GMCC CRAMS

PRODUCT SPECIFICATION

Hybrid Ultra-Capacitor (HUC)

TYPE: C46W-4N2-0008

1 Application scope

This product specification applies to the cylindrical HUC (C46W-4R2-0008) produced by GMCC. Please follow the methods specified in this specification.If you have any objections or other requests regarding the test items and test methods, please contact us.

2 Product type and model

2.1 Product type：cylindrical HUC
2.2 Product model：C46W-4N2-0008

3 Main technical parameters

3.1 Symbol description
C1—1h rate discharge capacity (A·h) , 1.0 C —1h discharge current， which equals the value of C1(A)
In this specification 1.0 C=8 A, SOC：state of charge, DOD：depth of discharge
3.2 Main technical parameters

Table 1 The main technical parameters of HUC (C46W-4N2-0008)

Item	Standard	Note
1 Rated Capacity	8 Ah	@25℃, 4.2V,1.0 C discharge to 2.8V
2 Median voltage	3.65 V	
3 AC Internal resistance	≤0.8 mΩ	@25℃, 50%SOC, 1kHz AC
4 DC internal resistance	≤2.5 mΩ	@25℃, 50%SOC, 50C, 10s, discharge
5 Charge cut-off voltage	4.20 V	@25℃
6 Discharge cut-off voltage	2.80 V	@25℃
7 Max 30s continuous charge current	170 A	@25℃, 50%SOC
8 Max 10s charge current	250 A	@25℃, 50%SOC
9 Max 30s discharge current	230 A	@25℃, 50%SOC,
10 Max 10s discharge current	320 A	@25℃, 50%SOC
11 Max 10s discharge power	1000 W	@25℃, 50%SOC, 10s
12 Capacity retention rate @-40℃, 5C discharge	≥ 60%	@-40℃, 100%SOC, 5C, discharge, to 2.5 V
13 Weight	321 g	
14 Charge temperature	-35~+55 ℃	
15 Discharge temperature	-40~+60 ℃	
16 Storage temperature	-40~+60 ℃	35~60℃ range with limitation on SOC & time
17 Max continuous charge and discharge current	10C (80A)	Recommended temperature 15~45℃
18 cycle life	30,000 80,000	@25℃,2.8-4.2V,10C @25℃,2.8-4.0V,10C

4 Appearance and dimension

4.1 Boundary Dimension
The boundary dimension of HUC is shown in Figure 1
Diameter：45.6 mm （25±2℃）
Height：94.4 mm （25±2℃,without terminal）
4.2 Appearance
Clean surface, no electrolyte leakage, no obvious scratches and mechanical damage, no deformation, no other obvious defects.

5 Performance

★All tests must be carried out with good contact with the test instrument.
5.1 Standard Test Condition
The HUC to used for testing must be new (the delivery time is less than 1 month) and no more than 5 cycles charge/discharge.
In addition to other special requirements, the general test environment conditions are 25 ± 2 ℃ and less than 65% RH.
5.2 Test Equipment Standard
（1）The precision of the measuring equipment should be ≥ 0.01 mm.
（2）The accuracy of the multimeter to measure the voltage and current should ≥ level 0.5, and the internal resistance should be ≥10kΩ/V.
（3）The measurement principle of Internal resistance tester should be AC impedance method (1kHz LCR).
（4）The current accuracy of the cell test system should be above ±0.1%, the constant voltage accuracy should be ±0.5%, and the timing accuracy should be ≥ ±0.1%.
（5）The accuracy of temperature measuring equipment should be ≥ ±0.5℃.
5.3 Charging Standard

The charging method is 1.0C constant current and 4.2V constant voltage charging in 25±2℃. When the compensating cut-off current drops to 0.05 C during constant voltage charging, the charging can be terminated and left to stand for 1 h.

5.4 Charging/discharging Time Interval

If there is no special requirement, the charging and discharging interval of HUC is 60min.

5.5 Initial Performance Test

Specific test items and standards are shown in Table 2

Number	Item	Test Procedure	Standard
1	Appearance and dimension	Visual and vernier caliper measurement	No obvious scratch, no deformation, no electrolyte leakage. The dimensions and tolerance shown in Figure 1.
2	Weight	Analytical balance	321±10g
3	Open-circuit voltage	Measure open-circuit voltage within 1h after charging according to 5.3	≥4.150V
4	Nominal discharge capacity	Discharging to the 2.8V at the current of 1.0 C within 1h after charging according to 5.3, and record capacity,then repeat for 5 times. When the range of three consecutive test results is less than 3%, the test can be terminated in advance and the average of the three test results can be taken.	1.0 C(A)capacity ≥ nominal capacity
5	Max 10s charge current	Discharging to 2.8V after charging at 25℃, 1.0 C according to 5.3, then record capacity; Nominate 50%SOC: standard charging to 100%SOC according to 5.3, then discharge for 0.5h at 1.0 C and left to stand for 2h; Constant current charging at n C for 10s to 4.2V; When occur the two currents in which the end voltages at 10s are located in the ranges of 4.15 to 4.20 V and 4.20 to 4.25 V, at this time the current at 4.2 V obtained by using the intercept method is the maximum charging current for 10s.	250A@25℃, 50%SOC, 10s, Charging
6	Max 10s discharge current	Discharging to 2.8V after charging at 25℃, 1.0 C according to 5.3, then record capacity; Nominate 50%SOC: standard charging to 100%SOC according to 5.3, then discharge for 0.5h at 1.0 C and left to stand for 2h; Constant current discharging at n C for 10s to 2.8V; When occur the two currents in which the end voltages at 10s are located in the ranges of 2.75 to 2.80 V and 2.80 to 2.85 V, at this time the current at 2.80 V obtained by using the intercept method is the maximum discharging current for 10s.	320A@25℃, 50%SOC, 10s, Discharging
7	Charge/discharge cycle life	Cyling with constant current of 10C between 2.8 - 4.2V or other voltage range at 25℃, the 1.0 C(A) capacity calibration is performed after every 1,000 cycles until reaches 80% capacity and the process capacity is recorded.	Remaining capacity≥80% nominal capacity
8	Charge recovery capability	After charging according to 5.3, stand in open circuit at 25±2℃ for 30d, then constant current discharging at 1.0 C to 2.8V and recording capacity. After charging according to 5.3, stand in high-temperature cabinet at 60±2℃ for 7d, then discharging at 1.0 C to 2.8V after stand in room temperature for 16h and recording capacity.	Capacity≥90% nominal capacity
9	High-temperature performance	After charging according to 5.3, stand in high-temperature cabinet at 60±2℃ for 8h, then discharging at 1.0 C to 2.8V and recording capacity.	Capacity≥95% nominal capacity
10	Low-temperature performance	After charging according to 5.3, stand in low-temperature cabinet at -40±2℃ for 20h, then discharging at 5 C to 2.5V and recording capacity.	Capacity≥60% nominal capacity
11	Low-pressure	After charging according to 5.3, put the cell in the low-pressure cabinet and adjust the pressure to 11.6kPa at 25±2℃, stand for 6h. Observe for 1h.	No fire, explosion or leakage
12	Short circuit	After charging according to 5.3, Connect the positive and negative poles of cell for 10min by the external circuit. The resistance of the external circuit should be less than 5mΩ. Observe for 1h.	No fire or explosion
13	Overcharge	After charging according to 5.3, constant current charging at 1.0 C until the voltage is the 1.5 times of the charging cut-off voltage specified in the specification or the charging time reaches 1h. Observe for 1h.	No fire, explosion or leakage
14	Over discharge	After charging according to 5.3, discharging at 1.0 C for 90min. Observe for 1h.	No fire or explosion
15	Heat	After charging according to 5.3, put the cell into the temperature cabinet, which increases from room temperature to 130±2℃ at the rate of 5℃/min, hold this temperature for 30min then stop heating. Observe for 1h.	No fire or explosion
16	Crush	After charging according to 5.3, Squeeze the cell plate with a half cylinder with	No fire or explosion

		a radius of 75mm and a length greater than the size of the cell, and apply pressure perpendicular to the direction of the cell plate at a speed of 5±1 mm/s. Stop squeezing when the voltage reaches 0V or the deformation reaches 30% or squeezing force reaches 200kN. Observe for 1h.	
17	Drop	After charging according to 5.3, the positive and negative terminals of the cell are fell down to the concrete floor from a height of 1.5m. Observe for 1h.	No fire, explosion or leakage
18	Seawater immersion	After charging according to 5.3, put the cell immerse in 3.5 wt%NaCl (simulating seawater composition at normal temperature) for 2h, and the depth of water should be completely above the cell.	No fire or explosion
19	Temperature cycle	After charging according to 5.3, put the cell in temperature cabinet. The temperature is adjusted according to the requirement in 6.2.10 of GB/T31485-2015, and cycle 5 times. Observe for 1h.	No fire or explosion

6 Notes

6.1 Charge
a) Overcharging is strictly prohibited and the charging voltage should not be higher than 4.25V.
b) Reverse charging is prohibited.
c) 15℃-35℃ is the best temperature for charging.
6.2 Discharge
a) Short circuit is prohibited.
b) Discharge voltage ≥2.8V @RT.
c) 15℃-35℃ is the best temperature for discharging.
6.3 Keep the cell away from children.
6.4 Storage and use
a) For short-time storage (within 1 month), the cell should be placed in a clean environment with a humidity lower than 65%RH and a temperature of 35℃~60℃. Keep the charge state of cell @ 50%SOC.
b) For long-time storage (within 6 months), the cell should be placed in a clean environment with a humidity lower than 65%RH and a temperature of -40℃ ~35℃. Keep the charge state of cell @ 50%SOC.
c) Recharge the cell every 3 months to ensure that it is not under-voltage.

7 Warning

7.1 Do not heat, modify or disassemble the cell which are very dangerous and may cause the cell to catch fire, overheat, leak electrolyte and explode, etc.
7.2 Do not expose the cell to extreme heat or fire, and do not put the cell in direct sunlight.
7.3 Do not connect the positive and negative terminals of the cell directly to other metal, which will lead to short circuit and may cause a fire or even an explosion of the cell.
7.4 Do not use positive and negative terminals incorrectly.
7.5 Do not immerse the cell in seawater or water, and do not make it soaked.
7.6 Do not make the cell bear heavy mechanical impact.
7.7 Do not directly weld the cell, overheating may cause deformation of the cell components (such as gaskets), which will lead to the cell bulge, electrolyte leakage and explosion.
7.8 Do not use the battery cells that have been crushed, dropped, short-circuited, leaked, or with other problems.
7.9 Do not directly touch the shells between the cells or connect them to form a path through conductor during using.
7.10 The cell should be stored and used away from static electricity.
7.11 Do not use the cells with other quality degraded cells. Do not use cells of different packages, models or other brands together.
7.12 If the cell appears rapidly becoming hot, odorous, discolored, deformed, or other reactions when using, please stop immediately and treat accordingly.
7.13 If electrolyte leaks onto skin or clothing, wash immediately with water to avoid skin discomfort.

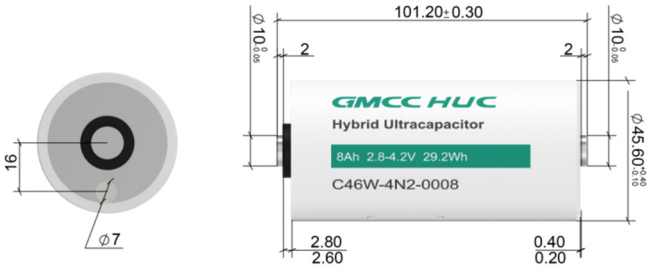
8 Transportation

8.1 Cells should be maintained at 50% SOC and be protected from severe vibration, shock, sunlight, and moisture.

9 Quality assurance

9.1 If you need to operate or apply the cell in conditions other than the specification, please consult us.We will not be assume any responsibility for accident caused by using the cell outside the conditions described in the specification.
9.2 We will not be assume any responsibility for the problems caused by the combination of cell and circuit, cell pack and charger.
9.3 Defective cells generated by the customer during the packaging process after shipment are not covered by the warranty.

10 Cell dimensions



Notes：not including sleeve