BS EN 62675:2014

BSI Standards Publication

Secondary cells and batteries containing alkaline or other non-acid electrolytes — Sealed nickel-metal hydride prismatic rechargeable single cells

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National foreword

This British Standard is the UK implementation of EN 62675:2014. It is identical to IEC 62675:2014.

The UK participation in its preparation was entrusted by Technical Committee PEL/21, Secondary cells and batteries, to Subcommittee PEL/21/1, Secondary cells and batteries containing alkaline and other non-acidic electrolytes.

A list of organizations represented on this committee can be obtained on request to its secretary.

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English Version

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

Accumulateurs alcalins et autres accumulateurs à électrolyte non acide - Éléments individuels parallélépipédiques rechargeables étanches au nickelmétal hydrure
(CEI 62675:2014)

Akkumulatoren und Batterien mit alkalischem oder anderen nichtsäurehaltigen Elektrolyten - Prismatische wiederaufladbare gasdichte Nickel-Metallhydrid-Einzelzellen für industrielle Anwendungen
(IEC 62675:2014)

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Foreword

The text of document 21A/550/FDIS, future edition 1 of IEC 62675, prepared by SC 21A "Secondary cells and batteries containing alkaline or other non-acid electrolytes", of IEC TC 21, "Secondary cells and batteries", was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN 62675:2014.

The following dates are fixed:

– latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement	(dop)	2015-07-01
– latest date by which the national standards conflicting with the document have to be withdrawn	(dow)	2017-10-01

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Endorsement notice

The text of the International Standard IEC 62675:2014 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60051 Series	NOTE	Harmonised as EN 60051 Series.
IEC 61434	NOTE	Harmonised as EN 61434.

Annex ZA
(normative)

Normative references to international publications with their corresponding European publications

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

NOTE 1 When an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

Publication	Year	Title	EN/HD	Year
IEC 60050-482	2004	International Electrotechnical Vocabulary-(IEV) -- Part 482: Primary and secondary cells and batteries		-

CONTENTS

SECONDARY CELLS AND BATTERIES CONTAINING ALKALINE OR OTHER NON-ACID ELECTROLYTES – SEALED NICKEL-METAL HYDRIDE PRISMATIC RECHARGEABLE SINGLE CELLS

1 Scope

This International Standard specifies marking, designation, dimensions, tests and requirements for sealed nickel-metal hydride prismatic secondary single cells.

NOTE In this context, "prismatic" refers to cells having rectangular sides and base.

When there exists an IEC standard specifying test conditions and requirements for cells used in special applications and which is in conflict with this standard, the former takes precedence.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in the IEC 60050-482, as well as the following apply.

3.1
sealed cell
cell which remains closed and does not release either gas or liquid when operated within the limits of charge and temperature specified by the manufacturer

Note 1 to entry: The cell is equipped with a safety device to prevent dangerously high internal pressure.

Note 2 to entry: The cell does not require addition to the electrolyte and is designed to operate during its life in its original sealed state.

Note 3 to entry: The nickel-metal hydride cell, however, may release gas towards the end of its life due to the accumulation of hydrogen in the cell.

[SOURCE: IEC 60050-482:2004, 482-05-17, modified – The existing note has been developed into Notes 1, 2 and 3 to entry.]

3.2
nominal voltage
suitable approximate value of 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 rechargeable single cell: 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 – Addition of Notes 1 and 2 to entry.]

3.3
rated capacity
capacity value of a 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 battery can deliver when discharged at the reference test current of 0,2 I_tA to a final voltage of 1,0 V at +20 °C when charged, stored and discharged under the conditions specified in Clause 7.

[SOURCE: IEC 60050-482:2004, 482-03-15, modified – Addition of Note 1 to entry.]

4 Parameter measurement tolerances

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

a) ±1 % for voltage;

b) ±1 % for current;

c) ±2 °C for temperature;

d) ±0,1 % for time;

e) ±1 % for capacity.

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 any report of results.

5 Designation and marking

5.1 Cell designation

Sealed nickel-metal hydride prismatic secondary single cells shall be designated by the letter "HP" followed by a letter L, M, H or X which signifies:

– low rate of discharge (L);
– medium rate of discharge (M);
– high rate of discharge (H);
– very high rate of discharge (X).

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

– L up to 0,5 I_t A,
– M up to 3,5 I_t A,
– H up to 7,0 I_t A,
– X up to and above 7,0 I_t A.

This group of two letters shall be followed by a group of figures indicative of the rated capacity of the cell in ampere-hours.

Cells that have been tested at 20 °C and 5 °C but not at –18 °C shall carry an additional marking of T5.

For example: HPH 100 or HPH 100 T5.

Cells in cases of steel material shall be designated by the letter "S" after the figures.

For example: HPH 100 S or HPH 100 S T5.

5.2 Cell termination

This standard does not specify cell termination.

5.3 Marking

Each cell or monobloc shall carry durable markings giving the following minimum information:

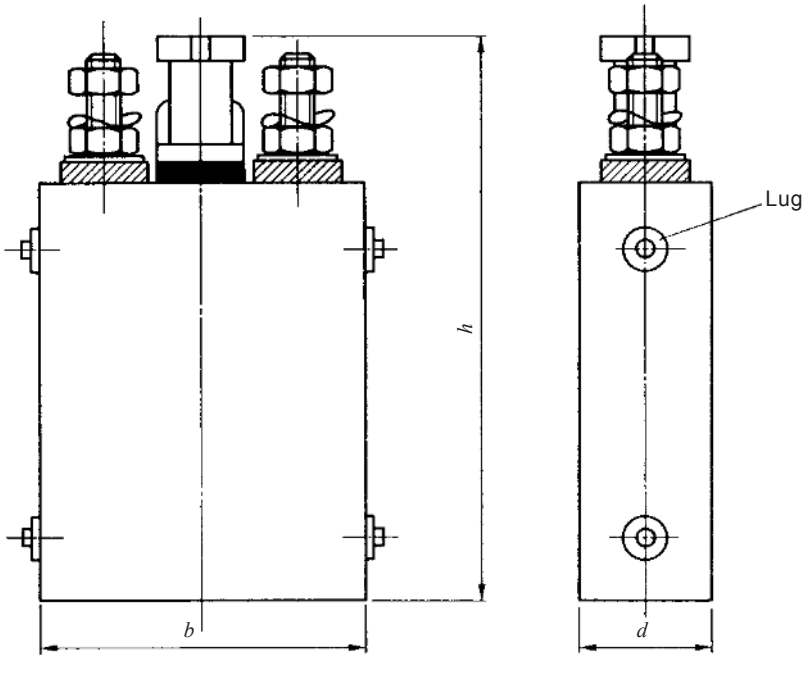
- type of cell (designation as specified in 5.1; in addition, it is permissible for a manufacturer to use his own type designation);
- name or identification of manufacturer or supplier;
- positive terminal: either a red washer or an indented or raised symbol, (see graphical symbol 5005 of IEC 60417:2002).

5.4 Safety recommendations

The manufacturer shall provide recommendations for the safe handling of the cell. See also IEC 61438.

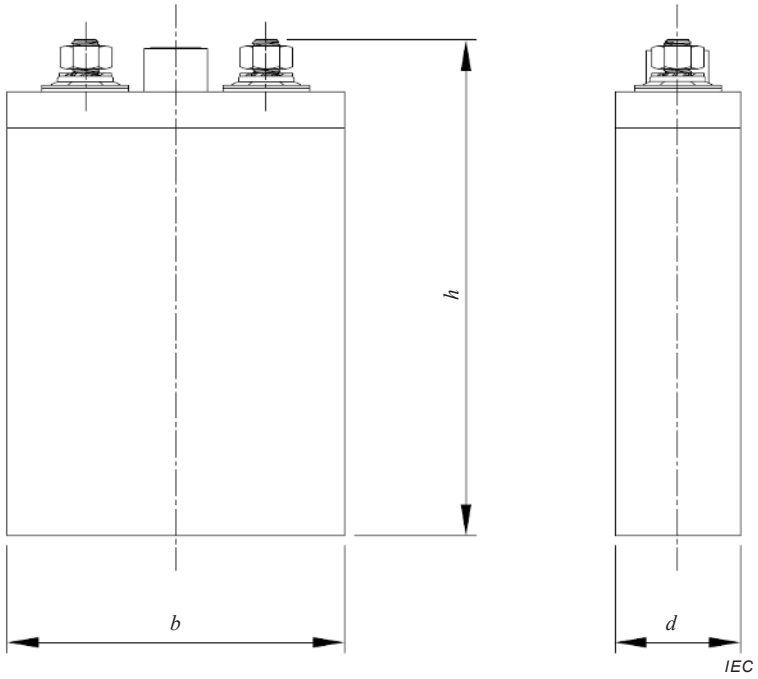
6 Dimensions

Dimensions of cells shown in Figure 1 and Figure 2 are given in Table 1 and Table 2.



NOTE Cells in steel container can have two or more terminals and four or more lugs.

Figure 1 – Example of a sealed prismatic cell in steel container with two terminals and four lugs



NOTE Cells in plastic container can have two or more terminals.

Figure 2 – Example of a sealed prismatic cell in plastic container with two terminals

Table 1 – Dimensions for sealed nickel-metal hydride prismatic cells in steel containers

Maximum height, *h* mm	**Width, *b*** mm	**Length, *d*** mm
210	155	55
320	230	61

Table 2 – Dimensions for sealed nickel-metal hydride prismatic cells in plastic containers

Maximum height, *h* mm	**Width, *b*** mm	**Length, *d*** mm
125	83	36
146	98	41
168	83	34
178	116	37, 40
191	134	49
195	60	78
200	120	47
224	182	55
300	220	224

NOTE 1 The dimensions given in Table 1 and Table 2 represent preferred values.

NOTE 2 The widths relate to the overall width dimension of the cell excluding for cells in steel container the thickness of the lug flanges. The values for widths and lengths given in Table 1 and Table 2 are maximum values; their negative tolerances are given in Table 3.

NOTE 3 The values for height given in Table 1 and Table 2 relate to the maximum height over the terminals or the closed cell vent, whichever is the greater. No lower limits are stated.

NOTE 4 The dimensions shown in Table 1 and Table 2 are not associated to particular cell capacities. They apply to all kinds of sealed nickel-metal hydride prismatic cells, i.e. L, M, H and X types.

Table 3 – Measurement tolerances in millimetres (valid for widths and lengths)

Up to and including 60 mm	0 to –2
Above 60 mm, up to and including 120 mm	0 to –3
Above 120 mm	0 to –4

7 Electrical tests

7.1 General

Charge and discharge currents for the tests in accordance with 7.2 to 7.10 inclusive shall be based on the value of the rated capacity.

In all tests, except where noted, no leakage of electrolyte in liquid form shall be observed. A cooling device may be necessary, referring to manufacturer's instructions. When the temperature on the cell reaches a level of 70 °C, the charge or discharge should be discontinued.

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

7.2 Charging procedure for test purposes

Prior to charging, the cells shall have been discharged in an ambient temperature of 20 °C ± 5 °C, at a constant current of 0,2 I_t A, down to a final voltage of 1,0 V.

Unless otherwise specified in this standard, the charge preceding the various discharge tests scheduled, shall be carried out in an ambient temperature of 20 °C ± 5 °C and either

a) at a constant current of 0,2 I_t A for 4h, then at a constant current of 0,1 I_t A for 3 h to 4 h. The duration of the charge shall therefore be 7 h to 8 h, or
b) at a constant current of 0,2 I_t A for 4 h 30 min, then at a constant current of 0,05 I_t A for 3 h to 4 h. The duration of the charge shall therefore be 7 h 30 min to 8 h 30 min.

7.3 Discharge performance

7.3.1 General

The following discharge tests shall be carried out in the sequence given.

All cells shall be tested at 20 °C as well as at +5 °C and/or –18 °C.

7.3.2 Discharge performance at 20 °C

The cell shall have been charged in accordance with 7.2. After charging, the cell shall be stored, in an ambient temperature of 20 °C ± 5 °C , for not less than 1 h and not more than 4 h. It shall then be discharged in the same ambient temperature and as specified in Table 4. The duration of discharge shall be not less than the minimum specified in Table 4.

The 0,2 I_t A discharge test is performed in order to verify the declared rated capacity of the cell.

Table 4 – Discharge performance at 20 °C

Discharge conditions		Minimum discharge duration			
Rate of constant current	Final voltage	Cell designation			
A	V	L	M	H	X
0,2 I_t [a]	1,0	5 h	5 h	5 h	5 h
1,0 I_t	1,0	–	38 min	48 min	54 min
5,0 I_t [b]	0,8	–	–	2 min 30 s	6 min 30 s
10,0 I_t [b]	0,8	–	–	–	1 min 30 s

[a] Five cycles are permitted for this test which shall, however, be terminated at the end of the first cycle which meets the requirement.

[b] Before the 5 I_t A and the 10 I_t A discharge tests, a conditioning cycle may be included if necessary. This cycle shall consist of charging and discharging in accordance with 7.2 and 7.3.2.

7.3.3 Discharge performance at +5 °C

The cell shall have been charged in accordance with 7.2. After charging, the cell shall be stored, in an ambient temperature of +5 °C ± 2 °C, for 24 h. Means shall be provided to ensure that the electrolyte temperature has reached +5 °C ± 2 °C within 24 h. It shall then be discharged in the same ambient temperature and as specified in Table 5.

The duration of discharge shall be not less than the minimum specified in Table 5.

Table 5 – Discharge performance at +5 °C

Discharge conditions		Minimum discharge duration			
Rate of constant current	Final voltage	Cell designation			
A	V	L	M	H	X
0,2 I_t	1,0	3 h 24 min	3 h 42 min	3 h 54 min	4 h 18 min
1,0 I_t	1,0	–	25 min	36 min	44 min
2,0 I_t [a]	1,0	–	–	10 min	18 min 30 s
3,0 I_t [a]	0,8	–	–	–	10 min 30 s

[a] Before the 2 I_t A and 3 I_t A tests, a conditioning cycle may be included if necessary. This cycle shall consist of charging and discharging, in an ambient temperature of 20 °C ± 5 °C, according to 7.2 and 7.3.2.

7.3.4 Discharge performance at –18 °C

The cell shall have been charged in accordance with 7.2. After charging, the cell shall be stored in an ambient temperature of –18 °C ± 2 °C, for 24 h. Means shall be provided to ensure that the electrolyte temperature has reached –18 °C ± 2 °C within 24 h. It shall then be discharged in the same ambient temperature and as specified in Table 6. The duration of discharge shall be not less than the minimum specified in Table 6.

Table 6 – Discharge performance at –18 °C

Discharge conditions		Minimum discharge duration			
Rate of constant current	Final voltage	Cell designation			
A	V	L	M	H	X
0,2 I_t	1,0	2 h 8 min	2 h 24 min	2 h 39 min	2 h 54 min
1,0 I_t	0,9	–	12 min	21 min	27 min
2,0 I_t [a]	0,9	–	–	6 min	9 min
3,0 I_t [a]	0,8	–	–	–	4 min

[a] Before the 2 I_t A and 3 I_t A discharge tests, a conditioning cycle may be included if necessary. This cycle shall consist of charging and discharging in an ambient temperature of 20 °C ± 5 °C, according to 7.2 and 7.3.2.

7.3.5 High rate current test

7.3.5.1 General

This test is to evaluate the ability of a cell to withstand high currents.

7.3.5.2 Test method

The cell shall have been charged in accordance with 7.2. After charging, the cell shall be stored, in an ambient temperature of 20 °C ± 5 °C, for not less than 1 h and not more than 4 h. It shall then be discharged for 5 s in the same ambient temperature and at the currents given in Table 7. During the discharge the terminal voltage shall be recorded.

Table 7 – High currents values

Cell type	Rate of constant current
L	6 I_t A
M	10 I_t A
H	15 I_t A
X	20 I_t A

7.3.5.3 Acceptance criteria

No fusing, no deformation of cell case, no deformation of internal cell components shall be observed. In addition, the cell voltage during the discharge should show no discontinuity.

7.4 Charge retention

The charge retention shall be verified by the following test:

After charging in accordance with 7.2, the cell shall be stored on open circuit for 28 days. The average ambient temperature shall be 20 °C ± 5 °C. The temperature may be allowed to vary within the range of 20 °C ± 5 °C for short periods during the storage.

The cell shall then be discharged under the conditions specified in 7.3.2 at a constant current of 0,2 I_t A. The duration of the discharge shall be not less than 4 h.

7.5 Endurance

7.5.1 Endurance in cycles

7.5.1.1 Test conditions

The endurance test shall be carried out in an ambient temperature of 20 °C ± 5 °C. Precautions shall be taken to prevent the cell case temperature from rising above +40 °C during the test, for example by providing a forced air draught if necessary or applying cooling instructions as provided by manufacturer's recommendation.

Before the first cycle, the cell shall have been discharged at a constant current of 0,2 I_t A down to a final voltage of 1,0 V.

7.5.1.2 Cycles 1 to 50

The cycling shall be carried out under the conditions specified in Table 8. Charge and discharge shall be carried out at constant current throughout. Cycling shall be continuous, except that it is permissible to allow the cell to stand for a short period at the end of discharge of each 49th and 50th cycle in order to start the next 50-cycle sequence at a convenient time.

Table 8 – Endurance in cycles

Cycle number	Charge	Discharge
1	0,1 I_t A for 11 h or 0,2 I_t A for 4 h 30 min, then 0,05 I_t A for 3 h to 4 h [b]	0,2 I_t A for 3 h
2 – 48	0,2 I_t A for 3 h 10 min or 0,2 I_t A for 3 h, then 0,05 I_t A for 40 min [b]	0,2 I_t A for 3 h
49	0,2 I_t A for 3 h 10 min or 0,2 I_t A for 3 h, then 0,05 I_t A for 40 min [b]	0,2 I_t A to 1,0 V
50	0,2 I_t A for 4 h, then 0,1 I_t A for 3 h to 4 h [a] or 0,2 I_t A for 4 h 30 min, then 0,05 I_t A for 3 h to 4 h [b]	0,2 I_t A to 1,0 V

[a] When the cell voltage begins to decline from the maximum charging voltage rise, charge is terminated.

[b] If the cell is designed to be charged according to method 7.2 b), charging for this cycle could be carried out in accordance with this procedure.

7.5.1.3 Acceptance criterion

Cycles 1 to 50 shall be repeated until the discharge duration on any 50th cycle becomes less than 3 h 30 min. At this stage, a further cycle shall be carried out in accordance with 7.3.2 at a constant current of 0,2 I_t A.

The endurance test is considered complete when two such successive cycles give discharge duration less than 3 h 30 min.

The number of cycles obtained when the test is completed shall be not less than 500.

7.5.2 Permanent charge endurance

This standard does not specify a permanent charge endurance test.

7.6 Charge acceptance at constant voltage

This standard does not specify a charge acceptance test at constant voltage.

Charging at constant voltage is not recommended.

7.7 Overcharge

This test is to evaluate the ability of the cell to keep its performances after an overcharge with representative charging conditions.

The ability of the cell to withstand an overcharge shall be determined by the following test.

Prior to this test, the cell shall be discharged in an ambient temperature of 20 °C ± 5 °C, at a constant current of 0,2 I_t A, down to a final voltage of 1,0 V.

The cell shall then be charged, in an ambient temperature of 20 °C ± 5 °C. The charging currents for this test shall therefore reflect the choice of option a) or b) of 7.2, according to the battery manufacturer recommendation:

a) for battery designed for option a): a constant current of 0,1 I_t A for 48 h;

b) for battery designed for option b): a constant current of 0,05 I_t A for 96 h.

After this charging operation, the cell shall be stored, in an ambient temperature of 20 °C ± 5 °C, for not less than 1 h and not more than 4 h.

The cell shall then be discharged in an ambient temperature of 20 °C ± 5 °C at a constant current of 0,2 I_t A down to a final voltage of 1,0 V. The duration of discharge shall be not less than 5 h, and the cell temperature shall not exceed 60 °C.

7.8 Vent plug operation

This standard does not specify a vent plug operation test.

7.9 Safety device operation

Warning: EXTREME CAUTION SHALL BE EXERCISED WHEN CARRYING OUT THESE TESTS ! CELLS SHALL BE TESTED INDIVIDUALLY, AND IT SHOULD BE NOTED THAT CELLS FAILING TO MEET THE REQUIREMENT COULD BURST WITH EXPLOSIVE FORCE EVEN AFTER THE CELL HAS BEEN DISCONNECTED FROM THE CHARGE CURRENT.

FOR THIS REASON, THE TEST SHALL BE CARRIED OUT IN A PROTECTIVE CHAMBER.

The following two tests shall be carried out in order to establish that the safety device of the cell will operate to allow the escape of gas when the internal pressure exceeds a critical value.

After charging in accordance with 7.2, the cell shall undergo a discharge on a 0,2 mΩ resistor per cell (to be multiplied by the number of cells in case of test done on a series connected cells), in an ambient temperature of 20 °C ± 5 °C, for 30 min.

After charging in accordance with 7.2, the cell shall undergo a charge, in an ambient temperature of 20 °C ± 5 °C, at a constant current of 0,2 I_t A, for a duration of 10 h or until reaching a voltage over 10,0 V/cell.

During and at the end of those tests, the cell shall not take fire or burst. Leakage of electrolyte and deformation of the cell are acceptable.

7.10 Gas leakage test

The cell shall have been prepared in accordance with 7.2. The cell shall be further charged at a constant current of 0,02 I_t A. During this charge the cell voltage shall be measured at intervals of 30 min. When the voltage is stabilised the cell shall be immersed in insulating oil and the charging continued for 1 h. Then the possible emergence of gas bubbles shall be observed for another hour with the cell still being charged. No gas bubble shall be observed during this 1h period.

7.11 Storage

The cells shall be prepared for storage according to the manufacturer's instructions. The cells shall then be stored for a period of 6 months in an average ambient temperature of 20 °C ± 5 °C and at a relative humidity of 65 % ± 20 %. During the storage period the ambient temperature shall not at any time fluctuate beyond the limits of 20 °C ± 10 °C.

After completion of the storage period, the cells shall be prepared for use according to the manufacturer's instructions. The cells are then subjected to the tests specified in 7.3.2 and shall meet all the requirements of that subclause.

8 Mechanical tests

Mechanical tests should be designed in relation to the intended application. Therefore this standard does not specify mechanical tests, which should be the subject of agreement between the customer and the manufacturer.

9 Physical appearance

Visual inspection shall be performed on cells. No cracking, damage or corrosion shall be apparent. Any deformation shall be within the tolerances of the dimensions specified in the manufacturer's drawings.

10 Conditions for approval and acceptance

10.1 Type approval

For type approval the sample sizes and sequence of tests given in Table 9 shall be used. The total number of cells required for type approval is 26. Cells used for the testing shall be new cells.

All cells shall be subjected to the tests in group A, after which they shall be divided randomly into five groups of five cells each, denominated B, C, D, E and F respectively. This allows one spare cell which permits a repeat test to cover any incident occurring outside the supplier's responsibility. Tests shall be carried out in sequence within each group of test.

The number of defective cells tolerated per group, and in total, is given in Table 9. A cell is considered to be defective if it does not meet the requirements of all or part of the tests of a group.

Table 9 – Sequence of tests for type approval

Group	Sample size	Clause or subclause	Tests	Number of defective cells	
				Per group	In total
A	26	5.3 6 7.3.2	Marking Dimensions Discharge at 20 °C	0	2
B	5	7.3.3 and/or 7.3.4 7.3.5	Discharge at +5 °C and/or –18 °C High rate currents	1	
C	5	7.4 7.5.1	Charge retention Endurance in cycles	1	
D	5	7.7 7.9	Overcharge Safety device operation	0	
E	5	7.10	Gas leakage test	0	
F	5	7.11	Storage	1	

10.2 Batch acceptance

These tests are applicable to deliveries of individual cells.

Unless otherwise agreed between supplier and purchaser, inspections and tests shall be performed using inspection levels and AQLs (acceptable quality level) recommended in Table 10. The sampling procedure should be established in accordance with IEC 60410.

Table 10 – Recommended test sequence for batch acceptance

Group	Clause or Subclause	Inspection/Tests	Recommendation	
			Inspection level	AQL %
A		Visual inspection	II	4
B		Physical inspection		
	6	– Dimensions	S3	1
		– Weight	S3	1
	5.3	– Marking	S3	1
C		Electrical inspection		
		– Open circuit voltage and polarity	II	0,65
	7.3.2	– Discharge at 20 °C	S3	1
NOTE Two or more failures on a single cell are not cumulative. Only the failure corresponding to the lowest AQL is taken into consideration.				

Bibliography

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

IEC 60417 (all parts), *Graphical symbols for use on equipment*

IEC 60485, *Digital electronic d.c. voltmeters and d.c. electronic analogue-to-digital convertors*[1]

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

IEC 61438, *Possible safety and health hazards in the use of alkaline secondary cells and batteries – Guide to equipment manufacturers and users*

[1] This publication was withdrawn.

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