# Product Specification

## IFP27175200A-105Ah

### 1 Scope

This product specification specifies the performance requirements, test methods, inspection rules, marking, packaging, transportation and storage requirements of the IFP27175200A-105Ah lithium-ion battery.

This product specification applies to the IFP27175200A-105Ah lithium-ion battery produced by the company.

### 2 Normative references

The clauses in the following documents have become clauses of this standard after being quoted in this standard. However, all parties that have reached an agreement based on this standard are encouraged to study whether the latest versions of these documents can be used. For undated reference documents, the latest version is applicable to this standard.

GB/T 2900.41 Electrician terminology primary batteries and accumulators

GB/T 19596 Terminology for Electric Vehicles

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 traction batteries for electric vehicles

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

### 3 terms and definitions

3.1 Rate current: the abbreviation C, 1C represents the current when the battery is charged and discharged at a rate of 1 hour, and 3C represents the current when the battery is charged and discharged at the rate of 1/3 hour.

3.2 DC internal resistance: the battery is discharged at the maximum pulse current for 10s at room temperature (25°C±2°C) and 50% SOC. The voltage and current changes before and after the discharge are calculated, and then the difference in voltage change is divided by the current The difference of the change is the DC internal resistance.

3.3 Maximum continuous charging current: The maximum current allowed for continuous charging of the battery under the specified temperature to ensure the normal operation of the battery.

3.4 Maximum continuous discharge current: The maximum current allowed for continuous discharge of the battery under the specified temperature to ensure the normal operation of the battery.

3.5 Constant current charging capacity ratio: the ratio of the charging capacity of the battery at a constant current charge to 3.65V at a certain rate under the conditions of room temperature and 0% S0C to the charging capacity under the standard charging method.

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

3.7 Product model meaning: IFP27175200A - 105Ah

105-represents the rated capacity of the battery

A-represents that the battery case is made of aluminum

200-represents the height of the battery

175-represents the width of the battery

27-represents the thickness of the battery

P- represents the battery shape is square

IF-represents the battery cathode material is lithium iron phosphate

### 4 basic performance

| Project | Specification | Remark |
|---|---|---|
| 4.1 Appearance | No cracks, scratches, deformation, stains, electrolyte leakage, etc. | |
| 4.2 size | (27±0.5)mm*(175±0.3)mm* (200 ±0.3) mm | See Appendix A. 1 for details |
| 4.3 Weight | (2060±50)g | |
| 4.4 Nominal voltage | 3.2V | |
| 4. 5 AC internal resistance | (0. 4—0.7)mQ | |

| | | |
|---|---|---|
| 4.6 DC internal resistance | Wl. 5mG | 50%SOC |
| 4.7 Rated capacity | 105Ah | |
| 4.8 Working voltage | 2. 0V~3. 65V | |
| 4.9 Cell thickness | (27±0.5)mm | |
| 4. 10 Energy Density | 163Wh/kg | |

## 5 Electrical performance

### 5.1 Charging performance

| project | Specification | Remark |
|---|---|---|
| 5. 1. 1 Maximum continuous charging current | 0.1C | 0°C~5°C 0%SOC~80%SOC |
| | 0.5C | 5 °C ∽15 °C 0%SOC ∽100%SOC |
| | 1.0C | 15°C ∽35°C 0%SOC~100%SOC |
| | 2. 0C | 15°C~35°C 0%SOC~80%SOC |
| | 0.5C | 35°C~55°C 0%S0C~100%S0C |
| 5.1.2 Maximum allowable charging voltage | 3. 9V | |
| 5.1.3 Maximum allowable charging temperature range | 0 °C ∽55 °C | |
| 5.1.4 Best charging temperature range | 10°C ∽35°C | |
| 5.1.5 Constant current charging capacity ratio | >90% | 2C |

### 5.2 Discharge performance

| Project | Specification | Remark |
|---|---|---|
| 5. 2. 1 Maximum continuous discharge current | 2C | Temperature rise<15°C (25°C) |
| 5. 2. 2 Maximum pulse discharge current | 5C (10S) | Battery surface temperature W45C, duration 10s, (under 25°C condition) |
| 5.2.3 Minimum allowable discharge voltage | 1.8V | Lower than 0C discharge lower limit voltage |
| 5. 2.4 Maximum allowable discharge temperature range | -30°C ∽60C | |
| 5. 2. 5 Optimal discharge temperature range | 10 °C ∽35 °C | |
| 5. 2. 6 Room temperature discharge capacity | ≥105Ah | |
| 5. 2. 7 High temperature discharge capacity | ≥105Ah | 55°C, 1C |
| 5. 2. 8 Low temperature discharge capacity/energy retention rate | ≥90% / ≥80% | 0°C, 1C, cut-off voltage 1.8V |
| | ≥85% / ≥70% | -10°C, 1C, cut-off voltage 1.8V |
| | ≥80% / ≥60% | -20°C, 1C, cut-off voltage 1.8V |
| | ≥70% / ≥50% | -30°C, 1C, cut-off voltage 1.8V |
| 5. 2. 9 rate discharge capacity retention rate | ≥95% | 25°C, 2C |
| 5. 2. 10 Charge and discharge energy efficiency | ≥90% | 25°C, 1C |

### 5.3 Power performance

| project | Specification | Remark |
|---|---|---|
| 5. 3. 1 Mass power density | ≥1300W/kg | 50%S0C, 25°C |
| 5. 3. 2 Volume power density | ≥2500 W/L | 50%SOC, 25°C |
| 5. 3. 3 Maximum discharge power | 2500W | 50%SOC, 25°C, see 7. 10 |
| 5.3.4 Maximum feedback power | 1400W | 50%SOC, 25°C, see 7. 10 |
| 5. 3. 5 Cold start power | 60W | 50%S0C, -20°C |

### 5.4 Battery life

| Project | Specification | Remark |
|---|---|---|
| 5. 4. 1 Standard cycle life | >3000 times | 25°C, 1C, see 7.12 |
| 5.4.2 High temperature cycle life | ≥1500 times | 45°C, 1C, see 7.12 |
| | ≥800 times | 55°C, 1C, see 7.12 |
| 5.4.3 Calendar life | ≥10 years | See Q/GX 003-2015, 5. 1. 18 |

## 5. 5 Storage performance

| Project | Specification | Remark |
|---|---|---|
| 5.5. 1 Optimal storage temperature range | 10°C~30°C | |
| 5.5.2 Self-discharge rate | ≤4% | 25°C, 28 days |
| 5. 5. 3 Room temperature charge retention rate | ≥96% | 25C, 28 days, refer to 7.8 |
| 5. 5.4 Room temperature capacity recovery rate | ≥97% | |
| 5. 5. 5 High temperature charge retention rate | ≥95% | 55°C, 7 days, refer to 7. 8 |
| 5. 5. 6 High temperature capacity recovery rate | ≥96% | |
| 5. 5.7 Recovery rate of storage capacity | >95% | 45°C, 50%S0C, 28 days |

## 6 safety performance

| project | Specification | Remark |
|---|---|---|
| 6.1 Over discharge | No explosion, no fire, no leakage | GBT 31485-2015 |
| 6.2 Overcharge | No explosion, no fire | GBT 31485-2015 |
| 6.3 Short circuit | No explosion, no fire | GBT 31485-2015 |
| 6.4 drop | No explosion, no fire, no leakage | GBT 31485-2015 |
| 6.5 heating | No explosion, no fire | GBT 31485-2015 |
| 6.6 Squeeze | No explosion, no fire | GBT 31485-2015 |
| 6.7 Sea water immersion | No explosion, no fire | GBT 31485-2015 |
| 6.8 Temperature cycle | No explosion, no fire, no leakage | GBT 31485-2015 |
| 6.9 Low air pressure | No explosion, no fire, no leakage | GBT 31485-2015 |

## 7 Test methods

### 7.1 Test environment

Unless otherwise noted, the battery test environment conditions are: temperature 25°C±2°C, relative humidity 25%≈85%, atmospheric pressure 86kPa～106kPa; battery charging adopts 7.2 method; battery discharge adopts 7.3 method; in this standard The room temperature mentioned refers to 25°C ± 2°C.

### 7.2 Standard charging

At room temperature (25°C±2°C), the single battery is discharged with 1C current to a voltage of 2.0V, and then left standing for 1h, and then charged with 1C current to a voltage of 3.65V, and then switched to constant voltage charging until the charging current drops to 0.05 Stop charging at C, and let it stand for 1 hour after charging.

### 7.3 Standard discharge

First, fully charge it according to 7.2. At room temperature, the single battery is discharged with a current of 1C until the voltage is 2.0V.

### 7.4 DC internal resistance

Charge according to method 7.2, discharge at 1C current for 30min at room temperature, discharge at 5C current for 10s, calculate the voltage and current changes before and after the discharge, and then divide the difference in voltage change by the difference in current change.

### 7.5 Low temperature discharge capacity

Charge according to the method of 7.2; store for 20h at the temperature specified in 5.2.8; discharge at the corresponding temperature with a current of 1C, and discharge to 1.8V. According to 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 5h; discharge at 55°C±2°C with 1C current and discharge to 2.0V to obtain high temperature discharge capacity.

**7.7 Charge and discharge capacity at room temperature rate**

At room temperature, use 7.3 method to discharge, and respectively charge with constant current to 3.65V at the specified rate to obtain the charge capacity at different rates; at room temperature, use 7.2 method to charge, respectively discharge to 2.0V at the specified rate to obtain different rates The discharge capacity.

**7.8 Charge retention rate, self-discharge rate and capacity recovery rate**

Charge according to 7.2 method, store at room temperature for 28 days or store at 55℃±2℃ for 7 days, discharge to 2.0V with 1C current to obtain the discharge capacity, and the ratio of its to the initial capacity is the charge retention rate;

Then charge according to method 7.2 and discharge method 7.3 to obtain the recovery capacity, and its ratio 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 the battery self-discharge rate.

**7.9 Storage capacity**

The recovery rate is charged according to method 7.2. After discharging at room temperature with 1C current for 30 minutes, store at 45℃±2℃ for 28 days. Charge according to method 7.2. Discharge with 1C current to 2.0V at room temperature to obtain the discharge capacity. The ratio of the initial capacity is the storage capacity recovery rate.

**7.10 Maximum discharge power and maximum feedback power**

Calculate the discharge capacity at different temperatures according to methods 7.3, 7.5 and 7.6, and use this as the calculation standard for SOC at different temperatures; after charging according to method 7.2, put it aside for the corresponding time at the ambient temperature to be measured (>0℃, 5h; ≤0℃, 20h), adjust the SOC to 90% with 1C current discharge, after standing for 1h, discharge with the current temperature maximum pulse current of 5C for 10s, leave it for 40s, and then charge with the current temperature allowable pulse current of 3.75C for 10s; sequentially at 1C The current adjusts the SOC to 80%, 70%,... 10%, tests the pulse charge and discharge capacity under different SOCs, records the process data, and calculates the different temperatures and SOCs according to the calculation formula of DC internal resistance and pulse power in the HPPC test method The maximum discharge power and maximum feedback power.

**7.11 Cold start test**

Charge according to 7.2 method, discharge to 50% SOC at room temperature with 1C current, put the battery in -20℃ environment for 20h, then discharge at -20℃ environment with 5kW/BSF power for 2s, then stand for 10s, repeat 3 times (see Q/GX 003-2015, 5.1.15 for BSF).

**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 to 3.65V at room temperature, and then charged at a constant voltage until the current drops to 0.05C. Let stand for 10 minutes, then discharge to 2.0V at a current of 1C. The discharge capacity should not be less than 500 times. 93% of the rated capacity, or when the number of cycles reaches 3000, the discharge capacity should not be less than 80% of the rated capacity.

**7.12.2. Cycle life at 45°C**

The battery is charged at a constant current of 1C to 3.65V at a temperature of 45°C, and then charged at a constant voltage until the current drops to 0.05C. Let it stand for 10 minutes, and then discharge to 2.0V at a current of 1C. The discharge capacity should not be low when repeated 1500 times. Less than 80% of the rated capacity.

**7.12.3. Cycle life at 55°C**

The battery is charged at a constant current of 1C to 3.65V at a temperature of 55°C, and then charged at a constant voltage until the current drops to 0.05C. Let it stand for 10 minutes, and then discharge to 2.0V at a current of 1C. The discharge capacity should not be low when repeated 800 times. Less than 80% of the rated capacity.

## 8 Inspection rules

### 8.1 Inspection items as specified in Table 8

| Inspection type | Test items | Inspection quantity |
|---|---|---|
| Exempt items | 4.4 Nominal voltage<br>4.7 Rated capacity<br>4.8 Working voltage<br>5.1.2 Maximum allowable charging voltage<br>5. 1.3 Maximum allowable charging temperature range<br>5.1.4 Best charging temperature range<br>5.2.3 Minimum allowable discharge voltage<br>5. 2. 4 Maximum allowable discharge temperature range<br>5. 2. 5 Optimal discharge temperature range<br>5. 5. 1 Optimal storage temperature range | / |

| | | |
|---|---|---|
| Factory inspection | 4.1 Appearance<br>4.5 AC internal resistance<br>5.2.6 Room temperature discharge capacity<br>5.5.2 Self-discharge rate | 100% |
| | 4.2 size<br>4.3 Weight | 160 pcs/batch |
| Type test | Other indicators other than inspection-free items and factory inspection items:<br>4.6 DC internal resistance<br>5. 1. 1 Maximum continuous charging current<br>5.1.6 Constant current charging capacity ratio<br>5. 2. 1 Maximum continuous discharge current<br>5. 2. 2 Maximum pulse discharge current<br>5. 2.7 High temperature discharge capacity<br>5. 2. 8 Low temperature discharge capacity/energy retention rate<br>5. 2. 9 rate discharge capacity retention rate<br>5. 3. 1 Mass power density<br>5.3.2 Volume power density<br>5. 3. 3 Maximum discharge power<br>5. 3. 4 Maximum feedback power<br>5.3.5 Cold start power<br>5.4.2 High temperature cycle life<br>5. 4. 3 Calendar life<br>5. 5. 3 Room temperature charge retention rate<br>5. 5. 4 Room temperature capacity recovery rate<br>5. 5. 5 High temperature charge retention rate<br>5. 5.6 High temperature capacity recovery rate<br>5.5. 7 Storage capacity recovery rate<br>6.1 Overdischarge<br>6.2 Overcharge<br>6.3 Short circuit<br>6.4 drop<br>6.5 Heating<br>6.6 Squeeze<br>6.7 Sea water immersion<br>6.8 Temperature cycle<br>6.9 Low air pressure | 2pcs/item |

## 8.2 Judgment rules for factory inspection

**Table 9 Batteries Grade Judgment and Treatment**

| Cell grade | Index requirements |
|---|---|
| A | Capacity ≥105 Ah, <115.5 Ah |
| B | Capacity ≥94.5 Ah, <105 Ah |
| C | Capacity ≥84 Ah, <94.5 Ah |

**8.3 Type inspection**

**8.3.1 The product shall undergo type inspection in one of the following situations:**

a) Production of new products and conversion of old products;

b) Transfer factory;

c) Resume production after stopping production for more than one year;

d) Structure; There are major changes in process or materials.

**8.3.2 Judgment rules In the type inspection, if one item is unqualified, it shall be judged as unqualified.**

**9 signs, packaging, transportation, storage**

**9.1 Logo**

There should be a clear bar code on each product.

**9.2 Packaging**

The products should have outer packaging to ensure that the products are not mechanically damaged during transportation, loading and unloading, and stacking.

**9.3 Transportation**

During transportation, violent loading and unloading shall be strictly prohibited to prevent severe vibration, impact or extrusion, and prevent sun and rain.

**9.4 Storage**

Products without opening the package should be stored in a clean, dry and ventilated warehouse with an ambient temperature of -10℃～30℃ and a relative humidity of ≤75%. The warehouse should not contain corrosive gases; the product should be kept away from fire and heat sources; The charging cycle should be carried out on a regular basis not exceeding 2 months.

**Figure A. 1 Battery size diagram**