报告编号（Report No.）：S-19020021

检验报告
TEST REPORT

NAME OF SAMPLE: Rechargeable Li-ion Battery
产品名称：锂离子电池组

CLIENT: SUNWODA Electronic Co., Ltd.
委托单位：欣旺达电子股份有限公司

CLASSIFICATION OF TEST: Commission test
检验类别：委托测试

深圳普瑞赛思检测技术有限公司
Shenzhen Precise Testing Technology Co., Ltd.

Applicant information 申请资料	
Name of samples: 样品名称：	Rechargeable Li-ion Battery 锂离子电池组
Type/ Model: 型号规格：	L18D4PF1 15.36V 4425mAh 67.5Wh（Rated）4510mAh 69Wh（Typical）
Lithium content:: 锂含量：	—
Trade mark: 商标：	—
Commission by: 委托单位：	SUNWODA Electronic Co., Ltd. 欣旺达电子股份有限公司
Commissioner address: 委托单位地址：	Floor 1,A,B,D District of Floor 2 and Floor 3 to 9 of Comprehensive Building, No.2 Yihe Road, Shilong Community, Shiyan Street, Bao'an District, Shenzhen City, Guangdong Province, P.R. China 中国广东省深圳市宝安区石岩街道石龙社区颐和路2号综合楼1楼、2楼A-B区、2楼D区3-9楼
Factory: 生产厂：	Sunwoda Electronic Co., Ltd. Sixth Branch 欣旺达电子股份有限公司第六分公司
Factory address: 生产厂地址：	Northeast of Intersection of Keyu Road and Tongguan Road, Gongming Street, Guangming New District, Shenzhen City, Guangdong Province,P.R.China 中国广东省深圳市光明新区公明街道科裕路与同观大道交汇处东北
Appearance: 样品外观颜色：	Black 黑色
Sample status: 样品状态：	Good 完好
Package of goods: 样品外包装：	Carton 纸箱
Quantity of sample: 样品数量：	41pcs
Sample identification: 样品标识序号：	b1#～b16# c1#～c25#
Receiving date: 接样日期：	2019-02-15
Completing date: 测试完成日期：	2019-03-01

Conclusion/结论：

The submitted samples comply with the requirements of UNITED NATIONS Section 38.3 Of The Sixth Revised Edition Of The Recommendations On The Transport Of Dangerous Goods, Manual Of Test And Criteria(ST/SG/AC.10/11/Rev.6 Section 38.3)

样品符合联合国《关于危险货物运输的建议书 试验和标准手册》第六修订版第 38.3 节的要求。

Seal/检验专用章：

Date of issue：2019.03.01

Approved : 批准： 冯俊发

Reviewed 审核： 李仲贤

Tested 测试： 朱踊昂

Test Conclusion测试结论

No. 序号	Name of test 测试项目名称		Test result 测试结果	Conclusion 本项结论	Remarks 备注
1	Altitude simulation 高度模拟	The submitted samples comply with the requirements of UNITED NATIONS Section 38.3 Of The Sixth Revised Edition Of The Recommendations On The Transport Of Dangerous Goods, Manual Of Test And Criteria(ST/SG/AC.10/11/ Rev.6 Section 38.3) 样品符合联合国《关于危险货物运输的建议书 试验和标准手册》第六修订版第38.3节的要求。	See Appendix 1	P	
2	Thermal test 温度试验		See Appendix 2	P	
3	Vibration 振动		See Appendix 3	P	
4	Shock 冲击		See Appendix 4	P	
5	External Short-circuit 外部短路		See Appendix 5	P	
6	Crush 挤压		See Appendix 6	P	
	Impact 撞击		See Appendix 6	N/A	
7	Overcharge 过度充电		See Appendix 7	P	
8	Forced discharge 强制放电		See Appendix 8	P	

Photos of samples and markings
样品及标识片

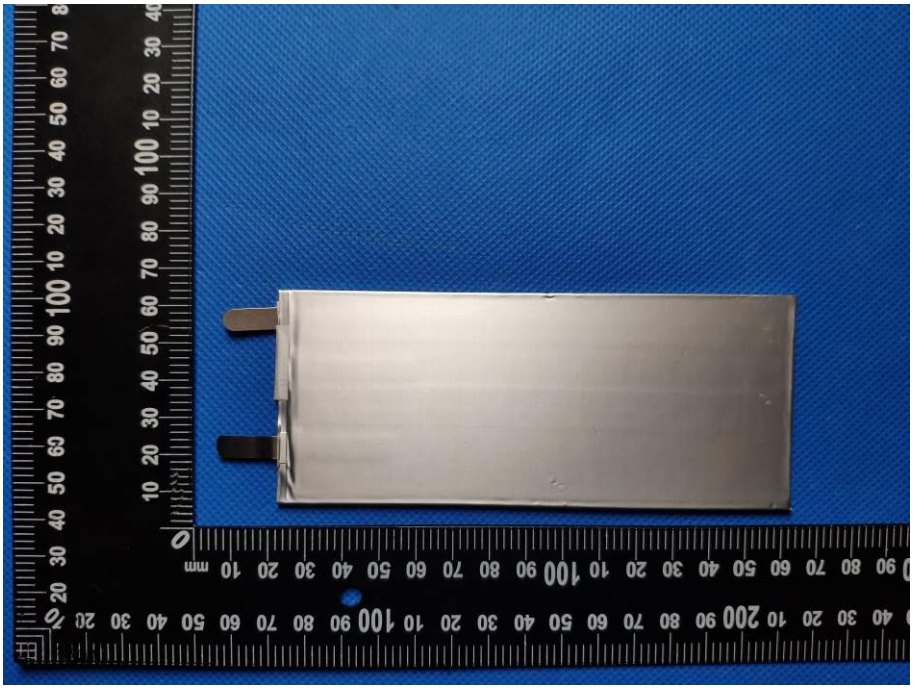
Battery (L18D4PF1 15.36V 4425mAh 67.5Wh（Rated）4510mAh 69Wh（Typical）)

Photos of samples and markings
样品及标识片

Battery (L18D4PF1 15.36V 4425mAh 67.5Wh（Rated）4510mAh 69Wh（Typical）)

Photos of samples and markings
样品及标识照片

Cell（3359E1 3.84V 17.17Wh）



Appendix 1
附表 1

Test Items 测试项目	Altitude simulation 高度模拟
1.1	**Test procedure** 测试步骤
	Test cells and batteries shall be stored at a pressure of 11.6kPa or less for at least six hours at ambient temperature (20±5℃). 试验电池芯和电池在环境温度(20±5℃)下，储存在小于等于11.6kPa的压力下至少六小时。
1.2	**Sample status** 样品状态
	b1# ~ b4#, at first cycle in fully charged states; b1# ~ b4#，在第一个循环完全充电；
	b5# ~ b8#, after 50 cycles ending in fully charged states; b5# ~ b8#，在第五十个循环完全充电；
1.3	**Result** 测试结果

Sample No. 样品编号	Before Test测试前		After Test测试后		Mass loss 质量损失 (M<1g: 0.5％ 1g≤M≤75g: 0.2％ M>75g: 0.1％)	Residual OCV 剩余电压 (≥90%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量(g)	Voltage 开路电压 (V)			
b1#	285.90	17.067	285.90	17.064	0.000	99.98	**O**
b2#	286.15	17.128	286.14	17.127	0.003	99.99	**O**
b3#	285.65	17.061	285.64	17.056	0.004	99.97	**O**
b4#	285.62	17.036	285.60	17.032	0.007	99.98	**O**
b5#	285.88	17.065	285.86	17.061	0.007	99.98	**O**
b6#	285.85	17.062	285.83	17.057	0.007	99.97	**O**
b7#	285.73	17.045	285.70	17.041	0.010	99.98	**O**
b8#	285.65	17.053	285.64	17.046	0.004	99.96	**O**

Note: **L**-Leakage, **V**-Venting, **D**-Disassembly, **R**-Rupture, **F**-Fire, **O**-No leakage, no venting, no disassembly, no rupture, no fire.

注：L- 泄漏；V- 排气；D- 解体；R- 破裂；F - 起火；O- 无泄漏、无排气、无解体、无破裂、无起火。

Appendix 2
附表 2

Test Items 测试项目	Thermal test 温度测试
1.1	**Test procedure** 测试步骤
	Test cells and batteries are to be stored for at least six hours at a test temperature equal to 72±2℃, followed by storage for at least six hours at a test temperature equal to -40±2℃, The maximum time interval between test temperature extremes in 30 minutes, This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5℃). 将电芯和电池在温度为72±2℃的条件下贮存不少于6个小时，然后，在温度-40±2℃条件下贮存不少于6个小时，两个温度间的间隔最长为30min,重复操作上述步骤直到10次，然后，将其在环境温度为20±5℃的条件下放置24个小时。
1.2	**Sample status** 样品状态
	b1# ~ b4#, at first cycle in fully charged states; b1# ~ b4#, 在第一个循环完全充电；
	b5# ~ b8#, after 50 cycles ending in fully charged states; b5# ~ b8#, 在第五十个循环完全充电；
1.3	**Result** 测试结果

Sample No. 样品编号	Before Test测试前		After Test测试后		Mass loss 质量损失 (M<1g: 0.5％ 1g≤M≤75g: 0.2％ M>75g: 0.1％)	Residual OCV 剩余电压 (≥90%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
b1#	285.90	17.064	285.88	16.727	0.007	98.03	**O**
b2#	286.14	17.127	286.10	16.772	0.014	97.93	**O**
b3#	285.64	17.056	285.60	16.718	0.014	98.02	**O**
b4#	285.60	17.032	285.58	16.706	0.007	98.09	**O**
b5#	285.86	17.061	285.82	16.719	0.014	98.00	**O**
b6#	285.83	17.057	285.78	16.712	0.017	97.98	**O**
b7#	285.70	17.041	285.65	16.715	0.018	98.09	**O**
b8#	285.64	17.046	285.58	16.711	0.021	98.03	**O**

Note: **L**-Leakage, **V**-Venting, **D**-Disassembly, **R**-Rupture, **F**-Fire, **O**-No leakage, no venting, no disassembly, no rupture, no fire.

注：L- 泄漏；V- 排气；D- 解体；R- 破裂；F - 起火；O- 无泄漏、无排气、无解体、无破裂、无起火。

Appendix 3
附表 3

Test Items 测试项目	Vibration 振动
1.1	**Test procedure** 测试步骤
	Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration, The vibration shall be a sinusoidal wave form with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes, This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell. 将电芯和电池牢固地安装在振动台的台面上，然后开始振动。振动以正弦波形式，以7Hz增加至200Hz，然后再减少回到7Hz为一个循环，一个循环持续15分钟的对数扫频。每个电芯和电池从三个互相垂直的方向上循环12次，3个小时。
1.2	**Sample status** 样品状态
	b1# ~ b4#, at first cycle in fully charged states; b1# ~ b4#, 在第一个循环完全充电；
	b5# ~ b8#, after 50 cycles ending in fully charged states; b5# ~ b8#, 在第五十个循环完全充电；
1.3	**Result** 测试结果

Sample No. 样品编号	Before Test测试前		After Test测试后		Mass loss 质量损失 (M<1g: 0.5％ 1g≤M≤75g: 0.2％ M>75g: 0.1％)	Residual OCV 剩余电压 (≥90%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
b1#	285.88	16.727	285.87	16.720	0.003	99.96	**O**
b2#	286.10	16.772	286.10	16.764	0.000	99.95	**O**
b3#	285.60	16.718	285.60	16.711	0.000	99.96	**O**
b4#	285.58	16.706	285.58	16.700	0.000	99.96	**O**
b5#	285.82	16.719	285.82	16.714	0.000	99.97	**O**
b6#	285.78	16.712	285.78	16.706	0.000	99.96	**O**
b7#	285.65	16.715	285.65	16.711	0.000	99.98	**O**
b8#	285.58	16.711	285.58	16.703	0.000	99.95	**O**

Note: **L**-Leakage, **V**-Venting, **D**-Disassembly, **R**-Rupture, **F**-Fire, **O**-No leakage, no venting, no disassembly, no rupture, no fire.

注：L- 泄漏；V- 排气；D- 解体；R- 破裂；F - 起火；O- 无泄漏、无排气、无解体、无破裂、无起火。

Appendix 4
附表 4

Test Items 测试项目	Shock 冲击
1.1	Test procedure 测试步骤
	Test cells and batteries shall be secured to the testing machine, and each cell shall be subjected to a half-sine shock of peak acceleration of 150g_n and pulse duration of 6 milliseconds. Large cells may be subjected to a half-sine shock of peak acceleration of 50g_n and pulse duration of 11 milliseconds. Small batteries shall be subjected to a half-sine shock of peak acceleration of 150g_n (or Acceleration(g_n)= $\sqrt{\left(\frac{100850}{mass}\right)}$,which is smaller) and pulse duration of 6 milliseconds, large batteries shall be subjected to a half-sine of peak acceleration of 50g_n (or Acceleration(g_n)= $\sqrt{\left(\frac{30000}{mass}\right)}$,which is smaller)and pulse duration of 11 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks 以稳固的托架固定住每个电芯和电池样品的全部配件表面。对每个电芯以峰值为150g_n的半正弦的加速度撞击，脉冲持续6毫秒，大型电芯须经受最大加速度50g_n和脉冲持续时间11毫秒的半正弦波冲击。对每个电池以峰值为150g_n（或与$\sqrt{\left(\frac{100850}{mass}\right)}$中的较小值）的半正弦的加速度撞击，脉冲持续6毫秒，大型电池组须经受最大加速度50g_n（或与$\sqrt{\left(\frac{30000}{mass}\right)}$中的较小值）和脉冲持续时间11毫秒的半正弦波冲击。每个电池或电池组须在三个互相垂直的电池安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。
1.2	**Sample status** 样品状态
	b1# ~ b4#, at first cycle in fully charged states; b1# ~ b4#, 在第一个循环完全充电；
	b5# ~ b8#, after 50 cycles ending in fully charged states; b5# ~ b8#, 在第五十个循环完全充电；
1.3	**Result** 测试结果

Sample No. 样品编号	Before Test测试前		After Test测试后		Mass loss 质量损失 (M<1g: 0.5％ 1g≤M≤75g: 0.2％ M>75g: 0.1％)	Residual OCV 剩余电压 (≥90%)	Test result 测试结果
	Mass 样品质量 (g)	Voltage 开路电压 (V)	Mass 样品质量 (g)	Voltage 开路电压 (V)			
b1#	285.87	16.720	285.85	16.716	0.007	99.98	**O**
b2#	286.10	16.764	286.10	16.758	0.000	99.96	**O**
b3#	285.60	16.711	285.60	16.706	0.000	99.97	**O**
b4#	285.58	16.700	285.58	16.694	0.000	99.96	**O**
b5#	285.82	16.714	285.82	16.709	0.000	99.97	**O**
b6#	285.78	16.706	285.78	16.701	0.000	99.97	**O**
b7#	285.65	16.711	285.65	16.701	0.000	99.94	**O**
b8#	285.58	16.703	285.58	16.696	0.000	99.96	**O**

Note: **L**-Leakage, **V**-Venting, **D**-Disassembly, **R**-Rupture, **F**-Fire, **O**-No leakage, no venting, no disassembly, no rupture, no fire.
注：L- 泄漏；V- 排气；D- 解体；R- 破裂；F - 起火；O- 无泄漏、无排气、无解体、无破裂、无起火。

Appendix 5
附表 5

Test Items 测试项目	External short circuit 外部短路
1.1	**Test procedure** 测试步骤
	The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 57±4℃ and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0.1 ohm at 57±4℃, This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57±4℃, the cell or battery must be observed for a further six hour for the test to be concluded. 保持试验环境温度稳定在57±4℃，以使电芯或电池样品外表温度达到57±4℃，然后，在此温度下，将其正负极用小于0.1欧姆的线路短接，待电芯或电池的外表温度恢复到57±4℃之后再持续1小时以上，对电芯或电池必须进一步观察6个小时才能下结论。
1.2	**Sample status** 样品状态
	b1# ~ b4#, at first cycle in fully charged states; b1# ~ b4#, 在第一个循环完全充电；
	b5# ~ b8#, after 50 cycles ending in fully charged states; b5# ~ b8#, 在第五十个循环完全充电；
1.3	**Result** 测试结果

Sample No. 样品编号	Max. External Temperature 样品表面最高温度 (℃)	Test result 测试结果	Remark 备注
b1#	57.7	**O**	
b2#	57.4	**O**	
b3#	57.6	**O**	
b4#	57.7	**O**	
b5#	57.4	**O**	
b6#	57.6	**O**	
b7#	57.7	**O**	
b8#	57.6	**O**	

Note: **D** –Disassembly, **R** –Rupture, **F** –Fire, **OT** –Over Temperature, **O** –no disassembly, no rupture, no fire, no Over temperature

注： D- 解体；R- 破裂；F– 起火；OT– 超过170℃；O– 无解体、无破裂、无起火、不超过170℃

Appendix 6 附表 6	
Test Items 测试项目	Crush 挤压/Impact 撞击
1.1	**Test procedure** 测试步骤
	Crush 挤压 A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached. (a) The applied force reaches 13kN±0.78kN; (b) The voltage of the cell drops by at least 100 mV; or (c) The cell is deformed by 50% or more of its original thickness. Once the maximum pressure has been obtained, the voltage drops by 100mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released. 电池芯或组成电池芯在两个平面间挤压。挤压在第一个接触点以约1.5cm/s 的速度慢慢进行，直到下面三个选项之一达到为止： (a)作用力达到 13kN±0.78kN； (b)电池芯电压降至少达到100mV； (c)电池厚度和最初比较变形至少50%。 一旦达到最大压力，电压降超过100 mV或者电池芯变形超过50%，压力应该解除。 **Impact 撞击** (applicable to cylindrical cells not less than 18mm in diameter) The sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm ± 0.1 mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg ± 0.1 kg mass is to be dropped from a height of 61 ± 2.5 cm at the intersection of the bar and sample in a controlled manner using a near Frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface. The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm ± 0.1 mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

Appendix 6 附表 6			
Test Items 测试项目	Crush 挤压/Impact 撞击		
	Cells and component cells meet this requirement if their external temperature does not exceed 170°C and there is no disassembly and no fire during the test and within six hours after this test. (适用于直径不小于18毫米的圆柱形电池）将电池或元件电池样品平放在一个平面上，其纵轴平行于测试台面年，将一直径为15.8 mm ± 0.1 mm的316型不锈钢棒横放在电池中心位置。然后，将一质量为9.1 kg ± 0.1 kg的物体从61±2.5 cm的高度落向样品。样品在进行试验时，其外表温度应不超过170℃。且试验结束后6个小时之内，样品应无解体、无起火现象发生。		
1.2	**Sample status** 样品状态		
	c1# ~ c5#, at first cycle at 50% of the design rated capacity; c1# ~ c5#，在第一个循环50%的额定容量；		
1.3	**Result** 测试结果		
Sample No. 样品编号	Max. External Temperature 样品表面最高温度 (℃)	Test result 测试结果	Remark 备注
c1#	22.7	**O**	
c2#	22.5	**O**	
c3#	22.4	**O**	
c4#	22.4	**O**	
c5#	22.6	**O**	
Note: **D** -Disassembly, **R** -Rupture, **F**-Fire, **OT** –Over Temperature, **O**- no disassembly, no fire, no Over temperature 注：D- 解体；R- 破裂；F - 起火；OT– 超过170℃；O-无解体、无起火、不超过170℃			

Appendix 7
附表 7

Test Items 测试项目	Overcharge 过度充电		
1.1	**Test procedure** 测试步骤		
	When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the or 22V，whichever is less. When the manufacturer's recommended charge voltage is more than 18V, the charging voltage of the test shall be 1.2 times maximum charge voltage. The charging current is 2 times of the maximum charging current recommended by the manufacturer。 如果厂家推荐的充电电压不超过18V，本测试的最小充电电压应该是两倍的厂家标定最大充电电压或者是22V，取其中较小者。如果厂家推荐的充电电压超过18V，充电电压应该为 1.2倍的厂家标定最大充电电压。充电电流为厂家推荐的最大充电电流2倍。		
1.2	**Sample status** 样品状态		
	b9# ~ b12#, at first cycle in fully charged states; b9# ~ b12#，在第一个循环完全充电；		
	b13# ~ b16#, after 50 cycles ending in fully charged states; b13# ~ b16#，在第五十个循环完全充电；		
1.3	**Result** 测试结果		
Sample No. 样品编号	Voltage Before test(V) 测试前开路电压(V)	Test result 测试结果	Remark 备注
b9#	17.026	**O**	
b10#	17.010	**O**	
b11#	17.083	**O**	
b12#	17.016	**O**	
b13#	17.003	**O**	
b14#	17.204	**O**	
b15#	17.036	**O**	
b16#	17.083	**O**	

Note: **D** -Disassembly, **F**-Fire, **O**- no disassembly, no fire.

注： D- 解体；F - 起火；O-无解体、无起火。

Appendix 8
附表 8

Test Items 测试项目	Forced discharge 强制放电
1.1	**Test procedure** 测试步骤
	Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D. C, power supply at an initial current equal to the maximum discharge current specified the manufacturer The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell, Each cell shall be forced discharged for a time interval(in hours) equal to its rated capacity divided by the initial test current(in ampere). 在20±5℃的环境温度下，将单个电芯连接在12V的直流电源上进行强制放电，此直流电源提供每个电芯初始电流为制造厂指定的最大放电电流，放电时间为额定容量除以初始电流。
1.2	**Sample status** 样品状态
	c6# ~ c15#, at first cycle in fully discharged states; c6# ~ c15#，在第一个循环完全放电；
	c16# ~ c25#, after 50 cycles ending in fully discharged states; c16# ~ c25#，在第五十个循环完全放电；
1.3	**Result** 测试结果

Sample No. 样品编号	Voltage Before test 测试前开路电压 (V)	Test result 测试结果	Sample No. 样品编号	Voltage Before test 测试前开路电压 (V)	Test result 测试结果
c6#	3.652	**O**	c16#	3.668	**O**
c7#	3.607	**O**	c17#	3.596	**O**
c8#	3.604	**O**	c18#	3.637	**O**
c9#	3.630	**O**	c19#	3.529	**O**
c10#	3.631	**O**	c20#	3.638	**O**
c11#	3.604	**O**	c21#	3.617	**O**
c12#	3.641	**O**	c22#	3.641	**O**
c13#	3.629	**O**	c23#	3.590	**O**
c14#	3.642	**O**	c24#	3.619	**O**
c15#	3.634	**O**	c25#	3.627	**O**

Note: **D** -Disassembly, **F**-Fire, **O**- no disassembly, no fire.

注： D- 解体；F - 起火；O-无解体、无起火。

注 意 事 项
Attention

1. 本报告无检测单位“检验专用章”无效。
   The test report is invalid without the official stamp of the lab.

2. 未经本实验室书面同意，不得部分地复制本报告。
   Nobody is allowed to photocopy or partly photocopy this report without written permission of the lab.

3. 本报告无批准人、审核人签名无效。
   The test report is invalid without the signature of ratifier, reviewer.

4. 本报告涂改无效。
   The test report is invalid if altered.

5. 如果报告中部分项目相对于测试依据有偏离的，将在当前测试项目中予以说明。
   If any test method is deviation from the designated test method, must be commented in the test data sheet.

6. 对检测报告若有异议，应于收到报告之日起十五天内向检测单位提出。
   Objections to the test report must be submitted to lab within 15 days.

7. 本报告仅对送检样品负责。
   The test report is valid for the tested sample only.

8. 本检测结果中**“N/A”**表示“不适用”，**“P”**表示“通过”，**“F”**表示“不通过”。
   As for the test result “N/A” means “Not Applicable”, “P” means “Pass” and “F” means “Fail”.

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