



BS 161 : 1976



UDC 621.326.7

Specification for

Tungsten filament lamps for general service (batch testing)

Spécification des lampes à filament de tungstène pour l'éclairage général (essai des lots)

Spezifikation für Wolframfadenlampen für allgemeine Beleuchtung (Losprüfung)

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BS 161 : 1976

Foreword

This British Standard has been prepared under the authority of the Electrical Illumination Standards Committee, and constitutes a revision of BS 161 : 1968 which is now withdrawn. Except in two places where safety requirements were referred to, this standard is identical with Publication 64 : 1973 'Tungsten filament lamps for general service' published by the International Electrotechnical Commission. For ease of reference, the page numbers of IEC 64 have been included at the foot of each page of this standard.

NOTE. A separate British Standard dealing with safety requirements for tungsten filament lamps for general service is in course of preparation.

The words 'batch testing' have been added to the title in order to clarify the object of the specification as given in clause 1.

Because the text of an IEC Publication has been copied it includes some minor material not appropriate to a British Standard.

For the purposes of this British Standard, the text of Publication 64 given in this publication should be amended as follows.

Terminology. The words 'British Standard' should replace 'Recommendation' wherever it appears.

Cross-references. The references to other IEC Recommendations should be replaced by references to British Standards as follows.

Reference(s)	IEC Publication	Appropriate British Standard
2	Publication 64A: Supplement to Publication 64 Tungsten filament lamps for general service — lamps with a life of 2,500 hours.	No equivalent BS
3.4 and 22	Publication 360 Standard method of measurement of lamp cap temperature rise	BS 5371 Standard method of measurement of lamp cap temperature rise
15.1, 16, C2 line 2 and C2, note 1 lines 8 and 14	Publication 61 Lamp caps and holders together with gauges for the control of interchangeability and safety	BS 5101 Lamp caps and holders together with gauges for the control of interchangeability and safety
C2, note 1 lines 8 and 14	CEE 3 Edison screw lamp holders (Identical to IEC 238)	BS 98 Dimensions of screw lamp-caps and lampholders (Edison type)
28.1	Publication 64 Tungsten filament lamps for general service	BS 161 Tungsten filament lamps for general service
Table III A, note and table III B, note 1	Publication 38 IEC standard voltages	BS 77 Voltages for a.c. transmission and distribution systems

Certification. Attention is drawn to the certification facilities described on the inside back cover of this standard.

TUNGSTEN FILAMENT LAMPS FOR GENERAL SERVICE

Introduction

This edition introduces a new concept for whole product appraisal. Emphasis is given to checking manufacturer's claims for compliance with this standard in preference to establishing precise levels of quality. Reliance is placed on the following:

- 1) The confidence derived from past testing experiences between the test authority and the manufacturer.
- 2) Reference to a manufacturer's own test data.
- 3) A much reduced market sample which is used as a comparability check of the consistency between market test and the manufacturer's own test data, thereby verifying the validity of the latter.

The two systems provide in practice the same assurances on consumer safeguards, such as should enable reciprocal recognition of licences or certification by the testing authorities concerned.

SECTION I — GENERAL

1. Object

 This recommendation states the technical requirements for the lamps in question, and the methods of test to be used in determining the quality and interchangeability of the lamps on a scientific basis both as regards individual batches as well as the whole production of a manufacturer, in an endeavour to maintain a community of interest between the purchaser and the manufacturer.

2. Scope

This recommendation applies to ordinary incandescent lamps for general lighting purposes having:

- a nominal life of 1 000 hours,
- a rated wattage of 25 ... 1 500 watts, inclusive,
- a rated voltage of 100 ... 250 volts, inclusive,
- bulbs clear or internally frosted,
- caps, normal bayonet or Edison screw,

as set out in Appendix A.

Note. — For those countries where there is an interest in lamps of 2 500 hours life, attention is drawn to IEC Publication 64A, Supplement to IEC Publication 64: Tungsten Filament Lamps for General Service.

3. Definitions

3.1 Type

This term denotes lamps which, independent of the type of cap, are identical in photometric and electrical rating.

3.2 *Batch*

This term denotes all the lamps of one type put forward at one time for test for acceptance.

3.3 *Group*

Lamps of the same rated wattage from the same schedule (normal or high luminous flux, see Appendix D) whose rated voltage falls within the same voltage range (100 ... 150 V; 200 ... 250 V).

3.4 *Cap temperature rise (Δt_s)*

The surface temperature rise Δt_s (above ambient) of a standard test-lampholder fitted to the lamp, when measured in accordance with IEC Publication 360, Standard Method of Measurement of Lamp Cap Temperature Rise.

3.5 *Inspection test quantity (I.T.Q.)*

The number of lamps to be tested with the object of determining the acceptability, either of the batch or of the whole production, as to mechanical and physical requirements.

3.6 *Rating test quantity (R.T.Q.)*

The number of lamps to be tested with the object of determining the acceptability, either of the batch or of the whole production, as to initial readings.

3.7 *Life test quantity (L.T.Q.)*

The number of lamps to be tested with the object of determining the acceptability, either of the batch or of the whole production, as to life.

3.8 *Whole product*

The whole of the production of stated types is defined by a nominative list of all the types which the manufacturer accepts to be included in the control.

Note. — This nominative list shall be shown on the certificate which will be delivered by the body operating the control.

3.9 *Light-centre length*

The light-centre length is the distance from the geometrical centre of the filament to the contact plate of the cap, including solder.

This definition applies whichever type of cap is used.

3.10 *Lumen*

The lumen is the unit of luminous flux. It is equal to the flux emitted in a solid angle of one steradian by a uniform point source of one candela.

Note. — The candela (abbreviation: cd) is the unit of luminous intensity. It is of magnitude such that the luminance of a full radiator at the temperature of solidification of platinum is 60 units of luminous intensity per square centimetre.

3.11 *Initial readings*

The initial readings are the photometric and electric measurements made at the end of the ageing period.

3.12 *Life*

The life of a lamp is the number of hours it operates to "burn-out" or to any other criterion of life performance laid down in this specification.

3.13 *Rated voltage*

The rated voltage is the voltage marked on the lamps. If, for special reasons, the lamps are marked with a voltage range, the rated voltage shall be the mean of the voltages marked.

Note. — This is intended to convey that range-marking should be used only for special reasons and would not be considered the normal way of marking most general lighting service lamps.

3.14 *Rated wattage*

The rated wattage is the wattage marked on the lamps.

3.15 *Rated lumens*

The rated lumens are the lumens marked on the lamps or declared.

SECTION II — SAMPLING

4. **Principles of sampling**

The lamps for testing shall be selected in accordance with a mutually agreed method such as to ensure proper representation (see Appendix B).

In order to cover the risk of accidental breakage, a certain number of lamps, in addition to the test quantity, shall be selected and tested.

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 result of the test (approval or rejection) is 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 the test results.

Note. — Accidentally broken lamps include for example lamps becoming defective during handling and transportation and also lamps becoming defective for reasons which are not connected with a normal procedure of testing for the measurement of lumens and watts according to Clause 24.

5. **Inspection test quantity (I.T.Q.) — Individual batches**

There shall be selected an I.T.Q. consisting of 35 lamps, in special cases 70 lamps.

6. **Inspection test quantity (I.T.Q.) — Whole product of a manufacturer**6.1 *Old system*

Samples shall be selected at random at regular intervals during a period of twelve months. The total number of lamps selected shall be between 600 and 650.

6.2 *New system*

There shall be an open market selection of 20 lamps of each of three different lamp types taken in a representative manner through the production year.



Each of the samples of 20 lamps shall be tested primarily for the purpose of checking the validity of the manufacturer's own test information (see Sub-clause 28.2; Comparability test).

7. Rating test quantity (R.T.Q.) — Individual batches

From the lamps which have passed the Inspection Test, there shall be selected at random an R.T.Q. comprising 25 lamps, in special cases 50 lamps.

8. Rating test quantity (R.T.Q.) — Whole product of a manufacturer

8.1 Old system

From the lamps which have passed the Inspection Test, there shall be selected at random an R.T.Q. of between 500 and 540 lamps.

Care shall be taken to ensure that the R.T.Q. is sufficiently representative of the types included in the I.T.Q.

8.2 New system

The lamps from Sub-clause 6.2 shall be submitted to the Rating Test.

9. Life test quantity (L.T.Q.) — Individual batches

From the lamps which have passed the Rating Test, there shall be selected at random an L.T.Q. comprising 20 lamps.

These lamps can also be used for checking compliance with Δt_s requirements.

10. Life test quantity (L.T.Q.) — Whole product of a manufacturer

10.1 Old system

From the lamps which have passed the Rating Test, there shall be selected at random an L.T.Q. of between 250 and 270 lamps.

Care shall be taken to ensure that the L.T.Q. is sufficiently representative of the types included in the I.T.Q. and R.T.Q.

When separate testing of lamp cap temperature rise is required, 20 lamps per type shall be used before life-testing, to check compliance with temperature rise requirements.

These 20 lamps shall form a representative sample of a yearly production of the relevant lamp type.

Note. — For purposes of temperature rise tests of a lamp cap, it is necessary for samples of a single type to have the same model of cap, but for all other tests the concept "type" is independent of the model of cap.

10.2 New system

The lamps from Sub-clause 6.2 shall be submitted to the Life Test.

SECTION III — MARKING AND REQUIREMENTS FOR MECHANICAL AND PHYSICAL CHARACTERISTICS

11. General

 Lamps shall be so designed and constructed that in all normal and accepted use their performance is reliable. In general, compliance is checked by carrying out all the tests specified.

12. Lamp marking

The following information shall be distinctly and indelibly marked on the lamp:

-  a) Mark of origin (this may take the form of a trade mark, the manufacturer's name, or the name of the responsible seller).
- b) The rated voltage or voltage range (marked "V" or volts).
The voltage range shall not exceed $\pm 2.5\%$ of the mean voltage.
- c) The rated wattage (marked "W" or watts).

In addition, the rated lumens ("lm" or lumen) shall be either marked on the lamp or made available by the supplier of the lamp.

13. Bulbs

The bulbs shall be free from defects detrimental to service.

14. Lamp dimensions

The lamps shall comply with the requirements specified in Appendix C for dimensions, interchangeability and safety.

15. Caps

- 15.1 The dimensions of the cap on the completed lamp shall be those given in the latest Standard Sheets of IEC Publication 61, Lamp Caps and Holders together with Gauges for the Control of Interchangeability and Safety.
- 15.2 The shell of the cap shall be of brass or other suitable material. Caps shall be so constructed and attached to the bulbs that they will withstand the torque specified in Appendix C, both during the inspection test and at the end of the life test.
- 15.3 The insulation resistance between the shell of the bayonet cap and the contact shall be not less than 50 megohms. The test shall be carried out as soon as possible after the ageing of the lamp, and the measurement shall be made one minute after the application of a d.c. voltage of 500 V.

16. Solder

The solder shall not prevent proper engagement of the cap in the holder conforming with the requirements of IEC Publication 61.

SECTION IV — REQUIREMENTS AND CONDITIONS OF TEST FOR RATING FOR CAP TEMPERATURE RISE AND FOR LIFE

17. Position of burning

Lamps shall burn in a vertical position, cap up. The lampholders axis on the test-racks shall not deviate from the vertical by more than 5°.

Lamps shall burn free from noticeable vibrations. No vibrations or shocks should be perceptible when touching the lampholders, either during burning or when switching on or off.

18. Lampholders

Lampholders on life-test racks shall be of sturdy construction and shall be designed to ensure adequate electrical contact and to prevent overheating.

The voltage drop between the point of measurement on the supply line and the cap contacts shall not exceed 0.1% of the test voltage.

For bayonet lampholders the cap shell shall be substantially at the same potential as the contact which is not connected to the fused main supply lead.

Note. — It is recommended that lampholders of the spring loaded plunger type should not be used for prolonged testing.

The torque imposed on insertion or extraction of the lamp must not exceed the values specified in Appendix C for the relevant lamp cap.

The cap temperature in operation shall not exceed 210 °C.

Lamps shall not be operated at excessive ambient temperatures, neither shall there be undue heating of a lamp by others.

19. Ageing

Before the initial readings are taken, lamps shall be aged in accordance with the schedule given in Appendix D.

20. Photometry

Measurements shall be carried out at the rated voltage with a suitable integrating photometer.

21. Initial readings

When measured at the rated voltage, the initial readings shall be in accordance with Appendix D.

22. Lamp cap temperature rise

The lamp cap temperature rise shall be measured by the method described in IEC Publication 360, and shall comply with the requirements stated in Appendix G.

23. Life test requirements

The luminous flux at 750 hours and the duration of life shall comply with the requirements given in Appendix E.

24. Life test procedure

24.1 Test voltage

The test voltage shall be a stable voltage (see Sub-clause 24.2) between 100% and approximately 110% of the rated voltage, the value to be selected by mutual agreement.

The equivalent life for rated volts shall be determined in accordance with the following equation:

$$L_o = L \left(\frac{U}{U_o} \right)^n$$

where: L_o = life at rated voltage

L = life at test voltage

U_o = rated voltage

U = average effective voltage during life test

n = 13 for vacuum lamps and 14 for gas-filled lamps.

The lamps shall be burned on alternating current at a frequency of a nominal value between 40 Hz and 60 Hz (c/s).

Note. — In general, testing at voltages in excess of the rated voltage is practised mainly for reasons of economy.

24.2 Voltage control

The momentary fluctuations from the test voltage during the life test shall not exceed $\pm 1\%$ and the effective mean value of the voltage during the life test shall be taken for the computation given in Sub-clause 24.1.

Transient voltage peaks, measured on the life-test rack, should not exceed ... times the test voltage (factors and measurement conditions are under consideration).

24.3 Switching on and off

Lamps shall be switched off twice daily for periods of not less than 15 minutes, such periods not being considered as part of the burning hours of the lamp.

24.4 Measurements

Lamps subjected to the life test shall be measured for lumens and watts, at the rated voltage, at 750 hours ± 25 hours or its equivalent if forced testing is used.

24.5 Termination of test

The life test shall be considered to have terminated at 1 250 hours, or its equivalent if forced testing is used.

SECTION V — CONDITIONS OF COMPLIANCE

25. General

Before making the tests, it should first be ascertained that the rated luminous flux of the lamps complies with the requirements of Clause D3, Appendix D. After completing the tests, it should be ascertained whether the lamps comply with Clause 11.



26. Individual batches

A batch shall be considered as satisfying the requirements of this specification if the requirements contained in Clauses 29, 31, 33.1 and 34 are fulfilled. If the batch fails to satisfy the requirements of any of these clauses, it shall be deemed not to comply with the specification.

27. Whole product of a manufacturer — Old system

Where the whole production is being tested over a period of twelve months, the complete test quantity shall be in accordance with Sub-clauses 30.1, 32.1, 33.2 and 35.1.



The whole production of a manufacturer shall be deemed to comply if at least 75% of the total number of types submitted for test meet the requirement that the number of lamps failing shall not exceed the qualifying limits shown in the following table.

Tests	Qualifying limit for a single type or criterion for type approval
For any test according to Clauses 12 to 16 inclusive	5% of the test quantity + 1 lamp *
For all tests, according to Clauses 12 to 16 inclusive	15% of the test quantity + 1 lamp *
For wattage tolerance according to Clause D2 of Appendix D	10% of the test quantity + 2 lamps *
For initial lumen tolerance to Clause D4 of Appendix D	10% of the test quantity + 2 lamps *
For cap temperature rise	Appendix G, Table VI
For life performance	Appendix E
For life-failures below 700 h	10% of the test quantity + 2 lamps *

* When the calculation results in a fractional number of samples, this is replaced by the next higher whole number.

28. Whole product of a manufacturer — New system

The whole product of a manufacturer shall be considered as satisfying the requirements of this specification if the conditions in Sub-clauses 30.2, 32.2, 33.2 and 35.2 are fulfilled for at least 75% of the total number of types submitted for appraisal.

28.1 Manufacturer's test data

The manufacturer shall make available to the testing authority all the results of his finished product tests, pertinent to the requirements of IEC Publication 64. The data shall refer to a sufficient number of lamps to be representative of the product, namely:

- for the four largest groups, at least 400 lamps with a minimum of 80 lamps per group,
- for each of the other groups which together with the largest groups make up 75% of the production, at least 35 lamps.

Note. — Attention is drawn to Tables IIA, IIB, IIC and IID, requiring a minimum of 35 lamps per type.