

NEWBATT

**PRODUCT
SPECIFICATION**

DOC NO. : CPS-A04- FFH4D3

REV. : A0

SHEET : 1 of 14

FFH4D3

PN: GT-SLF-FFH4D3-0902

Designed by	Product manager approval	Sales manager approval	Project manager approval	QA manager approval
Jin Z	Dylan Yu	Chen LG	Dong W	Huang JP

	Signature	Date
Customer Confirmation	Customer Code	
	Stamp	

Confidential : () Level3 () Level2 (√) Level1 ()

Requirements**FFH4D3 (A0 Edition)**

Specific requirements by the customer are stated below. This product of Newbatt Battary will be designed and manufactured accordingly to ensure the stated requirements to be satisfied.

	Requirement	Specification
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Customer Code: _____ **Signature:** _____ **Date:** _____

Content

Terms.....	5
1. Scope.....	6
2.Performance Specifications.....	6
2.1 Overview.....	6
2.2 Charge Mode & Specifications	7
2.3 Discharge Mode	7
2.4 Regenerate Pulse Charge Mode	8
2.5 Capacity at Low Temperature	8
2.6 Safety&Reliability	9
3. Temperature Rise	9
4. Storage Specifications	9
5. Termination of Battery Life	9
6. Working Conditions.....	9
7. Safety Precautions	11
8. Warnings& Hazards.....	12
9. Cell Design Drawing	13

Terms	Definition
Product	Referring to the 100Ah-3.2V-LFP secondary battery manufactured by Newbatt Battery.
Customer	Referring to the buyer in Sales Agreement.
Newbatt Battery	Referring to the seller in Sales Agreement.
PN	Referring to Part Number, a specific serial number given to a product manufactured for certain customer.
Battery Management System (BMS)	Referring to a monitoring system integrated in each battery pack and designed for monitoring, management and protection of battery cluster, which enhances safety application and prolongs battery life.
Ambient Temperature	Referring to the temperature of the air surrounding the battery.
Cell Temperature	Referring to the surface temperature of a battery cell typically captured by sensors of a BMS.
C-Rate	Referring to a measure of the rate at which a battery is discharged relative to its actual maximum capacity. A 0.5C rate means that the discharge current will discharge the entire battery in 2 hours.
Cycle	Referring to the number of complete charge/discharge cycles that the battery is able to support before that its capacity falls under 80% (or a criterion specified in <i>Sale Agreement</i>) of its original capacity.
Date of Manufacture	Referring to the date when a product is made, which is labeled on the top of each battery.
Open Circuit Voltage (OCV)	Referring to the voltage between the battery terminals with no load applied, which depends on the battery state of charge, increasing with state of charge.
Capacity Recovery	Referring to the discharge capacity which can be restored to a battery cell through various treatments, and which is the maximum result of at least 3 capacity tests carried out under the standard charge/discharge condition specified in 2.2.3, 2.3.1 and 2.3.5 and using the charge/discharge method specified in 2.2.3, 2.3.1 and 2.3.5.
Supply Agreement	Referring to the terms and conditions set by Newbatt Battery and the customer and under which Newbatt Battery will manufacture and supply products according to this specification.
Standard Charge Mode	Referring to the charge method stated in 2.2.3.
Standard Discharge Mode	Referring to the discharge method with a 30A discharge current stated in 2.3.1 or that with a minimum 2.5V OCV stated in 2.3.5.
Warranty	Referring to a specified period in which Newbatt Battery promise to repair or replace the product if necessary.
State of Charge (SOC)	Referring to the amount of charge remaining, as a percentage of the full charge, at a given moment.
Temperature Rise	Referring to the temperature rise of cells during charge or discharge under the standard charge/discharge condition specified in 2.2.3, 2.3.1 and 2.3.5.
Initial Status	Referring to the cell status within 7 days since its Date of Manufacture.

Units of Measurement

V— Volt
 A— Ampere
 Ah— Ampere-hour
 Wh— Watt-hour
 Ω — Ohm
 m Ω — MilliOhm
 $^{\circ}$ C— Degree Celsius
 mm— Millimetre
 s— Second
 Hz— Hertz

1. Scope

This product specification delivers the performance specifications, working conditions and safety risks of 3.2V-100Ah-LFP secondary battery (PN GT-SLF-FFH4D3-0902) manufactured by Newbatt Battery.

2. Performance Specifications

2.1 Overview

No.	Description/ Item	Specifications	Remarks
2.1.1	Nominal Capacity	100.0Ah	<ul style="list-style-type: none"> 1C Discharging Current Rate 25 \pm3 $^{\circ}$C
2.1.2	Minimum Capacity	100.0 Ah	<ul style="list-style-type: none"> 1C Discharging Current Rate 25 \pm3 $^{\circ}$C
2.1.3	Operating Voltage Range	2.50 - 3.65V	<ul style="list-style-type: none"> -15 $^{\circ}$C - 55 $^{\circ}$C
2.1.4	Initial Inner Resistance (1KHz)	\leq 0.40 m Ω	<ul style="list-style-type: none"> New Battery Status
2.1.5	Shipping Capacity	~30%Charging Status	
2.1.6	Storage Temperature	-30 ~ 55 $^{\circ}$ C	
2.1.7	Charge Temperature Range	-15 ~ 55 $^{\circ}$ C	<ul style="list-style-type: none"> Refer to 2.2
2.1.8	Discharge Temperature Range	-30 ~ 55 $^{\circ}$ C	<ul style="list-style-type: none"> Refer to 2.3
2.1.9	Weight	2.28 \pm 0.20Kg	<ul style="list-style-type: none"> N.A.

2.1.10	Energy Density	≥140 WH/Kg	25±3°C Standard Discharging Status
2.1.11	Dimensions	Refer to 9. Cell Design Drawing	• N.A.

2.2 Charge Mode & Specifications

No.	Description/ Item	Specifications	Remarks
2.2.1	Standard Charge Current	0.5C	25°C
2.2.2	Standard Charge Voltage	≤3.65V	
2.2.3	Standard Charge Mode	Using 0.5C Constant Current (CC) to charge to 3.65V, then Constant Voltage (CV) at 3.65V to charge until charge current reaches the lower limit of 3.0±0.5A.	
2.2.4	Standard Charge Temperature	25°C	Cell Temperature
2.2.5	Absolute Charge Temperature	0~55°C	Terminating charge process, once the cell temperature is beyond Absolute Charge Temperature.
2.2.6	Absolute Charge Voltage	≤3.8V	Terminating charge process, once the cell OCV is beyond Absolute Charge Voltage.

2.2.7 Other Charge Mode

Temp. (°C)	SOC: 0%	SOC: 10%	SOC: 20%	SOC: 30%	SOC: 40%	SOC: 50%	SOC: 60%	SOC: 70%	SOC: 80%	SOC: 90%	SOC: 95%	SOC: 100%
[-15~-10)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0
[-10~0)	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.08	0.08	0.06	0.05	0
[0~7)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.15	0.15	0.15	0.10	0
[7~15)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.40	0.30	0.20	0
[15~25)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.70	0.60	0.50	0.20	0
[25~35)	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.80	0.70	0.60	0.30	0
[35~45)	1.00	1.00	1.00	1.00	1.00	1.00	0.90	0.80	0.70	0.60	0.30	0
[45~50)	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.70	0.50	0.30	0.20	0
[50~55)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.45	0.40	0.20	0.15	0

2.3 Discharge Mode

No.	Description	Parameters	Remarks
2.3.1	Standard Discharge Current	50.0A	• 25±2°C
2.3.2	Maximum Continuous Discharge Current	50.0A	• N.A.
2.3.3	Maximum Discharge Long-Pulse Current	100.0A	• 2 minutes maximum
2.3.4	Maximum Discharge Short-Pulse Current	300.0A	• 10s maximum

2.3.5	Discharge cut-off Voltage	$\geq 2.5V$	• N.A.
2.3.6	Standard Discharge Temperature	$25 \pm 2^{\circ}C$	• Cell Temperature
2.3.7	Absolute Discharge Temperature	$-30 \sim 55^{\circ}C$	Regardless of the discharge mode, the discharge process should be terminated, once the cell temperature is beyond Absolute Discharge Temperature.

2.4 Regenerate Pulse Charge Mode

Regenerate Pulse Charge must be carried out under the circumstances stated below. Pulse current and duration need to be strictly controlled according to cell temperature and SOC. Any violation may cause permanent damage to batteries for which Newbatt Battery will be relieved from its liability.

2.4.1 The maximum regenerate pulse charge voltage 3.65V.

2.4.2 Regenerate pulse charge current and duration

SOC	Cell Temperature				
	$\leq 0^{\circ}C$	$0^{\circ}C \sim 10^{\circ}C$	$10^{\circ}C \sim 20^{\circ}C$	$20^{\circ}C \sim 55^{\circ}C$	$\geq 55^{\circ}C$
>95%	Prohibited	Prohibited	Prohibited	Prohibited	Prohibited
80%~95%	Prohibited	Prohibited	$\leq 1C / \leq 5s$	$\leq 1C / \leq 10s$	Prohibited
50%~80%	Prohibited	$\leq 1C / \leq 5s$	$\leq 1C / \leq 10s$	$\leq 1.5C / \leq 10s$	Prohibited
< 50%	Prohibited	$\leq 1.0C / \leq 10s$	$\leq 1.5C / \leq 10s$	$\leq 2.0C / \leq 10s$	Prohibited

2.4.3 Rest intervals between pulses ought to be no shorter than the pulse duration. Any charge current is prohibited during rest intervals, whereas discharge current or no current is allowed.

2.5 Capacity at Low Temperature (Initial Status)

No.	Description	Specifications	Remarks
2.5.1	Capacity at 25°C	$\geq 100.0Ah$	Charge/Discharge at $25 \pm 2^{\circ}C$
2.5.2	Capacity at 0°C	$\geq 87.1Ah$	Charge at $25 \pm 2^{\circ}C$ /Discharge at $0^{\circ}C$ with 1.0C (2.0~3.65V)
2.5.3	Capacity at -10°C	$\geq 78.5 Ah$	Charge at $25 \pm 2^{\circ}C$ /Discharge at $-10^{\circ}C$ with 1.0C (2.0~3.65V)
2.5.4	Capacity at -20°C	$\geq 74.2Ah$	Charge at $25 \pm 2^{\circ}C$ /Discharge at $-20^{\circ}C$ with 1.0C (2.0~3.65V)

2.6 Safety & Reliability

This product complies with the requirements of State-set mandatory standard of quality (GB/T 31485-2015) and of transportation (UN38.3).

3. Temperature Rise

During the measurement of temperature rise, battery cells should be set upright (according to 9. Cell Design Drawing) and placed in a large room with a stable temperature and enough convection. Temperature sensors should record both cell temperature and time. Temperature rise equals to cell temperature after discharge minus that before discharge.

No.	Description/ Item	Specifications	Remarks
3.1	Continuous Discharge Temperature Rise	$\leq 10^{\circ}\text{C}$	<ul style="list-style-type: none"> Discharge Current of 50.0A Duration of 2 hours
3.2	Pulse Discharge Temperature Rise	$\leq 5^{\circ}\text{C}$	<ul style="list-style-type: none"> Discharge Current of 300.0A Duration of 10s at any SOC

4. Storage Specifications

No.	Description/ Item	Specifications	Remarks
4.1	Capacity Recovery (Short-term)	$\geq 97.42\text{Ah}$	At initial status with 50% SOC, stored in a room with ambient temperature of 25°C for 60 days.
4.2	Capacity Recovery (Long-term)	$\geq 95.70\text{Ah}$	At initial status with 50% SOC, stored in a room with ambient temperature of 25°C for 183 days.
4.3	Absolute Storage Temperature	-30~55°C	N.A.
4.4	Capacity Retention	$\geq 80\%$ (3000 Cycles)	25 ±5°C, Standard Charging/Discharging 3000 Cycles

5. Termination of Battery Life

A customer should monitor and record the inner resistance of each battery cell. Both parties should agree on the method to measure inner resistance. When the inner resistance of a cell reaches 250% of that of its initial status, it should be terminated immediately. Any violation may cause safety hazards for which Newbatt Battery will be relieved from its liability.

6. Working Conditions

6.1 A BMS should be integrated in battery packs to ensure monitoring, management and protection of each battery cell. 6.2

A customer should provide BMS requirements, such as system specifications, framework, data and format, so Newbatt Battery would deliver BMS design and establish battery management profile accordingly.

6.3 Without the consent of Newbatt Battery, no changes may be made to BMS design or framework.

6.4 Operation data of battery should be recorded for responsibility determination of product quality. Incomplete operation data will relieve Newbatt Battery from its liability for battery quality.

6.5 A BMS should have the following primary functions.

No.	Description	Specifications	Protections
6.5.1	Charge cut-off Voltage	3.65V	Terminating charge process when cell OCV reaches 3.65V.
6.5.2	First Over-charge Protection	$\geq 3.8V$	Limiting charge current to 0 when cell OCV reaches 3.8V.
6.5.3	Second Over-charge Protection	$\geq 4.0V$	Limiting charge current to 0 when cell OCV reaches 4.0V. Locking BMS before the problem is identified and resolved.
6.5.4	Discharge cut-off Voltage	2.5V	Terminating discharge process when cell OCV reaches 2.5V.
6.5.5	First Over-discharge Protection	2.0V	Limiting discharge current to 0 when cell OCV reaches 2.0V.
6.5.6	Second Over-discharge Protection	1.5V	Limiting discharge current to 0 when cell OCV reaches 1.5V. Locking BMS before the problem is identified and resolved.
6.5.7	Short Circuit Protection	Prohibit Short Circuit	Cutting off overcurrent devices (fuses, circuit breakers).
6.5.8	Overcurrent Protection	Referring to 2.3	Limiting current within specified range according to 2.3.
6.5.9	Overheating Protection	Referring to 2.2 & 2.3	Terminating charge/discharge process when cell temperature is beyond the limits specified in 2.3 & 2.3.
6.5.10	Charging Time Protection	$\leq 8h$	Terminating charge process when charging time exceeds 8 hours.

Note 6.5.2, 6.5.3, 6.5.5, and 6.5.6 are warnings. Batteries are out of working condition in these cases and should be segregated and protected by the BMS or the customer. Newbatt Battery will be relieved from liability for quality issues and subsequent damage (to the customer or to a third party) caused by the abuse of batteries stated in 6.5.2, 6.5.3, 6.5.5, and 6.5.6.

6.6 Cell OCV below 1.5V may cause permanent damage to the battery for which Newbatt Battery will be relieved from

liability. According to 2.3.5, when discharge cut-off voltage is lower than 2.5V, the rest interval should be prolonged before

the next charge.

6.7 If batteries are to be stored beyond 30 days, they should be charged to at least 50% SOC.

6.8 According to 2.2, charging at low temperature is prohibited regardless of the charge mode. Any violation may considerably lower the battery capacity, for which Newbatt Battery will be relieved from liability. The BMS should monitor and manage the ambient temperature according to the temperature range of standard charge and regenerate charge.

6.9 Batteries should be placed in a container with enough convection or other effective cooling system.

Otherwise, Newbatt Battery will be relieved from liability for quality issues and subsequent damage (to the customer or to a third party) caused by overheating of batteries.

6.10 Batteries should be placed in a container which complies with the requirements of State-set standard of waterproof and dustproof. Otherwise, Newbatt Battery will be relieved from liability for quality issues and subsequent damage (to the customer or to a third party) caused by corrosion of batteries

7. Safety Precautions

7.1 Prevent batteries from being immersed in water.

7.2 Prevent batteries from fire or overexposure to any high temperature environment specified in 2.1.7 & 2.1.8. Cell temperature should never exceed 55°C or the BMS should shut down the battery system.

7.3 Prevent direct connection between the positive and negative terminal of a cell. The resulting short circuit could damage the product and generate heat that can cause burns. Special caution is required to prevent short circuiting any battery since the consequences can be very dangerous. Care must be taken during the installation of the battery pack to ensure batteries cannot be inserted in reverse. Also, caution must be given to prevent accidental short-circuiting of the battery.

7.4 Never reverse charge for it causes rapid gas generation and increased gas pressure, thus causing batteries to swell or rupture.

7.5 Prevent batteries from overcharge. A BMS should provide overcharge protection specified in 6.5.3 and 7.11.

7.6 Never leave the battery in the charger once it is fully charged. A timer is required to cut off the battery from the charger should charging time exceed 8 hours (6.5.10 & 7.11) or batteries may overheat and cause fire.

7.7 Avoid flame or sparks that could ignite the hydrogen gas produced by the battery and cause an explosion. Connection and disconnection of cables to battery terminals is one of the most common causes of sparks.

7.8 Avoid using airtight battery compartments. In some cases, gases (oxygen, hydrogen) may be given off, and there is a danger of the batteries bursting or rupturing in the presence of a source of ignition (sparks generated by a motor switch, etc.).

7.9 Wear eye protection when working around batteries and prevent eyes and skin from contacting electrolyte. Batteries contain corrosive acid and produce explosive gas as a byproduct of their operation. Acid on the skin should be neutralized with a solution of baking soda and water made into a paste. In case acid contacts eyes, flush with clear water and seek medical attention immediately.

7.10 Prevent batteries from vibration, collision and crush to preempt short circuit caused by distortion.

7.11 Prevent batteries from improper termination of charge, including overtime termination (6.5.10), overvoltage termination (6.5.2 & 6.5.3) and overcurrent termination (6.5.8). Improper termination of charge may occur when the battery system malfunctions. Any charging process regardless of the charge mode should be terminated before the problem is identified and resolved. The BMS should limit charge current to 0 or lock down the battery system to preempt further charging process, while also delivering warning messages to operators.

7.12 The test described in 2.6, if incorrectly performed, may cause fire or explosion, and thus requires professionals with proper equipment and laboratory.

8. Warnings & Hazards

8.1 Warning Notice

Warning

Due to various hazards, precautions must be taken when operating and maintaining the battery system.

The test described in 2.6, if incorrectly performed, may cause fire or explosion.

Proper protective equipment is needed to operate the battery system.

Battery system maintenance requires professionals with effective safety training.

8.2 Types of hazard

The customer should acknowledge the following types of hazards in battery operation.

8.2.1 Shock hazards occur when electric current passes through a person. Shocks range in severity from painful, but otherwise harmless, to heart-stopping lethality.

8.2.2 Chemical hazard caused by exposure to electrolyte.

8.2.3 Thermal hazards occur when electric power causes undesired heating effects whenever electric energy is converted to thermal energy at a rate faster than it can be safely dissipated.

9. Cell Design Drawing

<p>郑重声明： 本公司对本文件（含相关附件）中包含的产品设计方案，包括但不限于文字、图形、表格等享有完全、独立的知识产权，受中国《著作权法》及相关法律规定的保护。本文件（含相关附件）中所包含的设计方案和思路仅供接受人当前案例和我公司探讨确认使用。未经本公司书面授权，任何人不得将上述产品设计方案内容以任何方交给第三方使用，否则，本公司有权追究其侵权责任，并要求承担因此造成的全部经济损失。</p>					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <th style="width:5%;">修改记录</th> <th style="width:5%;">项次</th> <th style="width:55%;">修改内容</th> <th style="width:35%;">修改日期</th> </tr> <tr> <td>1</td> <td></td> <td></td> <td></td> </tr> <tr> <td>2</td> <td></td> <td></td> <td></td> </tr> <tr> <td>3</td> <td></td> <td></td> <td></td> </tr> </table>					修改记录	项次	修改内容	修改日期	1				2				3																																											
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<p>Technical requirements</p> <p>一、Material of can and terminal Can: AL3003-H14 Positive terminal: AL1060-H112 Negative terminal: Cu T2/AL1060-H112;</p> <p>二、Fuction</p> <p>1、The bursting pressure of the vent: 0.4Mpa~0.8Mpa; 2、Insulating resistance better than 1Gohm&500V, Dielectric strength: DC 3150V、AC 2230V; 3、Flame class of plastic is over UL94HB 4、The cell meet ROHS requiement</p>					<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:10%;">未注公差尺寸</td> <td style="width:10%;">制图:</td> <td colspan="3" style="width:30%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> <td style="width:10%;"></td> </tr> <tr> <td>>=20</td> <td>±0.05 ±0.10 ±0.20</td> <td>设计:</td> <td colspan="2"></td> <td>单位:</td> <td>MM</td> <td>零件名称:</td> </tr> <tr> <td>20-100</td> <td>±0.10 ±0.15 ±0.30</td> <td>审核:</td> <td colspan="2"></td> <td>数量:</td> <td></td> <td>零件图号:</td> </tr> <tr> <td>100-300</td> <td>±0.15 ±0.20 ±0.50</td> <td>核准:</td> <td colspan="2"></td> <td>表面处理:</td> <td></td> <td>设备名称:</td> </tr> <tr> <td>300-500</td> <td>±0.20 ±0.30 ±0.80</td> <td>比例:</td> <td>1:2.5</td> <td></td> <td>组件</td> <td></td> <td>设备编号:</td> </tr> <tr> <td>>=500</td> <td>±0.30 ±0.50 ±1.00</td> <td>材料:</td> <td colspan="2"></td> <td>日期:</td> <td></td> <td>页码:</td> </tr> <tr> <td>尺寸精度</td> <td>.xx .x .x</td> <td>日期:</td> <td colspan="2"></td> <td>页面尺寸:</td> <td>A4</td> <td>1/1</td> </tr> </table>					未注公差尺寸	制图:							>=20	±0.05 ±0.10 ±0.20	设计:			单位:	MM	零件名称:	20-100	±0.10 ±0.15 ±0.30	审核:			数量:		零件图号:	100-300	±0.15 ±0.20 ±0.50	核准:			表面处理:		设备名称:	300-500	±0.20 ±0.30 ±0.80	比例:	1:2.5		组件		设备编号:	>=500	±0.30 ±0.50 ±1.00	材料:			日期:		页码:	尺寸精度	.xx .x .x	日期:			页面尺寸:	A4	1/1
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Requirements

FFH4D3 (A0 Edition)

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