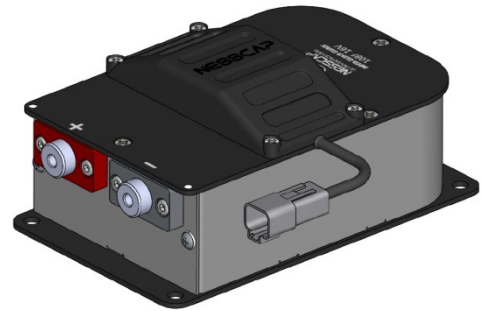


## FEATURES

- » Rated capacitance of 108F
- » Highest power performance with ultra-low ESR
- » Integrated UMU (Ultracapacitor Management Unit) for:
  - > Individual active cell balancing
  - > Voltage and temperature diagnosis by logic output
- » Rugged design for harsh environments
- » Typical Applications
  - > Hybrid BUS, Transportation and automotive
  - > Wind turbine, Industrial UPS and DVR



## SPECIFICATIONS

Electrical		EMHSR-0108C0-016R0C
Rated Voltage ( $V_R$ )		16.2V <sub>DC</sub>
Surge Voltage <sup>1</sup>		17.1V <sub>DC</sub>
Rated Capacitance <sup>2</sup>		108F
Capacitance Tolerance		0% ~ +20%
Max. ESR <sup>3</sup> (Internal Resistance)	AC (100Hz)	< 3.6m $\Omega$
	DC	< 4.3m $\Omega$
Max. Leakage Current <sup>4</sup>		< 4.2mA at less than 12.0V, > 44mA at more than 12.0V
Max. Current <sup>5</sup>		580A
Max. Stored Energy at $V_R$ <sup>6</sup>		3.9Wh
		13.2kJ
Gravimetric Specific Energy <sup>6</sup>		1.05Wh/kg
Temperature		
Operating Temperature Range		-40 ~ 65°C ( $ \Delta CAP  < 5\%$ and $\Delta ESR < 150\%$ of initial value measured at 25°C)
Storage Temperature Range		-40 ~ 70°C
Life		
Endurance (at $V_R$ and 65°C) <sup>7</sup>		1,500 hours ( $ \Delta CAP  < 20\%$ and $\Delta ESR < 100\%$ of specified value)
Room Temperature (at $V_R$ and 25°C)		10 years ( $ \Delta CAP  < 20\%$ and $\Delta ESR < 100\%$ of specified value)
Cycle Life (at 25°C) <sup>8</sup>		1 million cycles (between $V_R$ and $\frac{1}{2}V_R$ using constant current charge and discharge at 25°C)
Shelf Life		2 years
Enclosure		
Output Terminals		M8(Positive), M8(Negative) screw holes
Insulation Coordination		IEC 61287-1 (Cat. : OV II) Rated insulation voltage: 1kV DC Or 2.8kV AC (50Hz, 10sec) Rated impulse withstand voltage : 6kV DC
Protection Degree		IEC 60529 IP 30 (Protected against solid foreign objects more than 2.5mm diameter)
Vibration		SAE J2380
Shock Resistance		SAE J2464
Mounting		4 Locations, M8 holes on bottom covers

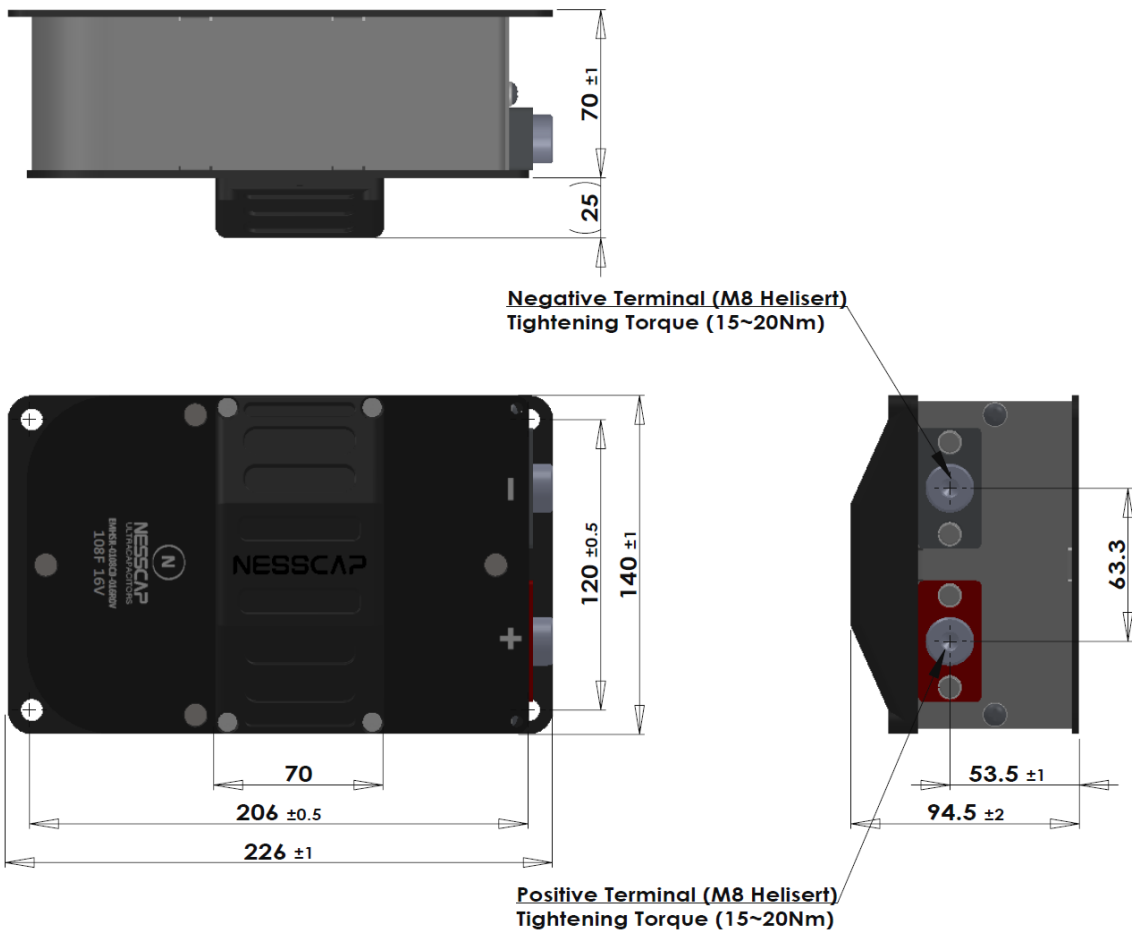
**UMU (Ultracapacitor Management Unit)**

Balancing	Active single cell balancing
Voltage monitoring	High and low logic signal
Temperature monitoring	NTC Thermistor
Communication	N/A
Signal Output	Deutsch 4-pin water-proof connector

**Certification**

RoHS	-
REACH	-

**Drawing**



Part Number	Capacitance (0/+20%) (F)	Weight (kg) Max	Dimensions(mm)				
			L (±1.0)	W (±1.0)	H1 (±1.0)	H2 (±1.0)	H3 (±2.0)
EMHSR-0108C0-016R0C	108	3	226	140	53.5	70	94.5

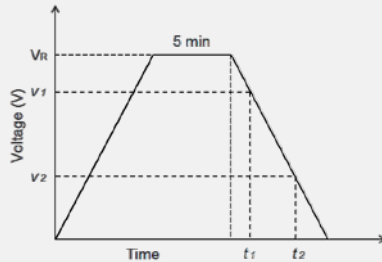
## Note

### 1. Surge Voltage

> Should not be repeated nor exceeded more than 1 second.

### 2. Rated Capacitance

- > Constant current charge with 4CV/1000 to  $V_R$   
Ex) In case of 108F16V module,  $4 \times 108 \times 16 / 1000 = 6.9A$
- > Constant voltage charge at  $V_R$  for 5min
- > Constant current discharge with 4CV/1000 to 2.4V



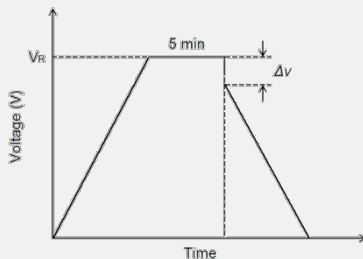
$$C = \frac{I \times (t_2 - t_1)}{v_1 - v_2}$$

Where  $v_1$  is the measurement starting voltage,  $0.8 \times V_R$  (V);  
 $v_2$  is the measurement end voltage,  $0.4 \times V_R$  (V);  
 $t_1$  is the time from discharge start to reach  $v_1$  (s);  
 $t_2$  is the time from discharge start to reach  $v_2$  (s);  
 $I$  is the absolute value of the discharging current (A).

### 3. ESR (Equivalent Series Resistance)

- $ESR_{AC}$   
 $ESR_{AC}$  is measured by 4-probe impedance analyzer using:  
 Condition: Potentiostat mode  
 AC Amplitude: 5mV  
 Frequency: 50Hz, 100Hz, 1kHz

- >  $ESR_{DC}$ 
  - Constant current charge with 4CV/1000 to  $V_R$
  - Constant voltage charge at  $V_R$  for 5min
  - Constant current discharge with 100A to 14V



$$R_d = \frac{\Delta v}{I}$$

Where  $R_d$  is the  $ESR_{DC}$  (Ω);  
 $\Delta v$  is the voltage drop for 10ms (V);  
 $I$  is the discharge current (A).

### 4. Leakage Current

- > The capacitor is charged to the rated voltage at 25°C.
- > Leakage current is the current at 72hours that is required to keep the capacitor charged at the rated voltage

### 5. Max. Current

- > Current for 1sec discharging from the rated voltage to the half rated voltage under constant current discharging mode.

$$I_{Max.} (A) = \frac{\frac{1}{2}V_R}{\Delta t / C + R_d}$$

Where  $\Delta t$  is the discharge time (sec) and  $\Delta t$  is 1 sec in this case;  
 $C$  is the capacitance (F);  
 $R_d$  is the  $ESR_{DC}$  (Ω);  
 $V_R$  is the rated voltage (V).

- > Max. current should not be used in normal operation and is provided only as a reference value.

### 6. Max. Stored Energy at $V_R$

$$E_{Max.} (Wh) = \frac{\frac{1}{2}CV_R^2}{3600}$$

Where  $C$  is the capacitance (F);  
 $V_R$  is the rated voltage (V).

$$\text{Gravimetric Specific Energy (Wh/kg)} = \frac{E_{Max.}}{\text{Weight}}$$

### 7. Endurance

- > Conditions
  - Temperature:  $65 \pm 2^\circ C$
  - Test duration : 1500 (+48/-0) h
  - Applied voltage:  $V_R \pm 0.4V$
- > Capacitance and ESR measurement are made at 25°C

### 8. Cycle life

- > Conditions
  - Cycle at room temperature
    - ① Constant current charge with 40A from  $1/2V_R$  to  $V_R$
    - ② Constant current discharge with 40A from  $V_R$  to  $1/2V_R$

For more information, you can reach us at one of following contacts

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