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**Small-sized valve regulated lead-acid
batteries — Part 1: General requirements,
functional characteristics — Methods of
test**

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In the event of any doubts arising as to the contents,
the original JIS is to be the final authority.

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Foreword

This translation has been made based on the original Japanese Industrial Standard revised by the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Battery Association of Japan (BAJ) / Japanese Standards Association (JSA) with the draft being attached, based on the provision of Article 12 Clause 1 of the Industrial Standardization Law applicable to the case of revision by the provision of Article 14.

Consequently, **JIS C 8702-1:2003** is replaced with this Standard.

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JIS C 8702 consists of the following three parts under the general title “*Small-sized valve regulated lead-acid batteries*”:

JIS C 8702-1 *Part 1: General requirements, functional characteristics — Methods of test*

JIS C 8702-2 *Part 2: Dimensions, terminals and marking*

JIS C 8702-3 *Part 3: Safety recommendations for use in electric appliances*

Small-sized valve regulated lead-acid batteries — Part 1 : General requirements, functional characteristics — Methods of test

Introduction

This Japanese Industrial Standard has been prepared based on the second edition of **IEC 61056-1** published in 2002 with some modifications of the technical contents to make it more appropriate.

The portions given dotted underlines and Annex JA are the matters in which the contents of the original International Standard have been modified. A list of modifications with explanations is given in Annex JB.

1 Scope

This Standard specifies general requirements and functional characteristics together with the corresponding test methods of small-sized valve regulated lead-acid batteries which do not require water addition and are used for cyclic application, trickle application and float application (hereafter referred to as “batteries”). This Standard is also applicable to batteries of types specified in **JIS C 8702-2**.

This Standard is not applicable to the batteries used for the following usages.

- Stationary lead-acid batteries specified in **JIS C 8704** standards group
- Lead-acid starter batteries specified in **JIS D 5301**
- Lead-acid traction batteries specified in **JIS D 5303** standards group

NOTE : The International Standard corresponding to this Standard is as follows.

IEC 61056-1 : 2002 *General purpose lead-acid batteries (valve-regulated types) — Part 1 : General requirements, functional characteristics — Methods of test* (MOD)

In addition, symbols which denote the degree of correspondence in the contents between the relevant International Standard and **JIS** are IDT (identical), MOD (modified), and NEQ (not equivalent) according to ISO/IEC Guide 21.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 7411 *Solid-stem general purpose liquid-in-glass thermometers*

JIS B 7505-1 *Aneroid pressure gauges — Part 1 : Bourdon tube pressure gauges*

JIS B 7507 *Vernier, dial and digital callipers*

JIS C 0446 *Identification of conductors by colours or numerals*

JIS C 1102-2 *Direct acting indicating analogue electrical measuring instruments and their accessories Part 2 : Special requirements for ammeters and voltmeters*

JIS C 8702-2 *Small-sized valve regulated lead-acid batteries — Part 2 : Dimensions, terminals and marking*

JIS C 8704 standards group *Stationary lead-acid batteries*

JIS C 60068-1 *Environmental testing Part 1 : General and guidance*

JIS D 5301 *Lead-acid starter batteries*

JIS D 5303 standards group *Lead-acid traction batteries*

JIS R 3505 *Volumetric glassware*

IEC 60417 *Graphical symbols for use on equipment, Index, survey and compilation of the single sheets*

IEC 61429 *Marking of secondary cells and batteries with the international recycling symbol ISO 7000-1135*

3 Terms and definitions

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

3.1 small-sized valve regulated lead acid battery

a small-sized lead-acid battery which provides the valve mechanism that opens when the internal pressure of the battery rises and has a function to absorb oxygen at its anode

3.2 single cell

battery of an elementary functional unit which serves as an electric energy source by the direct conversion of chemical energy

The battery consists of one single cell or two or more, and the number of single cells which constitute the battery is expressed as n .

3.3 monobloc battery

one battery electrically connecting two or more independent single cell compartments designed so that positive and negative plates, electrolytes, terminals or intermediate connection objects and suitable separators are assembled and accommodated

3.4 nominal voltage

a voltage used for marking of battery voltage

The nominal voltage of lead acid battery is 2 V per a single cell.

3.5 final voltage

the terminal voltage of a battery at which discharging is stopped

3.6 discharge current at the 20 hour discharge rate I_{20}

the discharge current that the duration of discharge becomes 20 h when the battery is discharged under the specified conditions until the final voltage per a single cell reaches 1.75 V

The unit of I_{20} shall be ampere (A).

3.7 discharge current at the 1 hour discharge rate I_1

the discharge current that the duration of discharge becomes 1 h when the battery is discharged under the specified conditions until the final voltage per a single cell reaches 1.60 V

The unit of I_1 shall be ampere (A).

3.8 rated capacity at the 20 hour discharge rate C_{20}

quantity of electricity which can be taken out from a battery determined by the manufacturer when the battery is discharged at a discharge current of I_{20} under the specified conditions until the final voltage per a single cell reaches 1.75 V

The unit of C_{20} shall be ampere hour (Ah).

3.9 rated capacity at the 1 hour discharge rate C_1

quantity of electricity which can be taken out from a battery determined by the manufacturer when the battery is discharged at a discharge current of I_1 under the specified conditions until the final voltage per a single cell reaches 1.60 V

The unit of C_1 shall be ampere hour (Ah).

3.10 actual capacity C_a

quantity of electricity which can actually be taken out when the battery is discharged at the specified discharge current until the specified final voltage is reached

The unit of C_a shall be ampere hour (Ah).

3.11 actual capacity at the 20 hour discharge rate C_{a20}

quantity of electricity which can actually be taken out when the battery is discharged at a discharge current of I_{20} until the final voltage per a single cell reaches 1.75 V

The unit of C_{a20} shall be ampere hour (Ah).

3.12 actual capacity at the 1 hour discharge rate C_{a1}

quantity of electricity which can actually be taken out when the battery is discharged at a discharge current of I_1 until the final voltage per a single cell reaches 1.60 V

The unit of C_{a1} shall be ampere hour (Ah).

3.13 full charge

state in which the substance that generates electric energy by a chemical reaction when the battery is discharged is fully charged

3.14 high rate discharge characteristics

the discharge characteristics of a battery when discharged at a comparatively large current relative to its capacity

3.15 gas recombining efficiency

the efficiency of such reversible chemical reaction that the gases produced by decomposition of water are returned to water by means of absorption of oxygen on anode

3.16 vent valve

a valve which operates at a certain internal pressure to exhaust gas but prevents external air from entering into the battery

3.17 storage characteristics

the characteristics of a battery when it is stored for a long period of time

3.18 deep discharge

discharge equivalent to the most portion of capacity of a battery

3.19 cyclic application

a specification of a battery based on such service that the discharging and charging are repeated alternately

3.20 trickle application

a specification of a battery based on such service that the battery is continuously charged at a very small current being disconnected from the load to compensate self discharging so that it is always stand by for unexpected discharging due to interruption of power service or the like

3.21 float application

a specification of a battery based on such service that the battery and the load are connected in parallel to the d.c. output of the rectifying device so that the battery is always under charged state being applied a constant voltage, the power is supplied from the rectifying device to the load simultaneously and the power is supplied from the battery to the load without interruption at the time of interruption of power service or of load change

3.22 life

the number of dischargings or the years lapsed until such an instant that the capacity measured in accordance with the specified test method, while the discharging and charging are performed under the specified conditions, decreases beyond the specified capacity

4 General requirements

4.1 Construction

A battery shall be composed of a single cell or a monobloc battery. The single cell shall be composed of flat plates accommodated in a square container or a pair of plates spirally wound accommodated in a cylindrical container. The electrolyte of single cell shall be fixed by such means that it is absorbed in plates and separators, or it forms the gel state.

The battery shall be equipped with a valve. The valve starts to operate with releasing the gas when the internal pressure exceeds the specified value, and also prevents the outer air from entering into the battery.

The battery shall be so constructed that neither water nor electrolyte can be added.

The battery shall withstand storage at $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and maximum 80 % in relative humidity for one year in inverted orientation without leakage. All battery components such as terminals, intercell connectors, containers shall withstand the current specified in 7.5.

4.2 Mechanical strength

A battery shall withstand the mechanical stresses, vibrations and shocks occurring in normal transportation, handling and use.

4.3 Marking items

The following items shall be marked on the surface of battery with an appropriate method.

- a) Type or product name
- b) Nominal voltage
- c) Rated capacity at the 20 hour discharge rate
- d) Name of supplier, name of manufacturer or their abbreviations
- e) Year and month of manufacture or their abbreviations
- f) Recycling symbol (see IEC 61429)

If the functional characteristic values or requirements are different from the values specified in clause 5, the values shall be supplied with the battery.

Additional data such as recommended charging voltage or charging current, rated capacities other than the rated capacity at the 20 hour discharge rate and battery weight shall be supplied with the battery in a suitable way.

4.4 Marking of polarity

The polarity of both terminals shall be marked on the lid of the battery adjacent to terminals by the plus symbol (+) and the minus symbol (−) (in accordance with 5005 and 5006 graphical symbols of IEC 60417). The case where the battery carries a marking of polarity of both terminals by the colour of the lead wire connected to the battery

shall be as specified in JIS C 0446.

The positive terminal should be red and the negative terminal black.

5 Functional characteristics and specific requirements

5.1 Capacity

For the capacity, either of the following a) or b) or both shall be selected in accordance with the agreement between the parties concerned with delivery.

- a) **Actual capacity at the 20 hour discharge rate C_{a20}** When the test is performed in accordance with 7.1 a), the actual capacity at the 20 hour discharge rate C_{a20} shall reach the rated capacity at the 20 hour discharge rate C_{20} or more within 5 cycles of charging and discharging.
- b) **Actual capacity at the 1 hour discharge rate C_{a1}** When the test is performed in accordance with 7.1 b), the actual capacity at the 1 hour discharge rate C_{a1} shall reach the rated capacity at the 1 hour discharge rate C_1 or more within 5 cycles of charging and discharging.

5.2 High rate discharge characteristics

When the test is performed in accordance with 7.2, the duration of discharge shall reach 27 min or more within 5 cycles of charging and discharging.

5.3 Cycle service endurance

When the test is performed in accordance with 7.3, the number of cycles shall be 200 times or more.

5.4 Storage characteristics

When the test is performed in accordance with 7.4, the actual capacity at the 20 hour discharge rate after a lapse of storage period shall be 75 % or more of the actual capacity at the 20 hour discharge rate before retention.

5.5 Maximum permissible current characteristics

Unless otherwise specified by the manufacturer, when the test is performed in accordance with 7.5, the duration of discharge shall be 150 s or more and the battery shall be free from deformation and other damages.

5.6 Charge acceptance characteristics after deep discharge

When the test is performed in accordance with 7.6, the actual capacity at the 20 hour discharge rate C_{a20} shall be 75 % or more of the rated capacity at the 20 hour discharge rate C_{20} .

5.7 Endurance in trickle application

When the test is performed in accordance with 7.7, the period lapsed until the capacity decreases to the level of the capacity specified in 7.7 f) or under shall be 2 years or more.