

Specification for supercapacitors
超级电容器规格书

Model

型 号: 2.7V4500F 60*138mm

Customer

客 户: _____

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一、Scope 适用范围

This specification applies to 2.7V4500F 60*138mm product.

本规格书适用于 2.7V4500F 60*138mm 产品。

二、Specification 主要技术参数

NO. 序号	Item 项目	Specification 规格	Remark 备注
1	Rated Capacitance 额定容量	4500F	Test methods are described below. 测试方法见下述说明
2	Rated Voltage 额定电压	2.7V	
3	Capacitance Tolerance 容量偏差	-10%~+20%	@25°C
4	Surge Voltage 浪涌电压	2.85V	
5	ESR _{DC} 直流内阻	≤ 0.29mΩ	Test temperature 测试温度: 25±2°C
6	Standard Charging Current 标准充电电流	150A	@25°C Charge at 150(A) constant current to the rated voltage. 150(A) 电流恒流充电到额定电压。
7	Standard Discharging Current 标准放电电流	150A	@25°C Discharge at 150(A) constant current to the half of rated voltage. 150(A) 电流恒流放电到额定电压的一半。
8	Power density 功率密度	5.69kW/kg	
9	Dump energy 储存能量	4.56Wh	
10	Voltage Holding 电压保持	≥80%	25°C, After 72 hours 72 小时后。
11	Operating Temperature Range 工作温度范围	-40~65°C	
12	Storage Temperature Range 储存温度范围	-20~50°C	
13	Maximum operating current 最大工作电流	210A	
14	Weight 重量	about 约 0.53kg	
15	Leakage Current 漏电流 LC(72h)	≤ 7.8mA	@25°C
16	Maximum peak current 最大峰值电流, 1s	2635.6A	

Note 说明

Constant current discharge method 恒流放电测试方法:

Measuring circuit 测试线路示意:

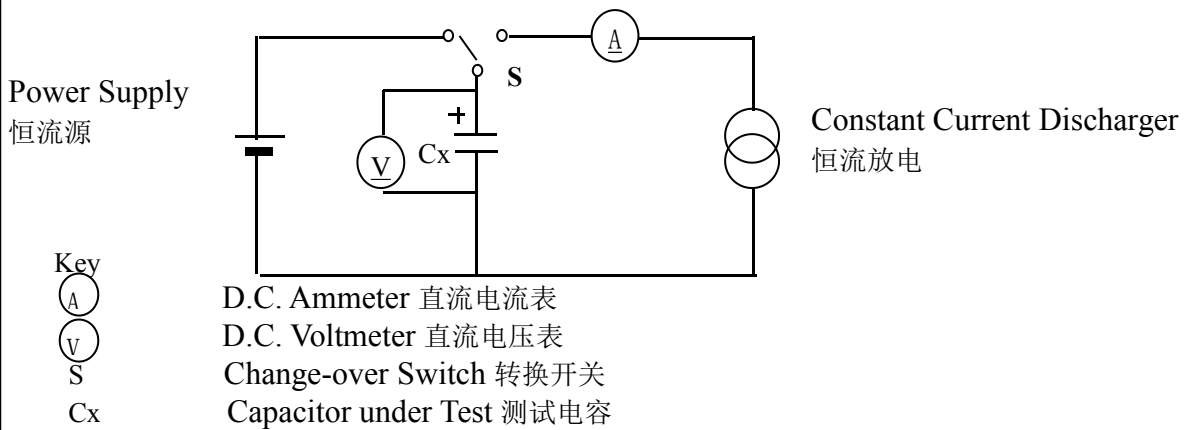


Figure 1: Circuit for Constant Current Discharge Method 图 1: 恒流放电方法线路

Measuring method 测试方法

1) Set the D.C. voltage at the rated voltage (U_R).

设定恒流源的电压在额定值。

2) Set the discharge current of the load meter according to the requirements in table 1.

按照表1的要求设定负载仪的放电电流。

3) Set the change-over switch to the constant current source charging end. After the constant current charging reaches the rated voltage value, rest for 10s.

将转换开关拨到恒流源充电端，恒流充电达到额定电压值后，静置10s。

4) The switching switch is set to the end of the load meter to discharge constant current, discharge to half of the rated voltage, and rest for 10s.

转换开关拨到负载仪端，进行恒流放电，放电至额定电压值的一半，静置10s。

5) After 5 cycles of charging and discharging, discharge at 90A constant current to 0.5V, then discharge at 20A constant current to 0.01V.

充放电循环5次后，90A恒流放电至0.5V，再以20A电流恒流放电至0.01V。

As shown in figure 2, the t_1 , t_2 values of the voltage at U_1 , U_2 at the time of discharge are recorded, and the capacity is calculated by the following formula.

如图 2 所示，记录放电时电压在 U_1 , U_2 的时刻， t_1 , t_2 的值，并用以下公式计算容量。

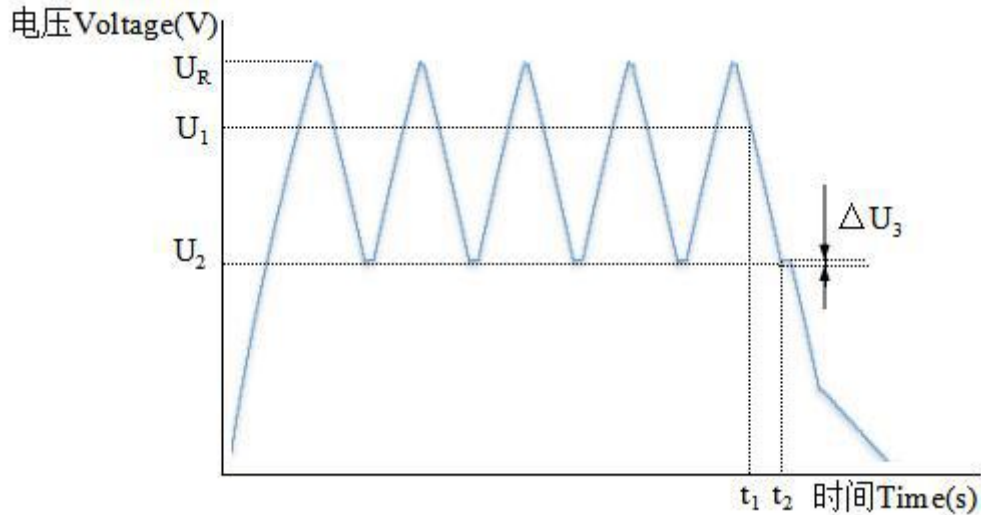


Figure 2: Voltage Characteristics between Capacitor Terminals 图 2: 电容器端电压特征

$$C = \frac{I \times (t_2 - t_1)}{U_1 - U_2}$$

- C the capacitance (F); 容量 (F)。
- I the discharge current (A); 放电电流 (A)。
- U_1 the measurement starting voltage (V); 测量开始时电压 (V)。
- U_2 the measurement end voltage (V); 测量结束时电压 (V)。
- t_1 the time from discharge start to reach U_1 (s); 放电开始到电压达到 U_1 的时间 (s)。
- t_2 the time from discharge start to reach U_2 (s); 放电开始到电压达到 U_2 的时间 (s)。
- U_R the rated voltage (V); 额定电压 (V)。

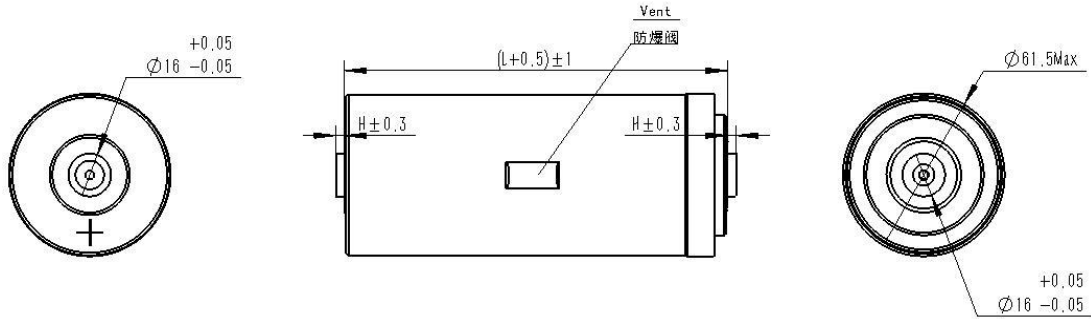
Discharge current and U_1 , U_2 are set according to table 1.
放电电流和 U_1 , U_2 按照表 1 制定。

Table 1: Discharge Conditions 表 1: 放电条件

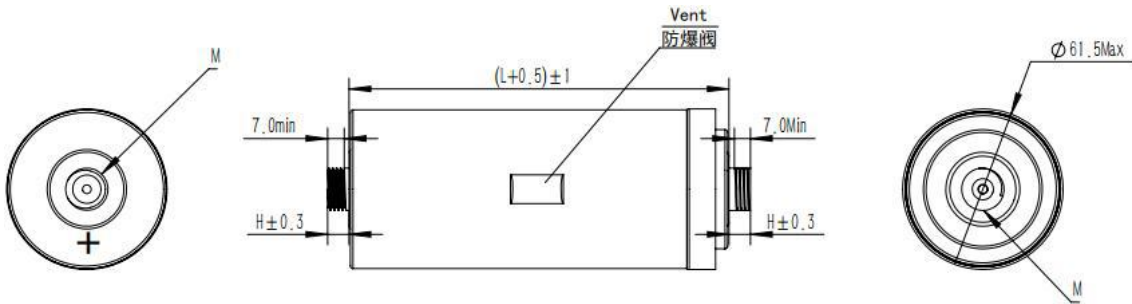
I (A)	150A
U_1	80% of rated voltage 额定电压值的 80%。
U_2	50% of rated voltage 额定电压值的 50%。
Remark: C_R is the rated capacitance in F (Farad), and U_R is the rated voltage in V (Volt). 注: C_R 是额定容量，单位法拉 (F)； U_R 是额定电压，单位伏特 (V)。	

三、Product size 产品尺寸

●光柱 Unthreaded Type:



●螺柱 Threaded Type:



光柱 Unthreaded Type		螺柱 Threaded Type	
H	3.2	M	M16
		H	8.1
L	138	L	138

四、Normal product performance 产品常规性能

No. 序号	Item 项目	Standard 标准	Test Method 测试方法
1	Load Life Test 寿命测试	$\Delta C/C \leq 30\%$ $ESR \leq 2 * R_{25^\circ C}$	After 1500+48 / - 0 hours of application of rated voltage at $65 \pm 2^\circ C$, satisfy the standard of capacity and ESR, and no visible damage at the same time, no electrolyte leakage. 在 $65 \pm 2^\circ C$ 下施加额定电压 1500+48 / - 0h 后, 满足容量和 ESR 标准, 同时无可见损伤, 无电解液泄漏。
2	Cycle Life 循环寿命	$\geq 500,000$ 次 $\Delta C/C \leq 30\%$ $ESR \leq 2 * R_{25^\circ C}$	Constant current charging to U_R , constant current discharging to $1/2U_R$ 恒流充电到额定电压 U_R , 恒流放电到 $1/2U_R$
3	Temperature Characteristics 温度特性	$-40^\circ C$ $\Delta C/C \leq 30\%$ $ESR \leq 2 * R_{25^\circ C}$ $65^\circ C$ $\Delta C/C \leq 30\%$ $ESR \leq 2 * R_{25^\circ C}$	

五、Product Reliability 产品可靠性

No. 序号	Item 项目	Standard 标准	Test Method 测试方法
1	Steady state humidity and heat test 稳态湿热测试	$\Delta C/C \leq 10\%$ $ESR \leq 2 * R_{25^\circ C}$	Stored at a humidity of 90-95% RH and a temperature of $40 \pm 2^\circ C$ for 240 ± 48 hours, satisfy the standard of capacity and ESR, and no visible damage at the same time, no electrolyte leakage. 湿度 90~95%RH, 温度 $40 \pm 2^\circ C$ 的条件下放置 240 ± 48 小时, 满足容量和 ESR 标准, 同时无可见损伤, 无电解液泄漏。
2	Vibration test 振动测试	$\Delta C/C \leq 10\%$	Frequency 频率: $10 \sim 55$ Hz Amplitude 振幅: 1.5mm Temperature 温度: $15^\circ C \sim 35^\circ C$ Vibration time 振动时间: 2H*3 (Three directions 3 个方向)
3	Puncture 穿刺	No fire, no explosion 不起火、不爆炸	After charging the capacitor cell to the rated voltage with constant current I, a high-temperature resistant steel needle with a diameter of 8mm is penetrated perpendicular to the direction of the capacitor plate at a speed of $10 \text{mm/s} \sim 40 \text{mm/s}$ (the steel needle stays in the capacitor). 对电容器单体以恒定电流 I 充电至额定电压, 将直径 8mm 的耐高温钢针、以 $10 \text{mm/s} \sim 40 \text{mm/s}$ 的速度, 垂直于电容器极板的方向贯穿(钢针停留在电容器中)。

六、Charge/Discharge Characteristics 充放电特性

Charge: Charge at 150(A) constant current to 2.7V, then rest for 10s.

充电: 150A 恒流充电到 2.7V, 静置 10s。

Discharge: Discharge at 150(A) constant current to 1.35V, then rest for 10s.

放电: 150A 恒流放电到 1.35V, 静置 10s。。

七、Notice 使用注意事项

7.1 Supercapacitors have a fixed polarity.

超级电容器具有固定的极性。

7.2 Supercapacitors should be used at nominal voltage.

超级电容器应在标称电压下使用。

7.3 Ambient temperature affects the life of the supercapacitor.

环境温度影响超级电容器的寿命。

7.4 Do not reverse charge.

不可以反向充电。

7.5 After installation, do not force or tilt capacitors.

安装后，不可强行扭动或倾斜电容器。

7.6 After welding, the circuit board and capacitor should be cleaned.

焊接后，线路板和电容器要清洗干净。

7.7 When the supercapacitors are used in series, there exists the problem of voltage balance between the monomers.

超级电容器串联使用时，存在单体间的电压均衡问题。

八、Storage 储存

8.1 Products should not be stored in areas where humidity exceeds 85 percent, or where toxic gases are present.

产品不能储存在湿度超过 85%，或有毒气体的地方。

8.2 Product is best stored in a temperature of -20 ~ 50 °C, 60% humidity environment..

最好储存在温度-20~50℃，湿度 60%的环境中。