भारतीय मानक **IS 2083 : 2024**

Indian Standard

क्षणदीप — विशिष्टि

(तीसरा पुनरीक्षण)

Flashlight — Specification

(Third Revision)

ICS 29.140.40

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Primary Cells and Batteries Sectional Committee, ETD 10

FOREWORD

This Indian Standard (Third Revision) is proposed to be adopted by the Bureau of Indian Standards, after the draft finalized by the Primary Cells and Batteries Sectional Committee had been approved by the Electrotechnical Division Council.

This standard was first published in 1962 and subsequently revised in 1978 and 1991 to upgrade the performance of flashlights, by including the requirements of variety of designs, dimensions and finish of flashlights.

This revision has been undertaken to take into account the technological developments taken place on flashlights. In this revision, the following major changes have been made:

a) Flashlights powered by replaceable/built-in secondary batteries incorporated;
b) Flashlights with LED light source incorporated;
c) Requirements for Photovoltaic source of supply added;
d) Marking, construction requirements updated; and
e) Requirements for photo biological safety, ingress protection added.

The composition of the Committee responsible for the formulation of this standard is given in Annex E.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical value (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FLASHLIGHT — SPECIFICATION

(Third Revision)

1 SCOPE

1.1 This standard specifies the requirements and tests for flashlights powered by replaceable primary batteries and replaceable/built-in secondary batteries with a maximum voltage of 48 V d.c.

1.2 This standard is applicable to pre-focused as well as focusing type of flashlights with incandescent bulb and LED module as light source.

1.3 The following are not covered under the scope of this standard:

a) Cord and plug connected handlamps that are within the scope of IS 10322 (Part 5/ Sec 6);

b) Emergency lighting that is within the scope of IS 10322 (Part 5/Sec 8); and

c) Flashlights that are intended for hazardous locations.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards.

3 TERMINOLOGY

For the purposes of this standard, the terms and definitions given in IS 16101, IS 16102 (Part 2) and IS 16614 (Part 1) as well as the following shall apply:

3.1 Flashlight — Portable luminaire fed by a built-in source, usually a dry battery or an accumulator, sometimes a manual generator.

3.2 Light Emitting Diode (LED) — Solid state device embodying a p-n junction, emitting optical radiation when excited by an electric current.

3.3 LED Module — Unit supplied as a light source. In addition to one or more LEDs, it may contain further components, for example optical, mechanical, electrical and electronic, but excluding the control gear.

3.4 Primary Battery — Battery which is not designed to be electrically recharged.

3.5 Secondary Battery — Battery which is designed to be electrically recharged.

NOTE — The recharge is accomplished by way of a reversible chemical reaction.

3.6 Type Tests —Tests carried out to prove conformity with the requirements of the specification. These tests are intended to assess the general quality and design of a given type of flashlight.

3.7 Acceptance Tests — Tests carried out on sample drawn from a lot or batch for the purposes of acceptance of the lot or batch.

3.8 Routine Tests — Tests carried out on each flashlight to check requirements which are likely to vary during production.

4 MATERIAL AND CONSTRUCTION

4.1 Materials

4.1.1 The body of the flashlight shall be made of aluminum, brass, plastic or any other suitable material (*see* **5**, **9** and **12.2**).

4.1.2 The front protecting sheet shall be made of glass or any other suitable material of minimum 85 percent transparency.

4.1.3 For method of measurement of transparency, please refer to IS 13360 (Part 9/Sec 5).

4.1.4 *Light Source*

4.1.4.1 The incandescent bulb shall conform to IS 2261.

4.1.4.2 LED Module shall conform to the requirements specified in Annex C.

4.1.5 *Batteries*

4.1.5.1 The secondary batteries shall conform to the following safety standards as applicable:

a) IS 16894 (Part 4) for lead acid batteries;

b) IS 16046 (Part 1) for nickel system batteries; and

c) IS 16046 (Part 2) for lithium system batteries.

4.1.5.2 The primary batteries shall conform to IS 8144 for multipurpose dry batteries, IS 15063 for alkaline

manganese dioxide batteries and IS 6303 Primary batteries — General, IS 6303 (Part 4) Primary batteries : (Part 4) Safety of lithium batteries and IS 6303 (Part 5) Primary batteries (Part 5) Safety of batteries with aqueous electrolyte.

4.1.6 *Photovoltaic Sources*

4.1.6.1 Photovoltaic sources of supply shall comply with IS 14286. Each photovoltaic module shall be operated within its maximum electrical parameters. However, the possibility of overcharging of lithium-ion cells shall not be dependent on photovoltaic sources operating within their limits of current and voltage.

4.1.6.2 Photovoltaic sources of supply that comply with the following are not required to comply with IS 14286:

a) The maximum output voltage is less than 30 V rms (42.4 V peak);
b) The maximum output power is less than 100 VA;
c) The supply is provided with backfeed protection; and
d) The panel is not intended to be mounted on or in a building structure.

4.1.7 *Charger*

A suitable charger with input 230 V a.c. with preferably solid state circuitry and automatic monitoring of the current may be provided. The d.c. leads of the charger are plugged into the socket of the flashlight with separate charger for recharging. Separate charger shall conform to IS 13252 (Part 1).

4.1.8 *Gaskets and Seals*

Gaskets and seals used in the construction shall comply with the relevant Indian Standards, if any. Rubber or neoprene compounds relied upon for protection from rain are only required to comply with Annex D.

4.2 Construction

4.2.1 The reflecting surface of the reflector shall be free (when seen with the naked eye) from defects, such as scratches and deformations.

Compliance is checked by visual inspection.

4.2.2 Contact parts of the switch shall be so constructed as to offer ease of operation and shall be capable of maintaining good electrical contact while in the "ON" position. The design of the switch shall be such as to prevent accidental short circuits.

Compliance is checked by inspection.

4.2.3 Joints, if any, in the body of the flashlight shall be firm.

Compliance is checked by inspection.

4.2.4 The fit between threaded parts shall be smooth and even.

Compliance is checked by inspection.

4.2.5 Springs, if used, in the construction of the flashlight shall be of necessary strength and durability and shall be corrosion-resistant.

NOTE — For coil spring galvanized or copper coated spring steel wire and for flat spring full hard brass, nickel plated spring steel or similar materials are considered to be satisfactory for the purpose of this requirement.

Compliance is checked by inspection and salt spray test as per **9.4**, **9.5** and **9.6**.

4.2.6 Flashlight with pins for insertion into socket outlets shall not impose undue strain on these socket outlets. The means for retaining the pins shall withstand the forces to which the pins are likely to be subjected in normal use.

Compliance is checked by inserting the pins of the flashlight into a socket-outlet without earthing contact. Dimensions of the pins shall comply with IS 1293.

4.2.7 All housing and other materials required to be handled shall be smooth, free from weld line, short molding, blow holes, pits, foreign matter and surface imperfections.

Flashlight shall have no ragged or sharp edges, other than those necessary for the functioning of the flashlight that could create a hazard for the user in normal use or during user maintenance.

Pointed ends of self-tapping screws or other fasteners shall be located so that they are unlikely to be touched by the user in normal use or during user maintenance.

Compliance is checked by inspection.

4.2.8 Current-carrying parts and other metal parts, the corrosion of which could result in a hazard, shall be resistant to corrosion under normal conditions of use.

NOTE — Brass, Stainless steel and similar corrosion-resistant alloys and plated steel are considered to be satisfactory for the purpose of this requirement.

Compliance is checked by verifying that after the tests of 13 and 14, the relevant parts show no sign of corrosion.

NOTE — Attention is to be paid to the compatibility of the materials of terminals and to the effect of heating.

4.2.9 All electronic components shall be mounted on printed circuit boards except the components which are designed for direct connection. The material of the printed circuit board shall be tested as per with IS 15252.

Compliance is checked by inspection.

4.2.10 *Internal Wiring*

a) Wire ways shall be smooth and free from sharp edges;

b) Wires shall be protected so that they do not come into contact with burrs, cooling fins, rough or sharp part or similar edges which may cause damage to their insulation;

c) Holes in metal through which insulated wires pass shall have smooth well-rounded surfaces or be provided with bushings;

d) Wiring shall be effectively prevented from coming into contact with moving parts;

e) Internal wiring and electrical connections between different parts of the flashlight shall be adequately protected or enclosed;

f) Insulated wires may be bunched and passed through a single opening in a metal wall within the enclosure of a product; and

g) Internal wiring shall be compatible with the temperature and voltage to which it is likely to be subjected and with respect to its exposure to oil, grease, or other conditions of service to which it is likely to be subjected.

Compliance is checked by inspection.

5 FINISH

The finish of the flashlight shall be pleasing and durable. In case of flashlight with metallic bodies this may be achieved by anodizing, lacquering, nickel chromium plating, painting or any other suitable process.

For plastic and other suitable material, it shall be smooth, free from scratches and other surface imperfections.

Compliance is checked as per **9**.

6 DIMENSIONS

The internal dimensions of the battery compartment or cartridge of the flashlight shall be such as to properly accommodate the required number of batteries as per IS 8144, IS 15063 and IS 6048.

7 MARKING

7.1 The flashlight shall be clearly and durably marked with the following mandatory markings:

a) Designation: Model number/name;

b) Name or trade mark;

c) IP Class (if specified by the manufacturer); and

d) Instructional and visual safeguard for photo biological safety as below:

1) CAUTION — Do not stare at light source; and

2) Fig. 1 or Fig. 2.

7.2 In addition, the following information shall be given by the flashlight manufacturer either on the flashlight or packaging or in installation instructions:

a) Year and month or week of manufacture;

NOTE — The year and month or week of manufacture may be in code.

b) Net quantity;

c) Details of light source:

1) Rated wattage;

2) Rated voltage;

3) Rated current; and

4) Rated light output.

d) Type and number of battery;

e) Name or trade mark and address of the manufacturer;

f) Country of origin; and

g) Packaging of rechargeable flashlight with built-in charging circuit shall be marked with following additional information:

1) Rated input voltage or voltage range;

2) Input current; and

3) Rated frequency.

7.3 Any special marking may be added if required by the purchaser.

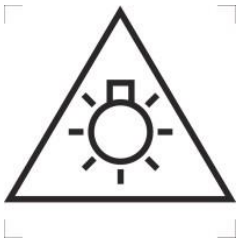

FIG. 1 PHOTOBIOLOGICAL SAFETY

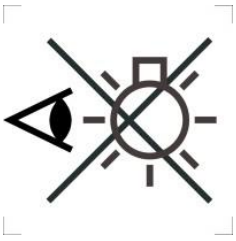

FIG. 2 PHOTOBIOLOGICAL SAFETY

7.4 Durability and Legibility of Marking

Compliance is checked by the following:

a) Presence and legibility of the marking is checked by visual inspection;

b) Durability of marking is checked by trying to remove it by rubbing lightly for 15 s with a piece of cloth soaked with water and, after drying, for a further 15 s with a piece of cloth soaked with hexane. The marking shall be legible after the test; and

c) Availability of information required in **7.2** by visual inspection.

7.5 The flashlights conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the flashlights may be marked with the Standard Mark.

8 TESTS

8.1 Type Tests

The type tests shall comprise the following:

a) Checking of construction (**4**);

b) Checking of dimensions (**6**);

c) Checking of markings (**7**);

d) Test for finish (**9**);

e) Test for mechanical assembly (**10**);

f) Drop test (**11**);

g) Climatic tests (**12**);

h) Life test for switch (**13**);

j) Insulation resistance test (**14**);

k) Test for contact resistance of the switch (**15**);

m) Light distribution test (**16**);

n) Lumen depreciation test for led flashlight (**17**);

p) Circuit current of led flashlight (**18**);

q) Test for charging current in built-in rechargeable battery operated flashlights (**19**);

r) Photobiological safety (**20**);

s) Test for ingress protection (optional) (**21**);

t) Over charge in rechargeable flashlights with built-in charger/separate charger/solar charger (**22**);

u) Endurance test for rechargeable flashlights (**23**); and

w) Thermal test (**24**).

8.1.1 *Samples for Type Tests*

A minimum number of nine samples of the same type of flashlight shall be required for conducting the type tests. The distribution of the tests among these nine samples shall be as given in Table 1.

8.2 Acceptance Tests

The following shall comprise acceptance tests:

a) Checking of construction (**4**);

b) Checking of dimensions (**6**)

c) Insulation resistance test (**14**);

d) Functional test for switch (**13.2**);

e) Test for contact resistance of the switch (**15**);

f) Light distribution test (**16**);

g) Circuit current of led flashlight (**18**); and

h) Test for charging current in built-in rechargeable battery operated flashlights (**19**).

8.2.1 *Sample for Acceptance Tests*

In case of large consignments, a sampling procedure may be agreed to between the purchaser and the manufacturer. A recommended sampling procedure for flashlights is given in Annex B.

8.3 Routine Tests

The following shall comprise routine tests:

a) Checking of construction (**4**);

b) Functional test for switch **(13.3)**; and

c) Circuit current of LED flashlight (**18**).

9 TEST FOR FINISH

9.1 The plating shall be a minimum of 3 microns of bright nickel followed by a minimum of 0.15 micron of regular chromium.

9.2 Thickness of chromium plating to be determined by stripping method as per **6** of IS 3203.

9.3 Thickness of nickel plating to be determined by BNF jet test method as per **5** of IS 3203.

9.4 Plating on steel parts should withstand acetic acid salt spray test as per IS 6910 for 8 h.

9.5 Plating on copper and copper alloy should withstand 16 h of plain salt spray test as prescribed in IS 1068.

9.6 Plating on zinc and zinc alloy parts should withstand acetic acid salt spray test as per IS 6910 for 8 h.

9.7 In the case of painted flashlight, the specimen shall be immersed in 5 percent salt solution at about 50 °C for one hour. At the end of the period, the surface of the painted specimen shall not soften, peel off or produce blobs.

9.3 Unless otherwise agreed, anodized aluminum parts should be tested for continuity of anodized coating as per IS 8375 and for sealing by marking test as per 5.2 of IS 5523.

10 TEST FOR MECHANICAL ASSEMBLY

10.1 Parts, including switches, shall be securely mounted and shall be prevented from turning, if such repositioning results in noncompliance with this standard.

Table 1 Sampling Size for Type Tests

(*Clauses* 8.1.1 *and* 24)

Sl No.	Test	Sample
(1)	(2)	(3)
i)	Checking of construction **(4)**	All
ii)	Checking of dimensions (6)	All
iii)	Checking of markings **(7)**	All
iv)	Test for finish (9)	1
v)	Test for mechanical assembly (10)	1
vi)	Drop test (11)	1
vii)	Climatic tests (12)	1[2]
viii)	Life test for switch (13)	1
ix)	Insulation resistance test (14)	1[1]
x)	Test for contact resistance of the switch (15)	1[1]
xi)	Light distribution test (16)	1[1]
xii)	Lumen depreciation test for led flashlight (17)	1
xiii)	Circuit current of LED flashlight (18)	1[1]
xiv)	Test for charging current in built-in rechargeable battery operated flashlights (19)	1[1]
xv)	Photobiological safety (20)	1
xvi)	Test for ingress protection (optional) (21)	1[2]
xvii)	Over charge protection in rechargeable flashlights with built-in charger/separate charger/solar charger (22)	1
xviii)	Endurance test for rechargeable flashlights (23)	1
xix)	Thermal test (24)	1

[1] The other tests, such as insulation resistance, light distribution and contact resistance of the switch may be done on any of these samples.

[2] Two additional samples may be required in case the Climatic test and ingress protection test is also to be conducted.

10.2 A movable joint, such as a swivel joint or telescoping arm, containing conductors shall be constructed so that movement of the joint will not result in damage to the insulation of conductors. Rotation shall be limited to 370 degrees, or the movable joint shall comply with the movable joint endurance test as below:

The movable joint shall be capable of withstanding 6 000 cycles of motion, linear or rotational. One cycle shall consist of moving the part to the maximum extent possible in one direction and back again, then to the maximum extent possible in the opposite direction.

There shall not have damage to the jacket or the insulation of the conductors.

10.3 A movable joint containing conductors shall comply with the movable joint torsion and pull tests as below and shall remain intact and operable:

The movable joint specified shall be subjected to the following conditions for 1 minute:

a) A torsion of 2.26 N.m ± 0.056 N.m; and
b) A straight pull applied by a mass of 16 kg or four times the maximum weight recommended by the manufacturer, whichever is greater.

There shall not be damage to the product that results in a risk of fire, risk of electric shock, or injury to persons.

10.4 A wall-hung flashlight shall be tested as below to check the strength of mounting means:

The product shall be mounted in accordance with the manufacturer's installation instructions using fasteners and constructions (brackets, screws, and similar limitations specified by the manufacturer) as described. When the support surface is not specified, a support surface of 9.5 mm 3/8 inch thick drywall (plasterboard) on 2 by 4 studs on 406 mm (16 inch) centers shall be used.

Fasteners shall be applied as specified in the instructions or, when not specified, shall be positioned in the drywall between studs. An adjustable product shall be adjusted to the position that gives the maximum projection from the wall. A gradually increasing force shall be applied to act vertically through the center of gravity of the product in the extended position. The force shall be increased over a period of not less than 5 and not more than 10 seconds until a load of four times the weight of the product, and not less than 10 lb (44.5 N), is applied to the mounting system. The load shall be maintained for 1 minute.

NOTE — 2 by 4 studs are made of softwood, such as spruce or pine, and have actual dimensions of 38.1 mm (1 inch to 1/2 inch) by 88.9 mm (3 inch to 1/2 inch). The drywall is affixed to the 38.1 mm (1 inch to 1/2 inch) surfaces.

The effectiveness of the mounting or hanging means shall not be impaired.

10.5 Flashlights intended to be mounted on the other surfaces shall be tested as below to check the strength of mounting means:

The product shall be hung in the intended manner in accordance with the manufacturer's installation instructions. A weight equal to three times the weight of the product shall be applied to the product, positioned so that it is approximately in the geometric center axis of the equipment. The weight shall be applied for 5 minutes.

The effectiveness of the mounting or hanging means shall not be impaired.

NOTE — Flashlights intended for mounting on wall and alternatively on other surfaces shall comply with requirements specified in both **10.4** and **10.5**.

10.6 The strength of handle used to support or carry a product shall be tested as below:

The weight of the product plus a force of three times the weight of the product shall be used. The load shall be uniformly applied over a 76 mm (3 inch) width at the center of the handle, without clamping.

The load shall be started at zero and gradually increased so that the test value is attained in 5 s to 10 s; the test values shall be maintained for 60 s. If a product has more than one handle and cannot be carried by one handle, the distribution of forces shall be determined by measuring the percentage of the product weight sustained by each handle with the product in the normal carrying position. If a product is furnished with more than one handle and can be carried by only one handle, each handle is to withstand the total force.

The handle shall not become detached from the product or have the function of the handle impaired.

NOTE — If the handle, its securing means, or that portion of the enclosure to which the handle is attached is constructed of polymeric material, the test specified above shall be conducted both in the as-received condition and following mold-stress relief conditioning.

10.7 A supporting device, such as chains, hooks, hanger holes, notches, magnets or the like used to support the product, shall comply with the requirements in **10.5**.

11 DROP TEST

11.1 The flashlight, complete with battery (batteries), shall be held in a normal position of use.

NOTE — In the case of cylindrical type of flashlights, the axis of the body shall be kept horizontal.

It shall be dropped in this position from a height of 1 m to a board made of seasoned deodar wood of dimensions as given in Table 2 placed on a concrete floor.

Table 2 Dimensions of Wooden Board

(*Clauses* 11.1 *and* 24)

Sl No.	Thickness	Width	Length
(1)	(2)	(3)	(4)
i)	30 mm	250 mm (*Min*)	At least twice the length of the flashlight under test

There shall be no severe deformation, split or crack in any part of the body or cover of the flashlight after 03 drops. There shall also be no defect in the functioning of the flashlight.

NOTES

1 The height of the drop shall be measured as the distance from the lowest part of the flashlight to the upper surface of the wooden board.

2 Any damage to the incandescent bulb or front protecting sheet shall not be considered for rejection under this test.

3 Drops conditions note to be added.

12 CLIMATIC TESTS

12.1 Dry Heat Tests

The flashlight shall be placed in a chamber maintained at 55 °C ± 2 °C for a period of 16 h. At the end of this period, it shall be taken out and cooled to room temperature and the switch shall then be tested for operation in accordance with **13.2**. There shall also be no deterioration to the finish of the flashlight.

12.2 Damp Heat (Accelerated) Test

12.2.1 The primary battery-operated flashlight shall be placed in a humidity chamber in which the temperature is 55 °C ± 2 °C. The relative humidity at all times shall be not less than 95 percent. The flashlight shall be exposed to these conditions for 16 hours at the end of which the sources of heat and humidity shall be cut off and the chamber allowed to cool to room temperature, the air being circulated meanwhile. The flashlight shall be subjected to two such cycles of damp heat and the switch shall be tested for functioning as specified in **13.2**. The insulation resistance shall also be checked (given in **14.1**) and there shall be no deterioration to the finish. The paint film shall show no sign of breakdown and the metal surface shall show no sign of corrosion, and no sign of deformation or color change shall be observed in the body of any other material.

12.2.2 The secondary battery-operated flashlight shall be placed in the most unfavorable position of normal use, in a humidity chamber containing air with a relative humidity maintained between 91 percent and 95 percent. The temperature of the air at all places where samples can be located shall be maintained within 1 °C of any convenient value 't' between 25 °C and 35 °C. The sample shall be kept in the cabinet for 48 h. After that, the insulation resistance and electric strength shall be measured as below:

12.2.2.1 *Insulation resistance*

Insulation resistance shall be measured in the humidity cabinet with a d.c. voltage of approximately 500 V, 1 min after application of the voltage. The insulation resistance between each live part of the flashlight and accessible parts of the flashlight (accessible parts of insulating material are covered with metal foil) shall be not less than 2 MΩ.

12.2.2.2 *Electric Strength*

Immediately after the insulation resistance test, the same parts as specified above shall withstand a voltage test for 1 min with an a.c. voltage as follows:

During the test, the supply contacts of the pins are short circuited. Accessible parts of insulating material of the pin are covered with metal foil. Initially no more than 750 V is applied between the contacts and the metal foil. It is then gradually raised to 1 500 V (this test is applicable for flashlights with inbuilt charging circuit).

No flashover or breakdown shall occur during the test measurements shall be carried out in the humidity cabinet.

After above tests as per **12.2.2.1** and **12.2.2.2**, the sample shall show no damage in visual inspection and shall function normally for 2 number of charge and discharge cycle.

NOTE — Charging time, rated voltage shall be as specified by the manufacturer.

12.3 Dry Cold Test (Optional)

If required for special purposes, the flashlight shall be placed for one hour in a cold chamber at – 40 °C ± 3 °C.

At the end of this period the specimen shall be checked for functioning of the switch and for insulation resistance.

13 LIFE TEST FOR SWITCH

13.1 The flashlight shall be loaded with the appropriate battery (or batteries) and the switch operated through specified numbers of cycles or as

defined by manufacturer successively as given below:

a) Electrical modular switch — 10 000 cycles; and

b) Mechanically constructed switch — 25 000 cycle.

Each cycle shall comprise a full operation of the switch including locking, if provided. The number of cycles per minute shall be 25 to 35. The battery (or batteries) and bulb shall be changed after every 10 000 cycles (or earlier, if necessary). In case of LED flashlight, LED need not to be changed during switch test.

At the end of the test, the switch shall continue to function.

13.2 Functional Test for Switch (for Acceptance only)

For the purposes of acceptance of samples, the test as given in 13.1 shall be carried out through 100 cycles only. The contact resistance then measured shall not exceed for:

a) Electrical modular switch — 100 milliohms; and

b) Mechanically constructed switch — 20 milliohms.

At the end of the test, the switch shall continue on and off function without any flickering or intermittent light.

13.3 Functional Test for Switch (for Routine Test only)

The test as given in 13.1 shall be carried out through only one cycle as a routine test.

14 INSULATION RESISTANCE TEST

14.1 Insulation resistance for Replaceable primary battery-operated flashlights shall be measured as below:

At a temperature of 27 °C ± 2 °C and relative humidity of 65 percent ± 4 percent, with the dry cells removed and the switch in open circuit condition, the insulation resistance between the anode and cathode for the cells shall be measured with an insulation resistance tester of rated voltage 500 V (*see* IS/IEC 61557-1). The insulation resistance value shall be not less than 2 MΩ.

14.2 Insulation resistance test for rechargeable flashlights shall be measured in accordance with 12.2.2.2.

15 TEST FOR CONTACT RESISTANCE OF THE SWITCH

The contact resistance of the switch shall be measured with a current of 300 mA flowing through switch contacts and source voltage being not greater than 3 V. The resistance shall not exceed for:

a) Electrical modular switch — 100 milliohms when the flashlight is new and 150 milliohms after 4 000 cycles of switch operation; and

b) Mechanically constructed switch — 20 milliohms when the flashlight is new and 30 milliohms after 10 000 cycles of switch operation.

NOTE — Each cycle shall comprise a full operation of the switch including locking, if provided. The number of cycles per minute shall be 25 to 35.

16 LIGHT DISTRIBUTION TEST

Light from the loaded flashlight shall be projected on to a plane at a distance of 2 m from the source and held perpendicular to the central line of the optical axis. In the case of focusing type of flashlight, this shall be done after focusing. The bright spot produced on the plane shall not exceed 30 cm in diameter and shall not be less than 12 cm in diameter.

NOTE — The use of an open box of not less than 60 cm x 60 cm x 60 cm with a circle having a black border and diameter 30 cm placed at the center of one side with a white background is recommended to carry out this test.

17 LUMEN DEPRECIATION TEST FOR LED FLASHLIGHT

The test shall be made in a draught-free room at a temperature of 27 °C, a relative humidity of 65 percent maximum and steady state operation of the LED flashlight. For more details on steady state operation of LED flashlight, *see* Annex A of IS 16614 (Part 2).

The test shall be done as below:

a) After steady state is reached using a d.c. power supply equivalent to number of batteries, light from flashlight, shall be projected on to a plane at a distance of 1 m from the source and held perpendicular to the central line of the optical axis. Measure the initial luminous flux (LT_0) at the brightest spot produced on the plane; and

b) After 200 h ON time, the light from flashlight shall be projected on to a plane at a distance of 1 m from the source and held perpendicular to the central line of the optical axis. Measure the luminous flux (LT_{200}) at the brightest spot produced on the plane using battery equivalent d.c. power supply.

The LED flashlight shall have a minimum 90 percent of initial lumen (LT_0) output after 200 hour usage.

18 CIRCUIT CURRENT OF LED FLASHLIGHT

The quantitative value with tolerance for the circuit current of LED flashlight under specific operating conditions shall be specified by the manufacturer and test method will be as shown in Fig 3.

Compliance:

The observed value shall not exceed the absolute maximum value specified by the manufacturer in the specification sheet.

19 TEST FOR CHARGING CURRENT IN BUILT-IN RECHARGEABLE BATTERY OPERATED FLASHLIGHTS

Quantitative value of charging current with tolerance shall be specified by flashlight manufacturer at rated voltage. Measured charging current value shall be less than the max allowable charging current specified by rechargeable battery manufacturer. Compliance is checked by measuring the charging current at rated voltage and method will be as shown in Fig 4.

20 PHOTOBIOLOGICAL SAFETY

Flashlights emitting visible light from incandescent or LED sources are considered to be for short term, non-general light services use where exposure is both incidental and intermittent. Products emitting light from these sources shall be marked in accordance with **7.1 (d)**.

NOTES

1 This requirement is associated with sources being no greater than risk Group 2.

2 Hazards associated with sources of risk Group 3 or greater are not addressed by the requirements in this standard.

The marking of **7.1 (d)** is not required if the emitted light, as measured by the methods specified in IS/IEC 62471, poses no reasonable risk of harm. No reasonable risk or harm from the emitted light is considered if either:

a) At a distance of 200 mm along any direction of the product, the light emission is less than 500 Lux;

b) In the range of visible light, the luminance light emission is less than 10 000 cd/m^2;

c) The light source (if not focused by external optics) is in risk Group 1 or lower; or

d) The product itself is determined to be in risk Group 1 or lower.

21 TEST FOR INGRESS PROTECTION

If IP rating has been specified by the manufacturer, the same shall be tested as below:

Flashlight shall be classified in accordance with the 'IP number' system of classification described in IS 12063.

Symbols for the degrees of protection are given in Section 3 of IS 10322 (Part 1). Tests for the degrees of protection are given in Section 9 of IS 10322 (Part 1).

Compliance to be checked as per IS 10322 (Part 1).

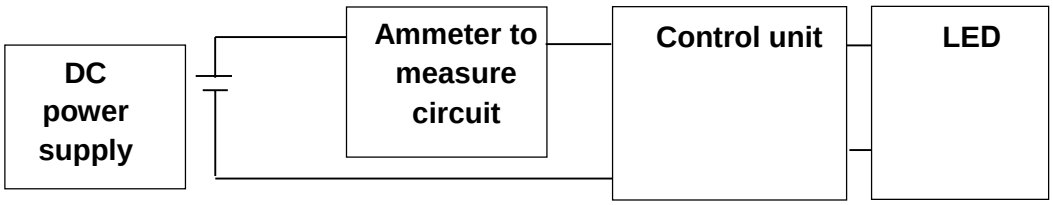

FIG. 3 CIRCUIT CURRENT

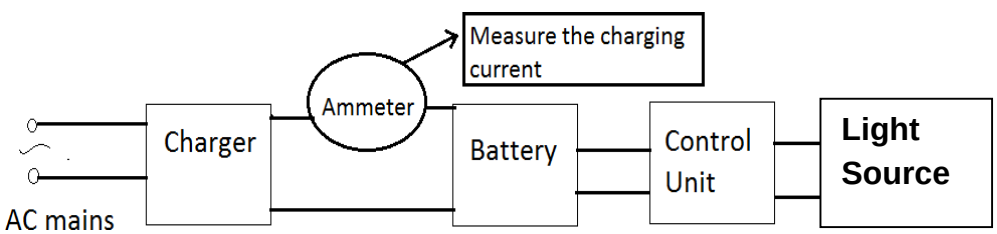

FIG. 4 CHARGING CURRENT

22 OVER CHARGE PROTECTION IN RECHARGEABLE FLASHLIGHTS WITH BUILT-IN CHARGER/SEPARATE CHARGER/ SOLAR CHARGER

22.1 Overcharge Protection

Rechargeable flashlight shall have overcharge protection as recommended in respective rechargeable battery standard or as specified by its manufacturer.

NOTE — The maximum charge and discharge current shall not be more than the maximum value specified by battery manufacturer.

Compliance shall be checked as per the corresponding value mentioned in the relevant battery specification.

22.2 Rechargeable flash light shall not discharge more than 0.25 mA while switch in open circuit condition.

23 ENDURANCE TEST FOR RECHARGEBALE FLASHLIGHTS

This test shall be applicable to rechargeable flashlight with built-in charger only.

23.1 Under conditions representing cyclic heating and cooling in during charging, the rechargeable flashlight shall not become unsafe or fail prematurely.

Compliance shall be checked by carrying out test as per **23.2**.

23.2 Test

a) The Flash light shall be mounted in a thermal enclosure with means for controlling the ambient temperature within the enclosure;

b) The ambient temperature within the enclosure shall be maintained within ± 2 °C of (t_a + 10 °C);

NOTES

1 Ambient temperature (t_a) will be 35 °C for all flashlights except flashlight with built in solar panel.

2 In case of flashlight with built in solar panel t_a is the air temperature inside the flashlight after 1 hour charging under direct sun. Charging current and voltage shall be applied to the flashlight during test by d.c. power source. d.c. power source charging current and voltage during testing shall be as specified by manufacturer or measured under direct Sun.

c) The flash light shall be tested in the enclosure for a total 20 cycles of charging, 3 hour rest and 20 cycles of discharging; and

d) During operating periods of the flashlight, the supply voltage shall be 1.05 ± 0.015 times the rated voltage as specified by manufacturer.

The flashlight shall not have become unsafe and no visible damage to the flashlight.

Compliance is checked by visual inspection.

Additionally, the flashlight shall operate satisfactorily during 50 supply voltage switching operations after the endurance test. Each switching operation shall consist of connection to the normal rated supply for 60 s and disconnection from the supply for 20 s.

Compliance is checked by inspection.

24 THERMAL TEST

Under conditions representing normal service, no part of the flashlight, shall attain a temperature which would impair safety.

In addition, parts intended to be touched, handled, adjusted or gripped by hand while the flashlight is at operating temperature shall not be too hot for the purpose.

Compliance is checked by the following test:

The temperature shall be measured as indicated in Table 3 in accordance with the following conditions:

The flashlight shall be tested in a draught proof enclosure designed to avoid excessive changes in ambient temperature. An example of a draught-proof enclosure is given in IS 10322 Annex D, but other types of enclosure may be used, if the results obtained are compatible with those that would be obtained by the use of the enclosure described in IS 10322 (Part 1) Annex D.

a) The ambient temperature of the draught proof chamber shall be within the range 10 °C to 30 °C and should preferably be 27 °C. It shall not vary by more than ± 1 °C during measurements and during a preceding period long enough to affect the results;

b) Measurements shall not be taken until the various measuring point of flashlight has achieved max temperature during charging the flashlight inside the chamber; and

c) Measure the temperature within 22 min to 28 min of discharged time after charging the flashlight as per manufacturer specified charging time.

In the test none of the temperature shall exceed the appropriate values given in Table 1 of this sub clause when the flashlight is operated at its rated ambient temperature t_a. In those cases, where the temperature in the test enclosure differs from t_a, this difference shall be taken into account when applying the limits in the Table 3. The temperature shall not exceed the values shown in Table 2 by more than 5 °C.

Table 3 Maximum Temperatures under the Test Conditions

(*Clause* 24)

Sl No. (1)	Part (2)	Maximum Temperature (3)
i)	Soldering joint of LED	85 °C or specified by LED manufacturer
ii)	MCPCB (LED)	85 °C or specified by LED manufacturer
iii)	Case of Capacitor	
	a) If Tc is marked	Tc[a]
	b) If Tc is not marked	50 °C
iv)	Parts intended to be handled or touched by hand	
	a) Metal parts	70 °C
	b) Non-metal parts	85 °C
v)	Parts intended to be gripped by hand	
	a) Metal parts	60 °C
	b) Non-metal parts	75 °C
vi)	Switches marked with individual ratings:	
	a) With T marking	T marking
	b) Without T marking	55 °C
vii)	Insulation of wiring(internal and external) supplied with flashlight	
	a) Glass fiber silicone-varnish impregnated	200 °C[b]
	b) Polytetrafluoroethylene (PTF	250 °C
	c) Silicone rubber (not stressed)	200 °C
	d) Silicone rubber (compressive stress only	170 °C
	e) Ordinary polyvinyl chloride (PVC	90 °C[b]
	f) Heat-resisting polyvinyl chloride (PVC)	105 °C[b]
	g) Ethylene vinyl acetate (EVA)	140 °C[b]
viii)	Other materials	
	a) Resin-bonded paper/fabric	125 °C
	b) Silicone rubber (where NOT used for electrical insulation)	230 °C
	c) Rubber (where NOT used for electrical insulation)	70 °C
	d) Wood, paper, textiles and the like	90 °C

[a] Measured at the given reference point marked by the device manufacturer.

[b] Reduced by 15 °C where insulation is stressed, for example clamped or flexed.

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 1068 : 1993	Electroplated coatings of nickel plus chromium and copper plus nickel plus chromium — Specification (*third revision*)
IS 1293 : 2019	Plugs and socket-outlets for household and similar purposes of rated voltage up to and including 250 V and rated current up to and including 16 A — Specification (*fourth revision*)
IS 1885 (Part 16/ Sec 1) : 1968	Electrotechnical vocabulary: Part XVI Lighting, Section I General aspects
IS 2261 : 1975	Specification for lamps for flashlights (*first revision*)
IS 2418	Tubular fluorescent lamps and general lighting service
(Part 1) : 1977	Safety requirements (*second revision*)
(Part 2) : 2018	Performance requirements (*second revision*)
IS 3203 : 1982	Methods for testing local thickness of electroplated coating (*first revision*)
IS 4905 : 2015/ ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)
IS 5523 : 1983	Methods of testing anodic coatings on aluminium and its alloys (*first revision*)
IS 6910 : 1985	Method of testing corrosion resistance of electroplated and anodized aluminium coatings by acetic acid salt spray test (*first revision*)
IS 8375 : 1977	Method for checking continuity of anodized coatings
IS 10322	Luminaires:
(Part 1) : 2014	General requirements and tests (*first revision*)
(Part 5)	Particular requirements
(Sec 6) : 2013	Handlamps
(Sec 8) : 2013	Emergency lighting
IS 13252 (Part 1) : 2010	Information technology equipment safety: Part 1 General requirements (*second revision*)
IS 13360	Plastics — Method of testing:
(Part 4/Sec 4) : 1999	Rheological properties, Section 4 Determination of properties of polymeric materials by means of a capillary rheometer
(Part 9/Sec 5) : 1999	Optical properties, Section 5 Determination of haze and luminous transmittance of transparent plastics
IS 14286 : 2010	Crystalline silicon terrestrial photovoltaic (PV) modules — Design qualification and type approval (*first revision*)
IS 15687 (Part 1) : 2006	Single — Capped fluorescent lamps: Part 1 Safety requirements
IS 16046	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:
(Part 1) : 2018	Nickel systems (*second revision*)
(Part 2) : 2018	Lithium systems (*second revision*)
IS 16101 : 2012	General lighting — LEDs and LED modules — Terms and definitions
IS 16103	LED modules for general lighting:
(Part 1) : 2012	Safety requirements
(Part 2) : 2012	Performance requirements
IS 16106 : 2012	Method of electrical and photometric measurements of solid state lighting (LED) products

IS No.	*Title*
IS 16614	Double-capped led linear lamps:
(Part 1) : 2018	Safety specification
(Part 2) : 2022	Performance requirements
IS 16894	Safety requirements for secondary batteries and battery installations:
(Part 1) : 2018	General safety information
(Part 4) : 2018	Valve-regulated lead-acid batteries for use in portable appliances

ANNEX B

(*Clause* 8.2.1)

SAMPLING PLAN AND CRITERIA FOR CONFORMITY FOR FLASHLIGHTS

B-1 LOT

B-1.1 All the flashlights of the same type and size manufactured by the same factory during the same period, using the same materials and process shall constitute a lot.

B-1.2 Sample shall be tested from each lot.

B -2 SCALE OF SAMPLING

B-2.1 The number of flashlights to be selected from each lot shall depend upon the lot size and shall be in accordance with col (1) and col (2) of Table 4.

B-2.2 Flashlights shall be selected at random. In order to ensure the randomness of selection, suitable procedures as given in IS 4905 shall be adopted.

B-3 NUMBER OF TESTS AND CRITERIA FOR CONFORMITY

B-3.1 All the flashlights selected in the sample shall be subjected to the acceptance tests given in **8.2**. A flashlight shall be called defective if it fails in any one of the acceptance tests. The lot shall be considered as conforming to the requirements of the acceptance tests, if the number of flashlight failing to satisfy in any one or more of the acceptance tests does not exceed the corresponding number of permissible defective [*see* col (4) Table 4].

Table 4 Sample Size and Permissible Number of Defectives

(*Clause* B-2.1)

Sl No.	Lot Size	Sample Size	Permissible No. of Defectives
	(*N*)	(*n*)	(a)
(1)	(2)	(3)	(4)
i)	Up to 100	13	1
ii)	101 to 300	20	2
iii)	301 to 500	32	3
iv)	501 to 1 000	50	5
v)	1 001 and above	80	7

NOTES

1 Whenever the lot size is below 14 all the flashlights shall be tested and no defective flashlight shall be permissible.

2 The sampling plan is such that the lots with 4 percent or less defectives would be accepted most of the time.

ANNEX C

(*Clause* 4.1.4.2)

REQUIREMENTS FOR LED/LED MODULES AS LIGHT SOURCE OF FLASHLIGHT

C-1 For the purpose of this annexure, the definition s given in IS 16101 and IS 1885 (Part 16/Sec 1) shall apply.

C-2 PERFORMANCE OF LED MODULES

C-2.1 Efficacy

LED/LED modules efficacy shall be calculated from the measured initial luminous flux divided by the measured initial input power.

The efficacy shall be minimum 100 lumens/watt at rated voltage and rated current declared by the manufacturer.

C-2.2 Lumen Maintenance

Value of the luminous flux at a given time in the life of a LED divided by the initial value of the luminous flux of the LED and expressed as a percentage of the initial luminous flux value.

LED/ LED Modules shall maintain a minimum of 85 percent of the initial luminous flux after completion of the 2 000 h test duration at rated current.

C-2.3 Colorimetric Characteristics

C-2.3.1 *Rated Colour and Colour Variation Code*

The rated colour of a flashlight shall preferably be one of the following seven values:

F 2700, P 2700, F 3000, F 3500, F 4000, F 5000, F 5700 or F 6500

For reference purposes, the standardized chromaticity co-ordinates and CCT values corresponding to these colours are given in IS 2418 (Part 2).

Table 5 Correlated Colour Temperatures and Chromaticity Coordinates

(*Clause* 4.1.4.2)

Sl No.	Rated Colour	CCT (K)	Chromaticity Coordinates	
			x	y
(1)	(2)	(3)	(4)	(5)
i)	F 6500	6 400	0.313	0.337
ii)	F 5700	5 700	0.329	0.342
iii)	F 5000	5 000	0.346	0.359
i)	F 4000	4 040	0.380	0.380
)	F 3500	3 450	0.409	0.394
i)	F 3000	2 940	0.440	0.403
ii)	F 2700	2 720	0.463	0.420
iii)	F 2700	2 720	0.463	0.420
ix)	P 2700	2 700	0.458	0.410

NOTES — The letters in the ‘colour’ designation stand for:

1 F = values from IS 2418 (Part 2) and IS 15687 (Part 1); and

2 P = value close to the planckian curve.

The chromaticity of a LED flashlight is measured both initially and maintained after an operation time 2 000 h. The measured actual chromaticity values both initial and maintained are expressed as fitting within one of four categories (*see* Table 6) corresponding to particular MacAdam ellipse tolerances around the rated colour as indicated by the manufacturer or responsible vendor.

To comply with this standard, the measured initial and maintained chromaticity values of each LED flashlight in the sample shall be within the rated colour category of Table 5 and Table 6. A tolerance category shall be assigned according to the MacAdam ellipse size that includes (circumscribes) the chromaticity co-ordinates of all LED flashlight in the tested sample.

C-2.3.2 *Colour Rendering Index* (*CRI*)

C-2.3.2.1 The rated CRI shall not be less than 70.

Compliance:

For all tested units in a sample, the measured initial CRI values shall not be lower than 3 points from the rated CRI value.

C-3 TESTS

The following shall constitute the type tests to be carried out on selected sample of LED/LED modules being drawn from regular production lot:

For method of measurement refer to IS 16106.

Table 6 Tolerance (Categories) on Rated Chromaticity Co-Ordinate Values

(*Clause* C-2.3.1)

Sl No.	Size of MacAdam Ellipse (Centred at the Chromaticity Co-Ordinate at the Corresponding Rated Colour)	Colour Variation Category	
		Initial	Maintained
(1)	(2)	(3)	(4)
i)	3 Step spread centred on the rated colour target	E	E
ii)	5 step	D	D
iii)	7 step	C	C
iv)	> 7 step	A	A

Table 7 Sampling Sizes

(*Clause* C-3)

Sl No.	Clause	Test	Minimum Number of Samples
(1)	(2)	(3)	(4)
i)	C-2.1	Efficacy	5
ii)	C-2.2	Lumen maintenance	20
iii)	C-2.3.1	Chromaticity tolerance (initial and maintained)	20
iv)	C-2.3.2	Colour rendering index (initial)	20

ANNEX D

(*Clause* 4.1.8)

ACCELERATED AGING TEST FOR RUBBER OR OTHER ELASTOMERIC COMPOUND

D-1 A rubber or other elastomeric compound, other than forming a part that is depended upon for protection from rain shall be tested as specified in **D-2** and **D-3**. As a result of the test, the part shall have physical properties as specified in Table 8 before and after aging.

D-2 The test procedure for determining whether a part complies with the requirement in **D-1** depends upon the material of which it is composed, its size and shape, the application in the product, and other factors. The test procedure may include visual inspection for cracks, deformation, and the like after accelerated aging, as well as comparison of hardness, tensile strength, and elongation before and after accelerated aging.

D-3 With reference to the requirements in **D-1** and **D-2**, a part of rubber or other elastomeric compound, if tested to compare its tensile strength and elongation before and after accelerated aging, is acceptable if these properties are not less than the minimum values specified in Table 1, corresponding to the temperature of the component during the temperature test. Neoprene rubber is acceptable for 60 °C and silicone rubber is acceptable for 105 °C without being subjected to the test.

Table 8 Accelerated Aging Test

(*Clause* D-1)

Sl No.	Temperature of Component During Temperature Test °C	Accelerated Aging Procedure	Minimum Acceptable Percent of Unaged Value for Samples	
			Tensile Strength	Elongation
(1)	(2)	(3)	(4)	(5)
i)	60 or less	Air oven aging for 70 h at 100 °C ± 1.0 °C	60	60
ii)	61 to 75	Air oven aging for 168 h at 100 °C ± 1 °C	50	50
iii)	76 to 90	Air oven aging for 168 h at 121.0 °C ± 1.0 °C	50	50
iv)	91 to 105	Air oven aging for 168 h at 136.0 °C ± 1.0 °C	50	50

ANNEX E

(*Foreword*)

COMMITTEE COMPOSITION

Primary Cells and Batteries Sectional Committee, ETD 10

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Amendments Issued Since Publication

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