



Guangzhou Funing Electric Power Technology Co., Ltd

广州富能电力科技有限公司

Specification For Approval

客户承认书

Customer Name Code 客户名称代码	
Model 产品型号	22-01-600109
Description 规格描述	160S1P-512V50Ah
Effective Date 生效日期	2022 年 09 月 20 日

Made By 制订	Checked By 审核	Approved By 批准

Customer Confirmation 客户确认	Company Name 公司名称:
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1、Scope of application documents/文件适用范围

This product specification only applies to the protection parameters of rechargeable lithium-ion battery products and batteries designed by Dong guan TGPRO New Energy Technology Co., Ltd.

本产品规格书仅适用由东莞市拓嘉新能源科技有限公司设计的可充电锂离子电池产品和电池组的保护参数。

2、The Specification Amendment/规格书修订

If the raw materials, production processing, production system or battery usage environments & other conditions need to be changed, the amendment side needs provide the written advice to the other side, only the both sides come to agreement, the amendment will be effective.

如因原材料、生产制程、生产系统或电池使用环境或其他条件发生改变，修订方需将改变的信息以书面形式通知对方取得供需双方同意后再行修订。

3、Product or Cell testing conditions/设备产品或电芯的测试条件

It is recommended to use newly produced battery packs and new cells for related tests. Unless specified, testing and measurement shall be done under temperature of $20\pm 5^{\circ}\text{C}$ and relative humidity of 45~75%.

建议采用新生产的电池组和新的电芯作相关的测试。除非有特别要求，否则测试需要在温度 $20\pm 5^{\circ}\text{C}$ ，相对湿度45~75%的条件下进行。

4、Standard / 标准

4.1 Reference Standard/参考标准

参考 GB 31241-2014 便携式电子产品用锂离子电池和电池组安全要求

参考 UL1642安全标准-(锂电池)

参考 GB/T 31486-2015 电动汽车用动力蓄电池电性能要求及试验方法

参考 GB/T 31485-2015 电动汽车用动力蓄电池安全要求及试验方法

参考 GB/T 31484-2015 电动汽车用动力蓄电池循环寿命要求及试验方法

4.2 Measuring Instrument and Apparatus/测量器具及设备

.1 Dimension Measuring Instrument/尺寸测量器具

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.02mm.

尺寸测量器具的精度等级应不小于0.02 mm。

.2 Voltmeter (伏特计)

Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/\text{V}$ 按照国家标准指定规格等级或采用灵敏度更高的，测量电压时内阻不应小于 $10\text{k}\Omega/\text{V}$ 。

.3 Ammeter (安培计)

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω . 按照国家标准指定规格等级或采用灵敏度更高的，包括电流表及电线在内的总外阻应小于 0.01Ω 。

.4 Impedance Meter (电阻计)

Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter).

内阻测试仪测量原理应为交流阻抗法 (1kHz LCR)。

4.3 Testing Conditions (Unless Specially Requirements) 测试条件 (除非特别规定)

Atmosphere Pressure : $86\sim 106\text{kPa}$ 大气压力: $86\sim 106\text{kPa}$

Temperature: $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$ 环境温度: $20^{\circ}\text{C}\pm 5^{\circ}\text{C}$

Relative Humidity: $\leq 75\%$ 环境湿度: $\leq 75\%$

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5. Main specifications 主要技术参数

5.1 Cell Battery specifications (电芯技术参数)

Cell 单体电 芯	No. (序号)	Item (项目)	General Parameter (常规参数)		Remark (备注)
	1	Rated Capacity (额定容量)	Typical (标称容量)	50Ah	Standard discharge (0.2C ₅ A) after Standard charge (标准充电后 0.2C ₅ A 标准放电)
	2	Nominal Voltage (正常电压)	3.2V		Mean Operation Voltage (即工作电压)
	3	Internal Impedance (内阻)	≤0.8 mΩ		Internal resistance measured at AC 1KHz after 50% charge (半电态下用交流法测量内阻) The measure must uses the new batteries that within one week after shipment and cycles less than 5 times (使用出货后不到一个星期及循环 次数少于 5 次的新电池测量)
	4	Dimension (尺寸)	Thickness/厚度: Max 24.5mm		Initial Dimension (初始尺寸)
			Width/宽度: Max 140.5mm		
			Height/高度: Max 160.5mm		
	5	Weight (重量)	1.15kg		APPROX
	6	Standard charge (标准充电)	Constant Current 0.33C ₅ A Constant Voltage 3.65V 0.02C ₅ A cut-off (持续电流: 0.33C ₅ A 持续电压: 3.65V 截止电流: 0.02C ₅ A)		Charge time : Approx3.5h
7	Rapid Charge 快速充电	Constant Current 1C ₅ A Constant Voltage 3.65V 0.01C ₅ A cut-off (持续电流: 1C ₅ A 持续电压: 3.65V 截止电流: 0.01C ₅ A)		Charge time : Approx1.5h@ ≥ 10°C	
8	Standard discharge (标准放电)	Constant current 0.33C ₅ A end voltage 2.5 V (持续电流: 0.33C ₅ A 截止电压: 2.5V)		16.5A	
9	Maximum discharge current 最大放电持续电流	Constant current: 2C ₅ A end voltage: 2.5 V (持续电流 2C ₅ A 截止电压: 2.5V)		100A@ ≥ 0°C	

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5.2 Battery Pack specifications for single module (电池组技术参数)

No	Item (项目)	General Parameter		Remark (备注)
1	Combination method	128S1P		
2	Rated Capacity (额定容量)	Typical	50Ah	Standard discharge after Standard charge (package) 标准充电后标准放电
		Minimum	48Ah	
3	Factory Voltage (出厂电压)	512-528V		Mean Operation Voltage (即工作电压)
4	Voltage at end of Discharge 放电终止电压	≤432V		Discharge Cut-off Voltage 放电截止电压
5	Charging Voltage (推荐的充电电压)	560V		V=串数*3.5V
6	Internal Impedance (内阻)	≤150mΩ		Under 20±5°C Environment Temperature , the Usage Frequency of Fully Charge (1KHz) , Use AC Internal Impedance test machine to test 20±5°C 环境温度下, 完全充电后使用频率为 (1kHz) 的交流内阻测试仪测量。
7	Max Charging Current (Icm) 允许最大充电电流	50A		Ampere-meter , Maximum allowable charging current of the battery pack 电流表测量, 电池组最大充电电流
8	Limited Charging Voltage(Uc1) 充电限制电压	576V		Volta-meter (Serial*3.6V) , Battery pack safe charging voltage 电压表测量(串数*3.6V (电芯的安全充电电压)), 电池组安全充电电压
9	Max Discharging current 最大放电电流	50A		Maximum discharge current allowed by the battery pack 允许用最大放电电流进行放电。
10	Discharge Cut-off voltage(Udo) 放电截止电压	400V		Voltage of the battery when the discharge is stopped 为电池组中止放电的负载电压(按电芯平台放电达到放电截止的电压值)
11	Operation Temperature Range (工作温度范围)	Charge: 0~55°C		
		Discharge: -20~55°C		
12	Storage Temperature Range (储存温度范围)	-20°C~25°C		Recommend (25±3°C); ≤60±25%RH storage moisture range. 推荐 ≤60±25%RH 储存湿度范围。
13	Single module Size/weight 单模组尺寸/重量	630*185*345mm /49Kg		
	Main control box size/weight 主控箱尺寸/重量	630*185*200mm /10Kg		
	System size/weight 系统尺寸/重量	630*185*2000mm/268Kg		

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5.3.1 Battery Management System 电池管理系统规范

A: BMS function introduction (BMS 功能介绍)

- 1) :The BMS is designed for 160 series lithium battery.
- 2) : The BMS have all functions which are : (该 BMS 系统具有以下一些功能)
 - .1 overcharge detection function (过充电保护功能)
 - .2 over discharge detection function (过放电保护功能)
 - .3 over current detection function (过电流保护功能)
 - .4 short detection function (短路保护功能)
 - .5 Temperature detection function 温度保护功能
 - .6 balance function (均衡功能)
 - .7 communicate function (通讯功能)
 - .8 Alarm function (告警功能, 电量板显示)
 - .9 Total capacity function (总容量功能)
 - .10 Storage history function (存储历史记录功能)

B: BMS Protect parameter (电池管理系统保护参数) (software set)

Items	Details	Standard
Cell overcharge protection	Overcharge detection voltage	$3.5 \pm 0.025V$
	Overcharge detection delay time	Typical:1.0s
	Overcharge release voltage	$3.4 \pm 0.05V$
Cell over-discharge protection	Over-discharge detection voltage	$2.7 \pm 0.5V$
	Over-discharge detection delay time	Typical:1.0s
	Over-discharge release voltage	$3.1 \pm 0.1V$ or charge
Over-current protection	discharge Over-current protection current1	$55 \pm 10A$
	discharge Over-current detection delay time 1	5S
	discharge Over-current protection current 2	$110 \pm 10A$
	discharge Over-current detection delay time 2	$\leq 600m \pm 50ms$
	Charge Over-current protection current	$55 \pm 10A$
Short protection	Short protection current	$300 \pm 50A$
	Protection condition	Load short
	Detection delay time	$\leq 30ms$
	Protection release condition	Charging release
Temperature(T) protection	Charge high T protection	$55 \pm 3^{\circ}C$
	Charge high T recover	$45 \pm 5^{\circ}C$
	Discharge high T protection	$55 \pm 5^{\circ}C$
	Discharge high T recover	$50 \pm 5^{\circ}C$
	Charge low T protection	$0 \pm 5^{\circ}C$
	Charge low T recover	$5 \pm 5^{\circ}C$
	Discharge low T protection	$-20 \pm 5^{\circ}C$
	Discharge low T recover	$-10 \pm 5^{\circ}C$
Balance	Balance threshold voltage	3.4V

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Communication	It has CAN and RS485 ,RS232 standard communication interface, it real-time monitoring the capacity of battery bank, the voltage, current,environment temperature, and charging/discharging current, RS485,RS232,Baud rate:9600Kb/S, CAN common Baud rate:500K/S,PYLON high volt host protocol 1.16. Master address:CODE 0.host
Alarm	It has over-temperature, over charge, under-voltage, over-current, short circuit alarm Function.

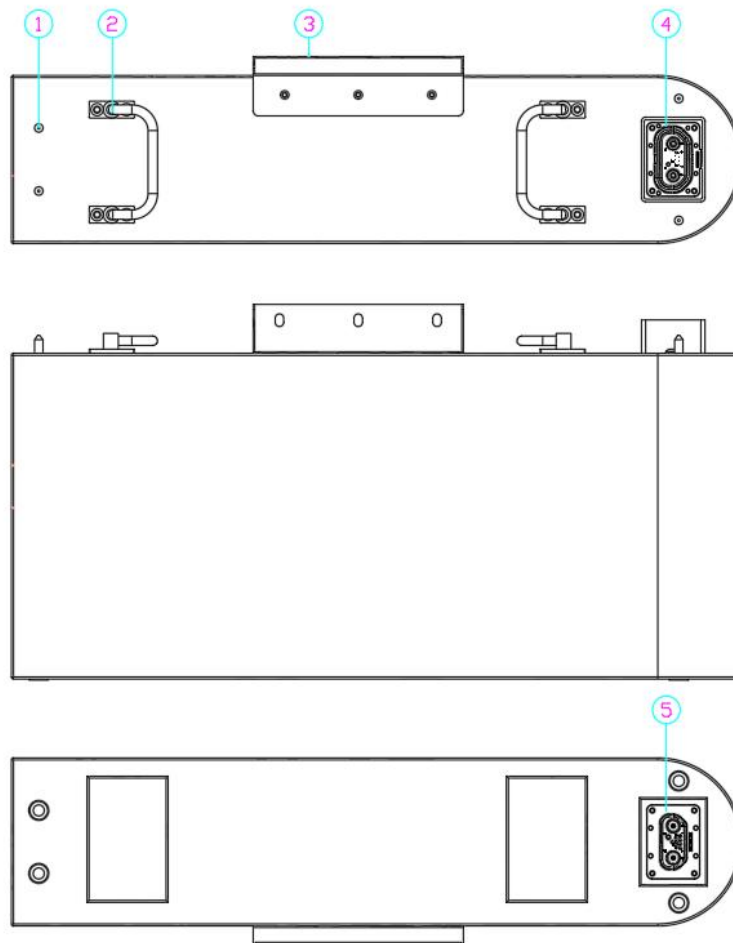
6. Appearance and structural dimensions 外观结构尺寸

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt. The structure and dimensions see attached drawing of the product.

电池的表面应无明显的划痕毛刺及其其它机械划伤，外露的金属端子应无锈蚀污垢。

6.1 Main control box 外观

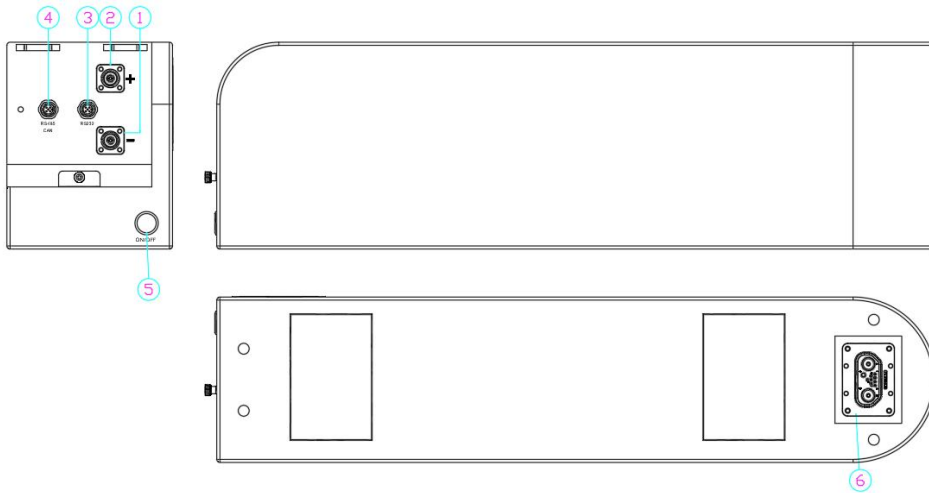
Battery module



No.	Description	Silk-screen	Remark
1	dowel pin		
2	handle		
3	hanger		
4	Pack Output terminal		
5	Pack Output terminal		

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main control box



No.	Description	Silk-screen	Remark
1	Pack input terminal	P-	
2	Pack input terminal	P+	
3	External communication	CAN/RS485	
4	Communication port	RS232	
5	start switch	ON/OFF	
6	Pack Output terminal		

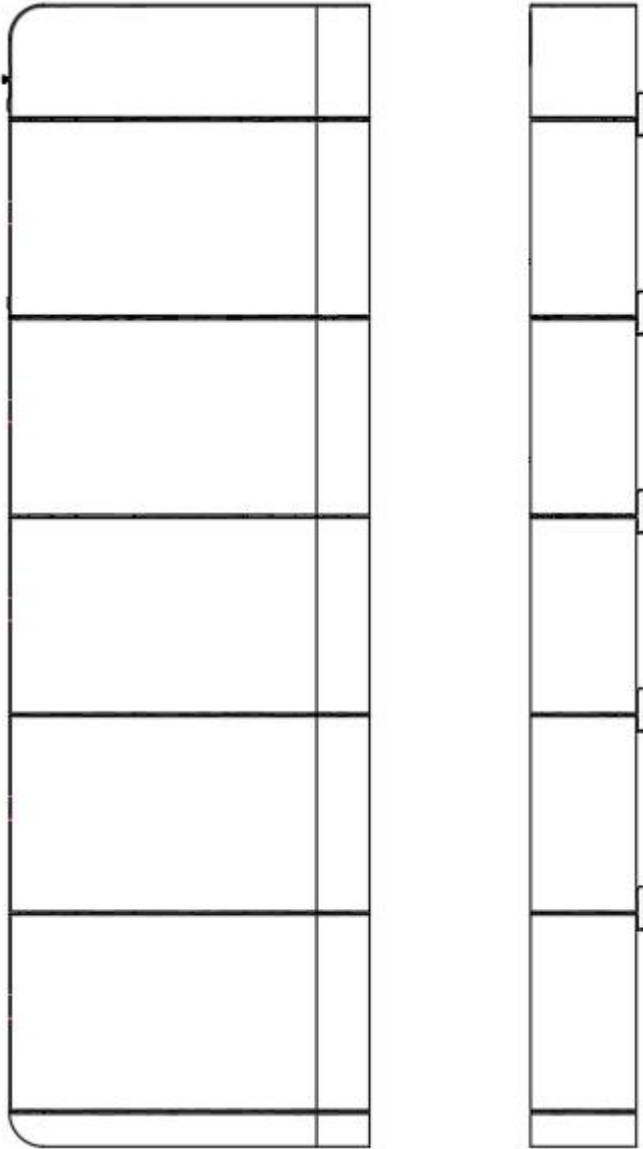
If there is any change in the pin position of the communication line, the customer shall be notified in writing or provided with supporting communication wire.

通信线脚位如有变，需书面知会客户或提供配套通信线材。

	脚位	RS485B并机通信	RS485A通信	CAN通信	RS232通信
	①	RS485B-B	RS485A-B		
	②	RS485B-A	RS485A-A		
	③				COM/GND
	④			CAN-H	RX
	⑤			CAN-L	TX

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Complete product image 完整产品图：（实物图仅为参考）



7.Storage and Others 贮存及其它事项

7.1 Long Time Storage 长期贮存

If stored for a long time(don' t used,exceed three months), the cell should be stored in drying and cooling place. The PACK is to be stored in a condition that the temperature of $23\pm 2^{\circ}\text{C}$ and the humidity Of 45%- 75%. Long-term use of unused batteries to recharge every 3 months。Ensure that the battery voltage is within the above range。

长期贮存的电池（未使用,超过3个月）须置于干燥、凉爽处。PACK 应储存在温度 $23\pm 2^{\circ}\text{C}$ ，湿度 45%- 75% 的条件下。长期搁置未使用电池每3个月补电一次，确保电池电压在上述范围内。

Appendix（附录）

Li-ion battery operation instructions and precautions 锂离子电池操作指引及注意事项

Preface 前言

This document of 'Handling Precautions and Guideline Li-ion Rechargeable Batteries' shall be

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applied to the battery cells manufactured by TGPRO.

本档“锂离子充电电池操作指示及注意事项”仅适用于东莞市拓嘉新能源科技有限公司生产电池。

Note (1) : 声明一

The customer is requested to contact TGPRO New Energy Technology Co., Ltd. in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

客户若需要将电池用于超出本规格书规定以外的设备，或在本规格书规定以外的使用条件下使用电池，应事先联系东莞市拓嘉新能源科技有限公司，因为需要进行特定的实验测试以核实电池在该使用条件下的性能及安全性。

Note (2) : 声明二

TGPRO New Energy Technology Co., Ltd. will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

对于在超出本规格书规定以外的条件下使用电池而造成的任何意外事故，东莞市拓嘉新能源科技有限公司概不负责。

Note (3): 声明三

TGPRO New Energy Technology Co., Ltd. will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.

如有必要，东莞市拓嘉新能源科技有限公司会以书面形式告知客户有关正确操作使用电池的改进措施。

Danger!

- Do not immerse the battery in water or allow it to get wet.
- 勿将电池投入水中或将其弄湿!
- Do not use or store the battery near sources of heat such as a fire or heater.
- 禁止在火源或极热条件下给电池充电! 勿在热源(如火或加热器)附近使用或贮存电池! 如果电池泄漏或发出异味, 应立即将其从接近明火处移开;
- Do not use any chargers other than those recommended by TGPRO.
- 请使用专用充电器!
- Do not reverse the positive(+) and negative(-) terminals.
- 勿将正负极接反!
- Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
- 勿将电池直接连接到墙上插座或车载点烟式插座上!
- Do not put the battery into a fire or apply direct heat to it.
- 勿将电池投入火中或给电池加热!
- Do not short-circuit the battery by connecting wires or other metal objects to the positive(+) and negative(-) terminals.
- 禁止用导线或其它金属物体将电池正负极短路, 禁止将电池与项链、发夹或其它金属物体一起运输或贮存!
- Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
- 禁止用钉子或其它尖锐物体刺穿电池壳体, 禁止锤击或脚踏电池!
- Do not strike, throw or subject the battery to sever physical shock.
- 禁止撞击、投掷或者使电池受到机械震动
- Do not directly solder the battery terminals.
- 禁止直接焊接电池端子!
- Do not attempt to disassemble or modify the battery in any way.
- 禁止以任何方式分解电池!

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- Do not place the battery in a microwave oven or pressurized container.
- 禁止将电池置入微波炉或压力容器中！
- Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries of different capacity, type or brand.
- 禁止与一次电池（如干电池）或不同容量、型号、品种电池组合使用！
- Do not use the battery if it gives off an odor, generates heat, becomes discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.
- 如果电池发出异味、发热、变形、变色或出现其它任何异常现象时不得使用；如果电池正在使用或充电，应立即从用电器中或充电器上取出并停止使用！

Caution!注意!

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

不要使用处于极热环境中的电池，如阳光直射或热天的车内。否则，电池会过热，可能着火（点燃），这样就会影响电池的性能、缩短电池的使用寿命。

If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.

如果电池漏液后电解液进入眼睛，不要擦，应用清水冲洗，并立即寻求医疗救助。如不及时处理，眼睛将会受到伤害。