

3.3.3

button cell

cell of a circular cross-section in which the overall height is less than the overall diameter

3.3.4

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. The cell is equipped with a safety device to prevent dangerously high internal pressure. The cell does not require addition to the electrolyte and is designed to operate during its life in its original sealed state

3.3.5

nominal cell voltage

nominal voltage of a sealed nickel-cadmium rechargeable single cell: 1,2 V

3.3.6

portable cell

cell designed mainly for use in an easily hand-carried battery

3.3.7

rated capacity

quantity of electricity C_5 Ah (ampere-hours) declared by the manufacturer which a single cell can deliver during a 5 h period when charging, storing and discharging under the conditions specified in 7.2.1

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) $\pm 0,1$ % 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.

For assistance in selecting instrumentation, see the IEC 60051 series for analogue instruments and IEC 60485 for digital instruments. The details of the instrumentation used shall be provided in each report of results.

5 Cell designation and marking

5.1 Cell designation

5.1.1 Small prismatic cells

Sealed nickel-cadmium small prismatic rechargeable single cells shall be designated by the letters "KF" followed by three groups of figures each one separated by a solidus.

- 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.

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

7.2.1 Discharge performance at 20 °C

The cell shall be charged in accordance with 7.1. 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.

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- 27 -

The cell shall then be discharged in an ambient temperature of 20 °C ± 5 °C and as specified in Tables 5, 6 or 7. The duration of discharge shall be not less than the values specified in Tables 5, 6 or 7.

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

Table 5 – Discharge performance at 20 °C for small prismatic cells

Discharge conditions		Minimum discharge duration h/min
Rate of constant current A	Final voltage V	
0,2 I_t ^a	1,0	5 h
1,0 I_t	0,9	42 min

^a Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

Table 6 – Discharge performance at 20 °C for cylindrical cells

Discharge conditions		Minimum discharge duration h/min			
Rate of constant current A	Final voltage V	Cell designation			
		L/LT/LU	M/MT/MU	H/HT/HU	X
0,2 I_t ^a	1,0	5 h	5 h	5 h	5 h
1,0 I_t	0,9	-	42 min	48 min	54 min
5,0 I_t ^b	0,8	-	-	6 min	9 min
10,0 I_t ^b	0,7	-	-	-	4 min

^a Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

^b Prior to the 5,0 I_t A and 10,0 I_t A tests, a conditioning cycle may be included if necessary. This cycle shall consist of charging at 0,1 I_t A in accordance with 7.1 and discharging at 0,2 I_t A, at an ambient temperature of 20 °C ± 5 °C, according to 7.2.1.

Table 7 – Discharge performance at 20 °C for button cells

Discharge conditions		Minimum discharge duration h/min		
Rate of constant current A	Final voltage V	Cell designation		
		L	M	H
0,2 I_t ^a	1,0	5 h	5 h	5 h
1,0 I_t	1,0	-	48 min	51 min
5,0 I_t ^b	0,8	-	-	6 min

^a Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

^b Prior to the 5 I_t A test, a conditioning cycle may be included if necessary. This cycle shall consist of charging at 0,1 I_t A in accordance with 7.1 and discharging at 0,2 I_t A, at an ambient temperature of 20 °C ± 5 °C, according to 7.2.1.

3.3.2

cylindrical cell

cell of circular cross-section in which the overall height is equal to, or greater than the overall diameter

3.3.3

button cell

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

3.3.4

nickel-metal hydride cell

cell containing a nickel hydroxide compound for the positive electrode and a hydrogen absorbing alloy for the negative electrode

3.3.5

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. The cell is equipped with a safety device to prevent dangerously high internal pressure. The cell does not require addition to the electrolyte and is designed to operate during its life in its original sealed state

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

3.3.6

nominal voltage

nominal voltage of a sealed nickel-metal hydride rechargeable single cell: 1,2 V

3.3.7

portable cell

cell designed mainly for use in an easily hand-carried battery

3.3.8

rated capacity

quantity of electricity C_5 Ah (ampere-hours) declared by the manufacturer which a single cell can deliver during a 5 h period when charging, storing and discharging under the conditions specified in 7.2.1

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) $\pm 0,1$ % 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.

For assistance in selecting instrumentation, see the IEC 60051 series for analogue instruments and IEC 60485 for digital instruments. The details of the instrumentation used shall be provided in each report of results.

In all tests, except where noted, no leakage of electrolyte in liquid form shall be observed.

7.1 Charging procedure for test purposes

Unless otherwise stated in this standard, the charging procedure for test purposes shall be carried out in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, at a constant current of $0,1 I_t$ A, for 16 h.

Prior to charging, the cell shall have been discharged in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, at a constant current of $0,2 I_t$ A, down to a final voltage of 1,0 V.

7.2 Discharge performance

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

7.2.1 Discharge performance at $20\text{ }^{\circ}\text{C}$

The cell shall be charged in accordance with 7.1. After charging, the cell shall be stored in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, for not less than 1 h and not more than 4 h.

The cell shall then be discharged in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ and as specified in Tables 5 or 6. The duration of discharge shall be not less than the values specified in Tables 5 or 6.

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

Table 5 – Discharge performance at $20\text{ }^{\circ}\text{C}$ for small prismatic cells and cylindrical cells

Discharge conditions		Minimum discharge duration h/min			
Rate of constant current	Final voltage	Cell designation			
A	V	L/LT	M/MT	H/HT	X
$0,2 I_t^a$	1,0	5 h	5 h	5 h	5 h
$1,0 I_t$	0,9	-	42 min	48 min	54 min
$5,0 I_t^b$	0,8	-	-	6 min	9 min
$10,0 I_t^b$	0,7	-	-	-	4 min

^a Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

^b Prior to the $5 I_t$ A and $10 I_t$ A tests, a conditioning cycle may be included if necessary. This cycle shall consist of charging at $0,1 I_t$ A in accordance with 7.1 and discharging at $0,2 I_t$ A in an ambient temperature of $20\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ according to 7.2.1.

Table 6 – Discharge performance at $20\text{ }^{\circ}\text{C}$ for button cells

Discharge conditions		Minimum discharge duration h/min
Rate of constant current A	Final voltage V	
$0,2 I_t^a$	1,0	5 h
$1,0 I_t$	0,9	35 min

^a Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

Li-Ion

3 Terms and definitions

For the purpose of this International Standard, the definitions contained in IEC 60050-486 and the following apply.

3.1

charge (capacity) recovery

capacity that a cell or battery can deliver after the charge following the charge retention test according to 3.2

3.2

charge (capacity) retention

capacity that a cell or battery can deliver after storage, at a specific temperature, for a specific time without subsequent recharging as a percentage of the rated capacity

3.3

final voltage

end-of-discharge voltage

specified closed circuit voltage at which a discharge of a cell or battery is terminated

3.4

nominal voltage:

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

NOTE 1 The nominal voltages of secondary lithium cells are given in Table 1.

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

3.5

rated capacity

quantity of electricity C_5 Ah (ampere-hours) declared by the manufacturer which a single cell or battery can deliver during a 5-h period, when charged, stored and discharged under the conditions specified in 7.2.1

3.6

secondary lithium battery

unit which incorporates one or more secondary lithium cells and which is ready for use. It incorporates adequate housing and a terminal arrangement and may have electronic control devices

3.7

secondary lithium cell

secondary single cell whose electrical energy is derived from the oxidation and the reduction of lithium. It is not ready for use in an application because it is not yet fitted with its final housing, terminal arrangement and electronic control device

7.1 Charging procedure for test purposes

Prior to charging, the cell or battery shall be discharged at $20\text{ °C} \pm 5\text{ °C}$ at a constant current of $0,2 I_t$ A, down to a specified end-of-discharge voltage.

Unless otherwise stated in this standard, cells or batteries shall be charged, in an ambient temperature of $20\text{ °C} \pm 5\text{ °C}$, using the method declared by the manufacturer.

7.2 Discharge performance

7.2.1 Discharge performance at 20 °C (rated capacity)

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

Step 1 – The cell or battery shall be charged in accordance with 7.1.

Step 2 – The cell or battery shall be stored, in an ambient temperature of $20\text{ °C} \pm 5\text{ °C}$, for not less than 1 h and not more than 4 h.

61960 © IEC:2003

– 19 –

Step 3 – The cell or battery shall be discharged, in an ambient temperature of $20\text{ °C} \pm 5\text{ °C}$, at a constant current of $0,2 I_t$ A, until its voltage is equal to the specified end-of-discharge voltage.

Step 4 – The capacity (Ah) delivered during step 3 shall be not less than 100 % of the rated capacity declared by the manufacturer. Steps 1 to 4 may be repeated up to four additional times, as necessary to satisfy this requirement.

7.2.2 Discharge performance at -20 °C

This test determines the capacity of the cell or battery at a low temperature.

Step 1 – The cell or battery shall be charged in accordance with 7.1.

Step 2 – The cell or battery shall be stored, in an ambient temperature of $-20\text{ °C} \pm 2\text{ °C}$, for not less than 16 h and not more than 24 h.

Step 3 – The cell or battery shall be discharged, in an ambient temperature of $-20\text{ °C} \pm 2\text{ °C}$, at a constant current of $0,2 I_t$ A, until its voltage is equal to the specified end-of-discharge voltage.

Step 4 – The capacity (Ah), delivered during step 3, shall be not less than that specified for this characteristic in Table 3.

7.2.3 High rate discharge performance at 20 °C

This test determines the capacity of a cell or battery when discharged at a high rate. This test is not required if the cell or battery is not designed to be used at this rate.

Step 1 – The cell or battery shall be charged in accordance with 7.1.