Customer(客户): _____

Lithium ion battery specification
锂离子电池规格书

Customer product Model (客户机型): 铅酸壳电池组
Lead acid shell battery pack

Product model (产品型号): **12.8V12Ah**

Model(型号): SL1212P01F

DATE 日期	Prepared by 拟制	Checked by 审核	Approved by 批准
2023-01-03	陈珍		

Note(注意):
1.Kindly please sign on the underneath and send it back to us if the sample has been approved.
如果样品已确认,请在下方签名并回传到我司.
2.Kindly please contact us as soon as possible if the sample isn't approved. Thanks!
如果样品未确认,请尽快与我司联系,谢谢!

Customer Approval 客户确认	
Stamp 签章	
Date 日期	

AMENDMENT RECORDS 修改记录				
Edition 版本	Description 描述	Prepared by 拟制	Approved by 批准	Date 日期
A0	New Release	陈珍		2023-01-03

Contents

目 录

1. Scope 适用范围

This specification is applied to SL1212P01F product Manufactured by SLNY, Product reference standard GB/T36276-2018.

本规范适用于盛利能源公司生产的 SL1212P01F 产品, 产品参考标准GB/T36276-2018.

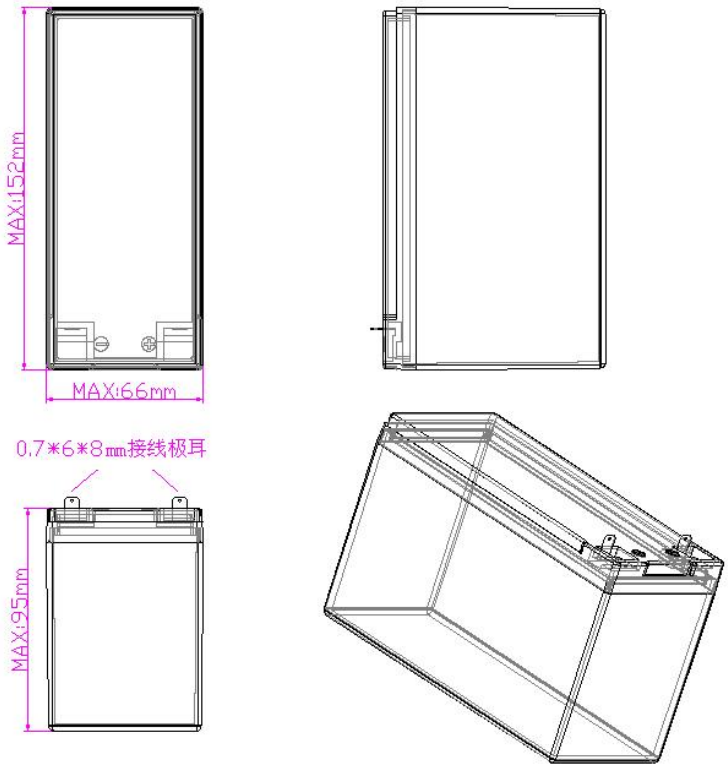
2. Product Configuration 产品配置

序号 No.	Item 项目	Criteria 标准	Remark 备注
1	Lithium iron phosphate cell 磷酸铁锂电芯	SL IFR26700D 3.2V 4000mAh	/
2	PCM 保护板	TDT-8181A-LZH-4S	/
3	Shape structure 外形结构	Lead acid shell 铅酸壳	Black 黑色
4	Waterproof grade 防水等级	IP65	/
5	Port definition 端口定义	Charge and discharge: 0.7 * 6 * 8mm wiring pole ear 充放电：0.7*6*8mm接线极耳	/

3.Product Dimension 外形尺寸

Dimensions 尺寸	Height (高度):MAX95 mm Width (宽度): MAX66 mm Length (长度): MAX152 mm	

4. Interface definition端口定义



5.Product Specification 产品技术规格

5.1 锂电池组 Battery

No. 序号	Item 项目	Rated Performance 额定性能		Remark 备注
1	Rated Capacity 额定容量	Typical 典型值	12Ah	0.2CStandard Discharging 0.2C标准放电
		Minimum 最小值	11.8Ah	
2	Nominal Voltage 标称电压	12.8V		
3	Shipments voltage 出货电压	Within 10 days of shipment 发货后10天内		13～14V
4	Charge cut-off Voltage 充电截止电压	14.6V		PACK
5	Discharge Cut-off Voltage 放电终止电压	10V		PACK
6	AC (1KHz) Impedance New Cell Max.(mΩ) 电池最大阻抗（mΩ）	≦120mΩ		AC 1KHz（AC Impedance） AC 1KHz 交流阻抗值
7	Standard Charging method 标准充电方式	0.2C (constant current) charge to 14.6V, then CV (constant voltage 14.6V) charge till charge current decline to 0.02C. 0.2C 恒流充电至 14.6V,然后 14.6V 恒压充电至电流 0.02C 截止.		Charge time: Approx. 5.0h. 充电时间:大约 5.0小时 PACK（成品）
8	Standard Discharging method 标准放电方式	0.2C constant current discharge to 10.0V. 0.2C 恒流放电至 10.0V.		PACK（成品）
9	Max. charge current 最大充电电流	15A		charge time:240min(Ref) 充电时间大约240min PACK(成品)
10	maximum discharge current 最大放电电流	15A		Continuous discharge mode 连续放电模式 PACK（成品）
11	Max. Pulse Discharge Current 最大瞬间放电电流	30A（100uS）		Ambient temperature 25℃
12	Operation Temperature and relative humidity Range 工作温度和湿度范围	Charge: 充电: 0~45℃ 60±25%R.H.		Charge at a very low temperature such as blew 0℃,will be get a lower capacity and reduce cycle life of the battery 低温如0度以下充电,充电效率会下降，并且会影响电池使用寿命
		Discharge: 放电: -10~60℃ 50±25%R.H.		
13	Long-term storage temperature 长期储存温度	0~25℃ 50±25%R.H (Electricity 50%~ 70% 电量50%~70%)		Must charge once when storage for half year. Must charge the battery which with protect circuit when storage for three moths. 达到半年须充电一次,带保护板电池3个月充电一次

14	Weight 重量	MAX:1.5Kg (PACK)	Whole product 整个产品
15	Temperature Performance 温度特性	After standard charging, at different temperatures 0.2C constant current discharge to 10.0Vtest capacity, if the charging temperature and discharge temperature are different, the gap between the different temperatures is 3 hours. 标准充电后,在不同温度下0.2C恒流放电至10.0V测试容量,如果充电温度和放电温度不同,则不同温度之间转换为3小时.	-20℃/25℃≧40%
			-10℃/25℃≧60%
			0℃/25℃≧85%
			25℃/25℃=100%
			60℃/25℃≧98%
16	Appearance 外观	By sight：Vertical 30 cm 目测：垂直 30cm	No damage, no leakage, no oil contamination. Legibly marked. 电池应无破损、无漏液、无油污等缺陷，标识清楚。

5.2 产品输出信息

序号 No.	类别 Item	特性名称 Name	规格参数 Specifications		备注 Remark
1	充电输入 Charging Input	电源输入 AC Charging Input	额定输入电压（V） Rated Input Voltage (V	14.6V	
			过流保护功能 Over-current Protection	Yes 有	
			正负极插反保护 Reverse polarity protection	NOs 无	
			额定输入电压（V） Rated Input Voltage (V)	14.6V	
			输入电流（A） Input Current (A)	15A	
2	电池输出 Battery output	0.7*6*8mm接线极耳输出 0.7 * 6 * 8mm wiring pole ear output	DC 12.8V 15A		

6.PCM Specification 保护板规格

Note: the following test environment is 25 ℃, and the measured range value of the protection board with relative humidity ≤ 60%, which may be different under extraordinary temperature. The working temperature range of the circuit is - 40-65 ℃, which is different from that of a single IC in test conditions and test circuit, so the detection range and measured data are also different. Please pay attention. Please refer to the specification of protection IC for specific test conditions and test circuits of IC.注：以下测试环境均为25℃，相对湿度≤60%所测出的保护板范围值,非常温下可能有所不同,该电路的工作温度范围为-40--65℃,本保护板与单颗IC在测试条件及测试电路上存在差异，所以在检测范围及实测数据上也有所不同，请予以留意。IC具体测试条件及测试电路请参照保护IC之规格书说明。

No	项目 Item	单位 Unit	最小值 Min.	中间值 Typ.	最大值 Max.	备注（Remark）
1	过充保护电压 Over charge protection voltage	V	3.625	3.65	3.675	来源IC规范 Source of IC spec
2	过充保护延时时间 Delay time for over charge protection	mS	500	1000	1500	来源IC规范 Source of IC spec
3	过充电解除电压 Over charge release voltage	V	3.51	3.56	3.61	来源IC规范 Source of IC spec
	过充解除恢复方法 Over charge release method	移开充电，并且电芯电压＜过充保护解除电压				
4	过放电保护电压 Over discharge protection voltage	V	2.224	2.32	2.40	来源IC规范 Source of IC spec
5	过放保护延时时间 Delay time for over discharge protection	mS	500	1000	1500	来源IC规范 Source of IC spec
6	过放电解除电压 Over discharge release voltage	V	2.48	2.58	2.68	来源IC规范 Source of IC spec
	过放电解除方法 Over discharge release method	连接上充电器，并且电芯电压＞过放解除电压				
	建议最大持续充/放电电流 max continuous charge/discharge current	A	15			
7	放电过流保护测试值 Discharge Over current protection testing values	A	30	40	50	来源IC\MOS规范 Source of IC \MOSspe
8	放电过电流保护延迟时间 Delay time for discharge over current protection	mS	500	1000	1500	来源IC规范 Source of IC spec
	均衡电压	V	3.575	3.60	3.625	来源IC规范 Source of IC spe
	均衡电流	mA	30	40	50	
9	充电过流保护测试值 Charge Over current protection testing values	A	30	40	50	I=VM/RSS（MOS内阻） I=CS/RSS（电阻）
10	充电过流保护延迟时间 Delay time for charge over current protection	mS	6	14	24	来源IC规范 Source of IC spec
	充电温度保护 Charge temperature protection	℃	55℃±5℃			
	放电温度保护 Discharge temperature protection	℃	70℃±5℃			
11	短路保护延迟时间 Delay time for short circuit protection	uS	100	300	600	来源IC规范 Source of IC spec
12	保护电路的功耗 Power consumption of protection circuit	uA	-	15	30	来源IC规范 Source of IC spec

13	PCM负极内阻 PCM Internal Resistance	mΩ	/	/	35	元件+PCB内阻
14	NTC电阻器 NTC resistor	kΩ	/	/	/	来源NTC规范25℃
15	ID电阻器 ID resistor	kΩ	/	/	/	来源电阻规范25℃
16	静电测试 ESD test	KV	直接接触±8KV各10次 空气接触±15KV各10次			打静电测试后,保护板不能瞬间保护,元器件也不能出现性能不良的情况。
17	休眠功能 Sleep function	有				来源IC规范 Source of IC spec
18	0V充电功能 0V charge function	有				来源IC规范 Source of IC spec

7.Product Performance 产品性能.

7.1 Standard Testing Conditions 标准测试环境

Test should be conducted with new batteries within one month after shipment from our factory and the batteries shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of 23±2℃ and relative humidity of 50±25%. If it is judged that the test results are not affected by such conditions , the tests may be conducted at temperature 15~30℃ and humidity 25~75%RH.

测试电池必须是本公司出厂时间不超过一个月的新电池,且电池未进行过五次以上充放电循环.除非其它特殊要求,本产品规格书规定的测试的环境条件为:温度 23±2℃,相对湿度 50±25%.如果只是验证,在试验结果不受影响的条件下,测试可在 15～30℃的温度和湿度 25～75% 范围内进行.

7.2 Test Equipment 测试设备要求

7.2.1 Dimension Measuring Instrument 尺寸测量器具

The calliper is implemented by instruments with equal or more precision scale of 0.01mm.

通过卡尺测量或者其他更精密的,精度≥0.01 毫米.

7.2.2 Voltmeter 电压表

Standard class specified in the national standard or more sensitive class having inner impedance more than 10kΩ/V。

依据国家标准或者更灵敏的内阻超过 10KΩ/V.

7.2.3 Ammeter 电流表

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

依据国家标准或更敏感的,电流表和导线内阻≤0.01Ω.

7.2.4 Impedance Meter 内阻仪

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

内阻用正弦交流电测试法.

7.2.5 All test equipments and measuring instruments are subject to passing inspection institutes.

所有测试设备、测量仪器需经检验机构检验合格.

7.2.6 Battery test system at the current accuracy should be within ± 0.1%, constant within ± 0.5% accuracy, and timing accuracy within ± 0.1%.

电池测试系统的电流精度应在±0.1%以内,恒压精度±0.5%以内,计时精度±0.1%以内.

7.2.7 Temperature measurement accuracy of instruments should not be less than ± 0.5 ℃.

测量温度的仪表准确度应不低于±0.5℃.

7.3 Safety Performance 安全检验标准

No. 序号	Item 项目	Test Method 测试方法	Requirements 标准要求
1	Infrabar 低气压	After standard charging, place the battery in a vacuum box at 20±5 °C, vacuum to reduce the pressure inside the box to 11.6 kPa , and keep it for 6 hours. After the test, perform a discharge charging cycle according to the standard charging and discharging method. 标准充电后,将电池放置于20±5℃的真空箱中,抽真空将箱内压强降低至11.6kPa,并保持6h,试验后按标准充放电方法进行一次放电充电循环.	No fire no explosion no leakage 不起火、不爆炸、不漏液
2	Temperature cycling test 温度循环	After standard charging, The cell are to be placed in a test chamber and subjected to the following cycles： ① Raising the chamber temperature to 75±2℃ within 30min and maintaining this temperature for 6h ②Reduce the chamber temperature to -40 ± 2 ° C in 30 min and keep the temperature for 6 h ③ Raising the chamber temperature to 75±2℃ within 30min and maintaining this temperature for 6h After 10 cycles After the test, perform a discharge charging cycle according to the standard charging and discharging method. 标准充电后,电芯放于可控温测试箱内并承受以下循环: ① 30min内升温至75±2℃,保温6h; ② 30min内降温至-40±2℃,保温6h; ③ 30min内升温至75±2℃,保温6h; 重复步骤①~③,共循环10次.试验后按标准充放电方法续进行一次放电充电循环.	No fire no explosion no leakage 不起火、不爆炸、不漏液
3	Vibration 振动测试	Cells are fully charged per Standard Charge are vibrated for install battery on the vibration table,adjust the equipment according to the following vibration and amplitude frequency.From X,Y,Z three directions in 10Hz～55Hz sweep vibration to sweep for 30mins with the sweep vibration to sweep frequency speed rate at 1oct/min : (Vibration frequency:10Hz～30Hz(single amplitude) Displacement amplitude(single):0.38mm Amplitude frequency:30Hz～55Hz(single amplitude) Displacement amplitude(single):0.19mm) 电池按标准充电模式充满电后，将电池安装在振动台面上， 按（ 振动频率： 10Hz ～ 30Hz, 位移单振幅：0.38mm; 振动频率：30Hz～55Hz,位移单振幅：0.19mm） 振动频率和对应的振幅以X,Y，Z三个方向从10Hz～55Hz循环扫频振动30min,扫频速率为1 oct/min.	Exterior appearance no Apparent stain,leakage,smoke and Explosion ≤0.5% 电芯外观无明显损伤，漏液，冒烟或爆炸 Diminishing rate of voltage≤0.5% 电压衰减≤0.5% Increasing rate of internal resistance ≤20% 内阻增大率≤20%
4	Free fall test 自由跌落	After standard charging,Each side of the battery dropped freely from a height of 1.0m onto the concrete slab,A total of 4 trials were conducted,After the test, a discharge charging cycle is performed according to the standard charging and discharging method. 标准充电后,电池每个面从1.0m高度自由跌落于混凝土板上,共进行4次试验,试验后按标准充放电方式进行一次放电充电循环.	No fire no explosion 不起火、不爆炸

5	External Short Circuit 外部短路	After standard charge, Connect the positive and negative terminals of the battery with a wire for 24h,Lead 80±20m Ω total resistance. 标准充电后,用导线连接电池正负极端子24h,导线总电阻为80±20mΩ.	No fire no explosion, 不起火、不爆炸
6	Overcharge Test 过充电	After standard charging, charge the battery pack to N*4.6V with the maximum charging current at constant current and voltage until the protective circuit plays a protective role. 标准充电后,以最大充电电流对电池组恒流恒压充电至N*4.6V,直至保护电路起保护作用.	No fire no explosion, 不起火、不爆炸
7	Over-discharge Test 过放电	After standard charge,Discharge the battery pack up to N*0.15V with the maximum discharge current, until the protective circuit plays a protective role,Set aside for 10 min and charge in standard mode 标准充电后,用最大放电电流对电池组放电至N*0.15V,直至保护电路起保护作用,搁置10min,标准充电方式充满电.	No fire no explosion, 不起火、不爆炸
8	Cycle life 循环寿命(1.0C)	Standard Charging rest for 30mins. Discharge cell with 0.2C to end voltage N*2.5Vrest for 30mins. Repeating the above steps until the discharge capacity reached the 80% of rated capacity, the number of cycles completed is defined as the battery cycle life. 标准充电,搁置 30min,用1C电流放电至N*2.5V.搁置 30min,重复上述步骤至容量衰减为额定容量的80%止,所完成的循环次数定义为该电池的循环寿命.	≥3000 cycles ≥3000 次
9	Constant damp heat 恒定湿热	After standard charge,The batteries in the 55+2℃,relative humidity 90 ~ 95% of the constant temperature and humidity box for 48 h, take out the 2 h at room temperature,Standard discharge to termination voltage. 标准充电后,将电芯放入55±2℃相对湿度90~95%的恒温恒湿箱中搁置48h,取出常温搁置2h,标准放电至终止电压.	No fire no explosion no leakage 不起火、不爆炸、不漏液
10	Capability of keeping electricity 荷电保持能力	At standard testing condition, After standard charging, no outer loading circuit, rest the pack 28days, discharging at 0.2C to N*2.5V. Recording the discharging time. 在标准测试环境下，标准充满电后，无外接负载线路， 电池组合搁置28天，然后用0.2C放电至N*2.5V，所记录放电时间。	≧250min
11	应力消除 Stress relief	After standard charging, the battery was placed in a blast oven at 70±2℃ for 7 h, then the sample was taken out and returned to room temperature. 标准充电后,电池放在70±2℃的鼓风恒温箱中搁置7h,然后取出样品并恢复至室温.	The outer casing has no physical deformation that causes the internal composition to be exposed. 外壳无导致内部组成暴露的物理形变

8.Storage and Transportation 储存和运输

8.1 Storage 储存

8.1.1 The Li-ion battery pack should be stored in a cool, dry and well-ventilated area. and should be far from the fire and the high temperature.

锂离子电池组应储存在阴凉、干燥、通风良好的地方.并应远离火源和高温.

8.1.2 The best capacity in storage is 30%-50% (Cell voltage between 3.2-3.4 V).

长期储存容量最好是在30％-50％(单体在3.2-3.4V之间的电压).

8.1.3 The battery should store in the product specification book stipulation temperature range. the best storage temp. is 0 to 25℃. The best humidity is 60±15%RH.

电池应储存在产品规格书规定的温度范围内.最好的储存条件为0～25℃,最佳湿度是60±15％RH.

8.1.4 If has surpassed above for three months the long time storage, suggested you should carry on additional charge to the battery.

如果存放超过3个月以上,建议您应该对电池进行充电.

8.2 Transportation 运输:

8.2.1 Do not mix battery products with other goods.

勿将电池与其他货物混装.

8.2.2 Do not immerse the battery products in water or allow it to get wet.

勿将电池浸入水中或弄湿.

8.2.3 Do not over 5 layers staking and upside-down.

叠放不得超过 5 层、不得倒置.

8.2.4 The highest temperature in transportation is lower than 65℃.

交通运输的最高温度应低于 65℃.

9.Use Attentions 使用注意事项

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

为确保正确使用的电池,请在使用之前仔细阅读本手册.

9.1 Handling 注意:

9.1.1 Do not expose the battery to the sun or put it in the fire

电池不得暴晒或投入火中.

9.1.2 Do not put the battery in a charger or equipment with wrong terminals connected.

不得把电池的充电器或错误终端设备连接.

9.1.3 Avoid shorting the battery

避免将电池短路.

9.1.4 Avoid excessive physical shock or vibration.

避免电池过度冲击或振动.

9.1.5 Do not disassemble or deform the battery.

不得拆卸或变形

9.1.6 Do not immerse in water.

不得浸入水中.

9.1.7 Do not use the battery mixed with other different make, type, or model batteries.

不要与其他不同品牌,类型或型号的电池混合使用.

9.1.8 Keep out of the reach of children.

放置在儿童接触不到的地方.

9.1.9 Do not drive a nail in, hit with a hammer, or stamp on the battery.

禁止钉刺、敲击、抛掷、脚踩电池.

9.2 Charge 充电

9.2.1 Special charger must be used for charging
充电必须使用专用充电器充电.

9.2.2 Never use a modified or damaged charger.
切勿使用改装或已损坏的充电器.

9.2.3 Do not charge the battery for more than 24 hours.
电池充电时间不能超过 24 小时.

9.2.4 Charging current: Can not surpass the biggest charging current which in this specification book stipulated.
充电电流:不能超过在规格书规定的最大充电电流.

9.2.5 Charging voltage: Do not exceed the maximum voltage specified in this specification.
充电电压:不能超过在规格书规定的最高电压.

9.2.6 Charge temperature: The battery must carry on the charge in the ambient temperature scope which this specification book stipulated.
充电温度:电池必须在规格书规定的环境温度范围内进行充电.

9.2.7 Uses 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.
使用恒定的电流和恒定电压的方式充电,禁止反向充电.如果电池的正、负极接反,会损坏电池.

9.3 Discharge 放电

9.3.1 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.
不能超过规格书规定的最大放电电流,过大的电流放电,可能会导致电池容量释放减少,导致电池发热.

9.3.2 Electric discharge temperature: The battery discharge must carry on in the ambient temperature scope which this specification book stipulated.
放电温度:电池放电必须在规格书规定的环境温度范围内进行.

9.3.3 Short-time over-discharge will be disconnected immediately, and will not affect normal use. However, excessive discharge will cause battery performance damage. When the battery is not used for a long time, due to the self-discharge characteristics of the battery, it should be periodically charged to prevent over-discharge.
过度放电:短时间过度放电马上断开,不会影响正常使用,但长时间过度放电会导致电池性能损坏,电池长期不使用时,由于电池自放电特性,应定期充电防止过放电的情况发生.

9.4 Disposal 处置:

Regulations vary for different countries. Dispose of in accordance with local regulations.
对不同国家的法规都有所不同,处理应符合当地法规.

10.Period of Warranty 保质期

There is a 12-month warranty for our export batteries from the date of shipment. If the problem happened during the warranty period, we are responsible to replace the defective ones according to the accurate analysis results. However, we wont take any responsibility if the problem is caused by the battery-related applications and related products.
从我司出货的日期起,产品有12个月的保修期.如果问题发生在保修期内,我们根据准确的分析结果更换质量不合格的产品.但是,如果问题是由于客户的应用程序和其他相关产品导致,我们将不会承担任何责任.

11.Other 其他

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, 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.

由于电池是利用化学反应的原理,随时间增加电池性能会降低,即使是存放了很长一段时间没有使用.此外,如果使用条件如充电、放电、环境温度等没有在规定范围内,会缩短电池的使用寿命,或者会产生漏液导致设备损坏.如果电池长时间不能充电,即使充电方法正确,也表示应该更换电池了.

12.Note 注意:

1.Any other items not included in this specification shall be determined by mutual agreement.

任何其他不包括在本规范的项目,应由双方协商确定.

2.Manufacturer reserves the right to after or amend the design ,model and specification without prior notice

供应商保留在不事先通知的情况下对设计、型号和规格修正和改进的权利.