JB

MACHINERY INDUSTRY STANDARD

OF THE PEOPLE'S REPUBLIC OF CHINA

ICS 29.220

K 81

File No.:

JB/T 11142-2011

General requirement of charging equipment of lithium-ion battery

锂离子蓄电池充电设备通用要求

Issued on: May 18, 2011 **Implemented on: August 01, 2011**

Issued by: Ministry of Industry and Information Technology of the People's Republic of China

Table of Contents

General requirement of charging equipment of lithium-ion battery

1 Scope

This Standard specifies the terms and definitions, models and basic parameters, technical requirements, tests, marks, packaging, transportation and storage for charging equipment of lithium-ion battery.

This Standard is applicable to the charging equipment for lithium-ion battery module or lithium-ion battery assembly composed of lithium-ion battery greater than or equal to 6A·h. It can be also used for the charging equipment for nickel-based battery and lead-acid battery module and assembly.

This Standard is applicable to the charging equipment that uses cables to connect to battery module or assembly, with AC rated voltage not exceeding 660V and DC rated voltage not exceeding 1000V.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

GB/T 156-2007, Standard voltage

GB/T 2423.5-1995, Environmental testing for electric and electronic products Part 2: Test methods Test Ea and guidance: Shock

GB/T 2423.8-1995, Environmental testing for electric and electronic products Part 2: Test methods Test Ed: Free fall

GB/T 3047.1-1995, Series of basic dimensions of panels, rack and cabinets for vertical increment of 20mm

GB/T 3859.1-1993, Semiconductor convertors - Specification of basic requirements

GB/T 3859.3-1993, Semiconductor convertors - Transformers and reactors

GB 4208-2008, Degrees of Protection Provided by Enclosure (IP Code)

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 extreme cell voltage

the voltage of the battery cell with the maximum or lowest voltage in the lithium-ion battery pack; during the charging process, it specifically refers to the voltage of the maximum voltage battery cell, and in the process of discharging, it refers to the voltage of the lowest voltage battery cell

3.2 charge interface

the general term for the communication interface and circuit interface of the lithium-ion battery assembly controller (BECU) connected to the charging equipment, of which except for the positive and negative connection ports of the charging power supply, it also includes part or all of the positive and negative connection interfaces of the network power supply, the charging control pilot circuit interface, the charging control circuit interface, and the I/O charging control circuit interface

3.3 on-board charge equipment

the charging equipment installed on motorized device or motor vehicle

3.4 pre-charge

when the minimum voltage of battery cell is lower than the minimum allowable value, before the minimum voltage of battery cell rises to the minimum allowable charging voltage, the voltage recovery charging process that uses the current less than the rated charging current; when the minimum voltage of battery cell rises above the minimum allowable voltage, the pre-charge process can be ended, and it will switch to normal charging

4 Models and basic parameters

4.1 Models

A model consists of structure characteristics, cooling method, rated output voltage and rated output current. The arrangement is shown in Figure 1.

4.3.3 DC power supply

The rated value of DC power supply voltage of the charging equipment shall meet the requirements of 4.6 in GB/T 156-2007. Preferred values are 110V, 220V, 440V, 600V, 750V, 1000V.

4.3.4 Output voltage range

The minimum output DC voltage of the charging equipment shall be less than or equal to 50% of the rated output voltage. The maximum output voltage shall be greater than 110% of the rated output voltage.

When the output voltage range requirement is greater than the above regulations, it shall be stipulated in the contract.

The preferred value of the DC output rated voltage of the charging equipment shall be selected from the following values: 16V, 32V, 48V, 63V, 95V, 126V, 200V, 330V, 420V, 530V, 630V.

4.3.5 Output current range

The maximum output current of the charging equipment shall be greater than or equal to 105%. If the output current range is required to exceed the above-mentioned stipulations, it shall be stipulated in the contract. The optimization of the rated output current of the charging equipment shall be selected from the following values: 2A, 5A, 10A, (16A), 20A, (30A), (40A), 50A, (80A), 100A, (125A), 160A, 200A , (250A), (300A), (400A), (500A).

NOTE: Bracketed ones are non-preferred values.

4.3.6 Load level of charging equipment

The load level of the charging equipment is level 1 specified in GB/T 3859.1-1993.

4.3.7 Equipment dimensions

Fixed or mobile equipment adopts cabinet type or chassis type. External dimensions refer to the external dimensions of the skeleton, excluding dimensions of attached boards, door panels protruding from the frame, handles and rings.

The external dimensions shall meet the requirements in GB/T 3047.1-1995.

Due to the limitation of vehicle space, the on-board shell is determined in the technical agreement by the manufacturer and the demander through negotiation.

5.4.1 Output voltage stability accuracy (stabilization accuracy)

When used for charging lithium-ion battery, the charging equipment must be connected to the lithium-ion battery module or the lithium-ion battery assembly, to form the charging system based on extreme battery cell. While charging at stable voltage, the maximum voltage of battery cell shall not exceed ±1% of the specified voltage limit and be less than or equal to ±30mV. The accuracy of voltage stabilization shall comply with the provisions of 3.5 in JB/T 10095-1999.

5.4.2 Output current stability accuracy (steady current accuracy)

When the charging equipment is in a steady-current charging state, the output current stability accuracy shall meet the requirements of 3.7 in JB/T 10095-1999.

5.4.3 Voltage limiting characteristics

When used to charge lithium-ion battery, when the charging equipment is in a steady-current charging state and the voltage of the maximum voltage of battery cell reaches the specified value, the charging current shall automatically decrease. Make the maximum voltage of battery cell not exceed ±1% of the specified voltage limit and be less than or equal to ±30mV. The automatic voltage adjustment range shall not be less than 40% of the rated voltage.

5.4.4 Current limiting characteristics

When used to charge lithium-ion battery, when the charging equipment is in a regulated charging state and the charging current reaches the specified value, the charging voltage shall automatically decrease. Make the charging current not exceed ±2% of the specified voltage limit. The automatic current adjustment range is 10%~100%.

5.4.5 Circuit breaker

There shall be a circuit breaker between the charging equipment and the battery. When necessary, the battery module or battery assembly can be connected to or disconnected from the charging equipment and the battery through the circuit breaker.

5.4.6 Output voltage adjustment range

The adjustment range of the output voltage of the charging equipment shall be greater than or equal to 40%~115% of the rated output voltage. When there are specific provisions in the contract, it shall comply with the provisions of the contract.

5.4.7 Output current adjustment range

5.9 Charging

5.9.1 Charging of general type charging equipment

The startup of general type charging equipment must meet the following requirements:

a) The self-check system of charging equipment is normal, in accordance with the conditions to start charging;

b) The charging equipment is firmly connected to the charging connector of the battery module or assembly. Connection is realized;

c) Battery module or assembly self-check is normal, in accordance with the charging conditions. According to the provisions of the communication protocol, a control instruction to allow charging is issued to the charging equipment;

d) The battery module and assembly have sent relevant data to the charging equipment according to the stipulated agreement;

e) The charging equipment completes the charging related operations according to the data sent by the battery module or assembly. The relevant data for user confirmation is output through the human-machine interface;

f) After the user confirms and sends out the start charging instruction, the charging process has just officially started;

g) When necessary, it is necessary to operate the special equipment on the charging equipment to allow the charging equipment to be started without some or all of the above procedures.

5.9.2 Charging of basic type and I/O type charging equipment

The start-up of basic and I/O charging equipment shall meet the following requirements:

a) The charging equipment and the battery module or assembly have been reliably connected through a dedicated charging connector;

b) The battery cell monitoring circuit and charging control circuit in the battery module or assembly are in a normal state;

c) All battery cells comply with the technical state that allows charging;

d) When necessary, it is necessary to operate the special equipment on the charging equipment to allow the charging equipment to be started without some or all of the above procedures.

supply charging equipment shall be greater than or equal to 90%.

The rated power factor of single-phase high-frequency switching power supply charging equipment shall be greater than or equal to 84%.

5.13 Operational performance

Operational performance shall meet the following:

a) The charging equipment is put into operation (startup). The instantaneous value of the maximum voltage of battery cell shall not exceed 1% of the specified voltage limit, and be less than or equal to 30mV;

b) When the maximum voltage of battery cell is lower than the specified voltage limit value, start the charging equipment. The output DC voltage shall not exceed 2% of the specified voltage limit;

c) If it has soft-start performance, when it is put into operation, the output voltage shall continuously rise to the rated value within 3s~8s;

d) When the digital charging equipment is put into operation, the time for the voltage to rise to the rated value shall comply with the manufacturer's specific requirements in the product technical documentation.

5.14 Safety requirements

5.14.1 Enclosure protection level

The enclosure protection level of equipment for indoor fixed use shall not be lower than IP20 specified in GB 4208-2008.

The enclosure protection level of equipment for outdoor fixed or mobile use shall not be lower than IP56 specified in GB 4208-2008.

The protection level of the on-board equipment enclosure shall not be lower than IP55 specified in GB 4208-2008.

The safety grounding terminal shall be installed in an easy-to-connect position. Set an obvious grounding symbol. Doors equipped with electrical components shall have safety grounding terminals. Use wires to connect with the cabinet. The screws and grounding points connecting the ground wire shall not be used for any other mechanical fastening purposes.

5.14.2 Electrical distance and creepage distance

The electrical clearance and creepage distance of the main circuit such as the bus bar shall meet the requirements of Table 12.

immediately stop charging. Disconnect the charging equipment from the battery. Send sound and light warning signals. General type charging equipment shall also display fault information.

b) When the short-circuit fault disappears, the charging equipment shall work normally. High-frequency switching power supply charging equipment shall have no damage to parts or loss of function. For the thyristor phase-controlled charging equipment, in addition to allowing the output fast fuse to blow, there shall be no damage to other parts or loss of function.

5.14.5.4 Grid voltage over-limit protection

The charging equipment shall be protected when the grid voltage is higher than 120% of the rated value or lower than 80% of the rated value. Send sound and light warning signals.

5.14.5.5 Grid voltage phase failure protection

For the charging equipment of three-phase input, when the grid voltage is out of phase, it shall be able to protect and send sound and light warning signals.

5.14.5.6 Over-temperature protection

When the charging equipment is operating normally, if the temperature of its key components is abnormal and exceeds the limit value, it shall be protected. Send sound and light warning signals.

5.14.5.7 Connection protection of charging connector

The connection protection of the charging connector shall meet the following requirements:

a) When the charging connector is not connected or the connection is unreliable, the converter circuit of the charging equipment shall be automatically disconnected from the input power supply. The positive and negative poles of the charging output shall be disconnected from the connector. The charging equipment shall be prohibited from starting operations;

b) The charging connector shall have technical measures to prevent short-circuit, burning and other accidents caused by DC arc during live plugging and unplugging operations. When charging normally, if the charging connector is operated, the charging equipment shall automatically stop charging. Before the charging connector is separated from the charging positive and negative connectors, the charging current flowing through the connector drops below a value that does not generate a current that is dangerous to safety. And it does not produce arcs that may cause short

f) When the charging equipment is in the charging state based on extreme battery cell, if it is not possible to establish a normal connection with the battery module or assembly, the charging operation of starting charging equipment is prohibited. Send alarm signals.

g) When the charging equipment is in the regular charging mode based on the terminal voltage and is connected to a lithium-ion battery that must be based on the extreme battery cell charging mode, the charging operation of starting charging equipment is prohibited. Send alarm signals.

h) The charging equipment shall be equipped with an emergency shutdown device. If necessary, the charging can be stopped immediately by operating the emergency shutdown device. Disconnect the charging equipment from the input power supply and battery.

5.14.5.10 Insulation protection

Insulation protection shall meet the following requirements:

a) The charging equipment shall have insulation monitoring device. When the insulation between the grid side and the valve side, the grid side and the electric chassis, and the valve side and the electric chassis drops more than the allowable value, it shall alert in time. Stop charging if necessary. Disconnect the charging equipment from the input power supply and battery;

b) When the insulation monitoring device of the battery module and assembly sends the insulation drop to the charging equipment to exceed the allowable value and request to stop charging, it shall immediately stop charging. Disconnect the charging equipment from the battery.

5.15 Noise

The noise shall meet the requirements of 3.16 in JB/T 10095-1999.

5.16 Mechanical properties

The charging equipment shall be able to withstand the impact specified in GB/T 2423.5-1995 and the free drop test specified in GB/T 2423.8-1995. After the test, its appearance and structure shall not be damaged, and it can work normally.

5.17 Cabinet body

The cabinet body shall meet the following requirements:

a) The cabinet body shall have sufficient mechanical strength. The surface

5.20.1.2 Electrostatic discharge immunity

The charging equipment shall be able to withstand the contact discharge test of 6kV test voltage and the air discharge test of 8kV.

The charging equipment is allowed to lose performance during the test. But it is not allowed to change the operating state or stored data. The charging equipment shall be able to work normally after the test. Do not allow performance degradation or performance below the performance level specified by the manufacturer.

5.20.1.3 Radio frequency electromagnetic field radiation immunity

In the frequency range of 80MHz to 1000MHz, it shall be able to withstand 3V/m radio frequency electromagnetic disturbance test.

The charging equipment shall be able to work continuously and normally. During normal operation, performance degradation or loss of performance is not allowed to be lower than the performance level specified by the manufacturer.

In the frequency range of 80MHz to 1000MHz, it shall be able to withstand 10V/m radio frequency electromagnetic disturbance.

The charging equipment is allowed to lose performance during the test. But it is not allowed to change the operating state or stored data. The charging equipment shall be able to work normally after the test. Do not allow performance degradation or performance below the performance level specified by the manufacturer.

5.20.1.4 Electrical fast transient / pulse group immunity

It shall be able to withstand the electrical fast transient pulse group immunity test with the test level as level 3 specified in GB/T 17626.4-2008.

The charging equipment is allowed to lose performance during the test. But it is not allowed to change the operating state or stored data. The charging equipment shall be able to work normally after the test. Do not allow performance degradation or performance below the performance level specified by the manufacturer.

5.20.1.5 Surge (impact) immunity

It shall be able to withstand 1.2/50μs (voltage) ~ 8/20μs (current) surge (impact) test. The test voltage is 2kV±0.2kV.

The charging equipment is allowed to lose performance during the test. But it

6 Tests

6.1 General rules

The test is divided into exit-factory test and type test.

The general requirements and test methods related to the test shall meet the requirements in GB/T 3859.1-1993 and GB/T 13422-1992.

The test is generally carried out by the manufacturer. If individual tests need to be carried out after on-site installation, it shall be stated in the contract or relevant technical documents.

When testing by the manufacturer, reliability test and compliance test can use resistive load. The test load in terms of charging control characteristics and control accuracy shall be a lithium-ion battery that meets the requirements. When there are special requirements, specific provisions shall be made in the contract.

The tests of power transformers and reactors shall meet the requirements in GB/T 3859.3-1993.

The accuracy level of the instruments and meters used in the test shall not be less than level 0.5. The accuracy of the digital voltmeter used to measure the voltage of a single battery shall not be less than 0.2%.

6.2 Exit-factory inspection

The assembled charging equipment shall undergo the exit-factory test one by one. After the test is conforming, the exit-factory test certificate shall be issued.

During the test, if there is only one item that does not meet the specified requirements, retest after rework is allowed. Only after passing the retest can the exit-factory test pass certificate be issued.

6.3 Type test

In addition to the provisions in 6.2 of GB/T 3859.1-1993, the following provisions are supplemented:

a) Products newly designed and put into production or transferred to factories;

b) When changes in design, process, materials, and main components may affect performance;

c) When production has been discontinued for more than two years;

This is an excerpt of the PDF (Some pages are marked off intentionally)

------ The End ------