid excessive physical shock or vibration.
- Do not disassemble or deform the battery.
- Do not immerse in water.
- Do not use the battery mixed with other different make, type, or model batteries.
- Keep out of the reach of children.

### . Charge and discharge

- Battery must be charged in appropriate charger only.



- Never use a modified or damaged charger.
- Do not leave battery in charger over 24 hours.
- . Storage
  - Store the battery in a cool, dry and well-ventilated area.
- . Disposal
  - Regulations vary for different countries. Dispose of in accordance with local regulations.

## **10. Battery operation instruction**

### **10.1 Charging**

Charging current: Cannot surpass the biggest charging current which in this specification book stipulated.

Charging voltage: Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage.

Charge temperature: The battery must carry on the charge in the ambient temperature scope which this specification book stipulated.

Use the constant electric current and the constant voltage way charge, the prohibition reverse charges. If the battery positive electrode and the cathode meet instead, can damage the battery.

### **10.2 Discharging current**

The discharging current does not have to surpass this specification book stipulation the biggest discharging current, the oversized electric current electric discharge can cause the battery capacity play to reduce and to cause the battery heat.

### **10.3 discharge temperature**

The battery discharge must carry on in the ambient temperature scope which this specification book stipulated

### **10.4 Over-discharges**

After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity.

### **10.5 Storing the Batteries**



The battery should store in the product specification book stipulation temperature range. If has surpasses above for six months the long time storage, suggested you should carry on additional charge to the battery.

#### **11. Period of warranty**

The period of warranty is half a year from the date of shipment. Tenergy that guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer's abuse and misuse.

#### **12. Other the chemical reaction**

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

#### **13.Note:**

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