

נורות פלואורניות בעלות שתי כיפות – דרישות בטיחות

Double-capped fluorescent lamps – Safety specifications



מסמך זה הוא הצעה בלבד

תקן זה הוכן ואושר על ידי הוועדה הטכנית 5206 – נורות וציוד עזר שלהן ומאור, בהרכב זה:

- | | |
|-------------------------------------|------------------------------------|
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| - המוסד לבטיחות ולגיהות | - אלכסנדר רודיאק |
| - המועצה הישראלית לצרכנות | - אינה ניסנבאום |
| - התאחדות התעשיינים בישראל | - לירון גבע, יונתן הולנדר |
| - מהנדסים/אדריכלים/טכנולוגים | - אורי דומן (יו"ר), אלון הוניגסברג |
| - מינוי אישי | - צביקה אגוזי |
| - מכון התקנים הישראלי - אגף התעשייה | - עוזי אלוף |
| - משרד הכלכלה והתעשייה | - שלומי אביסרור |
| - רשות ההסתדרות לצרכנות | - משה גולדברג |
| - רשות החשמל (משרד האנרגיה) | - סבטלנה קושניר |

מיכאל שיינגרט ריכז את עבודת הכנת התקן.

הודעה על מידת התאמת התקן הישראלי לתקנים או למסמכים זרים

תקן ישראלי זה, למעט השינויים והתוספות הלאומיים המצוינים בו, זהה לתקן של הנציבות הבין-לאומית לאלקטרוטכניקה IEC 61195 – Edition 2.2: 2014-09

הודעה על רויזיה

תקן ישראלי זה, ת"י 61195, והתקן הישראלי ת"י 61199 באים במקום התקנים הישראליים האלה:
 - ת"י 61195 מיוני 2011
 - ת"י 520 מאפריל 1964
 גיליון התיקון מס' 1 מינואר 1980
 גיליון התיקון מס' 2 מאוקטובר 1981
 גיליון התיקון מס' 3 מפברואר 1985
 גיליון התיקון מס' 4 מאוקטובר 1987
 גיליון התיקון מס' 5 מפברואר 2002
 גיליון התיקון מס' 6 ממאי 2002
 גיליון התיקון מס' 7 מנובמבר 2007
 - ת"י 520 חלק 2 מפברואר 1992
 גיליון התיקון מס' 1 מינואר 2002
 גיליון התיקון מס' 2 מאוקטובר 2006

מילות מפתח:

נורות פלואורניות, נורות פריקה, נורות חשמל, נורות, ציוד תאורה, בטיחות חשמל.

Descriptors:

fluorescent lamps, discharge lamps, electric lamps, lamps, lighting equipment, electrical safety.

עדכניות התקן

התקנים הישראליים עומדים לבדיקה מזמן לזמן, ולפחות אחת לחמש שנים, כדי להתאימם להתפתחות המדע והטכנולוגיה. המשתמשים בתקנים יוודאו שבידיהם המהדורה המעודכנת של התקן על גיליונות התיקון שלו. מסמך המתפרסם ברשומות כגיליון תיקון, יכול להיות גיליון תיקון נפרד או תיקון המשולב בתקן.

תוקף התקן

תקן ישראלי על עדכוניו נכנס לתוקף החל ממועד פרסומו ברשומות. יש לבדוק אם התקן רשמי או אם חלקים ממנו רשמיים. תקן רשמי או גיליון תיקון רשמי (במלואם או בחלקם) נכנסים לתוקף 60 יום מפרסום ההודעה ברשומות, אלא אם בהודעה נקבע מועד מאוחר יותר לכניסה לתוקף.

סימון בתו תקן

כל המייצר מוצר, המתאים לדרישות התקנים הישראליים החלים עליו, רשאי, לפי היתר ממכון התקנים הישראלי, לסמנו בתו תקן:



זכויות יוצרים

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הקדמה לתקן הישראלי

תקן ישראלי זה הוא התקן של הנציבות הבין-לאומית לאלקטרוטכניקה IEC 61195 (מהדורה 2.2) מספטמבר 2014, שאושר כתקן ישראלי בשינויים ובתוספות לאומיים.

התקן כולל, בסדר המפורט להלן, רכיבים אלה:

- תרגום סעיף חלות התקן הבין-לאומי בשינויים ובתוספות לאומיים (בעברית)
- פירוט השינויים והתוספות הלאומיים לסעיפי התקן הבין-לאומי (בעברית)
- תרגום חלקו העברי של התקן (באנגלית)
- התקן הבין-לאומי (באנגלית)

הערות לאומיות לתקן הישראלי מובאות כהערות שוליים וממוספרות באותיות האלף-בית.

סעיפים נוספים, שאינם קיימים בתקן הבין-לאומי IEC 61195 ממוספרים בתקן זה החל במספר העשרוני 201.x.

מהדורה זו של התקן הישראלי באה במקום מהדורת התקן הישראלי ת"י 61195 מיוני 2011, שאימצה את התקן הבין-לאומי IEC 61195 (מהדורה שנייה) מאוקטובר 1999 בשינויים ובתוספות לאומיים, ובמקום מהדורת התקן הישראלי ת"י 520 מאפריל 1964 לרבות גיליון התיקון מס' 1 שלו מינואר 1980, גיליון התיקון מס' 2 שלו מאוקטובר 1981, גיליון התיקון מס' 3 שלו מפברואר 1985, גיליון התיקון מס' 4 שלו מאוקטובר 1987, גיליון התיקון מס' 5 שלו מפברואר 2002, גיליון התיקון מס' 6 שלו ממאי 2002 ובמקום מהדורת התקן הישראלי ת"י 520 חלק 2 מפברואר 1992 לרבות גיליון התיקון מס' 1 שלו מינואר 2002 וגיליון התיקון מס' 2 שלו מאוקטובר 2006.

לנוחות המשתמש, ההבדלים העיקריים שבין מהדורה זו של התקן הישראלי לבין המהדורה הקודמת נובעים מאימוץ 1 AMENDMENT ו-2 AMENDMENT של התקן הבין-לאומי. לשם השוואה מדוקדקת בין המהדורות, יש לעיין בנוסח המלא שלהן.

חלות התקן (תרגום סעיף 1.1 של התקן הבין-לאומי בשינויים ובתוספות לאומיים)

הערה:

השינויים והתוספות הלאומיים בסעיף זה מובאים בגוף שונה.

תקן זה מפרט את דרישות הבטיחות לנורות פלואורוניות בעלות שתי כיפות, המיועדות למטרות תאורה כלליות, מכל הקבוצות בעלות כיפות בגדלים שלהלן: W4.3x8.5d ו-R17d, 2G13, G13, G5, Fa8, Fa6.

תקן זה מפרט גם את השיטה שהיצרן אמור להשתמש בה כדי להראות התאמה לדרישות תקן זה, על סמך הערכת ייצור מלאה בנוגע לרשומות הבדיקות שלו למוצרים מוגמרים. שיטה זו יכולה גם להיות מיושמת למטרות התעדה. בתקן זה מובאים גם פרטים על תהליכים לבדיקות אצווה שיכולים לשמש להערכה מוגבלת של אצוות.

תקן זה דן בבטיחות פוטוביולוגית לפי התקנים הישראליים ת"י 62471^(א) ות"י 62471 חלק 2^(ב).

סיכונים מקרינת אור כחול ומקרינה תת-אדומה הם מתחת לרמה הדורשת סימון.

^(א) התקן הישראלי ת"י 62471 זהה לתקן הבין-לאומי IEC 62471 (CIE S 009:2002) - First edition: 2006-07.

^(ב) התקן הישראלי ת"י 62471 חלק 2 זהה, למעט שינויים ותוספות לאומיים, לדוח הטכני הבין-לאומי

IEC/TR 62471-2 - Edition 1.0: 2009-08.

הערה – התאמה לתקן זה נוגעת לקריטריונים של בטיחות בלבד, ואינה מביאה בחשבון את הביצועים של נורות פלואורניות בעלות שתי כיפות המיועדות למטרות תאורה כלליות, בכל הנוגע למאפיינים של שטף אור, צבע, הדלקה (starting) והפעלה. בנוגע למאפיינים אלה מופנים המשתמשים לתקן הישראלי ת"י 60081.

פירוט השינויים והתוספות הלאומיים לסעיפי התקן הבין-לאומי

1.2 Normative references

- במקום חלק מן התקנים הבין-לאומיים המאוזכרים בתקן והמפורטים בסעיף זה חלים תקנים ישראליים, כמפורט להלן:

הערות (המידע המפורט בעמודת ההערות נכון ליום הכנת תקן זה)	התקן הישראלי החל במקומו	התקן הבין-לאומי המאוזכר
התקן הישראלי זהה לתקן הבין-לאומי IEC 60081 – Fifth edition: 1997-12 Amendment 1: 2000-01 Amendment 2: 2003-03 Amendment 3: 2005-09 Amendment 4: 2010-02 Amendment 5: 2013-07	ת"י 60081 – נורות פלואורניות בעלות שתי כיפות – דרישות ביצועים	IEC 60081
התקן הישראלי זהה, למעט שינויים ותוספות לאומיים לתקן הבין-לאומי IEC 60921 – Edition 2.1: 2006-06	ת"י 60921 – נטלים לשופורות פלואורניות – דרישות ביצועים	IEC 60921

- בסוף הסעיף יוסף:

חוקים, תקנות ומסמכים ישראליים

צו הגנת הצרכן (סימון טובין), התשמ"ג-1983, על עדכוניו

תקנים אירופיים

EN 50285:1999 - Energy efficiency of electric lamps for household use – Measurement methods

מסמכים זרים

Commission Directive 98/11/EC of 27 January 1998 – Implementing council directive 92/75/EEC with regard to energy labelling of household lamps

2 Safety requirements

2.1 General

- בסוף הסעיף יוסף סעיף 2.1.201, כמפורט להלן:

2.1.201. בנורות המוזנות במתח רשת, מתח הבדיקה יהיה 230 וולט.

2.2 Marking

- לאחר סעיף 2.2.2, יוספו סעיפים 2.2.201-2.2.202, כמפורט להלן:

2.2.201. נוסף על האמור לעיל, הסימון שלהלן יהיה בשפה העברית ויכלול את פרטי הסימון שבצו הגנת הצרכן (סימון טובין), התשמ"ג-1983, על עדכוניו, כמפורט להלן:

- פרט הסימון (1) בסעיף 3;
 - פרט הסימון (2) בסעיף 3;
 - פרט הסימון (3) בסעיף 3;
 - פרט הסימון (4א) בסעיף 3;
 - פרט הסימון (5) בסעיף 3;
 - פרט הסימון (6) בסעיף 3;
 - פרט הסימון (7), (ב), (4) בסעיף 3.
- סימון על אריזה יהיה כמפורט בסעיף 2 תת סעיף (ה), (2) בצו.

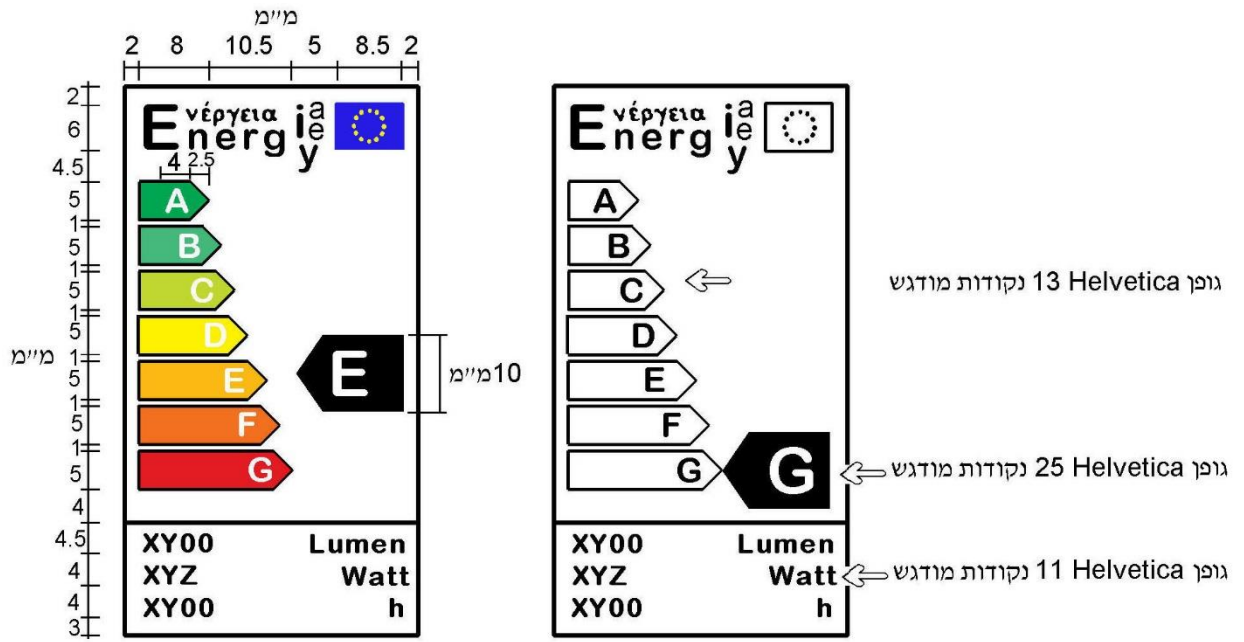
2.2.202. תווית נצילות אנרגייה

כל אריזה אינדיווידואלית תכלול אחת מתוויות נצילות האנרגייה המובאות בציור 1 שלהלן, בצורה ובמידות הנקובות בהן.

צורת התווית ותוכנה יהיו כמפורט בדירקטיבה האירופית 98/11/EC.

הצבעים בתווית הצבעונית יהיו כמפורט בדירקטיבה האירופית 98/11/EC.
למרות האמור לעיל:

- הגודל המינימלי של התווית יהיה 16 מ"מ × 30 מ"מ (תווית מוקטנת). היחס בין אורך התווית ורוחבה וכן בין מידות האלמנטים השונים יישמר;
- כאשר אריזה אינדיווידואלית קטנה מלהכיל תווית מוקטנת, התווית תוצמד לנורה או לאריזה אינדיווידואלית;
- כאשר תווית בגודל מלא מוצגת יחד עם הנורה (כגון על המדף שעליו מוצגת הנורה) אין צורך להצמיד את התווית לנורה או לאריזה אינדיווידואלית.



תווית צבעונית

תווית לא צבעונית

ציור 1 – תווית נצילות אנרגייה

הערות לציור 1:

1. אם הנתונים בחלק התחתון של התווית כבר סומנו במקום אחר על האריזה, אפשר להשמיט חלק זה.
 2. A היא דרגת נצילות האנרגייה הגבוהה ביותר. G היא דרגת נצילות האנרגייה הנמוכה ביותר.
- חישוב דרגות נצילות האנרגייה המסומנות בתוויות שלעיל, יהיה כמפורט בנספח F שלהלן.
- לאחר Annex E יוסף נספח F, כמפורט להלן:

נספח F – חישוב נצילות האנרגייה

(נורמטיבי)

F-1.

מחשבים את דרגת נצילות האנרגייה של הנורה כמפורט להלן:

נורות יהיו בדרגה A, אם הספק המבוא שלהן (וט) קטן מן המפורט בנוסחות שלהלן:

- עבור נורות פלואורניות בלי נטל אינטגרלי (נורות אלה דורשות נטל או/גם אמצעים אחרים לחיבורן לרשת הזינה), מחשבים לפי הנוסחה:

$$W \leq 0.15\sqrt{\phi} + 0.0097\phi$$

- עבור נורות אחרות, מחשבים לפי הנוסחה:

$$W \leq 0.24\sqrt{\phi} + 0.0103\phi$$

שבהן:

ϕ - שטף האור של הנורה (לומן)

W - הספק המבוא של הנורה (וט)

אם הנורה אינה בדרגה A, מחשבים את הספק הייחוס, W_R , לפי הנוסחות:

$$W_R = 0.88\sqrt{\phi} + 0.049\phi \quad (\phi > 34)$$

$$W_R = 0.2\phi \quad (\phi \leq 34)$$

שבהן:

ϕ - שטף האור של הנורה (לומן)

F-2.

מחשבים את מדד נצילות האנרגייה, E_I , לפי הנוסחה:

$$E_I = \frac{W}{W_R}$$

שבה:

W - הספק המבוא של הנורה (וט)

F-3. חישוב שטף האור והספק המבוא של הנורה יהיו כמפורט בתקן האירופי EN 50285:1999.

F-4.

דרגות נצילות האנרגייה יהיו, לפיכך, כמפורט בטבלה זו:

ממד נצילות האנרגייה (E_I)	דרגת נצילות האנרגייה
$E_I < 60\%$	B
$60\% \leq E_I < 80\%$	C
$80\% \leq E_I < 95\%$	D
$95\% \leq E_I < 110\%$	E
$110\% \leq E_I < 130\%$	F
$E_I \geq 130\%$	G

FINAL VERSION

VERSION FINALE

Double-capped fluorescent lamps – Safety specifications

Lampes à fluorescence à deux culots – Prescriptions de sécurité

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

DOUBLE-CAPPED FLUORESCENT LAMPS – SAFETY SPECIFICATIONS

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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This Consolidated version of IEC 61195 bears the edition number 2.2. It consists of the second edition (1999-10) [documents 34A/886/FDIS and 34A/900/RVD], its amendment 1 (2012-10) [documents 34A/1536/CDV and 34A/1577/RVC] and its amendment 2 (2014-09) [documents 34A/1739/CDV and 34A/1778/RVC]. The technical content is identical to the base edition and its amendments.

This Final version does not show where the technical content is modified by amendments 1 and 2. A separate Redline version with all changes highlighted is available in this publication.

This publication has been prepared for user convenience.

International Standard IEC 61195 has been prepared by sub-committee 34A: Lamps, of IEC technical committee 34: Lamps and related equipment.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 3.

Annexes A, B and D form an integral part of this standard.

Annexes C and E are for information only.

The committee has decided that the contents of the base publication and its amendments will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

The contents of the corrigendum of August 2000 have been included in this copy.

INTRODUCTION

The standards IEC 62471 and IEC/TR 62471-2 contain horizontal requirements available that need to be introduced into product standards, e.g. to IEC 61195.

The horizontal requirements are transformed into requirements for double-capped fluorescent lamps.

The lamps within the scope of this standard are general lighting service (GLS) lamps according to the definition 3.11 of IEC 62471:2006, "...lamps intended for lighting spaces that are typically occupied or viewed by people..."

According to Clause 6 of IEC 62471:2006, radiation of GLS lamps is measured at a distance equivalent to 500 lx.

Measured at the 500 lx distance, GLS lamps will not exceed risk group 1 for blue light hazard and risk group 0 for IR radiation. This combination of risk group and hazard does not require marking (Table 1 of IEC/TR 62471-2:2009).

Hazards from UV radiation of GLS lamps are now covered in 2.13 of IEC 61195.

Hence, IEC 62471 does not require any additional marking for GLS lamps.

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 groups 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.

This part of the standard covers photobiological safety according to IEC 62471 and IEC/TR 62471-2.

Blue light and infrared hazards are below the level which requires marking.

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

1.3.11

specific effective radiant UV power

effective power of the UV radiation of a lamp related to its luminous flux

NOTE 1 Specific effective radiant UV power is expressed in mW/klm.

NOTE 2 The effective power of the UV radiation is obtained by weighting the spectral power distribution of the lamp with the UV hazard function $S_{UV}(\lambda)$. Information about the relevant UV hazard function is given in IEC 62471. It only relates to possible hazards regarding UV exposure of human beings. It does not deal with the possible influence of optical radiation on materials, like mechanical damage or discoloration.

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 h \pm 50 h at a temperature of 120 °C \pm 5 °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 °C \pm 5 °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 h \pm 50 h at a temperature of 120 °C \pm 5 °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.

2.3.3 System requirements

Where a cap sheet as specified in IEC 60061-1 includes information on system requirements, lamps shall not exceed the limits specified.

Compliance is checked by measurement.

Table 3 – Sheet references of IEC 60061

Cap type	Sheet numbers	
	IEC 60061-1	IEC 60061-3
	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
2G13	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 °C ± 5 °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.

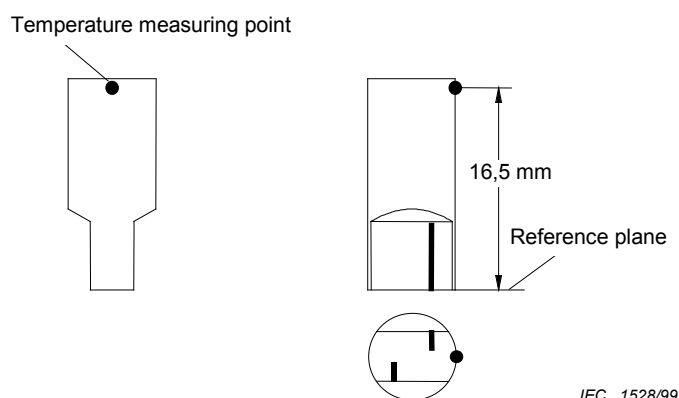
2.8 Creepage distance for caps

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).



IEC 1528/99

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: $B_{\min} - 0,2 \text{ mm}$ (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.

2.13 UV radiation

The specific effective radiant UV power emitted by the lamp shall not exceed the value of 2 mW/klm. For reflector lamps it shall not exceed the value of 2 mW/(m² · klx).

NOTE In IEC 62471 exposure limits are given as effective irradiance values (unit W/m²) and for risk group classification the values for general lighting lamps are reported at an illuminance level of 500 lx. The borderline for risk group exempt is 0,001 W/m² at an illuminance level of 500 lx. This means the specific value, related to the illuminance, is 0,001 divided by 500 in W/(m²·lx), which is 2 mW/(m²·klx). Since lx = lm/m², this equals 2 mW/klm specific UV power.

Compliance is checked by spectroradiometric measurement, under the same conditions as for the lamp's electrical and photometric characteristics as given in IEC 60081.

2.14 Water contact protection of lamp glass bulb

The lamp bulb is suitable for water contact and need not be tested for this property.

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	All families with the same method of marking	200	–	2,5
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)}
2.13	UV radiation	Design	By family, group, type	4	4	-

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) values shown in column 6 of table 4.

Table 5 – Acceptance numbers AQL = 0,65 %

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
32	2
33 to 50	3
51 to 65	4
66 to 80	5
81 to 100	6
101 to 125	7
126 to 145	8
146 to 170	9
171 to 200	10
201 to 225	11
226 to 255	12
256 to 285	13
286 to 315	14
316 to 335	15
336 to 360	16
361 to 390	17
391 to 420	18
421 to 445	19
446 to 475	20
476 to 500	21
501 to 535	22
536 to 560	23
561 to 590	24
591 to 620	25
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

Number of lamps in manufacturer's records	Qualifying limit for acceptance as percentage of lamps in records
1 001	3,65
1 075	3,60
1 150	3,55
1 250	3,50
1 350	3,45
1 525	3,40
1 700	3,35
1 925	3,30
2 200	3,25
2 525	3,20
2 950	3,15
3 600	3,10
4 250	3,05
5 250	3,00
6 400	2,95
8 200	2,90
11 000	2,85
15 500	2,80
22 000	2,75
34 000	2,70
60 000	2,65
110 000	2,60
500 000	2,55
1 000 000	2,54

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	11
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

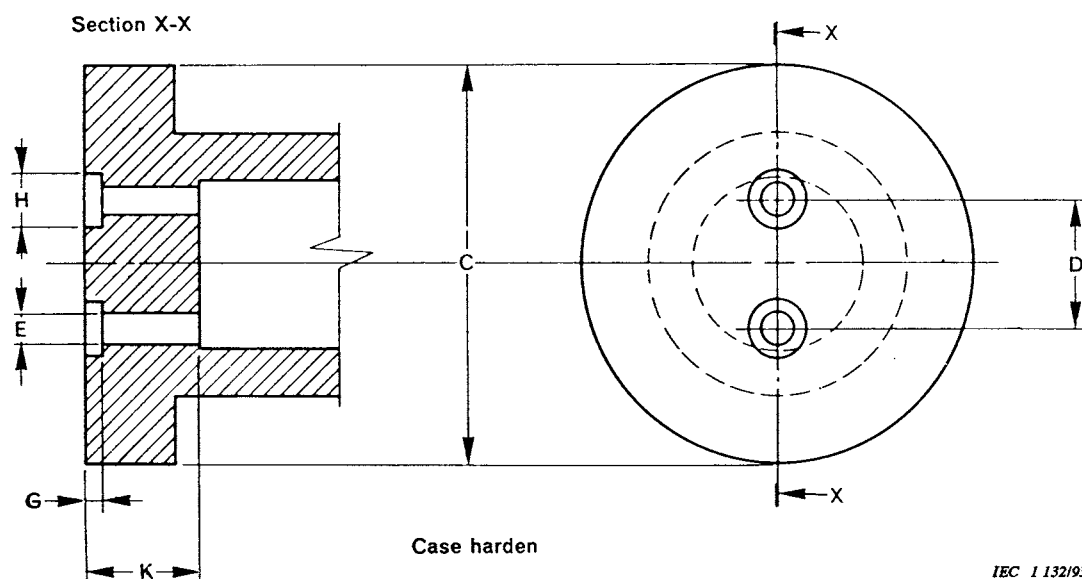
There shall be at least 500 lamps (see table 7).

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	$\pm 0,03$
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, G13 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.

C.4 Water contact

The bulb of lamps according to this standard is suitable for water contact, e.g. drips, splashing, etc., and therefore the bulb part of the lamps do not require additional luminaire protection.

Any IPX1 or better protection of the lamp contact areas can only be achieved in luminaires having lampholder with proper IP rating also for the sealing to the diameter of the lamp ends and providing protection to the lamp end components containing the contact areas.

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*

IEC 62471, *Photobiological safety of lamps and lamp systems*

IEC/TR 62471-2, *Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety*

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