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**Sealed nickel-metal hydride
rechargeable single cells**

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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 8708:2007** is replaced with this Standard.

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Sealed nickel-metal hydride rechargeable single cells

Introduction

This Japanese Industrial Standard has been prepared based on the third edition of **IEC 61951-2** published in 2011 with some modifications of the technical contents.

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

1 Scope

This Standard specifies the test methods and requirements for small prismatic, cylindrical and button sealed nickel-metal hydride rechargeable single cells (hereafter referred to as “cells”).

NOTE : The International Standard corresponding to this Standard and the symbol of degree of correspondence are as follows:

IEC 61951-2:2011 *Secondary cells and batteries containing alkaline or other non-acid electrolytes—Portable sealed rechargeable single cells—Part 2: Nickel-metal hydride (MOD)*

The 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 21-1**.

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 7507 *Vernier, dial and digital callipers*

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

JIS C 8500 *Primary batteries—General*

NOTE : Corresponding International Standard: IEC 60086-1:2006 *Primary batteries—Part 1: General (MOD)*

JIS C 8515 *Primary batteries—Physical and electrical specifications*

NOTE : Corresponding International Standard: IEC 60086-2:2006 *Primary batteries—Part 2: Physical and electrical specifications (MOD)*

JIS C 8712 *Safety requirements for portable sealed secondary cells, and batteries made from them, for use in portable applications*

NOTE : Corresponding International Standard: IEC 62133 *Secondary cells and batteries containing alkaline or other non-acid electrolytes—Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications* (MOD)

JIS C 8713 *Secondary cells and batteries containing alkaline or other non-acid electrolytes—Mechanical tests for sealed portable secondary cells and batteries*

NOTE : Corresponding International Standard: IEC 61959 *Secondary cells and batteries containing alkaline or other non-acid electrolytes—Mechanical tests for sealed portable secondary cells and batteries* (MOD)

JIS Z 8806 *Humidity—Measurement methods*

IEC 60410 *Sampling plans and procedures for inspection by attributes*

3 Terms and definitions

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

3.1 nominal voltage

voltage used for the voltage indication of a single cell or a battery

NOTE 1 The nominal voltage of a single cell is 1.2 V.

NOTE 2 The nominal voltage of a battery which is composed of n pieces of single cell is equal to n times the nominal voltage of single cell.

3.2 rated capacity

quantity of electricity C_5 Ah (ampere-hour) declared by the manufacturer, which a cell can deliver during about a 5 h period when subjected to charging, storing and discharging according to 7.3.2

3.3 small prismatic cell

cell in the form of a rectangular parallelepiped whose width and thickness dimensions are not more than 25 mm

3.4 cylindrical cell

cell of circular cross-section whose overall height is not less than the diameter

3.5 button cell

cell of circular cross-section whose overall height is less than the diameter

3.6 sealed nickel-metal hydride rechargeable single cell

cell containing nickel oxide for positive contact, hydrogen absorbing alloy for negative contact and potassium hydroxide or other alkaline solution for electrolyte, and constructed so that the positive electrode plate is isolated from the negative electrode plate by a separator, which remains closed and does not release either gas or liquid when operated within the limits of charge and temperature specified by the manufacturer

Generally, this cell is equipped with a gas exhaust mechanism to prevent dangerously high internal pressure. This cell does not require addition to the electrolyte and is designed to operate during its life in its original sealed state.

NOTE : This cell, however, may release gas from its gas exhaust mechanism towards the end of its life due to the accumulation of hydrogen in the cell.

3.7 surface temperature limited cell

cell which performs a function that prevents the temperature increase from a certain standard point even at the moment of anomaly occurrence such as short circuit of cell

3.8 trickle charge

method of charge that is continuously carried out with very small current with load separated in order to compensate the self-discharge of a storage cell

4 Measuring accuracy

The overall accuracy of controlled or measured values shall be within the following tolerances respectively.

- a) $\pm 1 \%$ for voltage
- b) $\pm 1 \%$ for current
- c) $\pm 1 \%$ for capacity
- d) $\pm 2 ^\circ\text{C}$ for temperature
- e) $\pm 0.1 \%$ for time
- f) $\pm 0.1 \text{ mm}$ for dimensions
- g) $\pm 5 \%$ for humidity

These tolerances shall comprise the combined accuracy of the measuring instruments, the measurement techniques used and all other sources of error in the test procedure.

The details of the measuring instruments and the like used shall be provided in each report of results.

4A Measuring instruments

The measuring instruments and the like used in the tests shall be selected according to the magnitude of measuring values. Furthermore, they shall be periodically calibrated to always ensure the accuracy shown below.

- a) **Measurement of voltage** The analog type instrument for voltage measurement shall be the voltmeter of Class 0.5 specified in **JIS C 1102-2** or that at least equivalent thereto in accuracy. For the digital type, the voltmeter with an accuracy equivalent to that of the analog type shall be used.

The resistance of the voltmeter shall be at least 10 k Ω .

- b) **Measurement of current** The analog type instrument for current measurement shall be the ammeter of Class 0.5 specified in **JIS C 1102-2** or that at least equivalent thereto in accuracy. For the digital type, the ammeter with an accuracy

equivalent to that of the analog type shall be used. This accuracy shall be maintained also on the current measuring device of the assembly of ammeter, electric shunt and lead wires.

- c) **Measurement of temperature** The instrument for temperature measurement shall be the solid-stem liquid-in-glass thermometer with a tolerance of $\pm 1\text{ }^{\circ}\text{C}$ specified in **JIS B 7411** or that at least equivalent thereto in accuracy, or a digital thermometer of which the minimum graduation is $1\text{ }^{\circ}\text{C}$ or under.

The accuracy of a digital type thermometer shall be $\pm 0.5\text{ }^{\circ}\text{C}$.

- d) **Measurement of time** The instrument for time measurement shall be that with an accuracy of $\pm 1\text{ s}$ per hour or that at least equivalent thereto in accuracy.
- e) **Measurement of dimensions** The instrument for dimension measurement shall be the vernier calliper (graduated in 0.05 mm) specified in **JIS B 7507** or that at least equivalent thereto in accuracy.
- f) **Measurement of humidity** The instrument used for humidity measurement shall be the instrument specified in 10.1 of **JIS Z 8806** or that at least equivalent thereto in accuracy.

5 Cell designation and marking

5.1 Designation

5.1.1 Small prismatic cells and cylindrical cells

5.1.1.1 General

Cells shall be designated as the following five according to the discharge capability.

- Low rate of discharge capability (L)
- Medium rate of discharge capability (M)
- Intermediate between medium rate of discharge capability and high rate of discharge capability (J) (cylindrical cells only)
- High rate of discharge capability (H)
- Very high rate of discharge capability (X)

NOTE 1 These symbols are normally used at the following rate of discharge, but not exclusive.

- L up to $0.5 I_t\text{ A}$
- M up to $3.5 I_t\text{ A}$
- J up to $5 I_t\text{ A}$ (cylindrical cells only)
- H up to $7 I_t\text{ A}$
- X up to or above $7 I_t\text{ A}$

NOTE 2 $I_t\text{ A}$ can be obtained according to the following formula (see **IEC 61434**).

$$I_t\text{ A} = \frac{C_s Ah}{1h}$$

When a cell is intended for permanent charge at elevated temperatures higher than 40 °C, a letter “T” is placed after the letter L, M, J or H (hereafter referred to as “T-cell”).

When a cell is intended for permanent charge at elevated temperatures higher than 50 °C, a letter “U” is placed after the letter L, M or H (hereafter referred to as “U-cell”).

When a cell is intended for surface temperature limitation for emergency, a letter “S” is placed after the letter L or M.

When a cell is intended for rapid charge, typically at 1.0 I, A, a letter “R” is placed after the letter L, M, H or X.

5.1.1.2 Small prismatic cells

Small prismatic cells shall be designated by the letters “HF” followed by a letter L, M, H or X and followed by three groups of figures, each group being separated by a solidus, as follows.

- a) The two figures to the left of the first solidus shall indicate the maximum width specified for the cell, expressed in millimetres, rounded up to the next whole number.
- b) The two figures in the middle between solidi shall indicate the maximum thickness specified for the cell, expressed in millimetres, rounded up to the next whole number.
- c) The two figures to the right of the second solidus shall indicate the maximum overall height specified for the cell, expressed in millimetres, rounded up to the next whole number.

Example : HFM18/07/49 (designating a small prismatic cell of medium rate of discharge capability with a maximum width of 18 mm, a maximum thickness of 7 mm and a maximum height of 49 mm)

5.1.1.3 Cylindrical cells

Cylindrical cells shall be designated by the letters “HR” followed by a letter L, M, J, H or X and further followed by two groups of figures, each group being separated by a solidus, as follows.

- a) The two figures to the left of the solidus shall indicate the maximum diameter specified for the cell, expressed in millimetres, rounded up to the next whole number.
- b) The two figures to the right of the solidus shall indicate the maximum height specified for the cell, expressed in millimetres, rounded up to the next whole number.

When a manufacturer designs a cell with dimensions and tolerances which make it interchangeable with a dry battery, the designation of table 2 may also be marked on the cell.

Examples of designation are shown below.

Example 1 HRL33/62 (designating a cylindrical cell of low rate of discharge capability with maximum diameter of 33 mm and maximum overall height of 61.5 mm)

Example 2 HRLT33/62 (designating a cylindrical cell of low rate of discharge capability intended for permanent charge at elevated temperatures higher than 40 °C with maximum diameter of 33 mm and maximum overall height of 61.5 mm)

Example 3 HRXR23/43 (designating a cylindrical cell of very high rate of discharge capability intended for rapid charge with maximum diameter of 23 mm and maximum overall height of 43 mm)

For cells dimensionally interchangeable with dry batteries, the dimensions shall be designated by letter L, M, R or S followed by one figure or two figures.

- 20: Size D (Unit 1)
- 14: Size C (Unit 2)
- 6: Size AA (Unit 3)
- 03: Size AAA (Unit 4)

Unless otherwise specified, cells dimensionally interchangeable with dry batteries shall correspond to the medium rate of discharge capability (M).

An example of designation is shown below.

Example 4 HRMR03 (designating a sealed nickel-metal hydride rechargeable cylindrical single cell of medium rate of discharge capability intended for rapid charge whose size indicates AAA that is dimensionally interchangeable with dry batteries)

5.1.2 Button cells

Button rechargeable cells shall be designated by the letters “HB” followed by two groups of figures separated by a solidus, as follows.

- a) The three figures to the left of the solidus shall indicate the maximum diameter specified for the cell, expressed in tenths of millimetres, rounded up to the next whole number.
- b) The three figures to the right of the solidus shall indicate the maximum height specified for the cell, expressed in tenths of millimetres, rounded up to the next whole number.

An example of designation is shown below.

Example : HB116/054 (designating a button cell with a maximum diameter of 11.6 mm and a maximum height of 5.4 mm)

5.2 Cell termination

This Standard does not specify the cell termination.

5.3 Marking

5.3.1 Small prismatic cells and cylindrical cells

The following items shall be marked on each jacketed cell supplied without terminations indelibly.

- Name designating sealed nickel-metal hydride rechargeable single cells
Example 1 Sealed nickel-metal hydride rechargeable single cell or Ni-MH
- Designation of cell as specified in 5.1
Example 2 HRM15/51, HFM18/07/49
- Rated capacity
- Nominal voltage
- Recommended charge current and recommended charge time, or recommended permanent charge current for “T” cell and “U” cell
- Polarity (+, -)
- Time of manufacture (A year, and a month or a week shall clearly be marked. For the marking, symbols or abbreviations may be used.)
- Name of manufacturer or supplier¹⁾ or its abbreviation, or registered trademark of product
- Marking²⁾ for the promotion of effective utilization of cells as resources

When a small prismatic or a cylindrical cell forms an integral part of a battery, generally, it is not necessary to mark the above-mentioned information on each cell. In this case, the above-mentioned matter shall be marked on the battery.

Notes ¹⁾ The suppliers refer to those who themselves do not manufacture, purchase products from the manufacturer and supply them to a third party.

²⁾ For the marking, “The Act on the Promotion of Effective Utilization of Resources” (Act No. 48 of April 26, 1991) shall be referred to.

5.3.2 Button cells

The following items shall be marked on each button cell supplied without terminations indelibly.

- Designation of cell as specified in 5.1
Example : HB116/054
- Polarity (+, -)
- Manufacture term (Year, and month or week shall clearly be marked. For the mark, symbols or abbreviations may be used.)
- Name of manufacturer or supplier, or registered trademark or its abbreviation
- Marking for the promotion of effective utilization of cells as resources

6 Dimensions

6.1 Small prismatic cell and cylindrical cell

6.1.1 General

For the dimensions of the cell (including the jacket), positions shown in figure 1 and figure 2 shall be measured.

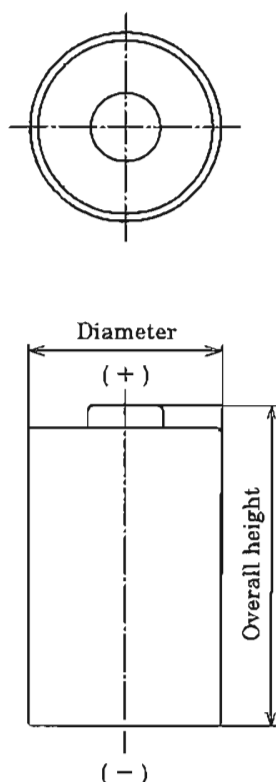


Figure 1 Cylindrical cell

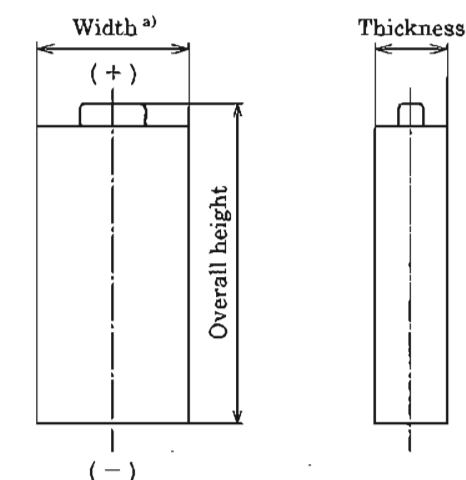
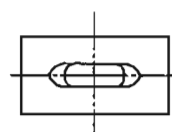


Figure 2 Small prismatic cell

Note ^{a)} The width of small prismatic cell shall be larger than or equal to the thickness.

6.1.2 Small prismatic cell

The dimensions of the cell (including the jacket) shall be according to table 1.

Table 1 Dimensions of small prismatic cell (including jacket)

Unit: mm

Designation ^{a)}	Width		Thickness		Overall height	
	Reference dimension	Tolerance	Reference dimension	Tolerance	Reference dimension	Tolerance
HF15/08/49	14.5	0 -1.0	7.4	0 -0.7	48.2	0 -1.0
HF15/09/49	14.5		8.3		48.2	
HF16/07/34	16.0		6.6		34.0	
HF18/07/36	17.3		6.1		35.7	
HF18/07/49	17.3		6.1		48.2	
HF18/09/49	17.3		8.3		48.2	
HF18/07/68	17.3		6.1	0 -1.0	67.3	0 -1.5
HF18/11/68	17.3		10.7		67.3	
HF18/18/68	17.3		17.3		67.3	
HF23/11/68	22.7		10.7		67.3	
HF23/15/68	22.7		14.5		67.3	

Note ^{a)} Letters HF shall be followed by a letter L, M, H or X (see 5.1.1.2).

6.1.3 Cylindrical cell

6.1.3.1 Cylindrical cell dimensionally interchangeable with dry battery

The dimensions of cylindrical cell dimensionally interchangeable with dry battery shall be according to table 2 and figure 3. All the dimensions shall conform to **JIS C 8515**.

Table 2 Dimensions of cylindrical cell interchangeable with dry battery

Designation ^{a)}	Type designation (informative) ^{b), c)}	Corresponding type name specified in JIS C 8515 ^{d)}	Nominal voltage	Dimensions mm										
				<i>A</i>	<i>B</i>	<i>C</i>	<i>D</i> ^{e)}	<i>E</i>	<i>F</i>		<i>G</i>	ϕ		ϕP
				Max.	Min.	Min.	—	Max.	Max.	Min.	Min.	Max.	Min.	Max.
HR03	Unit 4 AAA	R03 LR03	1.2	44.5	(43.3)	4.3	—	0.5	3.8	(2.0)	0.8	10.5	9.5	0.4
HR6	Unit 3 AA	R6 LR6		50.5	(49.2)	7.0	—	0.5	5.5	(4.2)	1.0	14.5	13.5	0.5
HR14	Unit 2 C	R14 LR14		50.0	(48.6)	13.0	—	0.9	7.5	(5.5)	1.5	26.2	24.9	1.0
HR20	Unit 1 D	R20 LR20		61.5	(59.5)	18.0	—	1.0	9.5	(7.8)	1.5	34.2	32.3	1.0

Numerical values in parentheses in this table are for reference.

Notes ^{a)} According to the nomenclature rules of **JIS C 8500**.

^{b)} In Japan, these are also known as Unit 4 (R03), Unit 3 (R6), Unit 2 (R14) and Unit 1 (R20).

^{c)} In some countries, these are also known as AAA (R03), AA (R6), C(R14) and D (R20).

^{d)} Carbon zinc batteries (R) and alkaline batteries (LR) shall conform to **JIS C 8515**, respectively.

^{e)} The "D" part is not specified for a sealed nickel-metal hydride cylindrical rechargeable single cell dimensionally interchangeable with dry battery because it is applicable only to a dry battery.