

Australian/New Zealand Standard™

**Self ballasted lamps for general lighting  
services—  
Safety requirements  
(IEC 60968:1988, MOD)**



### **AS/NZS 60968:2001**

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-041, Lamps and related equipment. It was approved on behalf of the Council of Standards Australia on 2 October 2001 and on behalf of the Council of Standards New Zealand on 12 October 2001. It was published on 29 November 2001.

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Association of Consulting Engineers, Australia  
Australian Chamber of Commerce and Industry  
Australian Electrical and Electronic Manufacturers Association  
Consumer Federation of Australia  
Electrical Compliance Testing Association of Australia  
Electrical Regulatory Authorities Council  
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*This Standard was issued in draft form for comment as DR 01055!*

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**Self ballasted lamps for general lighting  
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First published as AS/NZS 60968:2001

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## PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-041, Lamps and related equipment.

The objective of this Standard is to provide the lighting industry with safety requirements on self ballasted lamps for general lighting services.

This Standard is an adoption with national modifications and has been reproduced from IEC 60968:1988, *Self ballasted lamps for general lighting services—Safety requirements* including Amendment 1 (1991) and Amendment 2 (1999).

A vertical line in the margin shows where the base publication has been modified by Amendments 1 and 2.

Variations to IEC 60968:1988 are indicated at the appropriate places throughout this Standard. Strikethrough (*example*) identifies IEC tables, figures and passages of text which, for the purposes of this Australian/New Zealand Standard, are deleted. Where Australian/New Zealand tables, figures or passages of text are added, each is set in its proper place and identified by shading (*example*). Added figures are not themselves shaded, but are identified by a shaded border.

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- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text 'this standard' should read 'this Australian/New Zealand Standard'.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

In this Standard, the following print types are used:

- requirements proper: in arial type;
- *test specifications: in italic type;*
- explanatory matter: in smaller arial type.

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## STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

**Australian/New Zealand Standard****Self ballasted lamps for general lighting services—  
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Any IEC table, figure or passage of text that is struck-through is not part of this Standard. Any Australian/New Zealand table, figure or passage of text that is added (and identified by shading) is part of this Standard.

**1 General****1.1 Scope**

This standard 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 rated wattage up to 60 W;
- a rated voltage of 100 V to 250 V;
- Edison screw or bayonet caps.

The requirements of this standard relate only to type testing.

Recommendations for whole product testing or batch testing are under consideration.

**1.2 Normative references**

<b>AS</b>	
3117	Approval and test specification—Bayonet lampholders
3140	Approval and test specification—Edison-type screw lampholders
<b>AS/NZS</b>	
4695.2.2	Fire hazard testing of electrotechnical products—Test methods – Needle-flame test
4695.707	Fire hazard testing of electrotechnical products—Methods of test for the determination of the flammability of solid electrical insulating materials when exposed to an igniting source
<b>IEC</b>	
60061-1 Ed. 3.0 (b)	Lamp caps and holders together with gauges for the control of interchangeability and safety. Part 1: Lamp caps
60061-3 Ed. 3.0 (b)	Lamp caps and holders together with gauges for the control of interchangeability and safety. Part 3: Gauges
60238 Ed. 7.1 (b)	Edison screw lampholders

IEC	
60360 Ed. 3.0 (b)	Standard method of measurement of lamp cap temperature rise
60695-2-10	Fire hazard testing—Part 2-10: Glowing/hot-wire based test methods—Glow-wire apparatus and common test procedure

## 2 Definitions

For the purposes of this standard the following definitions apply:

### 2.1 Self-ballasted lamp

A unit which cannot be dismantled without being permanently damaged, provided with a lamp cap and incorporating a light source and any additional elements necessary for starting and stable operation of the light source.

### 2.2 Type

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

### 2.3 Rated voltage

The voltage or voltage range marked on the lamp.

### 2.4 Rated wattage

The wattage marked on the lamp.

### 2.5 Rated frequency

The frequency marked on the lamp.

### 2.6 Cap temperature rise ( $\Delta t_c$ )

The surface temperature rise (above ambient) of a standard test lampholder fitted to the lamp, when measured in accordance with the standard method described in IEC 60360.

### 2.7 Live part

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

### 2.8 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.

### 2.9 Type test sample

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

## 3 General requirement and general test requirements

**3.1** Self-ballasted lamps shall be so designed and constructed that in normal use they function reliably and cause no danger to the user or surroundings.

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



**3.2** All measurements unless otherwise specified, are carried out at rated voltage and frequency and in a draught-proof room at  $(25 \pm 1)^\circ\text{C}$ .

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

**3.3** Self-ballasted lamps are non repairable, factory sealed units. They shall not be opened for any tests. 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 testing (see clause 12).

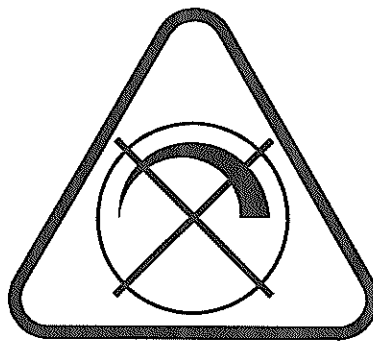
## 4 Marking

**4.1** Lamps shall be clearly and durably marked with the following mandatory markings:

- 1) Mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of the responsible vendor).
- 2) Rated voltage or voltage range (marked "V" or "volts").
- 3) Rated wattage (marked "W" or "watts").
- 4) Rated frequency (marked in "Hz").

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

- 1) Lamp current.
- 2) Burning position if restricted.
- 3) 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 luminaires.
- 4) Special conditions or restrictions which shall be observed for lamp operation, for example, operation in dimming circuits. Where lamps are not suitable for dimming, the following symbol may be used:



**4.3** Compliance is checked by the following:

- 1) Presence and legibility of the marking required in 4.1 – by visual inspection.
- 2) The durability of the 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.
- 3) Availability of information required in 4.2 – by visual inspection.

## 5 Interchangeability

5.1 Interchangeability shall be ensured by the use of caps in accordance with IEC 60061-1.

5.2 Compliance of the combination of cap and bulb is checked by the use of gauges for checking the dimensions controlling interchangeability in accordance with table 1.

*The gauges are those shown in the standard sheet included in IEC 60061-3.*

*For Edison screw lamp holder, compliance with Clauses 5.1 and 5.2 are checked by measurement and by inserting the lamp cap into a lamp holder complying with AS 3140 to ensure compatibility.*

*For Bayonet cap lamp holder, compliance with Clauses 5.1 and 5.2 are checked by measurement and by inserting the lamp cap into a lamp holder complying with AS 3117 to ensure compatibility.*

5.3 Self-ballasted lamps, when capped either B22d or E27 shall have a mass not exceeding 1 kg and shall not impart a bending moment, at the lampholder, of more than 2 Nm.

*Compliance shall be checked by measurement.*

Table 1 – Interchangeability gauges and lamp cap dimensions

Lamp cap	Cap dimensions to be checked by the gauge	Gauge sheet No. from IEC 60061-3
B22d or B15d	A max. and A min. D1 max. N min. Diametrical position of the pins Insertion in lampholder Retention in lampholder	7006-10 and 7006-11  7006-4A 7006-4B
E27	Max. dimensions of the screw thread Min. major diameter of the screw thread Contact making	7006-27B 7006-28A 7006-50
E26	Max. dimensions of the screw thread Max. major diameter of the screw thread	7006-27D 7006-27E
E14	Max. dimensions of the screw thread Min. major diameter of the screw thread Contact making	7006-27F 7006-28B 7006-54

## 6 Protection against electric shock

Self-ballasted lamps shall be so constructed that, without any additional enclosure in the form of a luminaire, no internal metal parts or live metal parts of the lamp cap are accessible when the lamp is installed in a lampholder according to IEC 60238.

*Compliance is checked by means of the test finger specified in figure 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 for general lighting service (GLS) lamps.

*Compliance is checked with the aid of a gauge in accordance with the current edition of IEC 60061-3, sheet 7006-51A for E27 caps and sheet 7006-55 for E14 caps or by measurement.*

NOTE Requirements for E26 caps are under consideration.

Lamps with B22 or B15 caps are subject 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 clause 7).*

## 7 Insulation resistance and electric strength after humidity treatment

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

### 7.1 Insulation resistance

The lamp shall be conditioned for 48 h in a cabinet containing air with a relative humidity between 91 % and 95 %. 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 d.c. voltage of approximately 500 V, 1 min 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 insulating material are covered with metal foil) shall be not less than 4 MΩ.

NOTE The insulation resistance of bayonet caps between shell and contacts is under consideration.

### 7.2 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:

- ES caps: between accessible parts and parts of screw caps (accessible parts of insulating material are covered with metal foil):
  - type HV (220 V to 250 V): 4 000 V r.m.s.
  - type BV (100 V to 120 V):  $2U + 1\,000\text{ V}$

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 flash-over or breakdown shall occur during the test. Measurements shall be carried out in the humidity cabinet.*

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

- Bayonet caps: between shell and contacts (under consideration).

## 8 Mechanical strength

### *Torsion resistance*

The cap 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.

B22d	3 Nm
B15d	1,15 Nm
E26 and E27	3 Nm
E14	1,15 Nm

*The test is made by means of the test holders shown in figures 2 and 3.*

Other appropriate holders can be used except in the case of uncemented caps.

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

*In the case of uncemented 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 clause 6).*

## 9 Cap temperature rise

The cap temperature rise  $\Delta t_s$  of the complete lamp during run-up, stabilization period and after stabilization shall not exceed the values mentioned below when measured under the conditions specified in IEC 60360:

B22d	125 K
B15d	120 K
E27	120 K
E14	120 K
E26	under consideration

*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 % from the mean voltage. For lamps with a wider range, the measurement shall be made at the highest value of the range.*

## 10 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 figure 4.*

*The test is made in a heating cabinet at a temperature of  $(25 \pm 5)^\circ\text{C}$  in excess of the operating temperature of the relevant part according to clause 9, with a minimum of  $125^\circ\text{C}$  for parts retaining live parts in position and  $80^\circ\text{C}$ \* 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.*

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\* Under consideration.

*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 1 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.

## 11 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 IEC 60695-2-10, 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 1 N, 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 IEC 60695-2-1.*

- *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 the tissue paper, spread out horizontally 200 ±5 mm below the specimen.*

The test is not made on parts of ceramic material.

**Base material of any printed circuit boards together with any coating or encapsulation is subject to the needle-flame test in accordance with AS/NZS 4695.2.2; however, any flames shall have extinguished within 15 s of removal of the test flame. The flame shall be applied to an edge of the board having the lowest heat sink effect, with the board orientated in its normal position of use and at a point, if possible, not less than 10 mm from a corner.**

**The needle-flame test is not carried out on base material that is made of material classified as FV-0 according to AS/NZS 4695.707. The sample of material submitted to the test of AS/NZS 4695.707 shall be no thicker than that of the relevant printed circuit board.**

## 12 Fault conditions

The lamps 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 conditions 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 cathode circuits are intact (de-activated lamp).*
- e) *The lamp operates, but one of the cathodes is de-activated or broken (rectifying effect).*
- 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 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.

Manufacturers or responsible vendors 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 % and 110 % of the rated voltage or, in case of a voltage range, at a voltage between 90 % and 110 % of the mean voltage of that range until stable conditions have been reached, then introducing the fault condition.*

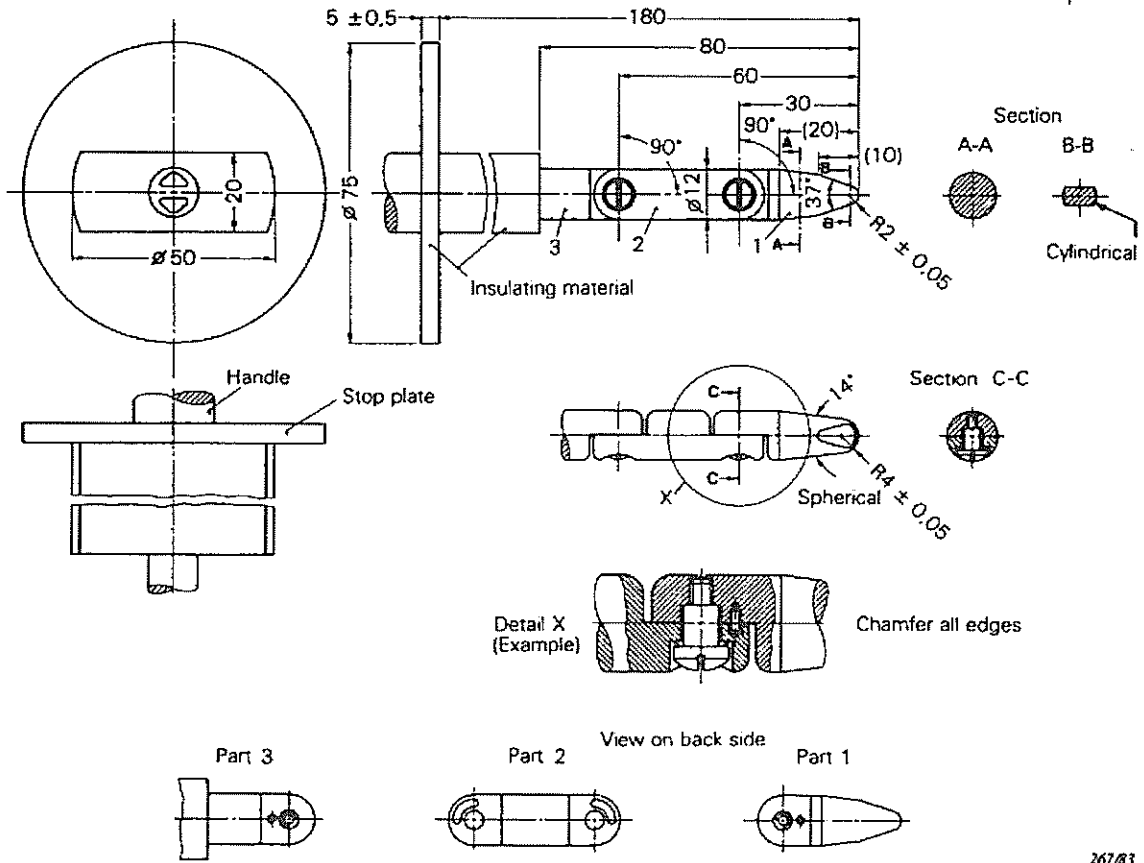
*In the case of fault conditions c), d) or e), the same operating conditions apply but the fault condition is introduced at the start of the test.*

*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 clause 6 is made. The insulation resistance (see 7.1) is checked with a d.c. voltage of approximately 1 000 V.*





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Linear dimensions in millimetres

Tolerances on dimensions without specific tolerance:

on angles:  $\begin{matrix} 0 \\ -10' \end{matrix}$

on linear dimensions:

up to 25 mm:  $\begin{matrix} 0 \\ -0,05 \end{matrix}$

over 25 mm:  $\pm 0,2$

Material of finger: e.g. heat-treated steel

Both joints of this finger may be bent through an angle of  $90 \begin{matrix} +10^\circ \\ 0 \end{matrix}$ , but in one and the same direction only.

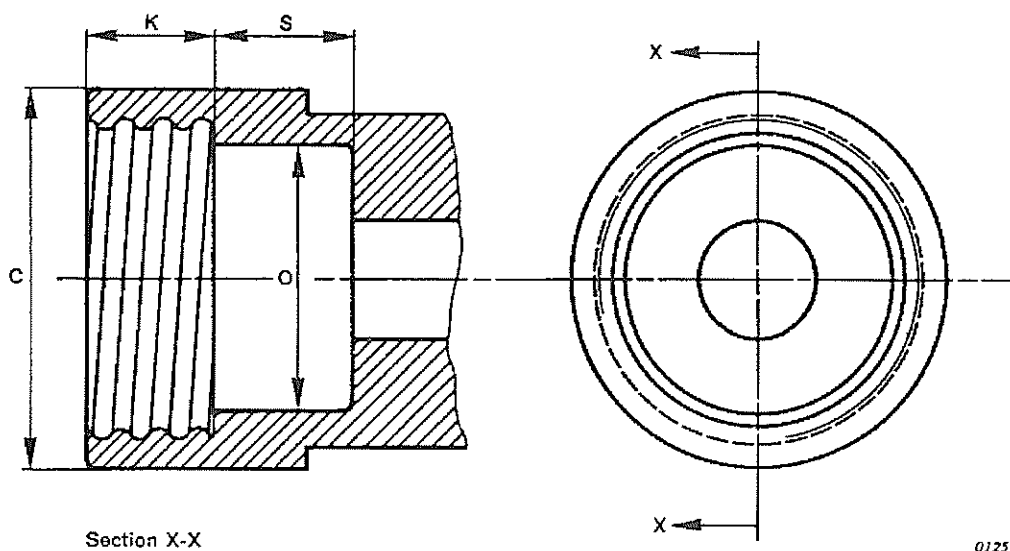
Using the pin and groove solution is only one of the possible approaches in order to limit the bending angle to  $90^\circ$ . For this reason dimensions and tolerances of these details are not given in the drawing. The actual design must ensure a  $90^\circ$  bending angle with a 0 to  $+10^\circ$  tolerance.

Figure 1 – Standard test finger

Dimensions in millimetres

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



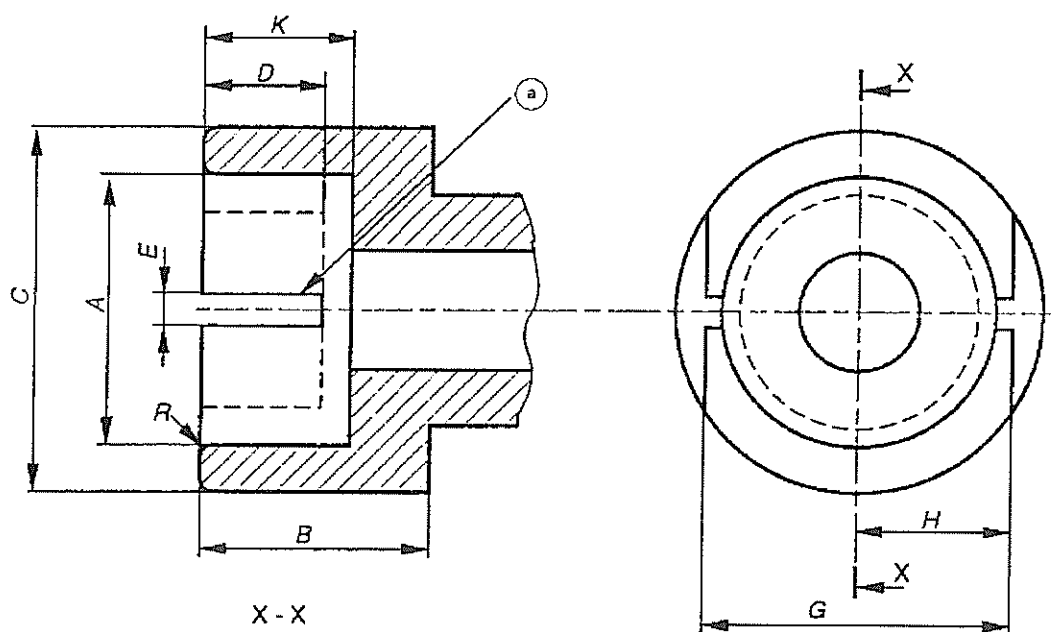


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Dimension	E14	E26	E27	Tolerance
C	20,0	32,0	32,0	Min.
K	11,5	11,0	11,0	± 0,3
O	12,0	23,0	23,0	± 0,1
S	7,0	12,0	12,0	Min.

Thread to be in accordance with holder threads of IEC 60061.

Figure 2 – Holder for torsion test on lamps with screw caps

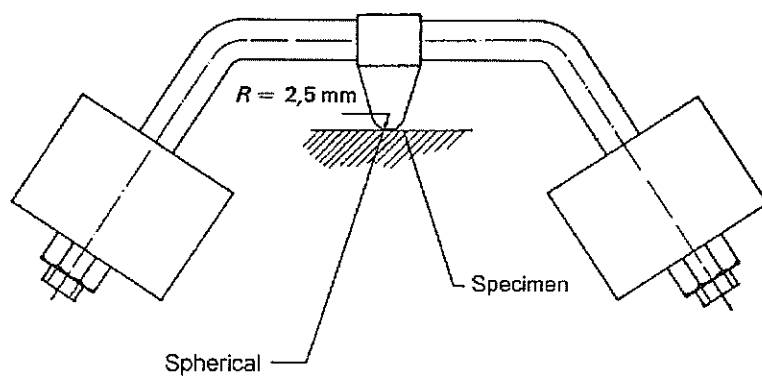


Dimensions	B15 mm	B22 mm	Tolerance mm
A	15,27	22,27	+0,03
B	19,0	19,0	Min.
C	21,0	28,0	Min.
D	9,5	9,5	Min.
E	3,0	3,0	+0,17
G	18,3	24,6	$\pm 0,3$
H	9,0	12,15	Min.
K	12,7	12,7	$\pm 0,3$
R	1,5	1,5	Approx.

NOTE The drawing illustrates the essential dimensions of the holder which need only be checked if doubt arises from the application of the test.

- Ⓐ These slots shall be symmetrical on centre line.

Figure 3 – Holder for torque test on lamps with bayonet caps



IEC 050/62

**Figure 4 – Ball-pressure apparatus**

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