

Australian/New Zealand Standard™

Incandescent lamps—Safety specifications

Part 1: Tungsten filament lamps for domestic and similar general lighting purposes



AS/NZS 60432.1:2007

This Joint Australian/New Zealand Standard was prepared by Joint Technical Committee EL-041, Lamps and Related Equipment. It was approved on behalf of the Council of Standards Australia on 1 June 2007 and on behalf of the Council of Standards New Zealand on 4 May 2007.

This Standard was published on 31 August 2007.

The following are represented on Committee EL-041:

Australian Electrical and Electronic Manufacturers Association
Australian Industry Group
Certification Interests (New Zealand)
Consumers' Federation of Australia
Electrical Compliance Testing Association
Electrical Regulatory Authorities Council
Energy Efficiency and Conservation Authority of New Zealand
IES: The Lighting Society
Institution of Professional Engineers New Zealand
Ministry of Economic Development (New Zealand)

Keeping Standards up-to-date

Standards are living documents which reflect progress in science, technology and systems. To maintain their currency, all Standards are periodically reviewed, and new editions are published. Between editions, amendments may be issued. Standards may also be withdrawn. It is important that readers assure themselves they are using a current Standard, which should include any amendments which may have been published since the Standard was purchased.

Detailed information about joint Australian/New Zealand Standards can be found by visiting the Standards Web Shop at www.standards.com.au or Standards New Zealand web site at www.standards.co.nz and looking up the relevant Standard in the on-line catalogue.

Alternatively, both organizations publish an annual printed Catalogue with full details of all current Standards. For more frequent listings or notification of revisions, amendments and withdrawals, Standards Australia and Standards New Zealand offer a number of update options. For information about these services, users should contact their respective national Standards organization.

We also welcome suggestions for improvement in our Standards, and especially encourage readers to notify us immediately of any apparent inaccuracies or ambiguities. Please address your comments to the Chief Executive of either Standards Australia or Standards New Zealand at the address shown on the back cover.

This Standard was issued in draft form for comment as DR 07124.

Australian/New Zealand Standard™

Incandescent lamps—Safety specifications

Part 1: Tungsten filament lamps for domestic and similar general lighting purposes

Originated as AS 4091—1993.
Revised and redesignated AS/NZS 60432.1:2007.

COPYRIGHT

© Standards Australia/Standards New Zealand

All rights are reserved. No part of this work may be reproduced or copied in any form or by any means, electronic or mechanical, including photocopying, without the written permission of the publisher.

Jointly published by Standards Australia, GPO Box 476, Sydney, NSW 2001 and Standards New Zealand, Private Bag 2439, Wellington 6020

ISBN 0 7337 8337 6

PREFACE

This Standard was prepared by the Joint Standards Australia/Standards New Zealand Committee EL-041, Lamps and Related Equipment, to supersede AS 4091—1993, *Tungsten filament lamps for general service - Safety requirements*.

The objective of this Standard is to specify safety requirements for tungsten filament lamps for general lighting service.

This Standard is identical with, and has been reproduced from IEC 60432-1, Ed. 2.1 (2005), *Incandescent lamps—Safety specifications – Part 1: Tungsten filament lamps for domestic and similar general lighting purposes*.

This Standard is Part 1 of a series which, when complete, will consist of the following:

AS/NZS

60432	Incandescent lamps—Safety specifications
60432.1	Part 1: Tungsten filament lamps for domestic and similar general lighting purposes (this Standard)
60432.2	Part 2: Tungsten halogen lamps for domestic and similar general lighting purposes
60432.3	Part 3: Tungsten halogen lamps (non-vehicle)

As this Standard is reproduced from an International Standard, the following applies:

- (a) Its number does not appear on each page of text and its identity is shown only on the cover and title page.
- (b) In the source text 'IEC 60432-1' should read 'AS/NZS 60432.1'.
- (c) A full point should be substituted for a comma when referring to a decimal marker.

The terms 'normative' and 'informative' are used to define the application of the annex to which they apply. A normative annex is an integral part of a standard, whereas an informative annex is only for information and guidance.

CONTENTS

	<i>Page</i>
1 General.....	1
1.1 Scope	1
1.2 Normative references.....	1
1.3 Definitions.....	2
2 Requirements.....	4
2.1 General.....	4
2.2 Marking.....	4
2.3 Protection against accidental contact in screw lampholders	5
2.4 Lamp cap temperature rise (Δt_s).....	5
2.5 Resistance to torque	6
2.6 Insulation resistance of B15d, B22d, E26/50×39 and E27/51×39 capped lamps and other lamps having insulated skirts	8
2.7 Accidentally live parts	8
2.8 Creepage distances for B15d and B22d capped lamps.....	9
2.9 Safety at end of life	9
2.10 Interchangeability	9
2.11 Information for luminaire design	9
3 Assessment	10
3.1 General.....	10
3.2 Whole production assessment by means of the manufacturer's records	10
3.3 Assessment of the manufacturer's records of particular tests	12
3.4 Rejection conditions of batches.....	12
3.5 Sampling procedures for whole production testing	12
3.6 Sampling procedures for batch testing	14
Annex A (normative) Miscellaneous test procedures.....	15
Annex B (normative) Packaging marking symbols.....	16
Annex C (normative) Resistance to torque test procedures.....	17
Annex D (normative) Induced-failure test.....	20
Annex E (normative) Operation-to-failure test.....	23
Annex F (normative) Acceptance numbers for various sample sizes and AQLs.....	25
Annex G (normative) Acceptance criteria – Continuously variable results	31
Annex H (normative) Induced-failure test – Grouping, sampling and compliance	33
Annex J (normative) Method of measuring mains impedance.....	36
Annex K (informative) Information for luminaire design	38

STANDARDS AUSTRALIA/STANDARDS NEW ZEALAND

Australian/New Zealand Standard**Incandescent lamps—Safety specifications****Part 1: Tungsten filament lamps for domestic and similar general lighting purposes**

1 General**1.1 Scope**

International Standard IEC 60432-1 specifies the safety and interchangeability requirements of tungsten filament incandescent lamps for general lighting service having:

- rated wattage up to and including 200 W;
- rated voltage of 50 V to 250 V inclusive;
- bulbs of the A, B, C, G, M, P, PS, PAR or R shapes* , or other bulb shapes where the lamps are intended to serve the same purpose as lamps with the foregoing bulb shapes;
- bulbs with all kinds of finishes;
- caps B15d, B22d, E12, E14, E17, E26**, E26d, E26/50×39, E27 or E27/51×39.

As far as is reasonably practicable, this standard is also applicable to lamps with bulbs and caps other than those mentioned above, but which serve the same purpose.

This standard specifies the method a manufacturer should use to show that his product conforms to 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.

This standard is concerned with safety criteria only and does not take into account the performance of tungsten filament lamps with respect to luminous flux, life or power consumption characteristics. Readers should refer to IEC 60064 for such characteristics with respect to types normally used for general lighting service.

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.

* See IEC 60887 for description of the letter symbols. Associated traditional names are:

- | | |
|-----------------------|---------------------------|
| – Pear shape | = A, PS |
| – Mushroom | = M |
| – Candle | = B, C (in North America) |
| – Round bulb | = P |
| – Globular | = G |
| – Reflector | = R |
| – Parabolic reflector | = PAR |

** There are two variations of E26 caps which are not fully compatible. In this standard separate references are made to E26/24 caps used in North America and E26/25 caps used in Japan.

References to International Standards that are struck through in this Clause are replaced by references to equivalent Australian or Australian/New Zealand Standards that are listed immediately thereafter and identified by shading. Any Australian or Australian/New Zealand Standard that is identical to the International Standard it replaces is appropriately identified.

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 60064: Tungsten filament lamps for domestic and similar general lighting purposes. Performance requirements~~

AS 2325, *Tungsten filament lamps for general service—Performance requirements* (identical to IEC 60064:1993)

IEC 60360: *Standard method of measurement of lamp cap temperature rise*

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

IEC 60432-2: *Incandescent lamps – Safety specification – Part 2: Tungsten halogen lamps for domestic and similar general lighting purposes*

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

AS/NZS 60598.1, *Luminaires Part 1: General requirements and tests*

IEC 60887: *Glass bulb designation system for lamps*

~~ISO 3951: Sampling procedures and charts for inspection by variables for percent non-conforming~~

AS 2490, *Sampling procedures and charts for inspection by variables for percent nonconforming*

1.3 Definitions

For the purpose of this International Standard the following definitions apply.

1.3.1

category

all lamps of one manufacturer having the same general construction (bulb shape, external dimensions, cap type, filament type), rated voltage, rated wattage and finish

For the purposes of this standard:

- a) clear, frosted and coatings equivalent to a frosted finish are considered to be the same;
- b) various coloured and white finishes are not considered to be the same.

NOTE – Lamps differing only by their caps (e.g. E27 and B22d) are of different 'categories', but of the same 'type' as defined in IEC 60064.

1.3.2

type

lamps which, independent of the type of cap, are identical in photometric and electrical characteristics

1.3.3**class**

all lamps of one manufacturer having the same general construction (bulb shape, external dimensions, cap type, filament type), rated wattage and finish and differing only by their rated voltages, when these voltages fall within the same voltage range (e.g. 100 V to 150 V, 200 V to 250 V)

1.3.4**rated voltage**

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

(If lamps are marked with a voltage range, it shall be interpreted that they are appropriate for use on any supply voltage within that range.)

1.3.5**test voltage**

rated voltage unless otherwise specified

(If lamps are marked with a voltage range, the test voltage shall be taken as the mean of the voltage range unless otherwise specified.)

1.3.6**rated wattage**

wattage specified in the relevant lamp standard or assigned by the manufacturer or responsible vendor

1.3.7**end of life**

instant when the energized lamp ceases to emit light

1.3.8**cap temperature rise (Δt_s)**

surface temperature rise, above ambient temperature, of a standard test lampholder fitted to the lamp's cap, when measured in accordance with the standard method described in IEC 60360

1.3.9**design test**

test made on a sample, for the purposes of checking compliance of the design of a category, class or group of categories with the requirements of the relevant clause

1.3.10**periodic test**

test repeated at intervals in order to check that the product does not deviate in certain respects from the given design

1.3.11**running test**

test applied at frequent intervals in order to provide data for assessment

1.3.12**batch**

all the lamps of one category, identified as such, and put forward at one time for checking compliance

1.3.13**whole production**

production of all types of lamps within the scope of this standard manufactured during a period of 12 months and nominated by the manufacturer in a list for inclusion in the control, this list being incorporated in the certificate when certification is in operation

1.3.14**bowl mirror lamp**

lamp with part of its bulb coated with reflecting material so as to reflect a substantial part of the light in the general direction of the lamp cap

1.3.15 1**maximum cap temperature**

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

1.3.16**lamp neck reference diameter**

that diameter of a lamp which is of influence on the protection against accidental contact and which is measured at a defined distance from the solder contact plate

For E14 capped lamps, this distance is 30 mm.

2 Requirements**2.1 General**

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

Lamps shall satisfy the requirements of this clause.

2.2 Marking**2.2.1 Mandatory markings**

The following information shall be marked on the lamps and shall be legible and durable when subjected to the test procedure in A.1:

- a) mark of origin (this may take the form of a trade mark, the manufacturer's name or the name of responsible vendor);
- b) the rated voltage or the rated voltage range, marked as 'V' or 'volts';
- c) the rated wattage, marked as 'W' or 'watts'.

For lamps with 40 mm diameter bulbs or larger and with a realized wattage of 14 W or less, the wattage need not be marked.

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.

2.2.2 Dichroic reflectorized (cool beam) lamps and bowl mirror lamps

The immediate lamp wrapping or container shall be marked with the relevant symbol as shown in annex B.

2.2.3 Lamps with operating position limitations

For lamps requiring operating position limitations, such as some 60 W candle and round bulb lamps capped with B22d or E27 caps which can comply with the requirement of the lamp cap temperature rise only by excluding the cap-up position, the immediate lamp wrapping or container shall be marked with the appropriate symbol. An example is shown in annex B.

NOTE – The requirements in 2.2.2 and 2.2.3 are intended as information for the end-user of the lamp.

2.3 Protection against accidental contact in screw lampholders

Dimensions of screw capped lamps shall be such that safety against accidental contact is ensured according to IEC 60061.

The lamps shall satisfy the gauges, defined in IEC 60061-3 in accordance with table 1.

Table 1 – Gauges for checking lamps for protection against accidental contact

Lamp cap	Gauge sheet No.	Lamp cap	Gauge sheet No.
E12	–	E26d	7006-29A
E14	see 2.3.1	E27/25 and E27/27	7006-51A
E17	–	E27/51×39	7006-51
E26/24	–		
E26/25	–		
E26/50×39	–		
NOTE – The dash marking in the Gauge sheet No. column means that at the moment no such test system has been developed.			

2.3.1 E14 capped lamps

E14 capped lamps shall satisfy the following requirements:

- candle lamps shall be fitted with caps E14/25×17 and tested with gauge 7006-55;
- round bulb, pigmy, tubular and reflector lamps having lamp neck reference diameters of 21 mm and greater shall be fitted with caps E14/25×17 and tested with gauge 7006-55;
- round bulb, pigmy, tubular and reflector lamps having lamp neck reference diameters between 16 mm and 21 mm shall be fitted with caps E14/23×15 or E14/20;
- round bulb, pigmy, tubular and reflector lamps having lamp neck reference diameters between 14 mm and 16 mm shall be fitted with caps E14/20.

In cases c) and d) a gauge is not required, because the choice of caps guarantees the same degree of safety as in cases a) and b).

2.4 Lamp cap temperature rise (Δt_s)

2.4.1 Average cap temperature rise

The average cap temperature rise per class of lamp manufactured in a period of 12 months shall not exceed the following:

- the appropriate value as specified in table 2; or
- 45 K lower than the relevant values in table 2 where advantage is taken of the lower maximum cap temperature of 2.5.4 b).

However, lamps fitted with E12, E17 and E26 caps with higher Δt_s values intended for special applications are permitted, provided suitable cautionary notices accompany each lamp.

NOTE – In North America, lampholder and luminaire designs may be primarily aligned with the cap temperature rise characteristics of common frosted, clear and white lamps. Therefore, lamps with other bulb finishes or other characteristics yielding a higher cap temperature rise may require special cautionary notices.

COPYRIGHT

2.4.2 Compliance

Compliance shall be checked by measurements of lamp cap temperature rise on lamps in the same class in accordance with the test procedure specified in IEC 60360.

If the lamp is marked with a voltage range, the cap temperature rise shall be measured at the mean voltage provided the limits of the voltage range do not differ by more than 2,5% from the mean voltage. For lamps with a wider voltage range, the measurement shall be at the highest marked voltage.

NOTE – Table 2 shows upper limits for average cap temperature rise which apply to all lamps listed by wattage, bulb and cap. In practice, several design features such as light centre length, mount shape and bulb finish affect cap temperature rise, but such factors are encompassed in each limit.

2.4.3 Batch testing

For the testing of batches when the 20 lamp sample size is needed, the average shall not exceed the appropriate value in accordance with 2.4.1, with an allowance of +9 K.

2.5 Resistance to torque

2.5.1 Caps

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

2.5.2 Unused lamps

For unused lamps, the lamp cap shall not move relative to the bulb when subjected to the relevant torque value from table 3 as tested in accordance with C.1. Where the means of attachment is other than by capping cement or adhesive, relative movement between bulb and cap is permitted, provided it does not exceed 10°.

2.5.3 Resistance to heat

The lamp cap and capping cement or other means of attachment shall endure exposure to heat at a level equal to the maximum cap temperature for which that class of lamp is designed.

The lamp cap shall not move relative to the bulb when subjected to the relevant torque values of table 4 after the heating test specified in C.2 at the appropriate temperature of 2.5.4. In the case where the means of attachment is other than by capping cement or adhesive, relative movement between bulb and cap is permitted, provided it does not exceed 10°.

Table 2 – Maximum allowable cap temperature rise (Δt_s) for various lamp wattages and classes over a 12 month period average

Group number	Wattage ¹ W	Bulb shape	Δt_s max. K							
			B15d	B22d	E12	E14	E17	E26/24	E26/25	E27
1	25 & 30	A, PS, M and other shapes intended for use in the same luminaire	-	-	-	-	-	95	65	-
	40		-	-	-	-	-	95	85	-
	60		-	125	-	-	-	120	95	120
	100		-	135	-	-	-	120	110	130
	150 & 200		-	135	-	-	-	120	100	130
2	40	B, G (diameter $\leq$ 45 mm), P and other shapes intended for use in the same luminaire	135	140	140 ^{4,6}	130	-	140 ^{4,6}	-	140
	60		145	125 ²	165 ^{4,6}	140	-	165 ^{4,6}	-	120 ²
3	15	C, F and other shapes intended for use in the same luminaire	-	-	-	-	90 ⁹	-	90	-
	25		-	-	120	-	110 ⁹	120	110	-
	40		-	-	140 ^{4,6}	-	130 ⁹	140 ^{4,6}	130	-
	60		-	-	165 ^{4,6}	-	130 ⁹	165 ^{4,6}	130	-
4	25 & 40	G (diameter > 45 mm)	-	-	-	-	110	-	110	-
	60 & 100		-	-	-	-	-	-	110	-
5	25	P & G (diameter $\leq$ 45 mm) with bowl mirror	-	-	-	-	110	-	110	-
	40		135	135	-	135	-	-	110	135
	60		135	-	-	135	-	-	110	-
6	60	A & PS with bowl mirror	-	130	-	-	-	-	110	130
	100		-	135	-	-	-	-	110	135
	150 & 200		-	135	-	-	-	-	-	135
7	25	R and other shapes intended for use in the same luminaire	-	-	-	-	85	-	-	-
	40		120	120	-	120	95	145 ⁶	95	120
	60		-	130	-	-	105	145 ⁶	105	130
	100, 150 & 200		-	135	-	-	-	145 ^{6,7,8}	110	135
8	75	PAR shapes ³	-	-	-	-	-	145 ^{6,8}	85	150
	100		-	-	-	-	-	145 ^{6,8}	100	150
	150		-	-	-	-	-	145 ^{6,8}	125	150
9	150	PAR shapes with dichroic reflector ³	-	-	-	-	-	175	150	175
1 For lamps with intermediate wattage values, the requirement of the next higher value shown applies. 2 This may require a limitation on operating position. 3 Lamps with skirted caps: E26/50x39, E27/51x39, etc. 4 Some lamp classes may be limited to operation in the cap-down or cap-down-through-horizontal positions by the manufacturer. 5 Some lamp classes may be limited to operation in the cap-down position by the manufacturer. 6 Some lamp classes may be limited by the manufacturer to applications in high-temperature lampholders, because low-temperature lampholders could deteriorate. 7 Some lamp classes may be limited by the manufacturer to applications at 260 °C maximum cap temperature in high-temperature lampholders. 8 Some lamps in this category may no longer be sold in the United States and Canada due to updated energy regulations. Consult local regulations. 9 Under consideration.										

2.5.4 Heating treatment temperatures

The heating treatment shall be conducted at one of the following levels:

- a) the maximum cap temperature, in relation to cap type as specified in table K.1; or
- b) for certain classes of lamps where 210°C is specified in table K.1, the manufacturer may elect to design lamps that can withstand a maximum cap temperature of 165°C, in which case the heating test is carried out at 165°C, provided their rated wattage is 15 W or lower, and the lamp is not a reflector or bowl mirror type.

NOTE – For special applications in North America, maximum cap temperatures lower than those shown in table K.1 may be assigned by the lamp manufacturer. When such a lower temperature lamp class is established, the manufacturer is encouraged to:

- propose special limits for this standard;
- alert luminaire manufacturers.

Table 3 – Torque test values for unused lamps

Cap type	Torque value Nm
B15d	1,15
B22d	3,0
E12	0,8
E14	1,15
E17	1,5
E26, E26d, E27, E26/50×39 and E27/51×39	3,0

Table 4 – Torque test values after heating

Cap type	Torque value Nm
B15d	0,3
B22d	0,75
E12	0,5
E14	1,0
E17	1,0
E26, E26d, E27, E26/50×39 and E27/51×39	2,5

2.6 Insulation resistance of B15d, B22d, E26/50×39 and E27/51×39 capped lamps and other lamps having insulated skirts

Insulation resistance between the shell of the cap and the contacts of bayonet capped lamps, or between the shell and the insulated skirt of skirted Edison screw capped lamps, shall be not less than 2 MΩ when measured in accordance with the procedure of A.3.

2.7 Accidentally live parts

2.7.1 Metal parts intended to be insulated from live parts

Metal parts intended to be insulated from live parts shall not be or become live. Any moveable conductive material shall be placed without the use of a tool, in the most onerous position before inspection in accordance with A.4.

2.7.2 Bayonet caps

On bayonet caps, any projection from the contact plate shall not come within 1 mm of metal parts intended to be insulated.

2.7.3 Edison screw caps

On Edison screw caps any projection from the cap shell shall not project more than 3 mm from the surface of the cap. See figure 1.

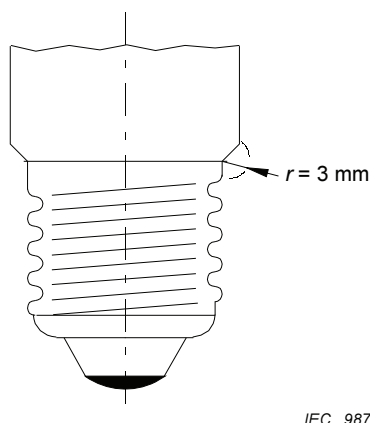


Figure 1 – Edison screw cap

2.8 Creepage distances for B15d and B22d capped lamps

The minimum creepage distance between the metal shell of the cap and the contacts shall be in accordance with the distance given in IEC 60061-4, sheet 7007-6.

2.9 Safety at end of life

When tested under the specified conditions, lamp failure shall not be accompanied by breakage of the outer glass envelope 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 D or in accordance with the alternative induced-failure test of annex A of IEC 60432-2, and
- an operation-to-failure test in accordance with annex E.

NOTE 1 – In case of disagreement, tests of annexes D and E are the reference methods.

NOTE 2 – The induced-failure test is not suitable for lamps with rated voltages below 100 V; however, the alternative induced-failure test is suitable for lamps with rated voltages below 100 V.

NOTE 3 – If lamps fail the induced-failure test, it is not necessary for them to be submitted to the operation-to-failure test.

NOTE 4 – Under circumstances defined in H.3, the operation-to-failure test may be used in place of the induced-failure test.

2.10 Interchangeability

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

Finished lamps shall satisfy the gauges for checking the dimensions controlling interchangeability in accordance with table 5. The gauges are those shown on particular standard sheets included in IEC 60061-3.

2.11 Information for luminaire design

Refer to annex K.