



Hefei Guoxuan High-Tech Power Energy Co., Ltd.

Number

Q/GX 024-2018

Title :

IFP28148115A-52Ah Lithium-ion Battery Product Specification

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IFP28148115A-52Ah Lithium-Ion Battery Product Specification

Lay down		Examine and verify		Ratify
Zhuang Huajie				
Standardization		Countersign		

Date of issue

Material date

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Preface

This standard is the enterprise standard implemented uniformly by the company.

The drafting format of this standard complies with the provisions of GB/T 1.1-2009 "Guidelines for Standardization Work Part 1: Structure and Drafting of Standards".

Based on references to GB/T 31484-2015 "Cycle Life Requirements and Test Methods for Power Batteries for Electric Vehicles", GB/T 31485-2015 "Safety Requirements and Test Methods for Power Batteries for Electric Vehicles", GB/T 31486-2015 "Electrical Performance Requirements and Test Methods for Power Batteries for Electric Vehicles", and Q/GX 003-2015 "Technical Specifications for Lithium-ion Power Batteries for Electric Vehicles", this standard Q/GX 021-2018 "Product Specification for IFP28148115A-52Ah Lithium-ion Battery" has been formulated by our company, incorporating practical product specifications and testing conditions. The document revises and supplements test methods and evaluation criteria to guide the manufacturing and acceptance processes of IFP28148115 A-52Ah lithium-ion battery products.

This standard was proposed and drafted by the Battery Research Institute.

This standard is administered by the Standards and Regulations Department.

The primary drafters of this standard are: Zhang Bao and Miao Meng.



Revision History

Version number	Change content	Revision date	Expurgator
Q/GX 024-2018	First release		

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1 Scope

This product specification document defines the performance requirements, testing methods, inspection rules, labeling, packaging, transportation, and storage requirements for the IFP28148115A-52Ah lithium-ion battery.

This product specification document applies to the IFP28148115A-52Ah lithium-ion battery manufactured by the company.

2 Normative Reference Document

The clauses in the following documents shall become part of this standard by reference. However, parties reaching agreements under this standard are encouraged to investigate whether the latest versions of these documents may be utilized. For references without dates, the latest versions shall apply to this standard.

GB/T 2900.41 Electrical Terms: Primary Batteries and Accumulators

GB/T 19596 Electric Vehicle Terminology

GB/T 31484-2015 Requirements and Test Methods for Cycle Life of Power Batteries for Electric Vehicles

GB/T 31485-2015 Safety Requirements and Test Methods for Power Batteries for Electric Vehicles

GB/T 31486-2015 Electrical Performance Requirements and Test Methods for Power Batteries for Electric Vehicles

Q/GX 003-2015 Technical Specification for Lithium-ion Power Batteries for Electric Vehicles

3 Terms and Definitions

3.1 C rate current: Abbreviated as C, where 1C denotes the current for charging and discharging the battery at a 1-hour rate, and 3C indicates the current for charging and discharging at a 1/3-hour rate.

3.2 DC internal resistance: Under room temperature ($25^{\circ}\text{C} \pm 2^{\circ}\text{C}$) and 50% SOC conditions, discharge the battery with maximum pulse current for 10 seconds. Calculate the voltage and current changes before and after discharge, then divide the difference in voltage change by the difference in current change to obtain the DC internal resistance.

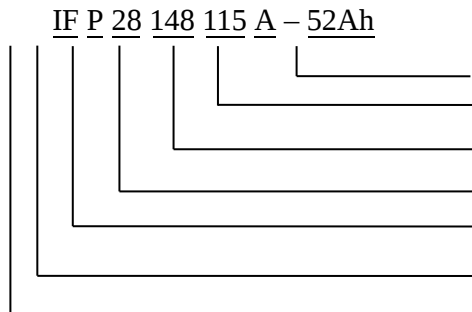
3.3 Maximum continuous charging current: The maximum current that a battery can sustain at a specified temperature to ensure normal operation.

3.4 Maximum continuous discharge current: The maximum current that a battery can discharge continuously at a specified temperature to ensure normal operation.

3.5 Constant-current charging capacity ratio: The ratio of the battery's charging capacity when charged at a specific rate to 3.65V under room temperature and 0% SOC conditions, compared to the charging capacity obtained using standard charging methods.

3.6 Cold start power: The maximum 2-second pulse discharge power of the battery at -20°C and 50% SOC.

3.7 Product model meaning:



Represents the rated capacity of the battery, indicates the aluminum material of the battery casing, and specifies the battery height dimension.

Representing battery width dimension

The thickness dimension represents the battery's shape, which is square.

The representative cathode material for batteries is lithium iron phosphate.

4 Fundamental Characteristics

Table 1 Basic Performance

Project	Specifications	Remarks
4.1 surface	No rupture, scratches, deformation, stains, or electrolyte leakage	
4.2 size	(28±0.5)mm*(148±0.3)mm* (115±0.3)mm	For details, see Appendix A.1.
4.3 weight	(950±15)g	
4.4 nominal voltage	3.2V	1/3C
	3.13V	1C
4.5 interior resistance of communication	(0.5~1.0)mΩ	
4.6 Direct current internal resistance	≤2.5mΩ	50%SOC
4.7 rated capacity	53.5Ah	1/3C
	52Ah	1C
4.8 working voltage	2.0V~3.65V	
4.9 Cell thickness	(28±0.5)mm	
4.10 energy density	180Wh/kg	1/3C
	170Wh/kg	1C

5 Electrical Properties

5.1 charging performance

Table 2 Charging Performance

Project	Specifications	Remarks
5.1.1 Maximum continuous charging current	0.1C	0℃~5℃ 0%SOC~80%SOC
	0.5C	5℃~15℃ 0%SOC~100%SOC
	1.0C	15℃~35℃ 0%SOC~100%SOC
	0.5C	35℃~55℃ 0%SOC~100%SOC

5.1.2 Maximum allowable charging voltage	3.9V	
5.1.3 Maximum allowable charging temperature range	0℃～55℃	

Table 2 Charging Performance (continued)

Project	Specifications	Remarks
5.1.4 Optimal charging temperature range	10℃～35℃	
5.1.5 Constant Current Charging Capacity Ratio	>95%	1C

5.2 Discharge Performance

Table 3 Discharge Performance

Project	Specifications	Remarks
5.2.1 Maximum continuous discharge current	1C	Temperature rise ≤15℃ (25℃)
5.2.2 minimum allowable discharge voltage	1.8V	Below the lower discharge voltage of 0℃
5.2.3 maximum allowable discharge temperature range	-30℃～55℃	
5.2.4 Optimal discharge temperature range	10℃～35℃	
5.2.5 room temperature discharge capacity	≥52Ah	
5.2.6 high temperature discharge capacity	≥52Ah	55℃, 1C
5.2.7 Low-temperature discharge capacity/energy retention rate	≥90% / ≥80%	0℃, 1C, cutoff voltage 1.8V
	≥85% / ≥70%	-10℃, 1C, cutoff voltage 1.8V
	≥80% / ≥60%	-20℃, 1C, cutoff voltage 1.8V
	≥70% / ≥50%	-30℃, 1C, cutoff voltage 1.8V
5.2.8 rate discharge capacity retention rate	≥95%	25℃, 2C
5.2.9 charge-discharge energy efficiency	≥90%	25℃, 1C

5.3 Power Performance

Table 4 Power Performance

Project	Specifications	Remarks
5.3.1 mass power density	≥1300W/kg	50%SOC, 25℃
5.3.2 volume power density	≥2500W/L	50%SOC, 25℃
5.3.3 maximum discharge power	1300W	50% SOC, 25℃, see 7.10
5.3.4 maximum feedback power	600W	50% SOC, 25℃, see 7.10
5.3.5 cold start power	60W	50%SOC, -20℃

5.4 Battery Life

Table 5 Battery Life

Project	Specifications	Remarks
5.4.1 standard cycle life	≥3000 times	25°C, 0.5°C/1°C, see 7.12
	≥2000 times	25°C, 1C/1C, see 7.12
5.4.2 high temperature cycling life	≥1500 times	45°C, 1C, see 7.12
	≥800 times	55°C, 1C, see 7.12
5.4.3 Calendar lifespan	≥10 years	Refer to Q/GX 003-2015, 5.1.18

5.5 Memory Property

Table 6 Storage Performance

Project	Specifications	Remarks
5.5.1 Optimal storage temperature range	10°C ~ 35°C	
5.5.2 self-discharge rate	≤4%	25°C, 28 days
5.5.3 Room temperature charge retention rate	≥96%	25°C, 28 days, refer to 7.8
5.5.4 room temperature volume recovery rate	≥97%	
5.5.5 high temperature charge retention	≥95%	55°C, 7 days, refer to 7.8
5.5.6 High Temperature Capacity Recovery Rate	≥96%	
5.5.7 Storage capacity recovery rate	≥95%	45°C, 50% SOC, 28 days

6 Safety Performance

Table 7 Safety Performance

Project	Specifications	Remarks
6.1 overdischarge	Non-explosive, non-flammable, and non-leaking	GBT 31485-2015
6.2 over-charging	Non-explosive and non-flammable	GBT 31485-2015
6.3 short	Non-explosive and non-flammable	GBT 31485-2015
6.4 decline	Non-explosive, non-flammable, and non-leaking	GBT 31485-2015
6.5 heat	Non-explosive and non-flammable	GBT 31485-2015
6.6 crimp	Non-explosive and non-flammable	GBT 31485-2015
6.7 sea immersion	Non-explosive and non-flammable	GBT 31485-2015
6.8 temperature cycle	Non-explosive, non-flammable, and non-leaking	GBT 31485-2015
6.9 cyclone	Non-explosive, non-flammable, and non-leaking	GBT 31485-2015

7 Test Method

7.1 Testing Environment

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Unless otherwise specified, the battery testing environment conditions are as follows: temperature 25°C ±2°C, relative humidity 25%–85%, and atmospheric pressure 86 kPa–106 kPa. Battery charging follows Method 7.2, while battery discharging follows Method 7.3. The room temperature mentioned in this standard refers to 25°C ±2°C. 7.2 Standard charging At room temperature (25°C ±2°C), the monomer battery was discharged at a current of 1C until the voltage reached 2.0 V, followed by a 1-hour resting period. Subsequently, it was charged at a current of 1C until the voltage reached 3.65 V, after which constant-voltage charging was initiated until the charging current decreased to 0.05C, at which point charging was stopped. The battery was then left resting for 1 hour post-charging. 7.3 standard discharge First, charge the battery according to Section 7.2. At room temperature, discharge the single-cell battery at 1C current until the voltage reaches 2.0V. 7.4 Direct current internal resistance Charge according to method 7.2. After discharging at 1C current for 30 minutes at room temperature, discharge at 5C current for 10 seconds. Calculate the voltage and current changes before and after discharge, then divide the difference in voltage change by the difference in current change. 7.5 Low Temperature Discharge Capacity Charge according to method 7.2; store at the temperature specified in 5.2.8 for 20 hours; discharge at 1C current at the corresponding temperature until 1.8V. Use this method to test the discharge capacity at different temperatures. 7.6 high temperature discharge capacity Charge according to method 7.2; store at 55°C ± 2°C for 5 hours; discharge at 1C current at 55°C ± 2°C until 2.0 V to obtain high-temperature discharge capacity. 7.7 Room temperature rate charge-discharge capacity At room temperature, discharge was performed according to method 7.3, followed by constant-current charging at specified rates up to 3.65 V to obtain charging capacities at different rates. Similarly, charging was conducted using method 7.2 at room temperature, with discharge performed at specified rates down to 2.0 V to determine discharge capacities at various rates. 7.8 Charge retention rate, self-discharge rate, and capacity recovery rate Charge according to method 7.2, store at room temperature for 28 days or at 55°C ± 2°C for 7 days, then discharge at 1C current to 2.0V to obtain the discharge capacity. The ratio of the discharge capacity to the initial capacity is defined as the charge retention rate. The recovery capacity is obtained by charging and discharging according to 7.2 and 7.3 respectively, and the ratio of the recovery capacity to the initial capacity is the capacity recovery rate. The difference between the room temperature capacity recovery rate and the room temperature charge retention rate is defined as the battery self-discharge rate.		

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7.9 storage recovery rate					
The storage capacity recovery rate was calculated by the ratio of the discharge capacity obtained after charging according to method 7.2 and discharging according to method 7.2 at room temperature with 1C current for 30min to 2.0V at 45°C±2°C for 28 days.					
7.10 Maximum discharge power and maximum feedback power					
The discharge capacities at different temperatures were determined according to Methods 7.3, 7.5, and 7.6, which served as the calculation criteria for State of Charge (SOC) at various temperatures. After charging using Method 7.2, samples were left at test ambient temperatures for specified durations (>0°C: 5 hours; ≤0°C: 20 hours). The SOC was adjusted to 90% through 1C current discharge followed by 1-hour static rest. Subsequently, maximum 5C current pulses were applied at ambient temperature for 10 seconds with 40-second intervals, followed by 10-second charging at permissible 3.75C current pulses. The SOC was sequentially reduced to 80%,70%, and 10% using 1C current to evaluate pulse charge-discharge performance. Process data were recorded, and maximum discharge power and maximum feedback power at different temperatures and SOC levels were calculated using the DC internal resistance and pulse power formulas specified in the High Power Pulse Charging (HPPC) testing methodology.					
7.11 cold start test					
Charge according to method 7.2, discharge at 1C current to 50% SOC at room temperature, then place the battery in a-20°C environment for 20 hours. Subsequently, discharge at 5 kW/BSF power for 2 seconds under-20°C conditions, followed by a 10-second rest period. Repeat this cycle 3 times (BSF reference: Q/GX 003-2015,5.1.15).					
7.12 Standard Cycle Life and High-Temperature Cycle Life					
7.12.1 standard cycle life					
The battery is charged at a constant current of 1C (or 0.5C) to 3.65V under room temperature conditions, then switched to constant voltage charging until the current drops to 0.05C, followed by a 10-minute rest period. Subsequently, it is discharged at a current of 1C to 2.0V. After repeating this cycle 500 times, the discharge capacity should not be less than 93% or 95% of the rated capacity (for 0.5C charging), or the discharge capacity should not be less than 80% of the rated capacity after 2000 or 3000 cycles (for 0.5C charging).					
7.12.2 45°C cycle life					
The battery is charged at 45°C with a constant 1C current until reaching 3.65V, then switched to constant voltage charging until the current drops to 0.05C for cutoff. After a 10-minute rest period, it is discharged at 1C current to 2.0V. After 1500 cycles, the discharge capacity should not be less than 80% of the rated capacity.					
7.12.3 55°C cycle life					

The battery is charged at 1C constant current to 3.65V under 55°C conditions, then switched to constant voltage charging until the current drops to 0.05C. After 10 minutes of rest, it is discharged at 1C current to 2.0V. When this cycle is repeated 800 times, the discharge capacity should not be less than 80% of the rated capacity.

8 Test Rule

8.1 The test items shall be specified in Table 8.

Table 8 Test Items

Test type	Inspecting item	Amount of inspection
Exempted items	4.4 nominal voltage 4.8 working voltage 5.1.3 Maximum allowable charging temperature range 5.2.3 Minimum allowable discharge voltage 5.2.5 Optimal discharge temperature range 4.7 Rated Capacity 5.1.2 Maximum allowable charging voltage 5.1.4 Optimal charging temperature range 5.2.4 Maximum allowable discharge temperature range 5.5.1 Optimal storage temperature range	/
Factory inspection	4.1 surface 5.2.6 room temperature discharge capacity 4.5 AC Internal Resistance 5.5.2 Self-discharge rate	100%
	4.2 size 4.3 Weight	160 Per Batch
Type test	Other indicators excluding exempted items and factory inspection items: 4.6 Direct current internal resistance 5.1.1 Maximum continuous charging current 5.2.1 Maximum continuous discharge current 5.2.7 high temperature discharge capacity 5.2.9 Rate discharge capacity retention rate 5.3.1 Mass Power Density 5.3.2 volume power density 5.3.4 maximum feedback power 5.4.2 high temperature cycling life 5.5.3 Room temperature charge retention rate 5.5.5 high temperature charge retention 5.5.7 Storage capacity recovery rate 6.2 over-charging 6.4 decline 6.6 crimp 6.8 temperature cycle 5.1.6 Constant Current Charging Capacity Ratio 5.2.2 Maximum Pulse Discharge Current 5.2.8 Low-temperature discharge capacity/energy retention rate 5.3.3 Maximum Discharge Power 5.3.5 Cold Start Power 5.4.3 Calendar Life 5.5.4 Room Temperature Capacity Recovery Rate 5.5.6 High Temperature Capacity Recovery Rate 6.1 Overdischarge 6.3 Short Circuit 6.5 Heating 6.7 Seawater immersion 6.9 Low Pressure	2 Only item

8.2 type test

8.2.1 Type testing shall be conducted for the product under any of the following circumstances:

- New product launch and transition of existing product production;
- Transfer to another facility;

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c) reproducing after more than one year of suspension; d) Significant changes in structure, process, or materials. 8.2.2 criterion rule If any item fails in type test, the whole product shall be deemed as unqualified. 9 Labeling, Packaging, Transportation, and Storage 9.1 sign Each product should have a clear bar code. 9.2 pack All products shall be equipped with outer packaging to ensure they are protected from mechanical damage during transportation, handling, and storage. 9.3 transport Violent handling during transportation must be strictly prohibited to prevent severe vibration, impact, or compression, as well as exposure to sunlight and rain. 9.4 keep in storage Products not opened should be stored in a clean, dry, and well-ventilated warehouse with ambient temperature ranging from-10°C to 30°C and relative humidity ≤75%. The warehouse should be free from corrosive gases. The products must be kept away from sources of ignition and heat. Regular charging cycles should not exceed 2 months.					

Appendix A
(Normative Appen-
dix) Battery Dime-
nsion Diagram

A.1 The battery size is shown in Figure A.1.

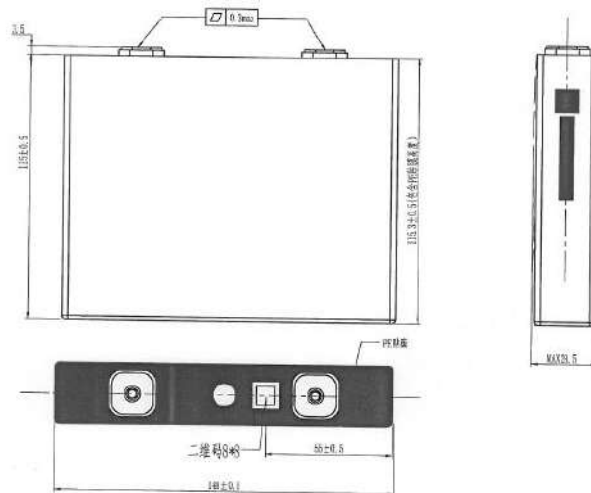


Figure A.1 Battery size diagram