IEC 63115-1

Edition 1.0 2020-01

INTERNATIONAL STANDARD

NORME INTERNATIONALE

colour inside

Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-metal hydride cells and batteries for use in industrial applications – Part 1: Performance

Accumulateurs alcalins et autres accumulateurs à électrolyte non acide – Accumulateurs étanches au nickel-métal hydrure destinés à l'utilisation dans les applications industrielles – Partie 1: Performances

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

COMMISSION ELECTROTECHNIQUE INTERNATIONALE

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – SEALED NICKEL-METAL HYDRIDE CELLS AND BATTERIES FOR USE IN INDUSTRIAL APPLICATIONS –

Part 1: Performance

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International Standard IEC 63115-1 has been prepared by subcommittee 21A: Secondary cells and batteries containing alkaline or other non-acid electrolytes, of IEC technical committee 21: Secondary cells and batteries.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
21A/716/FDIS	21A/720/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63115, published under the general title *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-metal hydride cells and batteries for use in industrial applications*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – SEALED NICKEL-METAL HYDRIDE CELLS AND BATTERIES FOR USE IN INDUSTRIAL APPLICATIONS –

Part 1: Performance

1 Scope

This document specifies the marking, designation, tests and requirements for sealed nickel-metal hydride cells and batteries used in industrial applications, including stationary applications.

When an IEC International Standard specifying test conditions and requirements for cells used in special applications is in conflict with this document, the former takes precedence (e.g. IEC 62675).

The following are some examples of applications that utilize the cells and batteries falling under the scope of this document.

- Stationary applications: telecom, uninterruptible power supplies (UPS), electrical energy storage system, utility switching, emergency power and similar applications.
- Motive applications: fork-lift truck, golf cart, AGV (Automatic Guided Vehicle), railway, and marine, excluding road vehicles.

Since this document covers batteries for various industrial applications, it includes those requirements that are common and minimum to the various applications.

This document applies to cells and batteries. If the battery is divided into smaller units, the smaller unit can be tested as representative of the battery. The manufacturer clearly declares the tested unit. The manufacturer can add functions to the tested unit that are present in the final battery.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC 60050-482:2004, *International Electrotechnical Vocabulary (IEV) – Part 482: Primary and Secondary cells and batteries*

IEC 61434:1996, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Guide to the designation of current in alkaline secondary cell and battery standards*

IEC 62675:2014, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-metal hydride prismatic rechargeable single cells*

ISO/IEC Guide 51, *Safety aspects – Guidelines for their inclusion in standards*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 60050-482, ISO/IEC Guide 51, and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.1
cell
sealed nickel metal hydride cell
cell containing a nickel hydroxide compound for the positive electrode, a hydrogen absorbing alloy for the negative electrode, and potassium hydroxide or other alkaline solution as electrolyte, and not releasing either gas or liquid when operated within the limits specified by the manufacturer

Note 1 to entry: A sealed cell may be equipped with a safety device to prevent a dangerously high internal pressure and is designed to operate during its life in its original sealed state. See IEC 60050-482:2004, 482-05-17.

3.2
monobloc
battery with multiple separate but electrically connected cell compartments each of which is designed to house an assembly of electrodes, electrolyte, terminals or interconnections and possible separators

[SOURCE: IEC 60050-482:2004, 482-02-17, modified – "battery" has been omitted from the term and the note to entry deleted.]

3.3
module ,<for cells>
group of cells connected together either in series and/or parallel configuration with or without protective devices (e.g. fuse or PTC) and monitoring circuitry

3.4
battery pack
energy storage device comprised of one or more cells, monoblocs or modules electrically connected

Note 1 to entry: A battery pack may have a monitoring circuitry which provides information (e.g. cell voltage) to a battery system.

3.5
battery system
battery
system which comprises one or more cells, cell blocks, monoblocs, modules or battery packs

Note 1 to entry: The battery system has a battery management system to cut off current in case of overcharge, overcurrent, overdischarge, or overheating.

Note 2 to entry: Overdischarge cut off is not mandatory if there is an agreement on this between the cell manufacturer and the customer.

Note 3 to entry: The battery system may have cooling or heating units.

Note 4 to entry: The battery system may be enclosed in a battery box.

3.6
battery management system
BMS
electronic system associated with a battery which has functions to cut off in case of overcharge, overcurrent, overdischarge, or overheating

Note 1 to entry: The BMS monitors and/or manages its state, calculates secondary data, reports that data and/or controls its environment to influence the battery's safety, performance and/or service life.

Note 2 to entry: The BMS is sometimes also referred to as a BMU (battery management unit).

Note 3 to entry: This note applies to the French language only.

3.7
final voltage
specified voltage of a battery at which the battery discharge is terminated

[SOURCE: IEC 60050-482:2004, 482-03-30, modified – The synonyms "end-of-discharge voltage", "cut-off voltage" and "end-point voltage" have been omitted.]

3.8
nominal voltage
suitable approximate value of the voltage used to designate or identify the voltage of a cell or battery

Note 1 to entry: The nominal voltage of a sealed nickel-metal hydride single cell is 1,2 V.

Note 2 to entry: The nominal voltage of a battery of n series connected cells is equal to n times the nominal voltage of a single cell.

[SOURCE: IEC 60050-482:2004, 482-03-31, modified – The words "the voltage of" have been added; the notes to entry have been added and the reference to electrochemical systems has been omitted.]

3.9
rated capacity
capacity value of a cell or battery determined under specified conditions and declared by the manufacturer

Note 1 to entry: The rated capacity is the quantity of electricity C_5 Ah (ampere-hours) declared by the manufacturer which a cell or battery can deliver during a 5 h period when charging, storing and discharging under the conditions specified in 7.3.1.

[SOURCE: IEC 60050-482:2004, 482-03-15, modified – "cell" has been added to the definition, along with a note to entry.]

4 Parameter measurement tolerances

The overall accuracy of controlled or measured values, relative to the specified or actual values, shall be within the following tolerances:

a) ± 1 % for voltage;
b) ± 1 % for current;
c) ± 1 % for capacity;
d) ± 2 °C for temperature;
e) ± 0,1 % for time.

These tolerances 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 instrumentation used shall be provided in each report of results.

5 Marking and designation

5.1 Marking

The marking information per item is shown in Table 1. Each part that is installed or maintained shall carry clear and durable markings giving the specified information.

If there are designations on a battery system, battery pack or module and if full traceability of all parts can be ensured by the battery system manufacturer, designations are not necessary on inner parts. This applies only to battery systems maintained at the battery system manufacturer's location.

However, for a transportable unit (i.e. a unit that is being shipped), it is necessary to provide the marking information on the main transportable unit. Furthermore, if there is an arrangement between the purchaser and the manufacturer as regards marking, the unit shall comply with that arrangement.

Table 1 – Marking per item type

Marking information	Cell or monobloc	Module or battery pack	Battery system
Secondary sealed nickel-metal hydride battery or Ni-MH	R	R	R
Polarity	R	R	R
Date of manufacture (which may be in code)	R	R	R
Name or identification of manufacturer or supplier	R	R	R
Rated capacity	R	R	R
Nominal voltage	R	R	R
Appropriate warning statement (including disposal instruction)	R	R	R
Cell designation as specified in 5.2	R	--	--
Battery structure as specified in 5.3	--	R	R
NOTE "R" = required; "--" = unnecessary or not applicable			

5.2 Cell and monobloc designation

Sealed nickel-metal hydride cells and monoblocs shall be designated with following form:

$$HA_1N_1S_1A_2$$

where

A_1 designates the shape of the cell or monobloc in which:

R is cylindrical;

P is prismatic.

A_2 designates the rate capability of the cell in which:

L is a low rate of discharge type;

M is a medium rate of discharge type;

H is a high rate of discharge type;

X is a very high rate of discharge type.

NOTE These cells are typically but not exclusively used for the following discharge rates:

L up to 0,5 I_tA,

M up to 3,5 I_tA,

H up to 7,0 I_tA,

X over 7,0 I_tA.

N_1 is the group of figures indicative of the rated capacity of the cell, regardless whether a cell or monobloc is being marked per Table 1 – Marking per item type.

S_1 is the monobloc structure formulation (in the case of a cell, S_1 is not shown):

a) it describes the number of cells in the minimum constitutive entity and on the right side of the number, it describes their connection mode in series (S) or in parallel (P).

See Clause A.1 and Clause A.2 in Annex A.

b) in the event that the minimum constitutive entities are connected in series or in parallel, it describes the number of minimum constitutive entities, and on the right side of the number, it describes their connection mode in series (S) or in parallel (P).

See Clause A.3 and Clause A.4 in Annex A.

EXAMPLE 1 "HR75H" would designate a cylindrical sealed nickel-metal hydride cell. Its rated capacity is 75 Ah. It is designed for high discharge rate.

EXAMPLE 2 "HP95M" would designate a prismatic sealed nickel-metal hydride cell. Its rated capacity is 95 Ah. It is designed for medium discharge rate.

EXAMPLE 3 "HP34[2P5S]H" would designate a monobloc composed of 5S connected prismatic sealed nickel-metal hydride 2P cells. Its rated capacity is 68 Ah. It is designed for high discharge rate.

EXAMPLE 4 "HP100[10S]L" would designate a battery composed of 10S connected prismatic sealed nickel-metal hydride monobloc. Its rated capacity is 100 Ah. It is designed for low discharge rate.

5.3 Module, battery pack and battery system designation

Sealed nickel-metal hydride modules, battery packs and battery systems shall be designated with following form:

$$HA_1\ T_1N_1\ S_2A_2$$

where

T_1 designates the item type of Table 1 in which:

O is module, in this case N_1 is cell capacity;

Q is battery pack, in this case N_1 is battery pack capacity;

Y is battery system, in this case N_1 is battery system capacity;

S_2 is the battery structure formulation.

The battery designation should include the breakdown structure of the battery. The descriptive path followed to formulate the battery is from the smallest entity to the largest one:

a) refer to 5.2;

b) refer to 5.3;

c) in the case of larger constitutive entities, the battery designation describes the symbols on the right side in the same way as mentioned above.

When some constitutive entities can be separated for ease of handling or transportation, these entities can be distinguished from other entities by bracketing.

Some examples are shown in Clause A.6 to Clause A.9 of Annex A.

EXAMPLE 1 "HRO75H" would designate a cylindrical sealed nickel-metal hydride module. Its rated capacity is 75 Ah. It is designed for a high discharge rate.

EXAMPLE 2 "HPY34[(10S)68S]H" would designate a prismatic sealed nickel-metal hydride battery system. Its rated capacity is 34 Ah. It is designed for a high discharge rate.

EXAMPLE 3 "HRO540[6P4S]L" would designate a module composed of 4S connected cylindrical sealed nickel-metal hydride 6P cells. Its rated capacity is 540 Ah as it comprises a 6P, 90 Ah capacity cell. It is designed for a low discharge rate.

6 Dimensions

6.1 Cylindrical cell

There are no monoblocs with a cylindrical cell. See Figure 1 for examples of maximum dimensions.

Key

A total width

B total thickness

C diameter

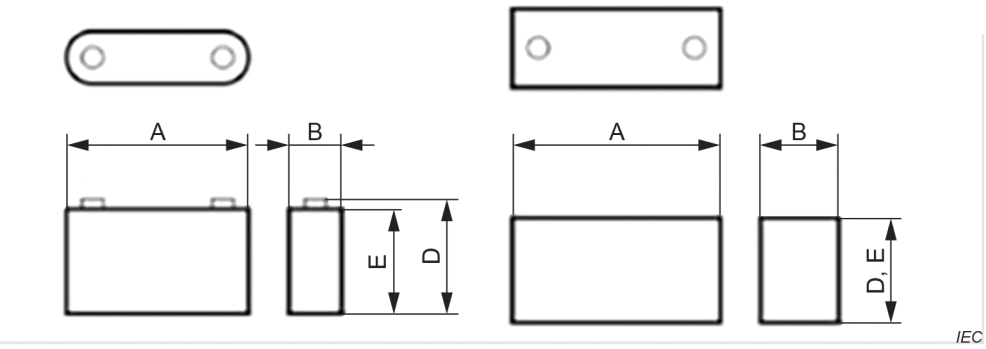
D total length (including terminals)

E total length (excluding terminals)

Figure 1 – Examples of maximum dimensions of a cylindrical cell

6.2 Prismatic cell and monobloc

Refer to IEC 62675:2014, Clause 6. See Figure 2 for examples of maximum dimensions.



Key

A total width

B total thickness

C diameter

D total length (including terminals)

E total length (excluding terminals)

Figure 2 – Examples of maximum dimensions of a prismatic cell and monobloc

6.3 Module, battery pack and battery system

Dimensions are defined as per the agreement between the user and manufacturer and shall be stated in the manufacturer's documents.

7 Electrical tests

7.1 General

Electrical tests are applied to cells and/or batteries. If the battery is divided into smaller units, the unit can be tested as representative of the battery. The manufacturer shall clearly declare the tested unit. The manufacturer may add to the tested unit, functions which are present in the final battery.

Charge and discharge currents for the tests in accordance with Clause 7 shall be based on the rated capacity (C_5 Ah). These currents are expressed as multiples of I_tA, where I_tA = C_5 Ah/1 h (refer to IEC 61434:1996).

NOTE In the case of parallel arrangement in a battery system, the total capacity is considered; for example, the designation "HRO540[6P4S]L" of EXAMPLE 3 in 5.3 has 540 Ah capacity, even if cells have 90 Ah capacity.

In all tests, except where noted, no leakage of electrolyte in liquid form shall be observed for the test to be acceptable.

A cooling device may be necessary according to manufacturer's instructions. When the temperature on the cell reaches 70 °C, the charge or discharge should be discontinued.

In all electrical tests, a safety pressure plate may be used on the outer surface of the cell to prevent a deformation of the cell case.

The manufacturer can use "monobloc(s)" instead of "cell(s)" for any test that specifies "cell(s)" as the test unit in this document. The cell manufacturer shall clearly declare the test unit for each test.

7.2 Charging procedure for test purposes

Prior to charging, the cells or batteries shall be discharged at 20 °C ± 5 °C at a constant current of 0,2 I_tA down to 1,0 V/cell.

Unless otherwise stated in this document, cells or batteries shall be charged in an ambient temperature of 20 °C ± 5 °C using the method as follows.

The charge shall be carried out at constant current throughout, in accordance with the conditions specified by cell types as follows.

1) For cells designed for slow charging, the charging procedure for test purposes shall be carried out at a constant current of 0,1 I_tA for between 10 h and 16 h (duration to be declared by manufacturer in in the test report).
2) For all other cells, charge shall be carried out under condition (a), (b) or (c).
   a) First at a constant current of 0,2 I_tA for 4 h, then at a constant current of 0,1 I_tA for 3 h to 4 h (3 h can be reduced as per the manufacturer's requirements, then apply all tests in this document). The duration of the charge shall therefore be 7 h to 8 h.
   b) First at a constant current of 0,2 I_tA for 4 h 30 min, then at a constant current of 0,05 I_tA for 3 h to 4 h. The duration of the charge shall therefore be 7 h 30 min to 8 h 30 min.
   c) First at a constant current of 0,2 I_tA, for 5 h, then at a constant current of 0,1 I_tA, for up to 2 h.

7.3 Discharge performance

7.3.1 Discharge performance at 20 °C

7.3.1.1 General

This test verifies the rated capacity of the cell or battery.

7.3.1.2 Test method

Step 1: The cell or battery shall be fully charged in accordance with 7.2.

Step 2: The cell or battery shall be stored in an ambient temperature of 20 °C ± 5 °C, for not less than 1 h and not more than 4 h.

Step 3: The cell or battery shall then be discharged in the same ambient temperature and with a current as specified in Table 2.

7.3.1.3 Acceptance criteria

The duration of discharge time, delivered during step 3 shall be not less than the minimum specified in Table 2.