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*Incorporating
Corrigendum No. 1*

Double-capped fluorescent lamps — Safety specifications

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British Standard

ICS 29.140.30

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National foreword

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The UK participation in its preparation was entrusted to Technical Committee CPL/34/1, Electric lamps, to Subcommittee CPL/34/1/1, General, commercial and domestic lamps, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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This British Standard, having been prepared under the direction of the Electrotechnical Sector Committee, was published under the authority of the Standards Committee and comes into effect on 15 April 2000

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English version

Double-capped fluorescent lamps - Safety specifications
(IEC 61195:1999)

Lampes à fluorescence à deux culots
Prescriptions de sécurité
(CEI 61195:1999)

Zweiseitig gesockelte
Leuchtstofflampen
Sicherheitsanforderungen
(IEC 61195:1999)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

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

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Foreword

The text of document 34A/886/FDIS, future edition 2 of IEC 61195, prepared by SC 34, Lamps, of IEC TC 34, Lamps and related equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as EN 61195 on 1999-12-01.

This European Standard supersedes EN 61195:1994 and its amendment A1:1998.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2000-09-01
- latest date by which the national standards conflicting with the EN have to be withdrawn (dow) 2002-12-01

Annexes designated "normative" are part of the body of the standard.

Annexes designated "informative" are given for information only.

In this standard, annexes A, B, D and ZA are normative and annexes C and E are informative. Annex ZA has been added by CENELEC.

Endorsement notice

The text of the International Standard IEC 61195:1999 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following note has to be added for the standard indicated:

IEC 60598-1 NOTE: Harmonized as EN 60598-1:1997 (modified).

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DOUBLE-CAPPED FLUORESCENT LAMPS – SAFETY SPECIFICATIONS

1 General

1.1 Scope

This International Standard specifies the safety requirements for double-capped fluorescent lamps for general lighting purposes of all lamps having Fa6, Fa8, G5, G13, 2G13, R17d and W4.3×8.5d caps.

It also specifies the method a manufacturer should use to show compliance with the requirements of this standard on the basis of whole production appraisal in association with his test records on finished products. This method can also be applied for certification purposes. Details of a batch test procedure which can be used to make limited assessment of batches are also given in this standard.

NOTE – Compliance with this standard concerns only safety criteria and does not take into account the performance of double-capped fluorescent lamps for general lighting purposes with respect to luminous flux, colour, starting and operational characteristics. Readers are referred to IEC 60081 for such characteristics.

1.2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60061-1, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 1: Lamp caps*

IEC 60061-2, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 2: Lampholders*

IEC 60061-3, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 3: Gauges*

IEC 60081, *Double-capped fluorescent lamps – Performance specifications*

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

IEC 60695-2-1/0, *Fire hazard testing – Part 2: Test methods – Section 1/sheet 0: Glow-wire test methods – General*

IEC 60921, *Ballasts for tubular fluorescent lamps – Performance requirements*

1.3 Definitions

For the purposes of this International Standard, the following definitions apply.

1.3.1

double-capped fluorescent lamp

double-capped low-pressure mercury discharge lamp of tubular form in which most of the light is emitted by a layer of fluorescent material excited by the ultra-violet radiation from the discharge

1.3.2

group

lamps having the same electrical and cathode characteristics, the same physical dimensions and the same starting method

1.3.3

type

lamps of the same group having the same photometric and colour characteristics

1.3.4

family

lamp groups which are distinguished by common features of materials, components, lamp diameter and/or method of processing

1.3.5

nominal wattage

wattage used to designate the lamp

1.3.6

design test

test made on a sample for the purpose of checking compliance of the design of a family, group or a number of groups with the requirements of the relevant clause

1.3.7

periodic test

test, or series of tests, repeated at intervals in order to check that the product does not deviate in certain respects from the given design

1.3.8

running test

test repeated at frequent intervals to provide data for assessment

1.3.9

batch

all the lamps of one family and/or group identified as such and put forward at one time for testing to check compliance

1.3.10

whole production

production during a period of twelve months of all types of lamps within the scope of this standard and nominated in a list of the manufacturer for inclusion in the certificate

2 Safety requirements

2.1 General

Lamps shall be so designed and constructed that in normal use they present no danger to the user or surroundings.

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

NOTE – Where testing can become unnecessarily difficult due to the lamp length, methods to alleviate the problem may be agreed between the supplier and the certification authority.

2.2 Marking

2.2.1 The following information shall be legibly and durably marked on the lamps:

- a) mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of the responsible vendor);
- b) the nominal wattage (marked "W" or "watts") or any other indication which identifies the lamp.

NOTE – In some countries, the length of the lamp is marked in place of the wattage.

2.2.2 Compliance is checked by the following:

- a) presence and legibility of the marking by visual inspection;
- b) durability of marking by applying the following test on unused lamps.

The area of the marking on the lamp shall be rubbed by hand with a smooth cloth dampened with water for a period of 15 s.

After this test, the marking shall still be legible.

2.3 Mechanical requirements for caps

2.3.1 Construction and assembly

Caps shall be so constructed and assembled to the bulbs that they remain attached during and after operation.

Compliance is checked by the following tests:

2.3.1.1 For lamp types using caps G5, G13 and R17d:

- a) for unused lamps compliance is checked by applying a torque test to the pins, as follows:
 - the lamp cap shall remain firmly attached to the bulb and there shall be no rotational movement between component parts of the cap exceeding an angular displacement of 6° when subjected to the torque levels listed in table 1.

Table 1 – Torque values for unused lamps

Cap type	Torque value Nm
G5	0,5
G13	1,0
R17d	1,0

The torque shall not be applied suddenly but shall be increased progressively from zero to the value specified in table 1.

The test holders for the application of the torque are shown in annex A. The test holder for the R17d cap is under consideration.

- b) following a heating treatment for a period of $2\,000\text{ h} \pm 50\text{ h}$ at a temperature of $120\text{ °C} \pm 5\text{ °C}$, the cap shall remain firmly attached to the bulb and there shall be no rotational movement between component parts of the cap exceeding an angular displacement of 6° when subjected to the torque levels specified in table 2.

For G13 capped lamps with a nominal wattage greater than 40 W, the heating shall be performed at a temperature of $140\text{ °C} \pm 5\text{ °C}$.

Table 2 – Torque values after heating treatment

Cap type	Torque value Nm
G5	0,3
G13	0,6
R17d	0,6

2.3.1.2 For lamp types using caps Fa6 and Fa8, compliance is checked by inspection on unused lamps.

2.3.1.3 For lamp types using cap 2G13:

- a) for unused lamps the cap shall remain firmly attached to the bulb when subjected to an axial pull of 40 N or a bending moment of 3 Nm. The bending moment shall be applied by holding in a uniform manner that part of the glass tubes closest to the cap, the pivot point lying at the cap reference plane (mating plane with the lampholder). The pulling force and bending moment shall not be applied suddenly but shall be increased gradually from zero to the specified value;
- b) following a heating treatment for a period of $2\,000\text{ h} \pm 50\text{ h}$ at a temperature of $120\text{ °C} \pm 5\text{ °C}$, the cap shall remain firmly attached to the bulb when subjected to the pulling forces and bending moments which are under consideration.

2.3.2 Dimensional requirements for caps

2.3.2.1 Lamps shall use standardized caps in accordance with the requirements of IEC 60061-1.

2.3.2.2 Compliance is checked by using the gauges shown in table 3.

Table 3 – Sheet references of IEC 60061

Cap type	Sheet numbers	
	IEC 60061-1	IEC 60061-2
	Lamp caps	Gauges
G13	7004-51	7006-45
G5	7004-52	7006-46A
Fa6	7004-55	7006-41
R17d	7004-56	7006-57
Fa8	7004-57	7006-40/7006-40A
2P	7004-33	7006-33

2.4 Insulation resistance

2.4.1 The insulation resistance between the metal shell of the cap and the pin(s) or contacts shall not be less than 2 MΩ.

2.4.2 Compliance is checked by measurement with suitable test equipment using a d.c. voltage of 500 V.

2.5 Electric strength

2.5.1 This test shall not apply to lamps having caps with internal resistors.

2.5.2 The insulation between the shell of the cap and the pin(s) or contacts shall withstand the test voltage. No flash-over or breakdown shall occur during the test.

2.5.3 Compliance is checked with a 1 500 V a.c. voltage of substantially sine-wave form, with a frequency of 50 Hz or 60 Hz and applied for 1 min. Initially, not more than half the prescribed voltage shall be applied; it shall then be raised rapidly to the full value.

Glow discharges without a drop in voltage are neglected.

2.6 Parts which can become accidentally live

2.6.1 Metal parts intended to be insulated from live parts shall not be or become live.

2.6.2 With the exception of cap pins no live part shall project from any part of the cap.

2.6.3 Compliance is checked by a suitable measuring system which may include visual inspection where appropriate. In addition, there shall be regular daily checks of the equipment or a verification of the effectiveness of the inspection. See 3.5.4.

2.7 Resistance to heat and fire

2.7.1 Insulating material of caps shall be resistant to heat.

2.7.2 Compliance is checked by the following test.

Samples are tested in a heating cabinet at a temperature of $125\text{ °C} \pm 5\text{ °C}$ for a period of 168 h.

For G13 caps to be used on lamps with a nominal wattage greater than 40 W, the samples shall be tested at a temperature of $140\text{ °C} \pm 5\text{ °C}$.

At the end of the test, the samples shall not have undergone any change impairing their further safety, especially in the following respects:

- reduction in the protection against electric shock as required in 2.4 and 2.5;
- loosening of cap pins, cracks, swelling and shrinking as determined by visual inspection.

At the end of the test, the dimensions shall comply with the requirements of 2.3.2.

2.7.3 External parts of insulating material shall be resistant to abnormal heat and to fire.

2.7.4 Compliance is checked by the following test.

Parts are subjected to a test using a nickel-chromium glow-wire heated to 650 °C . The test apparatus shall be that described in IEC 60695-2-1/0.

The sample to be tested is mounted vertically 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 of the sample. The penetration of the glow-wire into the sample is mechanically limited to 7 mm. After 30 s the sample is withdrawn from contact with the glow-wire tip.

Any flame or glowing of the sample shall extinguish within 30 s of withdrawing the glow-wire and any burning or molten drop shall not ignite a piece of tissue paper consisting of five layers spread out horizontally $200\text{ mm} \pm 5\text{ mm}$ below the sample.

The glow-wire temperature and heating current shall be constant for 1 min prior to commencing the test. Care shall be taken to ensure that heat radiation does not influence the sample 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 60695-2-1/0.

NOTE – Precautions should be taken to safeguard the health of personnel conducting tests against risk of

- explosion or fire;
- inhalation of smoke and/or toxic products;
- toxic residues.

2.8 Creepage distance for caps

2.8.1 The minimum creepage distance between contact pin(s) or contacts and the metal shell of the cap shall be in accordance with the requirements in IEC 60061-1. Relevant cap standard sheet numbers are given in table 3.

2.8.2 Compliance is checked by measurement in the most onerous position.

2.9 Lamp cap temperature rise

2.9.1 For lamps using caps G5, G13 and 2G13, and designed for operation with the use of a starter, the lamp cap temperature rise above ambient temperature shall not exceed 95 K. For lamps with W4.3×8.5d caps, the lamp cap temperature rise at the measuring point shall not exceed 55 K (see figure 1).

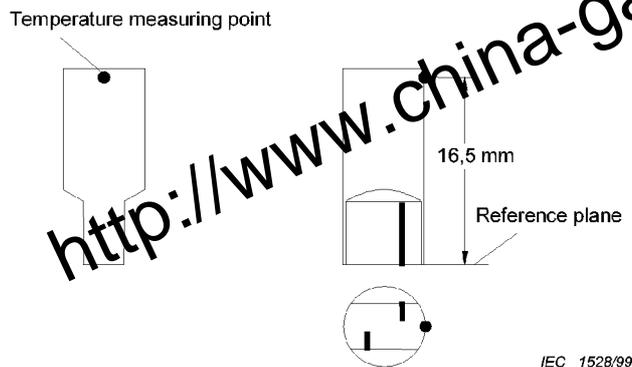


Figure 1 – Temperature measuring point

2.9.2 Compliance is checked by the procedure specified in annex B. Conditions of compliance are given in D.4.

2.9.3 Where it can be shown that one lamp group produces the highest cap temperature rise for a given lamp family, e.g. a lamp with a 26 mm nominal bulb diameter, only tests on this one lamp group are necessary to show compliance for all identically capped lamps.

2.10 Lamp minimum overall length

2.10.1 To ensure retention in luminaires, lamps shall comply with a minimum overall length specified as follows:

- for lamps with G5 and G13 caps: $B_{\min} - 0,2$ mm (under consideration);
- for lamps with Fa8 caps: B_{\min} ;
- for lamps with R17d and Fa6 caps: C_{\min} .

B_{\min} and C_{\min} are specified on the relevant data sheets of IEC 60081.

For lamps not specified in IEC 60081, reference should be made to the manufacturer's data.

2.10.2 Compliance is checked by measurement.

2.11 Information for luminaire design

Refer to annex C.

2.12 Information for ballast design

Refer to annex E.

3 Assessment

3.1 General

This clause specifies the method a manufacturer should use to show that his product conforms to this standard on the basis of whole production assessment in association with his test records on finished products. This method can also be applied for certification purposes. Subclauses 3.2, 3.3 and 3.5 give details of assessment by means of the manufacturer's records.

Details of a batch test procedure which can be used to make limited assessment of batches are given in 3.4 and 3.6. Requirements for batch testing are included in order to enable the assessment of batches presumed to contain unsafe lamps. As some safety requirements cannot be checked by batch testing and as there may be no previous knowledge of the manufacturer's quality, batch testing cannot be used for certification purposes nor in any way for an approval of the batch. Where a batch is found to be acceptable, a testing agency may only conclude that there is no reason to reject the batch on safety grounds.

3.2 Whole production assessment by means of the manufacturer's records

3.2.1 The manufacturer shall show evidence that his products comply with the particular requirements of 3.3. To this end, the manufacturer shall make available all the results of his product testing pertinent to the requirements of this standard.

3.2.2 The test results may be drawn from working records and as such may not be immediately available in collated form.

3.2.3 The assessment shall be based in general on individual factories, each meeting the acceptance criteria of 3.3. However, a number of factories may be grouped together, providing they are under the same quality management. For certification purposes, one certificate may be issued to cover a nominated group of factories but the certification authority shall have the right to visit each plant to examine the relevant local records and quality control procedures.

3.2.4 For certification purposes, the manufacturer shall declare a list of marks of origin and corresponding lamp families, groups and/or types which are within the scope of this standard and manufactured in a nominated group of factories. The certificate shall be taken to include all lamps so listed made by the manufacturer. Notification of additions or deletions may be made at any time.

3.2.5 In presenting the test results, the manufacturer may combine results of different lamp families, groups and/or types according to column 4 of table 4.

The whole production assessment requires that the quality control procedures of a manufacturer shall satisfy recognized quality system requirements for final inspection. Within the framework of a quality system based also on in-process inspection and testing the manufacturer may show compliance with some of the requirements of this standard by means of in-process inspection instead of finished product testing.

**Table 4 – Grouping of test records –
Sampling and acceptable quality levels**

1 Clause or subclause	2 Test	3 Type of test	4 Permitted accumulation of test records between lamp groups	5 Minimum annual sample per accumulation		6 AQL ^{a)} %
				For lamps made most of the year	For lamps made infrequently	
				2.2.2 a)	Marking – legibility	Running
2.2.2 b)	Marking – durability	Periodic	All families with the same method of marking	50	–	2,5
2.3.1.1 a) 2.3.1.3 a)	Construction and assembly of caps of unused lamps (except Fa6 and Fa8 caps)	Periodic	All families using the same cement, the same cap and with the same nominal lamp diameter	125	80	0,65
2.3.1.1 b) 2.3.1.3 b)	Construction and assembly of caps after heating test (except Fa6 and Fa8 caps)	Design	All families using the same cement, the same cap and with the same nominal lamp diameter	See D.1		
2.3.1.2	Construction and assembly of caps of unused lamps (Fa6 and Fa8 caps)	Periodic	All families using the same cement and the same cap	125	80	0,65
2.3.2.2	Dimensional requirements for caps	Periodic	All families using the same cap	32		2,5
2.4.2	Insulation resistance	Design	All families using the same cap and with the same nominal lamp diameter	See D.2		
2.5.3	Electric strength	Design	All families using the same cap and with the same nominal lamp diameter	See D.2		
2.6.3	Accidentally live part	100 % inspection	By group and type	—		
2.7.2	Resistance to heat	Design	All families using the same cap and with the same nominal lamp diameter	See D.3		
2.7.4	Resistance to fire	Design	All families using the same cap and with the same nominal lamp diameter	See D.3		
2.8.2	Cap creepage distance	Design	All families using the same cap and with the same nominal lamp diameter	See D.3		
2.9.2	Cap temperature rise	Design	Lamps selected according to 2.9.3	See D.4		
2.10.2	Minimum overall length	Running	All groups	200	80 ^{b)}	0,65 ^{b)}

NOTE – Except for design tests (see annex D), where tests can be applied to both ends of the lamps, both ends shall be tested. The lamp shall be a non-conformity if either one or both ends fail the requirement.

a) For the use of this term, see IEC 60410.
b) Under consideration.

3.2.6 The manufacturer shall provide sufficient test records with respect to each clause as indicated in column 5 of table 4.

3.2.7 The number of non-conformities in the manufacturer's records shall not exceed the limits shown in table 5 or 6 relevant to the Acceptable Quality Level (AQL) value shown in column 6 of table 4.

Table 5 – Acceptance numbers AQL = 2,5%

Part 1

Part 2

Number of lamps in manufacturer's records	Acceptance number	Number of lamps in manufacturer's records	Qualifying limit for acceptance as percentage of lamps in records
80	1	2 001	1,03
81 to 125	2	2 100	1,02
126 to 200	3	2 400	1,00
201 to 260	4	2 750	0,98
261 to 315	5	3 150	0,96
316 to 400	6	3 550	0,94
401 to 500	7	4 100	0,92
501 to 600	8	4 800	0,90
601 to 700	9	5 700	0,88
701 to 800	10	6 800	0,86
801 to 920	11	8 200	0,84
921 to 1 040	12	10 000	0,82
1 041 to 1 140	13	13 000	0,80
1 141 to 1 250	14	17 500	0,78
1 251 to 1 360	15	24 500	0,76
1 361 to 1 460	16	39 000	0,74
1 461 to 1 570	17	69 000	0,72
1 571 to 1 680	18	145 000	0,70
1 681 to 1 780	19	305 000	0,68
1 781 to 1 890	20	1 000 000	0,67
1 891 to 2 000	21		

Table 6 – Acceptance numbers AQL = 2,5 %

Part 1		Part 2	
Number of lamps in manufacturer's records	Acceptance number	Number of lamps in manufacturer's records	Qualifying limit for acceptance as percentage of lamps in records
32	2	1 000	3,65
33 to 50	3	1 075	3,60
51 to 65	4	1 150	3,55
66 to 80	5	1 250	3,50
81 to 100	6	1 350	3,45
101 to 125	7	1 525	3,40
126 to 145	8	1 700	3,35
146 to 170	9	1 925	3,30
171 to 200	10	2 200	3,25
201 to 225	11	2 525	3,20
226 to 255	12	2 950	3,15
256 to 285	13	3 600	3,10
286 to 315	14	4 250	3,05
316 to 335	15	5 250	3,00
336 to 360	16	6 400	2,95
361 to 390	17	8 200	2,90
391 to 420	18	11 000	2,85
421 to 445	19	15 500	2,80
446 to 475	20	22 000	2,75
476 to 500	21	34 000	2,70
501 to 535	22	60 000	2,65
536 to 560	23	110 000	2,60
561 to 590	24	500 000	2,55
591 to 620	25	1 000 000	2,54
621 to 650	26		
651 to 680	27		
681 to 710	28		
711 to 745	29		
746 to 775	30		
776 to 805	31		
806 to 845	32		
846 to 880	33		
881 to 915	34		
916 to 955	35		
956 to 1 000	36		

3.2.8 The period of review for assessment purposes need not be limited to a predetermined year, but may consist of 12 consecutive calendar months immediately preceding the date of review.

3.2.9 A manufacturer who has met, but no longer meets, the specified criteria shall not be disqualified from claiming compliance with this standard providing he can show that:

- a) action has been taken to remedy the situation as soon as the trend was reasonably confirmed from his test records;
- b) the specified acceptance level was re-established within a period of
 - 1) six months for 2.3.1 and 2.9;
 - 2) one month for other clauses.

When compliance is assessed after corrective action has been taken in accordance with items a) and b), the test records of these lamp families, groups and/or types which do not comply shall be excluded from the 12-month summation for their period of non-compliance. The test results relating to the period of corrective action shall be retained in the records.

3.2.10 A manufacturer who has failed to meet the requirements of a clause where grouping of the test results is permitted under 3.2.5 shall not be disqualified for the whole of the lamp families, groups and/or types so grouped, if he can show by additional testing that the problem is present only in certain families, groups and/or types so grouped. In this case, either these families, groups and/or types are dealt with in accordance with 3.2.9 or they are deleted from the list of families, groups and/or types which the manufacturer may claim are in conformity with the standard.

3.2.11 In the case of a family, group and/or type which has been deleted under 3.2.10 from the list (see 3.2.4), it may be reinstated if satisfactory results are obtained from tests on a number of lamps equivalent to the minimum annual sample specified in table 4 required by the clause where non-compliance occurred. This sample may be collected over a short period of time.

3.2.12 In the case of new products, there may be features which are common to existing lamp families, groups and/or types, and these can be taken as being in compliance if the new product is taken into the sampling scheme as soon as manufacture is started. Any feature not so covered shall be tested before production starts.

3.3 Assessment of the manufacturer's records of particular tests

Table 4 specifies the type of test and other information which applies to the method of assessing compliance to the requirements of various clauses.

A design test need only be repeated when a substantial change is made in the physical or mechanical construction, materials, or manufacturing process used to manufacture the relevant product. Tests are required for only those properties affected by the change.

3.4 Rejection conditions of batches

Rejection is established if any rejection number in table 7 with due regard to annex D is reached irrespective of the quantity tested. A batch shall be rejected as soon as the rejection number for a particular test is reached.

Table 7 – Batch sample size and rejection number

Subclause number	Test	Number of lamps tested	Rejection number
2.2.2 a)	Marking – legibility	200	
2.2.2 b)	Marking – durability	50	4
2.10.2	Minimum overall length	200	4 a)
2.4.2	Insulation resistance	Apply D.2	
2.3.2.2	Requirements for caps	32	3
2.6.3	Accidentally live parts	500	1
2.3.1.1 a) 2.3.1.3 a)	Construction and assembly of caps (unused lamps)	125	3
2.5.3	Electric strength	Apply D.2	
2.3.1.1 b) 2.3.1.3 b)	Construction and assembly of caps (after heating)	Apply D.1	
2.7.2	Resistance to heat	Apply D.3	
2.7.4	Resistance to fire	Apply D.3	
2.8.2	Cap creepage distance	Apply D.3	
2.9.2	Cap temperature rise	Test not applicable	

a) Under consideration

3.5 Sampling procedures for whole production testing

3.5.1 The conditions of table 4 apply.

3.5.2 The whole production running tests shall be applied at least once per production day. They may also be based on in-process inspection and testing.

The frequency of application of the various tests may be different, providing the conditions of table 4 are met.

3.5.3 Whole production tests shall be made on samples randomly selected at a rate not less than that indicated in column 5 of table 4. Lamps selected for one test need not be used for other tests.

3.5.4 For whole production testing of the requirements for accidentally live parts (see 2.6), the manufacturer shall demonstrate that there is a continuous 100 % inspection.

3.6 Sampling procedures for batch testing

3.6.1 The lamps for testing shall be selected in accordance with a mutually agreed method so as to ensure proper representation. Selection shall be randomly made as nearly as possible from one-third of the total number of containers in the batch, with a minimum of 10 containers.

3.6.2 In order to cover the risk of accidental breakage, a certain number of lamps in addition to the test quantity shall be selected. These lamps shall only be substituted for lamps of the test quantities if necessary to make up the required quantities of lamps for the tests.

It is not necessary to replace an accidentally broken lamp if the results of the test are not affected by its replacement, provided the required quantity of lamps for the following test is available. If replaced, such a broken lamp shall be neglected in calculating results.

Lamps having broken bulbs when removed from the packaging after transit shall not be included in the test.

3.6.3 Number of lamps in the batch sample

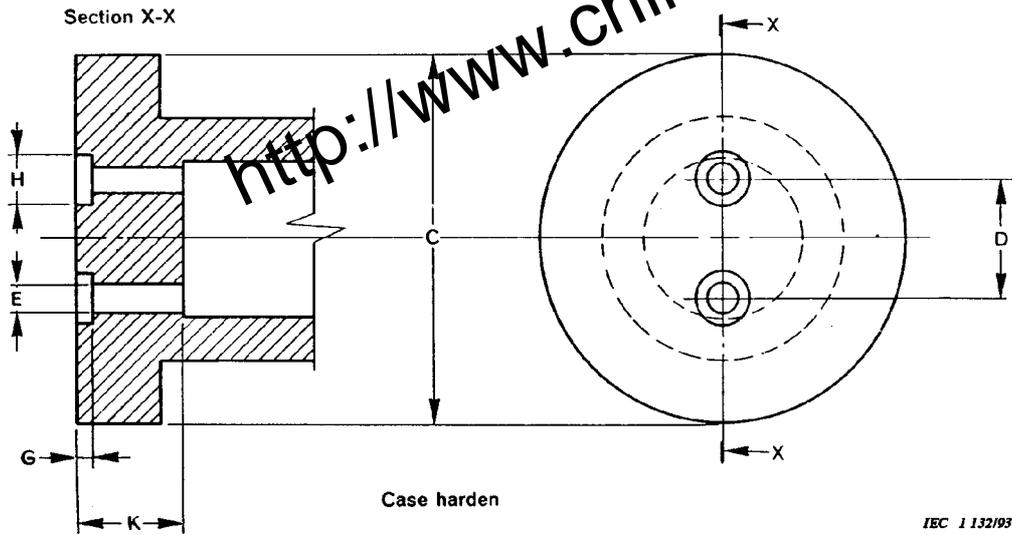
There shall be at least 500 lamps (see table 7).

3.6.4 Sequence of the tests

The testing shall be carried out in the order of the subclause numbers listed in table 7, up to and including 2.5.3. Subsequent tests may involve damage to the lamp and each test sample shall be taken separately from the original sample.

Annex A
 (normative)

Test holder for torsion test for G5 and G13 capped lamps



Dimension	G5 mm	G13 mm	Tolerance mm
C	16,0	36,0	Minimum
D	4,75	12,7	±0,03
E	2,8	2,8	+0,3
G	1,5	1,5	Approximate
H	4,0	4,0	Approximate
K	4,8	7,8	Minimum

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

Figure A.1 – Holder for torsion tests on lamps with bi-pin caps

In order to ensure appropriate engagement between the cap and holder during the test, a locating device shall be fitted at a suitable distance from the holder to provide adequate support for the lamp.

The face of the cap shall be in close contact with the face of the special holder.

Annex B
(normative)

Test for lamp cap temperature rise

The test shall be carried out under the following conditions.

- B.1** The circuit shall use the appropriate reference ballast as specified in IEC 60921.
- B.2** The supply voltage shall be 110 % of the rated voltage of the reference ballast with the starter circuit continuously closed.
- B.3** The test lamp shall be a normal production lamp but specially produced such that its cathodes are deactivated, i.e. without cathode emitter.
- B.4** The test lamp, in a bare condition, shall be suspended by means of nylon slings, in draught-free air, at $25\text{ °C} \pm 5\text{ °C}$. The plane through the cap pins shall be horizontal.
- B.5** The electrical connections to the lamp shall be through $1\text{ mm}^2 \pm 5\%$ copper wires attached to the cap pins.
- B.6** For G5, G13 and 2G13 caps, the thermocouple shall be attached to the insulating material of the cap as close to the centre as possible.
- B.7** The test shall continue until a stable temperature is achieved.

Annex C
(informative)

Information for luminaire design

C.1 Guidelines for safe lamp operation

To ensure safe lamp operation, it is essential to observe the following recommendations.

C.2 Maximum lamp cap temperature under normal operating conditions

Relevant tests are part of IEC 60598-1.

C.2.1 Lamps with G5, G7, G8 and 2G13 caps

Luminaires should be so designed that with the intended lamp installed in the luminaire, the lamp cap temperature under normal operating conditions does not exceed 120 °C at the cap rim and at the insulator material. For G13 or 2G13 capped lamps with a nominal wattage above 40 W, the maximum cap temperature should not exceed 140 °C.

For the measurement of the cap rim temperature, the hot junction of the thermocouple should be located on the cap shell at a distance not more than 2 mm from the cap-to-glass junction.

For the measurement of the insulator material temperature, the hot junction of the thermocouple should be located on the insulator part of the cap face along the line through the cap pins as near as possible to the centre between the contact pins.

The thermocouple wires (diameter maximum of 0,2 mm each) should be insulated up to the place of attachment.

C.2.2 Lamps with R17d, Fa6 and Fa8 caps

The values and the place of measurement are under consideration.

C.2.3 Lamps with W4.3×8.5d caps

The cap temperature at the measuring point shall not exceed 100 °C.

C.3 Spacing of lampholders

The attention of luminaire designers is drawn to the dimensions for lampholder spacing in IEC 60061-2 and the relevant gauging requirements in IEC 60061-3.

Annex D
(normative)

Conditions of compliance for design tests

For these tests, one end of the lamp shall be chosen randomly.

D.1 Cap construction and assembly

Attachment of caps after heating (see 2.3.1.1b))

Sample size: 32

Rejection number: 2

D.2 Insulation resistance and electric strength (see 2.4.2 and 2.5.3)

Each test shall be assessed separately.

First sample: 125

Rejection number: 2

If one failure is found, take a second sample of 125

Rejection number: 2 in the combined sample

D.3 Resistance to heat (see 2.7.2)
Resistance to fire (see 2.7.4)
Cap creepage distance (see 2.8.2)

Each test shall be assessed separately.

First sample: 5

Accept when no failure has been found
Rejection number: 2

If one failure is found, take a second sample of 5

Rejection number: 2 in the combined sample

D.4 Cap temperature rise (see 2.9.2)

First sample: 5

Accept if all samples have a temperature of at least 5 K below limit

In other cases, take a second sample: 5

Rejection number: 2 lamps with a cap temperature rise that exceeds 95 K in the combined sample

Annex E
(informative)

Information for ballast design

E.1 Guidelines for safe lamp operation

To ensure safe lamp operation, it is essential to observe the following recommendations.

E.2 Lamp end temperature under abnormal operating conditions

In the case where a lamp does not start, any continuation of cathode preheating should not lead to overheating of the lamp ends.

In the case where one of the cathodes is depleted or broken, while the lamp continues to operate (partial rectification), overheating of the lamp ends should be prevented by suitable measures in the circuit.

E.3 Limitation of working voltage

For G5-capped lamps with diameter 16 mm, the working voltage between any lamp terminal and earth should not exceed 430 V r.m.s.

Bibliography

IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

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Annex ZA (normative)

**Normative references to international publications
with their corresponding European publications**

This European Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE: When an international publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60061-1 + supplements (mod)	1969	Lamp caps and holders together with gauges for the control of interchangeability and safety Part 1: Lamp caps	EN 60061-1 + amendments	1993
IEC 60061-2 + supplements (mod)	1969	Part 2: Lampholders	EN 60061-2 + amendments	1993
IEC 60061-3 + supplements (mod)	1969	Part 3: Gauges	EN 60061-3 + amendments	1993
IEC 60081	1997	Double-capped fluorescent lamps Performance specifications	EN 60081	1998
IEC 60410	1973	Sampling plans and procedures for inspection by attributes	-	-
IEC 60695-2-1/0	1994	Fire hazard testing Part 2: Test methods Section 1/sheet 0: Glow-wire test methods General	EN 60695-2-1/0	1996
IEC 60921 (mod)	1988	Ballasts for tubular fluorescent lamps Performance requirements	EN 60921	1991

<http://www.china-gauges.com/>

BS EN
61195:2000
IEC
61195:1999

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