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मानक

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IS 15111-1 (2002): Self Ballasted Lamps for General Lighting Services, Part 1: Safety Requirements [ETD 23: Electric Lamps and their Auxiliaries]



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“Knowledge is such a treasure which cannot be stolen”

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भारतीय मानक

सामान्य प्रकाश व्यवस्थाओं के लिए स्वतः बालास्टकृत लैम्प

भाग 1 सुरक्षा अपेक्षाएँ

Indian Standard

**SELF BALLASTED LAMPS FOR GENERAL
LIGHTING SERVICES**

PART 1 SAFETY REQUIREMENTS

ICS 29.140.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

FOREWORD

This Indian Standard (Part 1) was adopted by the Bureau of Indian Standards, after the draft finalized by the Electric Lamps and Their Auxiliaries Sectional Committee had been approved by the Electrotechnical Division Council.

The lamps covered under these standards are self ballasted lamp. Such lamps incorporates permanently enclosed element that are necessary for starting and for stable operation and which does not include any replaceable or interchangeable parts.

These lamps are considered as energy efficient lamps and are commonly known as compact fluorescent lamps.

The need of preparing this standard has been realized only after ensuring the manufacturing potential and demand in the country.

There are other types of compact fluorescent lamps, which are the discharge lamp of the low-pressure mercury type having single cap for operations on external circuits with internal or external means of starting. The requirements of such lamps will be covered in a separate standard.

This standard has been dealt within two parts, one exclusively on safety requirements and the other on performance requirements.

This standard is based on IEC 60968 (1988) ' Self ballasted lamps for general lighting services, safety requirements' issued by the International Electrotechnical Commission (IEC) with following modifications:

- a) Schedule of type test and acceptance test have been incorporated;
- b) Ambient test condition changed to 27°C;
- c) Selection of samples incorporated;
- d) Conditions of compliances incorporated;
- e) Lamps of rating up to 26 W are only covered; and
- f) E 26 caps not included.

For the purpose of deciding whether a particular requirements 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 : 1960 'Rules for rounding off numerical values (revised)'. 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

SELF BALLASTED LAMPS FOR GENERAL LIGHTING SERVICES

PART 1 SAFETY REQUIREMENTS

1 SCOPE

This standard (Part 1) specifies the safety and interchangeability requirements together with the test methods and conditions, required to show compliance of tubular fluorescent and other gas discharge lamps with integrated means for controlling starting and stable operation (self ballasted lamps), intended for domestic and similar general lighting purposes having:

- a) a rated wattage up to and including 26 W,
- b) a rated voltage up to and including 250 V, and
- c) Edison screw E 14 and E 27 or bayonet caps B 15d and B 22d.

The performance requirements are given in Part 2 of this standard.

Recommendations for whole product testing are under consideration.

2 REFERENCES

Following Indian Standards are necessary adjuncts to this standard:

<i>IS No.</i>	<i>Title</i>
418 : 1978	Tungsten filament general service electric lamps (<i>third revision</i>)
1258 : 1987	Bayonet lamp holders (<i>third revision</i>)
8913 : 1978	Methods of measurement of lamp cap temperature rise
9206 : 1979	Dimensions of caps for tungsten filament general service electric lamps
10276 (Part 1) : 1982	Edison screw lamp holders: Part 1 Requirements and test
10276 (Part 2) : 1982	Edison screw lamp holders: Part 2 standard data sheets for lamp holders and gauges
11000 (Part 2 / Sec 1) : 1988	Fire hazard testing: Part 2 Test methods, Section 1 Glow wire test and guidance
15111 (Part 2) : 2002	Self ballasted lamps for general lighting services: Part 2 Performance requirements

3 TERMINOLOGY

For the purpose of this standard following definitions shall apply.

3.1 Self Ballasted Lamp

A tubular fluorescent or other discharge lamp unit that incorporates, permanently enclosed, all elements that are necessary for starting, and for stable operation, and which does not include any replaceable or interchangeable parts.

3.2 Type

Lamps that, independent of the type of cap, is identical in photometric and electrical rating.

3.3 Rated Voltage

The voltage or the voltage range marked on the lamp.

3.4 Rated Wattage

The wattage marked on the lamp.

3.5 Rated Frequency

The frequency marked on the lamp.

3.6 Cap Temperature Rise (Δt_s)

The surface temperature rise (above ambient) of a standard test lamp holder fitted to a lamp, when measured in accordance with the standard method described in IS 8913.

3.7 Live Part

A conductive part which may cause an electric shock in normal use.

3.8 Type Test

A test or series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant standard.

3.9 Type Test Sample

A sample consisting of one or more similar units submitted by the manufacturer or responsible vendor for the purpose of type test.

3.10 Acceptance Test

Tests carried out on samples taken from a lot for the acceptance of the lot.

3.11 Inspection Test Quantity (ITQ)

The number of lamps selected for the purpose of determining the acceptability of a batch as to marking, interchangeability, protection against electric shock, insulation resistance, electric strength and mechanical strength (*see 15.2*).

3.12 Rated Luminous Flux

The flux marked on the lamp or declared as such by the manufacturer or responsible vendor.

4 SELECTION OF LAMPS FOR TESTS (SAMPLING)

4.1 Method of Selection

The inspection test quantities (ITQ) shall be selected in a mutually agreed manner such as to ensure proper representation of the batch.

4.1.1 The selection of lamps for individual batches should be made as follows:

- a) *Up to and including 20 containers per batch* — out of every container an equal number of lamps (or as near to equal as possible) shall be selected at random in order to obtain 25 lamps required.
- b) *Over 20 containers per batch* — Out of 20 containers, every distributed over the whole batch, one lamp shall be selected at random from each container to obtain the 25 lamps required.

NOTE — Method of selection of lamps for type testing are under consideration.

4.2 Inspection Test Quantity (ITQ)

Inspection test quantity shall consist of 25 lamps.

4.3 Accidentally Broken and/or in Corrected Operated Lamps

4.3.1 Lamps, which are accidentally broken, shall, when necessary, be replaced to ensure that the required number of lamps for performance requirements completed the test.

Any such broken or incorrectly operated lamps shall be neglected in the evaluation of life test results specified in Part 2 of this standard.

NOTE — In order to avoid unnecessary delay it is recommended that spare lamps be available for carrying out other tests of this standard including tests specified in Part 2 of this standard.

5 GENERAL REQUIREMENT AND GENERAL TEST REQUIREMENTS

5.1 Self ballasted lamps shall be so designed and constructed that in normal use they function reliably

and cause no danger to the user or the surroundings.

In general, compliance is checked by carrying out all the tests specified.

5.2 All measurements unless otherwise specified, are carried out at rated voltage and frequency and in a draught-proof room at $(27 \pm 1^\circ\text{C})$.

If lamps are marked with a voltage range, rated voltage is taken as the mean of the voltage range marked.

5.3 Self ballasted lamps are non-repairable, factory-sealed units. They shall not be opened for any test. In the case of doubt based on the inspection of the lamp and the examination of the circuit diagram, and in agreement with the manufacturer or responsible vendor, lamps specially prepared so that a fault condition can be simulated shall be submitted for the testing (*see 14*).

6 MARKING

6.1 The lamps shall be clearly and durably marked with the following mandatory markings:

- a) Mark of origin (this may take the form of a trade-mark, the manufacturers name or the name of the responsible vendor);
- b) Rated voltage or the voltage range (marked 'V' or 'Volts');
- c) Rated wattage (marked 'W' or 'Watts');
- d) Rated frequency (marked in 'Hz');
- e) Rated luminous flux;
- f) Rated colour temperature; and
- g) Country of manufacture.

6.2 In addition, the following information shall be given by the lamp manufacturer either on the lamp or packing or in installation instructions:

- a) Lamp current;
- b) Burning position if restricted;
- c) For lamps with a weight significantly higher than that of the lamps for which they are a replacement, attention should be drawn to the fact that the increased weight may reduce the mechanical stability of certain luminaries; and
- d) Special conditions or restrictions, which shall be observed for lamp operation, for example, operation in dimming circuits.

6.3 Compliance is checked by the following:

- a) Presence and legibility of the marking required in 6.1 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 6.2 by visual inspection.

6.4 BIS Certification Marking

The self ballasted lamps may also be marked with the Standard Mark.

6.4.1 The use of Standard Mark is governed by the provisions of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of conditions under which the licence for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

7 INTERCHANGEABILITY

7.1 Interchangeability shall be ensured by the use of caps in accordance with IS 9206.

7.2 Compliance of combination of cap and bulb is checked by the use of gauges for checking the dimensions controlling interchangeability in accordance with IS 9206.

8 PROTECTION AGAINST ELECTRIC SHOCK

Self ballasted lamps shall be so constructed that, without any additional enclosure in the form of luminaire, no internal metal parts or live metal parts of the lamp cap are accessible when the lamp is installed in a lamp holder according to IS 1258 or IS 10276.

Compliance is checked by means of the test finger specified in Fig.1, if necessary, with a force of 10 N.

Lamps with Edison screw caps shall be so designed that they comply with the requirements for inaccessibility.

Compliance is checked by with the aid of a gauge in accordance with IS 10276 (Part 2).

Lamps with B 22 caps are subjected to the same requirements as normal incandescent lamps with this cap.

External metal parts other than current-carrying metal parts of the cap shall not be or become live. For testing, any movable conductive material shall be placed in the most onerous position without using a tool.

Compliance is checked by means of the insulation resistance and electric strength test (see 9).

9 INSULATION RESISTANCE AND ELECTRIC STRENGTH AFTER HUMIDITY TREATMENT

9.1 Insulation resistance and electric strength shall be adequate between current-carrying metal parts of the lamp and accessible parts of the lamp.

9.2 Insulation Resistance

The lamps shall be conditioned for 48 h in a cabinet containing air with a relative humidity between 91 percent and 95 percent. The temperature of the air is maintained within 1°C of any convenient value between 20°C and 30°C.

Insulation resistance shall be measured in the humidity cabinet with a dc voltage of approximately 500 V. One minute after application of the voltage, the insulation resistance between current-carrying metal parts of the cap and accessible parts of the lamp (accessible parts of the insulating material are covered with metal foil) shall be not less than 4 MΩ.

The insulation resistance of B 22 caps between shell and contact shall be not less than 5 MΩ.

9.3 Electric Strength

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

Screw caps: between accessible parts and parts of screw caps (accessible parts of insulating material are covered with metal foil):

Type HV (220V to 250V): 4 000 V r.m.s.

Type BV (100V to 120V): 2U + 1 000V

Value U = rated voltage.

During the test the eyelet and the shell of the cap are short-circuited.

Initially no more than half the prescribed voltage is applied. It is then gradually raised to the full value.

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

The distance between the foil and the current-carrying parts is under consideration.

B 22 caps: between shell and contacts (under consideration).

10 MECHANICAL STRENGTH

10.1 Torsion Resistance

The caps shall remain firmly attached to the bulb or that part of the lamp, which is used for screwing the

lamp in or out when subjected to the torque levels listed below:

B 15d.....	1.15 Nm
B 22d.....	3 Nm
E 14.....	1.15 Nm
E 27.....	3 Nm

The test is made by means of the test holder shown in Fig. 2 and 3.

The torque shall not be applied suddenly, but shall be increased continuously from 0 to the specified value.

In the case of un-cemented caps, relative movement between cap and bulb is permitted provided it does not exceed 10°.

After the mechanical strength test the sample shall comply with the requirements of accessibility. (see 8). Also neither the lamp nor the cap shall become loose.

11 CAP TEMPERATURE RISE

The cap temperature rise tests of the complete lamp during run-up, stabilization period and after stabilization shall not exceed the value mentioned below. When measured under the conditions specified in IS 8913:

B 15d.....	120 K
B 22d.....	125 K
E 14.....	120 K
E 27.....	120 K

The values above correspond to a 60W Max. Incandescent lamp and serve to prevent heating problems in incandescent lamp luminaries which have been tested with a heat test source lamp to check their thermal characteristics.

Measurement shall be carried out at rated voltage if the lamp is marked with a voltage range, it shall be measured at the mean voltage of that range, provided the limits of the voltage range do not differ by more than 2.5 percent from the mean voltage. For lamps with a wider range, the measurement shall be made at the highest value of the range.

12 RESISTANCE TO HEAT

Self ballasted lamps shall be sufficiently resistant to heat. External parts of insulating material providing protection against electric shock, and parts of insulating material retaining live parts in position shall be sufficiently resistant to heat.

Compliance is checked by subjecting the parts to a ball-pressure test by means of the apparatus shown in Fig. 4.

The test is made in a heating cabinet at a temperature of 27 ± 5°C in excess of the operating temperature of the relevant part according to 10, with a minimum of 125°C for parts retaining live parts in position and 80°C for other parts. The surface of the part to be tested is placed in the horizontal position and a steel ball of 5 mm diameter pressed against this surface with a force of 20 N.

The test load and the supporting means are placed within the heating cabinet for a sufficient time to ensure that they have attained the stabilized testing temperature before the test commences.

The part to be tested is placed in the heating cabinet for a period of 10 min before the test load is applied.

If the surface under test bends, the part where the ball presses is supported. For this purpose if the test cannot be made on the complete specimen, a suitable part may be cut from it.

The specimen shall be at least 2.5 mm thick, but if such a thickness is not available on the specimen then two or more pieces are placed together.

After one hour the ball is removed from the specimen, which is then immersed for 10 s in cold water for cooling down to approximately room temperature. The diameter of the impression is measured, and shall not exceed 2 mm.

In the event of curved surfaces the shorter axis is measured if the indent is elliptical.

In case of doubt, the depth of the impression is measured and the diameter calculated using the formula:

$$\Phi = 2 \sqrt{p (5 - p)}$$
, in which *p* = depth of impression

The test is not made on parts of ceramic material.

13 RESISTANCE TO FLAME AND IGNITION

Parts of insulating material retaining live parts in position and external parts of insulating material providing protection against electric shock are subjected to the glow wire test in accordance with IS 11000 (Part 2/Sec 1), subject to the following details:

The test specimen is a complete lamp. It may be necessary to take away parts of the lamp to perform the test, but care is taken to ensure that the test conditions are not significantly different from those occurring in normal use.

The test specimen is mounted on the carriage and pressed against the glow-wire tip with a force of 1N, preferably 15 mm, or more, from the upper edge, into the centre of the surface to be tested. The penetration of the glow-wire into the specimen is mechanically limited to 7 mm.

If it is not possible to make the test on a specimen as described above because the specimen is too small, the above test is made on a separate specimen of the same material, 30 mm square and with a thickness equal to the smallest thickness of the specimen.

The temperature of the tip of the glow wire is 650°C. After 30 s the specimen is withdrawn from contact with the glow-wire tip.

The glow-wire temperature and heating current are constant for 1 min prior to commencing the test. Care is taken to ensure that heat radiation does not influence the specimen during this period. The glow-wire tip temperature is measured by means of a sheathed fine-wire thermocouple constructed and calibrated as described in IS 11000 (Part 2/Sec 1).

Any flame or glowing of the specimen shall extinguish within 30 s of withdrawing the glow-wire and any flaming drop shall not ignite a piece of tissue paper, spread out horizontally 200 ± 5 mm below the specimen.

The test is not made on parts of ceramic material.

14 FAULT CONDITIONS

The lamp shall not impair safety when operated under fault conditions, which may occur during the intended use.

Each of the following fault conditions is applied in turn, as well as any other associated fault condition that may arise from it as logical consequences. Only one component at a time is subjected to a fault condition:

- a) In a switch start circuit the starter is short-circuited;
- b) Short-circuit across capacitors;
- c) The lamp does not start, because one of the cathodes is broken;
- d) The lamp does not start, although the cathodes circuits are intact (de-activated lamp);
- e) The lamp operated, but one of the cathodes is deactivated or broken (rectifying effect); and
- f) Opening or bridging other points in the circuit where the diagram indicates that such a fault condition may impair safety.

Examination of the lamp and its circuit diagram will generally show the fault conditions, which should be applied. These are applied in sequence in the order that is most convenient.

The manufacturer or the responsible vendor shall submit a specially prepared lamp with the relevant fault condition, where possible in such a way that by operating a switch outside the lamp the fault condition is introduced.

Components or devices in which a short-circuit does not occur shall not be bridged. Similarly, components or devices in which an open circuit cannot occur shall not be interrupted.

Manufacturer or responsible vendor shall produce evidence that the components behave in a way that does not impair safety, for instance, by showing compliance with the relevant specification

In the case of fault conditions (a), (b) or (f), compliance is checked by operating the sample free burning at room temperature and at a voltage between 90 percent and 110 percent of the rated voltage or, in case of a voltage range, at a voltage between 90 percent and 110 percent of the mean voltage of that range until stable conditions have been reached, then introducing the fault condition.

In case of the fault conditions (c), (d) or (e), the same operating conditions apply but the fault condition is introduced at the start of the test.

The sample is then tested a further 8 h. During this test it shall not catch fire, or produce flammable gases and live parts shall not become accessible.

To check if gases liberated from component parts are flammable or not, a test with a high frequency spark generator is made.

To check if accessible parts have become live, a test in accordance with 8 is made. The insulation resistance (see 8.2) is checked with a dc voltage of approximately 1 000 V.

15 CONDITIONS OF COMPLIANCE

15.1 General Conditions

A batch shall be considered as confirming to this standard if the requirements contained in this standard are fulfilled. If the batch fails to satisfy the requirements of any of these requirements, it shall be deemed not to comply with this standard.

15.2 Test for Inspection Test Quantity

15.2.1 Following shall constitute inspection tests:

- a) Marking,
- b) Interchangeability,
- c) Protection against electric shock,
- d) Insulation resistance and electric strength, and

- e) Mechanical strength.

A batch shall be considered to comply with the requirements of 6, 7, 8, 9 and 10, if the number of lamps failing does not exceed qualifying limits given below:

- a) For any single requirement : 2 Max
- b) For all requirements taken together : 4 Max

16 TESTS

16.1 Classification of Tests

16.1.1 Type Tests

The following shall constitute the type tests to be carried out on selected sample of self ballasted lamps, sample being drawn preferably from regular production lot:

- a) Marking (see 6),
- b) Interchangeability (see 7),
- c) Protection against electric shock (see 8),
- d) Insulation resistance and electric strength after humidity treatment (see 9),
- e) Mechanical strength (see 10),
- f) Cap temperature rise (see 11),
- g) Resistance to heat (see 12),
- h) Resistance to flame and ignition (see 13), and

- j) Fault conditions (see 14).

16.1.2 The number of sample shall be as given for ITQ in respect of tests for 6 to 10 and their criteria for acceptance is given in 15.2.

16.1.3 The number of samples for temperature rise when tested in accordance with 11 shall be five from which not more than one shall fail.

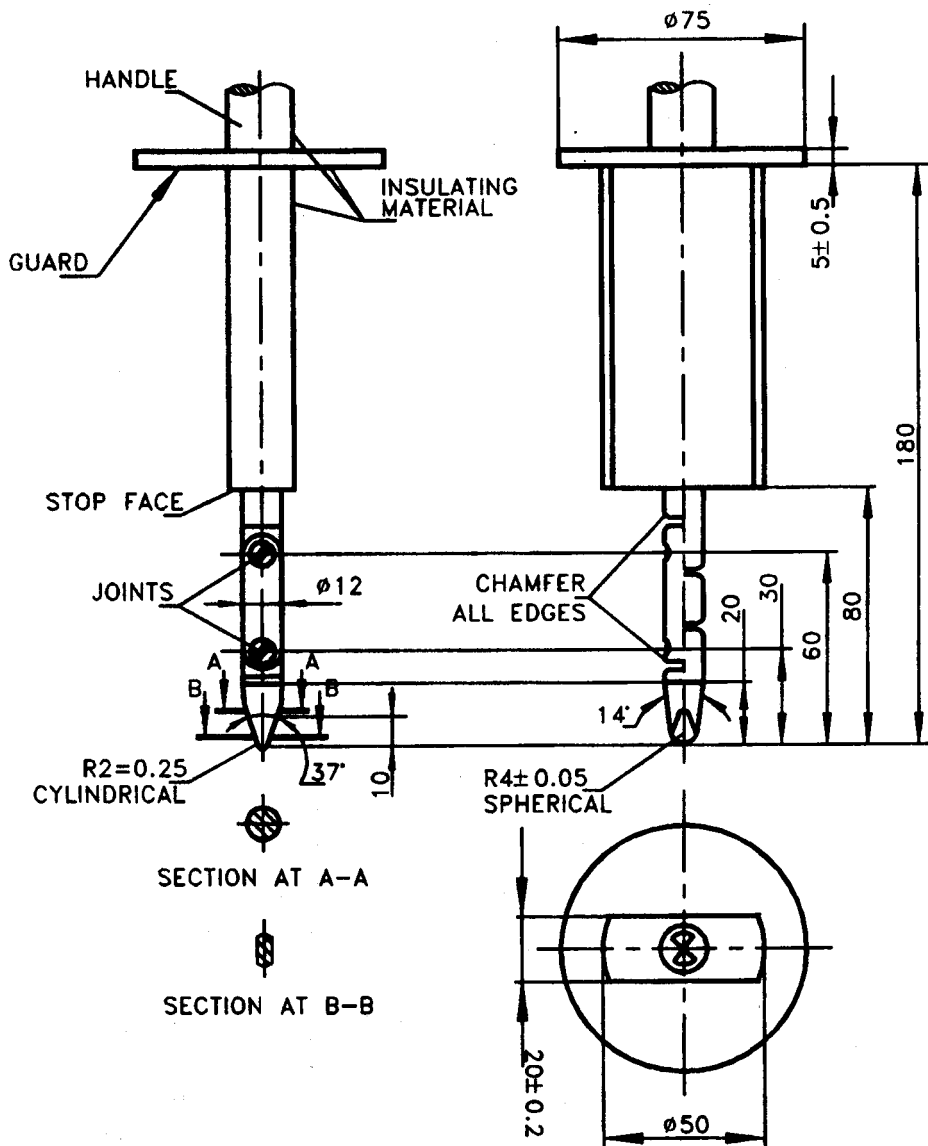
16.1.4 The number of samples for resistance to heat (12), resistance to flame and ignition (13) and fault condition (14) shall be one and no failures are allowed in any of these tests.

16.2 Acceptance Test

The following shall constitute as acceptance tests:

- a) Marking (see 6),
- b) Interchangeability (see 7),
- c) Protection against electric shock (see 8),
- d) Insulation resistance and electric strength after humidity treatment (see 9),
- e) Mechanical strength (see 10), and
- f) Cap temperature rise (see 11).

16.2.1 Sampling shall be the same as given against ITQ in respect of test of 6 to 10 and five in respect of test of 11. Criteria for acceptance shall be as given in 15.2 for cap temperature rise the number of failure shall not exceed one.



Linear dimensions in millimetres.

Tolerances on dimensions without specific tolerance:

on angles: -10

on linear dimensions: -0.05

Up to 25 mm: - 0.05

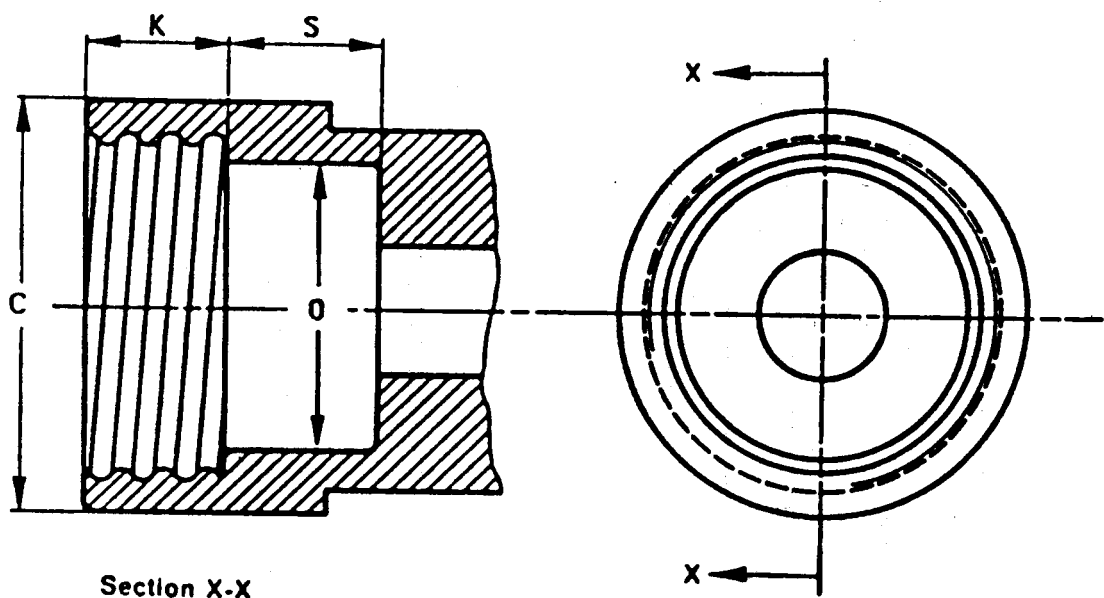
Over 25 mm: ± 0.2

Material of finger: for example heat-treated steel

Both joints of this finger may be bent through an angle of $90 + 10^\circ$ but in one and the same direction only.

Using the pin and groove solution is only one of the possible approaches in order to limit the bending angle to 90°. For this reason dimensions and tolerances of these details are not given in the drawing. The actual design must ensure a 90° bending angle with a 0 to + 10° tolerance.

FIG. 1 STANDARD TEST FINGER

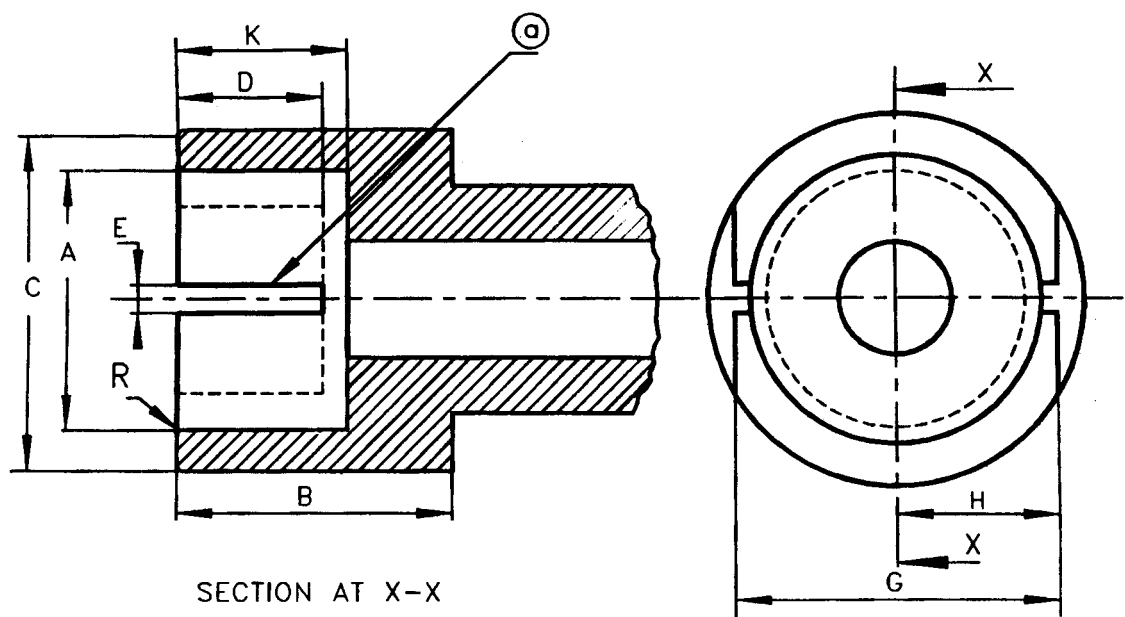


All dimensions in millimetres.

The drawing is intended only to illustrate the essential dimensions of the holder.

Dimensions	E 14	E 27	Tolerance
<i>C</i>	20.0	32.0	<i>Min</i>
<i>K</i>	11.5	11.0	± 0.3
<i>O</i>	12.0	23.0	± 0.1
<i>S</i>	7.0	12.0	<i>Min</i>

FIG. 2 HOLDER FOR TORSION TEST ON LAMPS WITH SCREW CAPS

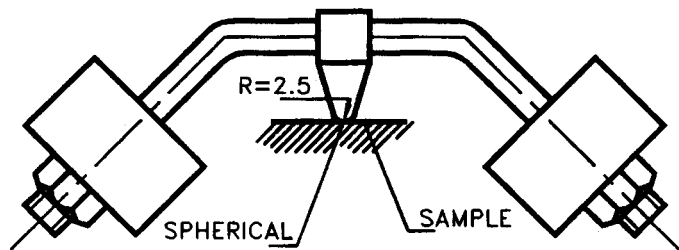


The drawing is intended only to illustrate the essential dimensions of the holder.

All dimensions in millimetres.

Dimensions	B 15	B 22	Tolerance
<i>A</i>	15.27	22.27	+ 0.3
<i>B</i>	19.0	19.0	<i>Min</i>
<i>C</i>	21.0	28.0	<i>Min</i>
<i>D</i>	9.5	9.5	<i>Min</i>
<i>E</i>	3.0	3.0	+ 0.17
<i>G</i>	18.3	24.6	± 0.3
<i>H</i>	9.0	12.15	<i>Min</i>
<i>K</i>	12.7	12.7	± 0.3
<i>R</i>	1.5	1.5	Approx

FIG. 3 HOLDER FOR TORSION TEST ON LAMPS WITH BAYONET CAPS



All dimensions in millimetres.

FIG. 4 BALL-PRESSURE APPARATUS

Bureau of Indian Standards

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Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the latest issue of 'BIS Catalogue' and 'Standards : Monthly Additions'.

This Indian Standard has been developed from Doc : No. ET 23 (5195).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110 002
Telephones : 323 01 31, 323 33 75, 323 94 02

Telegrams: Manaksanstha
(Common to all offices)

Regional Offices :

Central : Manak Bhavan, 9 Bahadur Shah Zafar Marg
NEW DELHI 110002

Telephone

{ 323 76 17
323 38 41

Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Kankurgachi
KOLKATA 700 054

{ 337 84 99, 337 85 61
337 86 26, 337 91 20

Northern : SCO 335-336, Sector 34-A, CHANDIGARH 160 022

{ 60 38 43
60 20 25

Southern : C. I. T. Campus, IV Cross Road, CHENNAI 600 113

{ 254 12 16, 254 14 42
254 25 19, 254 13 15

Western : Manakalaya, E9 MIDC, Marol, Andheri (East)
MUMBAI 400 093

{ 832 92 95, 832 78 58
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AMENDMENT NO. 1 NOVEMBER 2003
TO
IS 15111 (PART 1) : 2002 SELF BALLASTED LAMPS
FOR GENERAL LIGHTING SERVICES
PART 1 SAFETY REQUIREMENTS

(*Page 2, clause 6.1*) — Insert the following after 6.1(g):

‘h) Power factor.’

(ET 23)

Reprography Unit, BIS, New Delhi, India