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| Dazzle Robotics Private Limited | |
| GenX Pro+ Solid-State Lithium-ion Battery Product Specification | Product: Genx Pro+ 14S1P 35Ah |
| | Release Date: 20-02-2024 |
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1.Scope Application

This product specification describes the performances and indicators of Solid-State Lithium- ion Batteries produced by Dazzle Robotics Private Limited. Note: The solid-state lithium-ion batteries described in this specification refers to a lithium- ion battery with solid-state technology (based on mixed solid liquid electrolyte).

2.Product Model

GenX Pro+ 51.8V 14S1P 35000Mah

3.Product Details

| Item | Specs |
|---------------------------|-------------------------------|
| Length | 189mm |
| Width | 88mm |
| Height | 158.2mm |
| Connector Cable | UL3135 8AWG |
| Balance Connector Cable | UL3239 22AWG |
| Balance Connector | MOLEX 16P |
| Discharge Connector | AS150U |
| Cell Specs | 3.65V 35Ah Solid State Li-Ion |
| Cell Configuration | 6S1P |
| External Metal Protection | Optional Not standard |
| Packing | Heat Shrink Sleeve |

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4. Product Specification

| NO. | Items | Specifications |
|-----|-----------------------|--|
| 1 | Nominal Capacity | 35Ah (0.33C) |
| 2 | Nominal Voltage | 51.1V |
| 3 | Charging Voltage | 58.8V |
| 4 | Cut-Off Voltage | 38.5V |
| 5 | Charging Method | Ultrafast 1C(35A) constant current (CC) charge To 58.8V, then constant voltage (CV) charge till charge current decline to $\leq 0.02C(0.7A)$. |
| | | Fast 0.5C(17.5A) constant current (CC) charge To 58.8V, then constant voltage (CV) charge till charge current decline to $\leq 0.02C(0.7A)$. |
| | | Standard 0.33C(11.55A) constant current (CC) charge to 58.8V, then constant voltage (CV) charge till charge current decline to $\leq 0.02C(0.7A)$. |
| 6 | Dis-Charging Method | High Rate 5C (175A, duration $\leq 60s$) |
| | | Fast 3C (105A) |
| | | Standard 0.33C (11.55A) |
| 7 | Cycle Life | ≥ 1000 cycles ($25^{\circ}C \pm 3^{\circ}C$, 0.5C/1C) |
| | | ≥ 800 cycles ($25^{\circ}C \pm 3^{\circ}C$, 0.5C/3C) |
| 8 | Operating Temperature | Charge: $0^{\circ}C \sim 55^{\circ}C$ Discharge: $-20^{\circ}C \sim 60^{\circ}C$ |
| 9 | Storage Temperature | Short-term(one month): $-20^{\circ}C \sim 45^{\circ}C$ Long-term(six months): $-10^{\circ}C \sim 35^{\circ}C$ |
| 10 | Store Humidity | $\leq 85\%RH$ |
| 11 | Energy Density | Weight Specific Energy: $\geq 310Wh/Kg$ (0.33C/0.33C) Volume Specific Energy: $\geq 700Wh/L$ (0.33C/0.33C) |
| 12 | Internal Resistance | $19 \pm 0.6 m\Omega$ |
| 13 | Weight | $5.95kg \pm 15.0g$ |

5. Battery Performance

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| 5.1 Electrochemical Characteristics at cell level | | | |
|---|------------------------------------|--|--|
| NO. | Items | Criteria | Test Methods |
| 1 | Cycle Life (25°C) | 0.5C/1C Capacity \geq Initial Capacity $\times 80\%$ (1000 cycles) | Under the condition of 1 standard atmospheric pressure, ambient temperature 25 ± 3 °C , relative humidity $\leq 85\%RH$, 0.5 C constant current constant voltage charged to 4.2V, cutoff current 0.02C, 30min-rest, and discharged at 1C constant current to 2.75 V, 30min-rest, repeat the above steps until the cycle capacity decays to 80% of the initial capacity (Pressure with 0.02MPa) ; |
| | | 0.5C/3C Capacity \geq Initial Capacity $\times 80\%$ (800 cycles) | Under the condition of 1 standard atmospheric pressure, ambient temperature 25 ± 3 °C , relative humidity $\leq 85\%RH$, 0.5C constant current constant voltage charged to 4.2V, cutoff current 0.02C, 30min-rest, and discharged at 3C constant current to 2.75 V, 30min-rest, repeat the above steps until the cycle capacity decays to 80% of the initial capacity (Pressure with 0.02MPa) ; |
| 2 | Low temperature discharge at -20°C | Capacity \geq Discharge capacity at 25°C $\times 80\%$ | Under the condition of ambient temperature 25 ± 3 °C, charge to 4.2V at 0.33C standard constant current constant voltage, cut-off current 0.02C, 10min-rest, and then discharge to 2.75V at 0.33C constant current, 10min- rest, repeat this step for 3 cycles. Then charge to 4.2V with 0.33C standard constant current, constant voltage cutoff current of 0.02C; the battery is placed at -20 ± 3 °C for 24h, and discharged to 2.75V at 1C constant current. |

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| 5.1 Electrochemical Characteristics at cell level | | | |
|---|--------------------------------------|---|---|
| NO. | Items | Criteria | Test Methods |
| 3 | Rate discharge | 3C discharge capacity > 0.33C discharge capacity × 95% | Under the condition of ambient temperature $25 \pm 3^{\circ}\text{C}$, charge to 4.2V at 0.33C standard constant current constant voltage, cut-off current 0.02C, 10min-rest, and then discharge to 2.75V at 0.33C constant current, 10min- rest, repeat this step for 3 cycles. Then charge to 4.2V with 0.33C standard constant current, constant voltage cutoff current of 0.02C; The battery is discharged to 2.75V at 3C constant current. |
| 4 | 25 °C retention and recovery at 25°C | Capacity retention \geq Rated capacity × 94% Recovery capacity \geq Rated capacity × 96% | Under the condition of ambient temperature $25 \pm 3^{\circ}\text{C}$, charge to 4.2V at 0.33C standard constant current constant voltage, cut-off current 0.02C, 10min-rest, and then discharge to 2.75V at 0.33C constant current, 10min- rest, repeat this step for 3 cycles. Then charge to 4.2V with 0.33C standard constant current, constant voltage cutoff current of 0.02C; The Cell is stored in an oven at $25 \pm 2^{\circ}\text{C}$ for 28 days, and then the retention rate and recovery rate are measured in a standard discharge charging method at an ambient temperature of $25 \pm 3^{\circ}\text{C}$. |

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| 5.1 Electrochemical Characteristics at cell level | | | |
|---|---------------------------------------|---|---|
| NO. | Items | Criteria | Test Methods |
| 5 | Charge retention and recovery at 45°C | Capacity retention \geq Rated capacity \times 92% Recovery capacity \geq Rated capacity \times 94% | Under the condition of ambient temperature $25 \pm 3^\circ\text{C}$, charge to 4.2V at 0.33C standard constant current constant voltage, cut-off current 0.02C, 10min-rest, and then discharge to 2.75V at 0.33C constant current, 10min- rest, repeat this step for 3 cycles. The cell is stored in an oven at $45 \pm 2^\circ\text{C}$ for 28 days, and then the retention rate and recovery rate are measured in a standard discharge charging method at an ambient temperature of $25 \pm 3^\circ\text{C}$ (Pressure with 0.02MPa) |
| 6 | Charge retention and recovery at 55°C | Capacity retention \geq Rated capacity \times 94% Recovery capacity \geq Rated capacity \times 96% | Under the condition of ambient temperature $25 \pm 3^\circ\text{C}$, charge to 4.2V at 0.33C standard constant current constant voltage, cut-off current 0.02C, 10min-rest, and then discharge to 2.75V at 0.33C constant current, 10min- rest, repeat this step for 3 cycles. The cell is stored in an oven at $55 \pm 2^\circ\text{C}$ for 7 days, and then the retention rate and recovery rate are measured in a standard discharge charging method at an ambient temperature of $25 \pm 3^\circ\text{C}$ |
| 7 | Storage performance | Capacity \geq Nominal capacity \times 100 % 3 months \geq 90% 6 months \geq 85% 12 months \geq 80% | Measure initial status and initial capacity. Standard charge and store for 3 months, 6 months and 12months respectively. Measure the final capacity, then charge and discharge at 0.33C for 3 cycles, and measure the discharge capacity. |

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5.2 Safety Performance

| NO. | Items | Criteria | Test Methods |
|-----|-------------------|---------------------------------------|--|
| 1 | Overcharge | No fire No explosion | The battery is charged to 4.2V at 0.33C constant current, charged to cutoff current of 0.02C at constant voltage, and charge to 4.62V with 1C constant current then observe for 1h. |
| 2 | Forced-Discharge | No fire No explosion No leakage | The battery is charged to 4.2V at 0.33C constant current, charged to cutoff current of 0.02C at constant voltage, and discharged at 1C for 90 min or the voltage of 0V, then observe for 1h. |
| 3 | Short Circuit | No fire No explosion | The battery is charged to 4.2V at 0.33C constant current, charged to cutoff current of 0.02C at constant voltage, put the battery into a ventilation cabinet and connect the positive and negative terminals directly by a 80 ± 20 mΩ wire for 10min at $25\pm 5^{\circ}\text{C}$, then observe for at least 1h. |
| 4 | Dropping | No fire No explosion No leakage | The battery is charged to 4.2V at 0.33C constant current, charged to cutoff current of 0.02C at constant voltage. Free fall from a height of 1m to the cement ground, one drop on each surface (6 tests in total) |
| 5 | Thermal stability | No fire No explosion No leakage | The battery is charged to 4.2V at 0.33C constant current, charged to cutoff current of 0.02C at constant voltage. Put the battery into an oven and heating from room temperature to $130\pm 2^{\circ}\text{C}$ at the rate of $5\pm 2^{\circ}\text{C}/\text{min}$, then observe for at least 1h. (Pressure with 0.02MPa) |
| 6 | Crushing | No fire No explosion | The battery is charged to 4.2V at 0.33C constant current, charged to cutoff current of 0.02C at constant voltage . Squeeze the battery with a semi cylindrical extrusion head at the speed of 5mm/s until the voltage is 0V or the deformation reaches 15% , then observe for at least 1h. |

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6. Visual Inspection

There shall be no such defects as scratch, flaw, crack, and leakage, which may adversely affect the commercial value of the battery.

7. Standard Environmental Test Condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition: Temperature : $20\pm 5^{\circ}\text{C}$, Humidity : $\leq 75\%RH$
Atmosphere : 86KPa ~ 106KPa

8. Storage

8.1 Long Time Storage : If the battery is to be stored for a long time (over 3 months), the battery should be stored in dry and cool place.

The battery should be charged and discharged every six month. The battery's storage voltage should be 3.6~3.75V and the battery is to be stored at the condition as NO.7.

8.2 Others : Any matters which have not been covered in this specification should be conferred between the customer and Others

9. Warranty Period and Product Liability

(1) Warranty period of this product is 3 months from the production date.

(2) Dazzle Robotics Private Limited is not responsible for the troubles caused by Mishandling of the battery which is clearly against the instructions in this specification.