

# INTERNATIONAL STANDARD

## NORME INTERNATIONALE

**Incandescent lamps – Safety specifications –  
Part 3: Tungsten-halogen lamps (non-vehicle)**

**Lampes à incandescence – Prescriptions de sécurité –  
Partie 3: Lampes tungstène-halogène (véhicules exceptés)**

IEC 60432-3:2002

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### INCANDESCENT LAMPS – SAFETY SPECIFICATIONS –

#### Part 3: Tungsten halogen lamps (non-vehicle)

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This consolidated version of IEC 60432-3 consists of the first edition (2002) [documents 34A/1011/FDIS and 34A/1019/RVD], its amendment 1 (2005) [documents 34A/1120/FDIS and 34A/1129/RVD] and its amendment 2 (2008) 34A/1267/FDIS and 34A/1285/RVD].

The technical content is therefore identical to the base edition and its amendments and has been prepared for user convenience.

It bears the edition number 1.2.

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# INCANDESCENT LAMPS – SAFETY SPECIFICATIONS –

## Part 3: Tungsten halogen lamps (non-vehicle)

### 1 General

#### 1.1 Scope

This part of IEC 60432 specifies the safety requirements for single-capped and double-capped tungsten halogen lamps, having rated voltages of up to 250 V, used for the following applications:

- Projection (including cinematograph and still projection)
- Photographic (including studio)
- Floodlighting
- Special purpose
- General purpose
- Stage lighting

This International Standard does not apply to general purpose single-capped tungsten halogen lamps, covered by IEC 60432-2, that are used as replacement for conventional tungsten filament lamps.

#### 1.2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60050-845:1987, *International Electrotechnical Vocabulary (IEV) – Chapter 845: Lighting*

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

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

IEC 60061-4, *Lamp caps and holders together with gauges for the control of interchangeability and safety – Part 4: Guidelines and general information*

IEC 60357, *Tungsten halogen lamps (non-vehicle)*

IEC 60432-1:1999, *Incandescent lamps – Safety specifications – Part 1: Tungsten filament lamps for domestic and similar general lighting purposes*

#### 1.3 Definitions

For the purpose of this International Standard, the definitions given in IEC 60050(845), as well as the following apply:

##### 1.3.1

##### **tungsten halogen lamp**

gas-filled lamp containing halogens or halogen compounds, the filament being of tungsten

**1.3.2****single-capped tungsten halogen lamp**

tungsten halogen lamp having a single cap or base

**1.3.3****double-capped tungsten halogen lamp**

tungsten halogen lamp having a cap or base on each end of the lamp

**1.3.4****extra low voltage tungsten halogen lamp**

tungsten halogen lamp with a rated voltage lower than 50 V

NOTE Abbreviated: ELV tungsten halogen lamp

**1.3.5****extra low voltage low-pressure tungsten halogen lamp**

tungsten halogen lamp with a gas pressure below a certain value and a rated voltage less than or equal to 12 V

**1.3.6****self-shielded tungsten halogen lamp**

tungsten halogen lamp for which the luminaire needs no protective shield

NOTE Abbreviated: self-shielded lamp.

Examples of self-shielded tungsten halogen lamps are:

- ELV tungsten halogen lamps with integral outer envelope;
- ELV low-pressure tungsten halogen lamps;
- mains voltage tungsten halogen lamps which conform to IEC 60432-2;
- mains voltage tungsten halogen lamps which conform to the relevant clauses of this standard.

**1.3.7****outer envelope**

transparent or translucent enclosure containing a tungsten halogen light source

NOTE The enclosure can also consist of a reflector with integral front cover

**1.3.8****rated voltage**

voltage or voltage range specified in this standard or assigned by the manufacturer or responsible vendor

NOTE If lamps are marked with a voltage range, they are appropriate for use on any supply voltage within that range.

**1.3.9****test voltage**

rated voltage unless otherwise specified

NOTE If lamps are marked with a voltage range, the test voltage is the mean of the voltage range, unless otherwise specified.

**1.3.10****rated wattage**

wattage specified in this standard or assigned by the manufacturer or responsible vendor

**1.3.11****rated current**

current specified in this standard or assigned by the manufacturer or responsible vendor



### 1.3.12

#### **test current**

rated current unless otherwise specified

### 1.3.13

#### **specific effective radiant UV power**

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

Unit: mW/klm

For a reflector lamp, this is the effective irradiance of the UV radiation related to the illuminance.

Unit: mW/(m<sup>2</sup>·klx)

NOTE The effective power (or irradiance) of the UV radiation is obtained by weighting the spectral power distribution of the lamp with the action spectrum published by the American Conference of Governmental Industrial Hygienists (ACGIH), which is endorsed by the World Health Organization (WHO) and recommended by the International Radiation Protection Association (IRPA). For references, see Bibliography.

### 1.3.14

#### **maximum pinch temperature**

maximum temperature which the components in the pinch/seal of a lamp are designed to withstand over the expected life of the lamp

### 1.3.15

#### **maximum lamp cap-contact, base-pin or base-post temperature**

maximum temperature of the lamp cap-contact, base-pin or base-post, which should be observed to safeguard electrical contact over the expected life of the lamp

### 1.3.16

#### **maximum cap temperature**

maximum temperature for which the components in the cap area of a lamp are designed to withstand over the expected life of the lamp

### 1.3.17

#### **maximum reflector-rim temperature**

maximum temperature for which the connection between front cover and reflector is designed to withstand over the expected life of the lamp

### 1.3.18

#### **group**

lamps for the same application as defined by the scope of this standard

### 1.3.19

#### **type**

lamps of the same group having the same nominal wattage, bulb shape and cap

### 1.3.20

#### **family**

grouping of lamps characterized by common features such as materials, components and/or method of processing

### 1.3.21

#### **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

### 1.3.22

#### **periodic test**

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

### 1.3.23

#### **running test**

test repeated at frequent intervals to provide data for assessment

### 1.3.24

#### **batch**

all lamps in one family and/or group and identified as such and put forward at one time for checking compliance

### 1.3.25

#### **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

### 1.3.26

#### **breakdown**

plasma discharge between two points inside the bulb of the lamp with maximum difference of electrical potential

For the purposes of this standard it is assumed that breakdown has occurred if the current exceeds the rated current by a factor of 5 (under consideration).

## 2 Requirements

### 2.1 General

Tungsten halogen 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 relevant tests specified in this standard. For the purposes of this standard, the voltage designations shown in IEC 60357 apply.

### 2.2 Marking

#### 2.2.1 Lamp marking

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

- mark of origin (this may take the form of a trademark, the manufacturer's name, the brand name or the name of the responsible vendor);
- rated wattage (marked "W" or "watts");
- rated voltage or rated voltage range (marked "V" or "volts"), or for airfield lamps the rated current (marked "A").

The rated voltage marking for lamps intended for use on United Kingdom supply voltages may be "240 volts" or "240 V".

NOTE The United Kingdom implementation of 230 V (European harmonization process) allows supply voltages to remain at 240 V.

Compliance is checked on unused lamps as follows:

- presence and legibility by visual inspection;
- durability by applying the following test.

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

After this test, the marking shall still be legible.

### 2.2.2 Additional information and marking

If applicable, the following information shall be given.

- a) Lamps shall be supplied with an appropriate cautionary notice indicating the need of a protective shield to be fitted to the luminaire. Alternatively the immediate lamp wrapping or container may be marked with the corresponding symbol as shown in A.1.

NOTE In North America a suitable cautionary notice is required. Use of the symbol is optional.

- b) For self-shielded lamps, (not needing luminaire shielding), the immediate lamp wrapping or container shall be marked with the symbol as shown in A.2.

NOTE 1 This does not apply to lamps covered by IEC 60432-2.

NOTE 2 In North America, a written notice may be used in place of this symbol.

- c) For dichroic-coated reflector lamps the immediate lamp wrapping or container shall be marked with the symbol as shown in A.3.

NOTE This symbol is not required in North America.

- d) Double-capped lamps, with rated voltages 50 V – 250 V, shall be supplied with a cautionary notice or symbol as shown in Clause A.4 indicating that the luminaire shall be disconnected from the power supply before insertion or withdrawal of the lamp.

NOTE 1 In the USA special package marking is required regarding the use of 500 W double-capped halogen lamps in residential indoor luminaires.

NOTE 2 In North America a suitable cautionary notice is required. Use of the symbol is optional.

Compliance is checked by visual inspection.

## 2.3 Caps or bases

### 2.3.1 General

Caps or bases originally developed for single-capped ELV lamps shall not be used for general purpose tungsten halogen lamps with rated voltages higher than 50 V.

NOTE Examples of such ELV fits are: G4, GU4, GY4, GX5.3, GU5.3, G6.35, GY6.35, GU7 and G53.

The GU10 base shall be used for aluminised reflector lamps only. The G9, GU10 or GZ10 base shall be used for self-shielded lamps only.

Compliance is checked by inspection.

### 2.3.2 Creepage distances

The minimum creepage distance between contacts or between contacts and the metal shell of the cap, if any, shall be in accordance with the recommendations in IEC 60061-4.

Compliance is checked by measurement.

### 2.3.3 Dimensions

If tungsten halogen lamps use standardized caps/bases they shall be in accordance with the requirements of IEC 60061-1.

Compliance is checked on finished lamps by using the gauges of IEC 60061-3.

Non standardized caps/bases shall be in accordance with the manufacturer's specification.

Compliance is checked by inspection.

### 2.4 Maximum UV radiation of self-shielded lamps

The specific effective radiant UV power of self-shielded tungsten halogen lamps shall not exceed:

- 2 mW/klm or,
- for reflector lamps 2 mW/(m<sup>2</sup>·klx).

Compliance is checked by measurement of the spectral power distribution.

### 2.5 Gas pressure of low-pressure self-shielded extra low voltage lamps

During operation, the gas pressure of single-capped low-pressure self-shielded ELV tungsten halogen lamps shall be limited. This shall be achieved by restricting:

- a) the cold fill pressure to less than  $1 \times 10^5$  Pa (1 bar), and
- b) the lamp volume to 1 cm<sup>3</sup> maximum, and
- c) the rated wattage to 100 W maximum.

Compliance is checked by inspection and by means of the test specified in Annex B.

### 2.6 Safety at end of life of self-shielded lamps with rated voltages from range B or C

When tested under the specified conditions, lamp failure shall not be accompanied by breakage of the bulb nor its ejection from the cap.

For bayonet capped lamps, it is also required that there shall not be an internal short-circuit to the cap shell after the test.

The test conditions are:

- an induced-failure test in accordance with Annex F, or
- an operation-to-failure test.

The operation-to-failure test shall be carried out under the conditions specified for the life test procedure in Annex A of IEC 60357. The test rack circuit characteristics shall be in line with Table E.1 of IEC 60432-1. The test is continued until end of life.

NOTE 1 In the event of dispute the reference test method is the induced failure test.

NOTE 2 Some lamp designs are not suitable for testing with the induced failure test because a breakdown cannot reliably be achieved. Such lamps, provided they are of voltage range B or C, will be submitted to an operation-to-failure test as described above.

## 2.7 Information for luminaire design

Refer to Annex C.

## 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. Subclause 3.2 gives 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 3.3. 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 manufacturer's records

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

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

The assessment shall be based in general on individual factories, each meeting the acceptance criteria of 3.2.1. 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 local relevant records and quality control procedures.

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.

In presenting the test results, the manufacturer may combine the results of different lamp families, groups and/or types according to column 4 of Table 1.

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 assurance 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.

The manufacturer shall provide sufficient test records with respect to each clause and subclause as indicated in column 5 of Table 1.

**Table 1 – Grouping of test records –  
Sampling and acceptable quality levels (AQL)**

1 Sub-clause	2 Test	3 Type of test	4 Permitted accumulation of test records	5 Minimum annual sample per accumulation		6 AQL <sup>a</sup> %
				For lamps made most of the year	For lamps made infrequently	
2.2.1	Marking – legibility	Running	All families with the same method of marking	200	32	2,5
2.2.1	Marking – durability	Periodic	All families with the same method of marking	50	20	2,5
2.2.2	Additional information and marking	Running	By group and type	200	32	2,5
2.3.2	Caps or bases – creepage distances	Design	All families with same cap or base	Use Clause D.1		–
2.3.3	Caps or bases – dimensions	Periodic	All families with same cap or base	32		2,5
2.4	UV radiation	Design		Use Clause D.2		–
2.5	Gas pressure	Periodic	By group and type	125	80	0,65
2.6	Safety at end of life – Induced failure or – Operation to failure <sup>b</sup>	Design	All lamps of all families	Use Clause D.3		–
		Periodic		Use Clause D.4		–
	– Induced failure or – Operation to failure <sup>b</sup>			315		0,25
<sup>a</sup> For the use of this term, see IEC 60410.						
<sup>b</sup> The operation to failure test is allowed in those cases where no reliable breakdown can be achieved. See also Note 2 to subclause 2.6.						

The number of non-conformities in the manufacturer's records shall not exceed the limits shown in Tables 2, 3 or 4 relevant to the acceptable quality level (AQL) values shown in column 6 of Table 1.