Charged by C4V CHARGING AHEAD

NEAR PRIME TECHNOLOGIES

LITHIUM-ION PRISMATIC CELL
MODEL C4V-53AH-27156146
PRODUCT SPECIFICATION AND USER GUIDELINES

COUNTRY OF ORIGIN: UNITED STATES OF AMERICA

C4V-53AH-27156146-US

CHARGED BY

C4V CHARGING AHEAD

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DIGITAL DNA

Scan with phone camera

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1.0 DEFINITIONS

Name	Definition
SN	Serial number
Ambient Temperature	The temperature of the environment the product is exposed to
BMS	Battery management system
Cell Temperature	The temperature measured by the temperature sensor in contact with the cell
C-rate	A measure of the rate at which a cell is charged or discharged relative to its nominal capacity. 1C is a one-hour discharge; 0.5C is a two-hour discharge.
Cycle	One cycle consists of one charge and one discharge
OCV	Open circuit voltage
Standard Charge	See “Standard Charging Method” in Chapter 3
Standard Discharge	See “Standard Discharging Method” in Chapter 3
SOC	State of charge. 100% SOC means the cell is fully charged.
Units	V: Volt; A: Ampere; W: Watt; Ah: Ampere-Hour; Wh: Watt-Hour; °C: Degree Celsius; Hz: Hertz

1.1 Scope

This document describes the principles to be used as guidelines for installation, operation, maintenance, storage, and transport of 53 Ah lithium-ion cells, charged by C4V technology and supplied by C4V Gigafactories.

1.2 Country of Origin and Manufacturing

Item	Specification
Country of Origin	United States of America (ISO 3166 code US)
Manufacturing Site	Near Prime Technologies, Building 48 and 53, Endicott, New York
Country Product Code	C4V-53AH-27156146-US
Technology Licensor	C4V, Vestal, New York, USA, charged by C4V
Supplier of Record	Near Prime Technologies LLC, Endicott, New York, USA
Production Status	In production
FEOC Status	FEOC compliant
Digital DNA Record	DDNA-53-US-K
Specification Revision	Rev K, 11/2024

The 53 Ah cell is in production at the Near Prime Technologies campus in Endicott, New York. Sections 2.0 and 3.0 are identical for every country of origin; only this section, the country product code and the Digital DNA stamp change.

DIGITAL DNA STAMP

Scan the code with any phone camera. The product record is carried inside the code itself, so the product code, country of origin, manufacturing site, chemistry, key ratings and specification revision appear on screen with no internet connection and no application.

Record: DDNA-53-US-K Code: C4V-53AH-27156146-US

2.0 ELECTRICAL SPECIFICATIONS

This section outlines the electrical specifications.

No.	Item	Specification	Comments
2.1	**Cell Chemistry**	Lithium Mixed Metal Phosphate	
2.2	**Typical Capacity**	53 Ah	0.2C charge / 0.2C discharge at 25°C
2.3	**Typical Energy**	196 Wh	0.2C charge / 0.2C discharge at 25°C
2.4	**Specific Energy**	164 Wh/kg	0.2C charge / 0.2C discharge at 25°C
2.5	**Energy Density**	317 Wh/L	0.2C charge / 0.2C discharge at 25°C
2.6	**Nominal Voltage**	3.7 V	
2.7	**Operating Voltage Range**	2.8 - 4.2 V	Recommended range is 3 - 4.1 V for optimal cell performance
2.8	**Maximum Charge Voltage**	4.2 V	
2.9	**Standard Charging Method**	0.5C constant current to 4.1 V, then constant voltage at 4.1 V until current ≤ 0.1C	Acceptable to go ≤ 2C constant current; for constant voltage details please refer to Testing Protocol.
2.10	**Standard Discharging Method**	0.2C constant current to 3.0 V	Acceptable to go ≤ 2C constant current
2.11	**Cell Internal Impedance**	≤ 1 mΩ	AC resistance at 1 kHz and 50% SOC
2.12	**Cycle Life**	≥ 80% of initial capacity after 3000 cycles; ≥ 70% SOH after 5500 cycles (at 25°C)	Standard charging / discharging method. Cells in compression (300 ± 20 kgf)
2.13	**Continuous Charge Current**	≤ 1C	
2.14	**Peak Charge Current**	≤ 2C	
2.15	**Continuous Discharge Current**	≤ 1C	
2.16	**Peak Discharge Current**	≤ 2C	
2.17	**Operating Temperature (Charge)**	0 to 60°C	
2.18	**Operating Temperature (Discharge)**	-10 to 60°C	
2.19	**Storage Temperature**	-20 to 45°C	-20 to 25°C storage for 6 months. The cell will need to maintain charge if stored at > 25°C elevated temperatures

3.0 MECHANICAL SPECIFICATIONS

No.	Item	Specification	Comments
3.1	**Cell Dimensions**	Width: 156 ± 0.5 mm; Height: 143.2 ± 0.5 mm (without terminal), 146.4 ± 1.0 mm (with terminal); Thickness: 27.1 ± 1.5 mm at 300 kgf ± 20 kgf	Thickness specification includes the cell label
3.2	**Cell Weight**	1.20 ± 0.05 kg	
3.3	**Cell Design**	Z-fold stacking method	
3.4	**Cell Orientation for Operation**	Vertical, horizontal, and side	Vertical: terminal on top; Horizontal: laying on large dimensions with terminals facing the side; Side: laying on small dimensions with terminals facing the side
3.5	**Certificates**	UN38.3, UL1973, UL1642, UL9540A	More certificates (IEC) underway

4.0 INSTALLATION, OPERATION, MAINTENANCE, AND HANDLING

4.1 Installation

1. The orientation of a cell in installation can be (1) vertical orientation with terminal on top; (2) horizontal orientation by laying on large dimensions with terminals facing to the side; (3) laying on small dimensions with terminals facing the side.

2. Each cell in a battery or power pack shall be strictly managed, controlled and protected by a qualified BMS.

3. Customer shall provide detailed information of the BMS, including but not limited to its design, features, setting, and data file format to C4V Gigafactory for design review and record keeping.

4. Once the detailed information of the BMS has been reviewed and agreed by C4V Gigafactory, customer shall not modify the design, features, setting or data file format of the BMS without the prior written agreement with C4V Gigafactory.

5. As a minimum requirement, the BMS shall include the monitoring and control functions in the following table, besides the specification defined in Chapter 3 of this document.

Item	Specification	Action
Stop charging	4.1 V	Charging stops by BMS when cell voltage reaches 4.1 V
Overcharge protection	4.25 V	Overcharge protection electronics must be in BMS
Stop discharging	3 V	Discharging stops by BMS when cell voltage reaches 3 V
Over-discharge protection	2.7 V	Over-discharge protection electronics must be in BMS
Short-circuit protection	—	Short circuit protection electronics must be in BMS
Over-current protection	120 A	Overcurrent protection electronics must be in BMS
Over-temperature protection	—	Stop charging and discharging by BMS when cell temperature is out of limit

6. The cells in battery design must take full consideration of the heat dissipation of the cell.

7. The cells in a battery module must be waterproof and dustproof, as defined in UL and IEC standards, to prevent corrosion of cells and connectors.

4.2 Operation

1. This cell is designed to deliver a finite service life. The customer shall develop and implement an active tracking system to monitor and record the internal resistance of each cell in its entire service life.

2. Customer shall ensure that the following application conditions are strictly obeyed.

(1) Customer shall procure that each cell shall be used under the strict monitoring, control and protection of a BMS.

(2) Customer shall keep relevant records of the BMS monitoring data throughout the entire service life of each cell.

(3) No warranty or liability claim will be considered without BMS diagnosis records (on a regular basis, and during maintenance) of the relevant product.

4.3 Maintenance

Always prevent draining any cell down to over-discharge state. The cell may be permanently damaged internally when the cell voltage is lower than 2.5 V, therefore this situation shall be strictly avoided.

After discharge cutoff in accordance with the specification in Section 3, the internal power consumption of the system should be reduced to a minimum to prolong the idle time before recharge. The cell installer should inform the users of the product to recharge the cells periodically to prevent over-discharge state.

The cells should avoid charging at a low temperature outside of the specification. The BMS should ensure in any case that the cells will charge above the minimum charging temperature.

4.4 Storage

The recommended temperature range for storage of the cells is -20 to 45°C. The cell can be safely in storage at a temperature between -20 to 25°C for 6 months. The cell will need to maintain charge if stored at > 25°C elevated temperatures for a prolonged time. When the cells are intended to be stored for a prolonged period of time (more than 6 months), the SOC of cells should be recharged to around 50% periodically. Recharge every three months is recommended.

4.5 Transportation

Lithium-ion cells or batteries are regulated as a hazardous material under the U.S. Department of Transportation's (DOT) Hazardous Materials Regulations (HMR; 49 C.F.R., Parts 171-180). The C4V Gigafactory lithium-ion cells or batteries must conform to all applicable HMR requirements when offered for transportation or transported by air, highway, rail, or water.

Each shipping carrier has their own rules for packaging and handling of lithium-ion cells during transportation. Those rules should be strictly followed.

5.0 SAFETY WARNINGS

1. Do not immerse cells into water.
2. Do not drop cells into fire.
3. Do not expose cells to any high temperature out of operation temperature range of Section 3. Shut down the system by BMS when the temperature is out of range.
4. Do not short-circuit cell terminals, otherwise high current and temperature may cause body injury or fire hazards.
5. Ample safety precautions should be implemented to avoid short circuit during system integration.
6. Always connect cell terminals with right polarity. Reverse charging should be strictly avoided.
7. No overcharge of a cell, which may cause overheating and fire hazards.
8. A timer should be implemented in the charger circuit and set up properly, to avoid overcharge.
9. Cells should be securely fixed to solid platform, and power cables should be securely attached by fastener to avoid accidental contact with conductors, which may cause arcing and sparks.
10. Do not package cells and electrical connections within plastic enclosure. Improper electrical connection within a battery may cause overheating.
11. When the electrolyte leaks, avoid skin and eye contact with the electrolyte. In case of contact with electrolyte, wash with plenty of water and seek assistance from a physician.
12. Fire or explosion may occur during cell abuse test. The test can only be carried out in a professional laboratory by certified personnel.