



## Specification Approval Sheet

Name: LiFePO4 rechargeable battery

Model: 31913

SPEC: 24V 10Ah

Approved By	Checkup	Make

Customer Confirmation	Signature	Date
	Company Name :	
	Stamp :	

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## History of revision

Version	Description	Date
A/0	First issue	2010.7.8



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**Scope**

This Product Specification describes the requirements for the rechargeable lithium ion battery ("Battery") to be supplied by Tenergy Corporation.

**1. Description and Model**

1.1. Description	Lithium ion rechargeable battery
1.2. Model	IFR26650E-3200 8S3P 24V 10Ah

Note: IFR\*26\*650\*E\* 3200\*8S3P = LiFePO4--Li-ion Cylindrical\*Diameter\*Height\* Kind\* Capacity\* Configuration Code

**2. Nominal Specifications**

Items	Specification	
2.1. Nominal Capacity	10.0Ah (Typ.) 9.6Ah (Min.)	
2.2. Nominal Voltage	25.6V	
2.3. Charging Voltage	29.2 ±0.05 V	
2.4. Charging method (Can float charging)	CC-CV Constant Current with limited Voltage- Constant Voltage with limited Current (or float charging see 7.1)	
2.5. Initial Charging Current	Standard Charge	: 2.0A
	Max. Charge	: 9.6A
2.6. Max. Discharge Current (Pulse)	40A	
2.7. Discharge Method-Standard	4.8A	
2.8. Max. Continuous Discharge	25A	
2.9. Discharge Cut-off Voltage	20V	
2.10. Battery Dimension	Length*Width*High (Max)	See Fig.1 Dimension drawing
2.11. Operating Temperature	Charge	5°C ~ 60°C
	Discharge	-20°C ~ 60°C
2.12. Storage Temperature	1 month	-25°C ~ 45°C
	3 month	-25°C ~ 30°C
2.13. Weight	2.5 ± 0.2KG	



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**3. Outline Dimensions**

See attached drawing (Fig.1).

**4. Appearances**

There shall be no such defect as scratch, flaw, crack, rust, discoloration, leakage, which may adversely affect commercial value of the battery.

**5. Reference Standard and Test Conditions**

This specification is compiled by referring the Standard UL1642、 IEC61960:2003、 UN38.3 GB/T 18287-2000 and so on.

Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature  $25\pm 5^{\circ}\text{C}$  and humidity  $65\pm 20\%$  RH. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature  $15 \sim 30^{\circ}\text{C}$  and humidity  $25 \sim 85\%$  RH.

**6. Electrical Characteristics**

Items	Test Condition					Criteria
6.1. Standard Charge	The "Standard Charge" means charging the Battery with initial charge current 2.0A and with constant voltage 29.2 V ,then constant voltage ( 29.2V )with floating current taper to 200mA cut-off (Charger for exclusive use lithium ion rechargeable battery, with an accuracy $29.2\pm 0.05\text{V}$ ) at $25\pm 5^{\circ}\text{C}$ .(if float charging, not limit the CV current)					
6.2. Nominal Capacity	The capacity means the discharge capacity of the Battery, which is measured with discharge current 2.0A with 20V cut-off at $25\pm 5^{\circ}\text{C}$ within 5 hour after the Standard Charge.					$\geq 9.6\text{Ah}$
6.3. Cycle Life	Each cycle is an interval between the charge (charge current 2A) CC 2.0A to 29.2V, CV to 200mA , stop 30min and discharge (discharge current 4.8A) with 20 V cut off, stop 30min at $25\pm 5^{\circ}\text{C}$ .Capacity after 1000 cycles and plus 1 day, measured under the same conditions stated in 7.2					$\geq 80\%$ Nominal capacity
6.4. Internal Impedance	Internal resistance measured at 1KHz after Standard Charge.					$\leq 300\text{m}\Omega$
6.5. Rated capacity	Charge Current	Discharge Current				
	2.0A	2A	5.0A	10A	25A	
		100%	$\geq 97\%$	$\geq 95\%$	$\geq 90\%$	
6.6. Charge retention	Capacity after 28 days storage at $25^{\circ}\text{C}$ from Standard Charge, measured under the same conditions stated in 7.2.					Retention capacity $\geq 85\%$
6.7. Battery voltage	As of shipment					26.0~26.8(V)
6.8. Discharge						No leakage, No



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Character	current					appearance defect
		-20°C	0°C	25°C	60°C	
	2.0A	≥60%	≥80%	100%	≥100%	

**7. Safety Characteristics (single cell)**

Items	Test Condition	Criteria
7.1. Impact	A 25.5 mm diameter bar is inlaid into the bottom of a 9.1kg weight. And the weight is to be dropped from a height of 610mm onto a sample battery and then the bar across the center of the sample.	No explosion, No fire
7.2. Short Circuit	To short-circuit the Cell charged 3.65V by connecting positive and negative terminal by 50milli-ohm wire for 1 hour.	No explosion, No fire
7.3. Over Charge	Cells are charge at constant current of 3C <sub>5</sub> mA and constant voltage of 10V for 2 hour.	No explosion, No fire
7.4. Over discharge	After standard charge .Cells are discharged at constant Current of 0.2C <sub>5</sub> mA to2V, and the positive and negative terminal is connected by a 30Ω wire for 24 hour.	No explosion, No fire
7.5. Nail test	A Steel needle (diameter: 2.5mm-5mm) is Penetrated vertically through the center of a fully charged cell	No explosion, No fire
7.6. Heating test	After standard charge ,Cells are heated in a circulating air Oven at a rate of 5°C per minute to 130°C and keeping the state for 30 minutes	No explosion, No fire
7.7. Crush	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 30min	No explosion, No fire

**8. Protection**

When Li-ion rechargeable battery is used over the permitted voltage or current, electrolyte may disassemble, and this case will affect safety performance of Li-ion rechargeable battery.

**Specifications of PCM:**

No.	Test item	Criterion
1	Voltage	Charging voltage DC:3.65V/cell
2	Current	Low current consumption for single cell ≤150μA
		Maximal continuous discharging current 25 A
3	Cell balance	Balance Start Point voltage 3.60±0.025V
4	Over charge Protection (single cell)	Balance Current 100mA
		Over charge detection voltage 3.9±0.025V
		Over charge detection delay time 0.5~2.5S
		Over charge release voltage 3.8±0.05V
5	Over discharge protection (single cell)	Over discharge detection voltage 2.0±0.05V
		Over discharge detection delay time 144mS
		Over discharge release voltage 2.3±0.05V
6	Over current protection	Over current detection voltage 100mV
		Over current detection current 50±5A
		Detection delay time 16ms
		Release condition Automatic Recovery
7	Short protection	Detection condition Exterior short circuit
		Detection delay time 200-500us



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		Release condition	Automatic Recovery
8	Resistance	Protection circuitry (MOSFET)	$\leq 50\text{m}\Omega$
9	Temperature	Operating Temperature Range	$-40\sim+85^{\circ}\text{C}$
		Storage Temperature Range	$-40\sim+125^{\circ}\text{C}$

### 9. Product Liability

The Safety should be sure to confer previously with between the both parties.

The results of the conference must be recorded and the range of the liability or the burden should be cleared.

The indications of a warning are established by conference with between the both parties.

### 10. Shipping

The capacity of delivery battery is approximately at 30% of charging. During transportation, keep the battery from acutely vibration, impacting, solarization, drenching.

### 11. Warranty

As long as the Battery is treated in accordance with this Product Specification and / or Handling Precautions and Prohibitions, Supplier warrants that the Battery should be free from any defect for a period of 6 month ( $25^{\circ}\text{C}$  or less) from the date of shipment or for 1000 cycles (see 7.3), whichever comes earlier.

The warranty set forth above or described in Handling Precautions and Prohibitions for Lithium Ion Rechargeable Batteries excludes a defect, which is not related to manufacturing of the Battery.

### 12. Others

12.1.Storage for a long time If Battery is preserved for a long time (more than 3 months); the Battery should be preserved at the dry and low temperature.

12.2.Other Any matters that this specification does not cover should be conferred between the both parties.

### ! Note

- When charging the battery, use dedicated chargers and follow the specified conditions.
- Use the battery only in the specified equipment.
- Do not connect battery directly to an electric outlet or cigarette lighter charger.
- Do not heat or throw battery into a fire.
- Do not use, leave battery close to fire or inside of a car where temperature may be above  $60^{\circ}\text{C}$ . Also do not charge / discharge in such conditions.
- Do not immerse, throw, and wet battery in water/ seawater.
- Do not put batteries in your pockets or a bag together with metal objects such as necklaces. Hairpins, coins, or screws. Do not store batteries with such objects.
- Do not short circuit the (+) and (-) terminals with other metals.
- Do not place battery in a device with the (+) and (-) in the wrong way around.
- Do not pierce battery with a sharp object such as a needle.
- Do not hit with a hammer, step on or throw or drop to cause strong shock.
- Do not disassemble or modify the battery.
- Do not solder a battery directly.
- Do not use a battery with serious scar or deformation.



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### **! Warning**

- Do not put battery into a microwave oven, dryer, or high-pressure container.
- Do not use battery with dry batteries and other primary batteries, or batteries of a different package, type, or brand.
- Stop charging the battery if charging is not completed within the specified time.
- Stop using the battery if abnormal heat, odor, discoloration, deformation or abnormal condition is detected

### **During use. Charge. Storage.**

- Keep away from fire immediately when leakage or foul odor is detected.
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.  
If liquid leaking from the battery gets into your eyes, do not rub your eyes. Wash them well with clean water and go to see a doctor immediately.

### **! Caution**

- Store batteries out of reach of children so that they are not accidentally swallowed.
- If younger children use the battery, their guardians should explain the proper handling.
- Before using the battery, be sure to read the user's manual and cautions on handling thoroughly.
- Thoroughly read the user's manual for the charger before charging the battery.
- For information on installing and removing from equipment, thoroughly read the user's manual for the specific equipment.
- Batteries have life cycles. If the time that the battery powers equipment becomes much shorter than usual, the battery life is at an end. Replace the battery with a new same one.
- Remove a battery whose life cycle has expired from equipment immediately.
- When the battery is thrown away, be sure it is non-conducting by applying vinyl tape to the (+) and (-) terminals.
- When not using battery for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the battery pack is charged, used and stored, keep it away from objects or materials with static electric charges.
- If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.
- The battery can be used within the following temperature ranges. Do not exceed these ranges.  
Charge temperature range: 5°C to 60°C  
Discharge temperature range: -20°C to 60°C  
(When using equipment)

**Fig.1 Dimension drawing IFR26650E-3200 8S3P 24V 10Ah**

(Unit: mm)

