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Alkaline primary batteries

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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 8511 : 1998** is replaced with this Standard.

This revision has been made based on **IEC 60086-2 : 2000** *Primary batteries—Part 2 : Physical and electrical specifications* for the purposes of making it easier to compare this Standard with International Standard; to prepare Japanese Industrial Standard conforming with International Standard; and to propose a draft of an International Standard which is based on Japanese Industrial Standard.

Attention is drawn to the possibility that some parts of this Standard may conflict with a patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have technical properties. The relevant Minister and the Japanese Industrial Standards Committee are not responsible for identifying the patent right, application for a patent after opening to the public, utility model right or application for registration of utility model after opening to the public which have the said technical properties.

Editor's notice : New **JIS** Mark Scheme went into effect on October 1st, 2005 according to the revision of the Industrial Standardization Law, so old **JIS** mark indication is omitted from this English version. Up-to-date information including list of JIS subject to New **JIS** Marking System is issued on the website of JISC (<http://www.jisc.go.jp>).

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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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Contents

	Page
Introduction	1
1 Scope	1
2 Normative references	1
3 Definitions	1
3.1 alkaline primary batteries	2
3.2 application test	2
3.3 service output (of a primary battery)	2
3.4 service output test	2
3.5 expiry month and year of recommended use	2
4 Symbols and abbreviations	2
5 Classification and type designation	2
6 Nominal voltage	3
7 Performances	3
7.1 Open-circuit voltage	3
7.2 Minimum average duration	3
7.3 Resistance to electrolyte leakage	3
7.4 Safety	3
8 Dimensions	3
9 Terminals	4
10 Appearance	4
11 Tests	4
11.1 Classification of tests and test items	4
11.2 Storage conditions and test conditions of sample battery	4
11.3 Instrument and apparatus	4
11.4 Test methods	4
12 Inspection	5
12.1 Type inspection	5
12.2 Acceptance inspection	5
13 Marking	6
Annex 1 (normative) Precaution for handling	22
Annex 2 (informative) Comparison table between JIS and corresponding International Standard	24

Alkaline primary batteries

Introduction This Japanese Industrial Standard has been prepared based on the tenth edition of **IEC 60086-2** *Primary batteries—Part 2 : Physical and electrical specifications* published in 2000 and Amendment 1 (2001) with some modifications of the technical contents.

The portions given sidelines or dotted underlines are the matters in which the contents of the original International Standard have been modified. A list of modifications with the explanations is given in Annex 2 (informative).

1 Scope The Standard specifies alkaline primary batteries among primary batteries.

Remarks : The International Standard corresponding to this Standard is given below.

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**.

IEC 60086-2 : 2000 *Primary batteries—Part 2 : Physical and electrical specifications* (MOD)

2 Normative references The following standards contain provisions which, through reference in this text, constitute provisions of this Standard. If the indication of the year of coming into effect is given to these referred standards, only the edition of indicated year constitutes the provision of this Standard but the revision and amendment made thereafter are not applied. The normative references without the indication of the year of coming into effect apply limiting only to the most recent editions (including the amendments).

JIS C 8500 : 2001 *Primary batteries : General*

NOTE : **IEC 60086-1** : 1996 *Primary batteries—Part 1 : General* is equivalent to the said standard.

JIS C 8514 *Safety of primary batteries with aqueous electrolyte*

JIS B 0021 *Geometrical product specifications (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out*

NOTE : **ISO/DIS 1101** : 1996 *Geometrical product specifications (GPS)—Geometrical tolerancing—Tolerancing of form, orientation, location and run-out* is identical with the said standard.

3 Definitions For the purpose of this Standard, the definitions given in **JIS C 8500** and the following definitions apply :

3.1 alkaline primary batteries primary batteries which employ metal oxide or oxygen as the positive electrode active material, zinc as the negative electrode active material, and aqueous solution of alkaline metal hydroxide as the electrolyte

3.2 application test test which simulates the actual use of a battery in a specific application, for example, “portable lighting”, “tape recorder” or “transistor radio” test

3.3 service output (of a primary battery) service life, or capacity, or energy output of a battery under specified conditions of discharge

3.4 service output test test designed to measure the service output of a battery

NOTE : A service output test may be prescribed, for example, when

- a) an application test is too complex to replicate ;
- b) the duration of an application test would make it impractical for routine testing purposes.

3.5 expiry month and year of recommended use the period during which a battery operates normally and satisfies the minimum average duration (MAD) given in attached tables 1 to 5 and attached tables 6.1 to 6.5, when the specified duration test is carried out

Information : This term has the same meaning as the “Year and month or week of manufacture, which may be in code, or the expiration of a guarantee period, in clear” specified in **IEC Standard**.

4 Symbols and abbreviations For the purpose of this Standard, the following symbols and abbreviations apply in addition to those given in **JIS C 8500** :

- a) EV : end-point voltage
- b) MAD : minimum average duration
- c) OCV : open-circuit voltage (off-load voltage)
- d) R : load resistance
- e) Vn : nominal voltage of a battery

5 Classification and type designation Classification is made by using type designations as given in attached tables 1 to 5 and attached tables 6.1 to 6.5. Alkaline primary batteries are classified into alkaline manganese battery system, air zinc battery system and silver oxide battery system. Alkaline manganese batteries are further subclassified into alkaline dry batteries and alkaline button batteries. Respective battery system symbols are given below :

L : alkaline manganese batteries

P : air zinc batteries

S : silver oxide batteries

The type designations, inherent code and code denoting shape and dimensions are based on **JIS C 8500**.

Information : Attached tables 1 to 5 and attached tables 6.1 to 6.5 are prepared following to the examples of categories given in **IEC 60086-2**.

6 Nominal voltage Nominal voltage (V_n) shall be as shown in attached tables 1 to 5 and attached tables 6.1 to 6.5.

7 Performances

7.1 Open-circuit voltage When the test is carried out as specified in 11.4.4, open-circuit voltages (OCV) shall be as given in attached tables 1 to 5 and attached tables 6.1 to 6.5.

7.2 Minimum average duration When the test is carried out as specified in 11.4.5 and the average duration (hereafter referred to as “average value”) is obtained by means of the procedures given below, the minimum average duration (MAD) shall be not less than the appropriate MAD shown in attached tables 1 to 5 and attached tables 6.1 to 6.5.

- a) The sample size of batteries to be tested shall be nine.
- b) The average value shall be obtained from all the test results.
- c) If the average value so obtained is not less than MAD and the number of batteries which show a test value less than 80 % of MAD is not more than one, these batteries are considered as complying with the characteristic value.
- d) If the average value so obtained is less than MAD, or two or more batteries show a test value less than 80 % of MAD, these batteries are not considered as uncomplying with the characteristic value, the test shall be repeated on other nine samples and the average value shall be obtained same as that in the first test.
- e) If the average value in the second test is not less than MAD and the number of batteries which show a test value less than 80 % of MAD is not more than one, these batteries are considered as complying with the characteristic value.
- f) If the average value in the second test is less than MAD, or two or more batteries show a test value less than 80 % of MAD, these batteries are considered as not complying with the characteristic value and the third test is not carried out.

7.3 Resistance to electrolyte leakage When the test is carried out as specified in 11.4.6, no electrolyte leakage or deformation shall be apparent by visual check.

7.4 Safety When the test is carried out as specified in 11.4.7, the requirements specified in JIS C 8514 shall be satisfied. Precautions for handling are given in Annex 1.

8 Dimensions The dimensions shall, before and after the tests specified in clause 11, conform with the dimensions specified in attached tables 1 to 5 and attached tables 6.1 to 6.5.

NOTE : As for button batteries of battery system symbol “L”, “P” or “S”, the height may sometimes become higher than the specified maximum overall height by 0.25 mm when they are discharged to below the specified end point voltage.

9 Terminals Terminals shall have the shapes given in attached tables 1 to 5 and attached tables 6.1 to 6.5. The terminal shall be made of metallic materials capable of keeping favorable electric contact continuously with corresponding apparatus. They shall be plated with nickel, tin or the like as needed, and free from rust or deformation which will cause trouble in practical use.

10 Appearance In the appearance, batteries shall be free from stain damage or deformation exceeding the specified dimension which will cause trouble in practical service. The marking shall be clear.

11 Tests

11.1 Classification of tests and test items Classification of tests and test items shall be as stated in **JIS C 8500**. However, safety shall be included in the initial test.

11.2 Storage conditions and test conditions of sample battery The storage condition and test condition shall be as stated in **JIS C 8500**. However, fundamental conditions of temperature and humidity referring to storage state, open-circuit voltage, duration and resistance to electrolyte leakage at over-discharge shall be a temperature of $20^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and a relative humidity of $(60 \pm 15) \%$.

11.3 Instrument and apparatus The voltmeter, load resistance (R) and dimension measuring apparatus to be used in the tests shall be as stated in **JIS C 8500**.

11.4 Test methods

11.4.1 Dimension The specified dimension measuring apparatus shall be used.

11.4.2 Terminal The sample shall be checked visually.

However, the specified dimension measuring apparatus may be used for the deformation.

11.4.3 Appearance The sample shall be checked visually.

However, the specified dimension measuring apparatus may be used for deformation.

11.4.4 Open-circuit voltage The sample shall be allowed to stand under the fundamental temperature and humidity conditions for at least 8 h and the open-circuit voltage (OCV) shall be measured by using the voltmeter specified in **11.3** under the said condition. Air zinc batteries shall be tested further 10 min after removal of air inlet seal.

11.4.5 Duration The duration shall be checked as stated below :

- a) **Commencement of discharge** After the sample has been allowed to stand at the fundamental temperature and humidity conditions for at least 8 h.
- b) **Temperature and humidity at discharge** The fundamental temperature and humidity conditions.
- c) **Load resistance** As specified in attached tables 1 to 5 and attached tables 6.1 to 6.5.
- d) **Discharge method** As specified in attached tables 1 to 5 and attached tables 6.1 to 6.5. In general, the discharge shall be carried out five days or more in a week (7 days).

- e) **Completion of discharge** The instant at which the open-circuit voltage decreases first below the end-point voltage (EV) specified in attached tables 1 to 5 and attached tables 6.1 to 6.5.

11.4.6 Resistance to electrolyte leakage The test for resistance to electrolyte leakage shall be carried out as follows :

- a) **Resistance to electrolyte leakage at overdischarge** The test for resistance to electrolyte leakage at overdischarge shall be carried out as follows :

- 1) Discharge conditions The test conditions given in **11.4.5** Duration.
- 2) Completion of discharge The instant when the on-load voltage decreases first below 40 % of the nominal voltage.

- b) **Resistance to electrolyte leakage at high temperature** The resistance to electrolyte leakage at high temperature shall be checked by allowing the battery to stand under the conditions stated below. For air zinc batteries, the test shall be carried out with the air inlet seal attached.

- 1) Temperature and humidity at test : $45^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and a relative humidity not exceeding 70 %
- 2) Test period : 30 days

11.4.7 Safety The safety test shall be as specified in **JIS C 8514**. The principal test contents are shown below :

- 1) Leaving out of a used battery
- 2) Transportation – impact
- 3) Transportation – vibration
- 4) Climatic – temperature cycle
- 5) Reverse loading
- 6) External short circuit
- 7) Over discharge
- 8) Free fall

12 Inspection

12.1 Type inspection The type inspection shall be as stated in **JIS C 8500**. However, safety shall be taken as an item of type inspection and checked at least once per three years.

12.2 Acceptance inspection The acceptance inspection shall be as stated in **JIS C 8500**. However, the acceptance inspection shall be carried out on initial inspection items, and the dimensions shall be checked as follows :

- 1) For circular batteries : overall height (A) and diameter (ϕ)
- 2) For non-circular batteries : overall height (A), length and width

13 Marking The marking shall be made on battery body or minimum package container in accordance with table 1.

- a) **Battery system or its symbol**
- b) **Type designation** However, type designated by shape and dimension symbols may be marked.
- c) **Nominal voltage**
- d) **Polarity of (+)** However, for alkaline batteries, polarities of (+) and (–) shall be marked.
- e) **Manufacturer's name and abbreviation**
- f) **Expiry month and year of recommended use or month and year of manufacture** The marking of expiry month and year of recommended use or month and year of manufacture shall be as stated in **JIS C 8500**. Examples of marking are shown below :

Example 1 Expiry month and year of recommended use (month - year)
05-2005 : May 2005

Example 2 Expiry month and year of recommended use (month - year)
05-04 : May 2004

- g) **Precaution for use** The points of the following matters shall be marked.

Not to do reverse loading, charging, short circuit, heating, putting into fire, disassembling, mixed use of different kind (battery system, size, etc.) batteries, or mixed use of new battery and used battery.

- h) **Precaution for erroneous swallowing** The points of the following matters shall be marked.

Small batteries shall be located on a place not accessible by the hands of little children, because such batteries may have a risk of accidentally being swallowed. In case of emergency due to swallowing, immediately consult a doctor.

Table 1 Classification of marking by type designation

Type designation	Classification	
	Items to be marked on body	Items to be marked on body or smallest packing container
LR1, LR03	a), b), c), d), e), f), h)	g)
LR6, LR14, LR20, 3LR12, 4LR61, 4LR25X, 4LR25-2, 6LR61	a), b), c), d), e), f), g)	—
LR8D425, LR9(LR1662), LR53(LR23C61), LR41(LR736), LR1120, LR55(LR1121), LR54(LR1130), LR43(LR1142), LR44(LR1154), SR62(SR516), SR63(SR521), SR65(SR616), SR64(SR527), SR60(SR621), SR67(SR716), SR66(SR626), SR58(SR721), SR68(SR916), SR59(SR726), SR69(SR921), SR41(SR736), SR57(SR927), SR1120, SR55(SR1121), SR48(SR754), SR56(SR1126), SR54(SR1130), SR42(SR1132), SR43(SR1142), SR44(SR1154), 4LR44, 4SR44	b), d)	a), c), e), f), g), h)
PR70(PR536), PR41(PR736), PR48(PR754), PR44(PR1154), PR2330	d) ⁽¹⁾	a), b) ⁽¹⁾ , c), e), f), g), h)

Note ⁽¹⁾ If it is impossible to mark the items on the battery body of air zinc battery, because the air inlet or groove exists on the positive seal on the positive pole terminal surface, the polarity of “+” and “type designation” may be marked on the air inlet seal.

Remarks : The type designation in parentheses in the column of type designation means that it is expressed by shape and dimension symbols.

Attached Table 1 Category 1 batteries

Type designation	Open-circuit voltage (OCV) V	
	Max.	Min. (informative)
LR8D425, LR1, LR03, LR6, LR14, LR20	1.65	1.45

Positive contact

Pip is optional

Negative contact area

Positive contact

Pip is optional

Negative contact area

NOTES

1 In a battery of cap and base terminal, the terminals are insulated from the cylindrical side of battery.

2 In attached figure 1a : surface of negative terminal C may not be flat.

3 In attached figure 1b : surface of negative terminal C shall be essentially flat.

4 The surfaces of negative terminal in attached figures 1a and 1b may not be always recessed from the cylindrical side of battery.

5 When the surface of negative terminal is the bottom part of battery, dimensions A and B shall be measured from the bottom part and dimension E shall be zero.

6 Dimension ϕP in coaxiality tolerance (eccentricity), to be measured in accordance with **JIS B 0021**.