
Specification for
Glow modulator tubes of assessed quality
Generic data and methods of test

Spécification des tubes modulateurs à luminescence de qualité assurée:
Données génériques et méthodes d'essai

Spezifikation für Glimmodulatorröhren bestätigter Güte:
Generische Daten und Prüfverfahren

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Foreword

This British Standard, which has been prepared under the direction of the Electronic Components Standards Committee, is the generic specification for glow modulator tubes in the BS 9000 system of standards for electronic parts of assessed quality.

British Standard Specification for

Glow modulator tubes of assessed quality

Generic data and methods of test

Section one. General matters

1.1 Scope

This British Standard forms part of the system of common standard specifications for electronic parts of assessed quality and should be read in conjunction with the standards in the BS 9000 series.

It applies to glow modulator tubes as defined in 1.3 and gives the terms, definitions, symbols, test methods and other material necessary to implement fully the detail specification for these tubes.

1.2 Related documents

The following publications are related to this standard:

- BS 308 Engineering drawing practice
- BS 448 Dimensions of electronic tubes and valves
- BS 1991 Letter symbols, signs and abbreviations
- BS 2011 Basic environmental testing procedures (IEC 68)
 - Part 1.1 General
 - Part 2.1 Tests
- BS 3939 Graphical symbols for electrical power, telecommunications and electronics diagrams (IEC 117)
- BS 4727 Glossary of electrotechnical, power, telecommunications, electronics, lighting and colour terms
 - Part 1 Terms common to power, telecommunications and electronics:
 - Group 06 Electronic tube terminology
 - Part 4 Terms particular to lighting and colour:
 - Group 01 Radiation and photometry
 - Group 02 Vision and colour terminology
- BS 6001 Sampling procedures and tables for inspection by attributes
- BS 9000 General requirements for electronic components of assessed quality
 - Part 1 General description and basic rules
- IEC 50(531) International electrotechnical vocabulary Chapter 531 Electronic tubes
- IEC 151-19 Part 19 Methods of measurement on corona stabilizers

1.3 Terminology

For the purposes of this British Standard the following terms and their definitions apply in addition to those from BS 4727 and IEC 50(531).

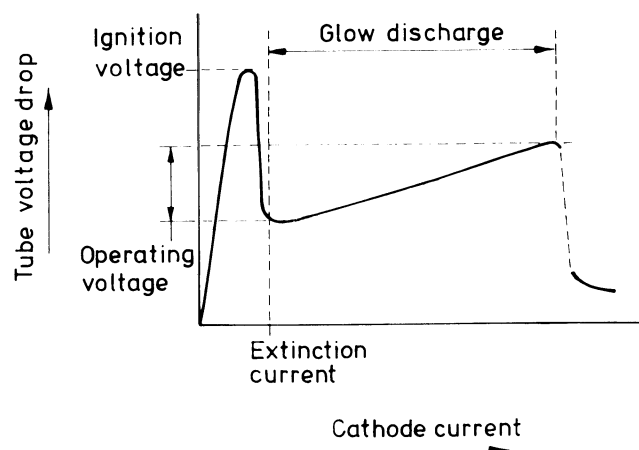


Figure 1. Typical voltage/current characteristic

Figure 1 illustrates the typical voltage/current characteristic of a glow modulator tube and the terms used to describe its operation.

1.3.1 glow modulator tube. A glow discharge tube in which variation of the cathode current modulates the luminous intensity of the cathode glow. The light output is propagated in a defined solid angle.

1.3.2 effective luminous intensity. Luminous intensity of a comparison source operated at a specified colour temperature and which produces the same response as the glow modulator tube, evaluated under specified conditions of measurement.

NOTE. This is expressed in the form 'the effective luminous intensity with the comparison source at *colour temperature and measured with **spectral sensitivity curve is . . . cd', where '*' is the colour temperature of the comparison source and '**' refers to the relative spectral sensitivity curve of the evaluating photodetector (e.g. S20 response).

1.3.3 operating voltage. The tube voltage drop at a stated value of cathode current which is within the operating range of the glow discharge.

1.3.4 light output pulse rise time. The time interval during which the effective luminous intensity rises from 10 % of the pulse amplitude to 90 % of the pulse amplitude when the operating current is increased by a stated amount at a rate which is sufficiently fast not to restrict the light output pulse rise time.

1.3.5 light output pulse fall time. The time interval during which the effective luminous intensity falls from 90 % of the datum level to 10 % of the datum level when the operating current is reduced by a stated amount at a rate which is sufficiently fast not to restrict the light output pulse fall time.

1.3.6 entrance pupil — of a photodetector. The stop,  **Documents**
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[1.3.7]

or stop image, which determines the cross section of the beam of light received by the photodetector from a point on the tube under test.

1.3.7 aperture angle (acceptance angle, collection angle) — **of a photodetector.** The angle subtended by the diameter of the entrance pupil at a stated point on the tube under test.

1.4 Letter symbols, signs and abbreviations

For the purposes of this British Standard any letter symbols used shall be at the discretion of the detail specification writer and shall preferably be in accordance with BS 1991 where applicable.

1.5 Graphical symbols

For the purposes of this British Standard any graphical symbols used shall be at the discretion of the detail specification writer and shall preferably be in accordance with BS 3939 where applicable.

1.6 Marking of the tube and packing

The following symbols or codes shall be clearly and durably marked on the tube in the following order of preference as space permits. All symbols and codes except terminal marking and operating conditions shall also appear on the primary pack, e.g. carton, box, plastic envelope, etc., used as initial protection or wrapping for delivery:

- (a) manufacturer's part designation number and special marking relating to hazard and special operating conditions;
- (b) manufacturer's factory identification code;
- (c) date code;
- (d) number of the detail specification.

1.7 Eligibility for qualification approval

The primary stage of manufacture is the joining together of all piece parts.
The subcontracting of the primary stage or any subsequent stage to an unapproved manufacturer is prohibited.

1.8 Structurally similar tubes

When simultaneous or successive production is proceeding on several types of the tube having common features, those common features may be sampled from the complete range of types instead of from each lot of each type.

When this clause is applicable, the extent of structural similarity and its effect on sampling for qualification approval and the formation of inspection lots for quality conformance inspection shall be stated by the Chief Inspector subject to the approval of the National Supervising Inspectorate.

Examples of common features are as follows:

- envelope dimensions;
- bases;
- cathode material;
- cathode cavity dimensions;
- gas type and pressure.

1.9 Delayed delivery

Tubes held by the manufacturer for a period exceeding

one year following acceptance inspection shall be re-inspected prior to release as prescribed in the detail specification.

1.10 Procedure for qualification approval

The manufacturer shall comply with the general requirements of the basic rules governing qualification approval (see 2.3 of BS 9000 : Part 1).

The following table supersedes the sample size requirements of 2.3.1 of BS 9000 : Part 1, for production lot sizes below 280 specimens. The samples may be drawn from one production lot. When using the table a second sample, as shown, shall be taken when the quantity of defectives exceeds the acceptance quantity but is less than the reject quantity.

Group	Lot size	Sample size	Accept	Reject	Second sample	Total sample	Accept	Reject
A & B	Up to 7	6	0	1				
		8–280	0	2	2	8	1	2
C & D	Any	2	0	2	2	4	1	2

1.11 Certified test records

See 2.8 and appendix C of BS 9000 : Part 1.

1.12 Standard ratings and characteristics

Not applicable.

1.13 Unchecked parameters

Not applicable.

1.14 Procedure to be followed in the event of failures in group C or D inspection

The procedure described in 2.6.4 of BS 9000 : Part 1 shall be used.

1.15 Ordering information

This shall be stated in the detail specification.

1.16 Release prior to completion of group B tests

Not applicable.

Section two. Test procedures

This section contains the preferred test methods for quality assessment of glow modulator tubes. The detail specification states which of the tests are applicable to a particular tube together with the appropriate inspection levels and acceptable quality levels.

2.1 Test and measurement conditions

All tests shall be carried out under the standard atmospheric conditions for testing as specified in 5.3 of BS 2011 : Part 1.1 : 1977.

The limits quoted in the detail specification are absolute. The limits used for acceptance inspection testing are inset to take account of measurement uncertainty.

2.2 Visual inspection

Unless otherwise specified, visual inspection shall be performed under normal factory lighting conditions

and without visual aids.

Visual inspection shall be carried out for good appearance and workmanship and shall include clarity and correctness of marking; other requirements may be listed in the detail specification.

2.3 Dimensioning and gauging procedures

Dimensional measurements shall be carried out either by use of conventional measuring instruments (vernier calipers, rules, micrometers, etc.) or by gauges. Gauges shall be in accordance with BS 448 where applicable.

2.4 Electrical test procedures

2.4.1 Alternative methods of test. See 2.4.2 of BS 9000 : Part 1.

2.4.2 Index of test methods. For convenience of identification in detail specifications the following numbering system for test methods has been used:

Title	Method
Ignition voltage	1001
Operating voltage	1002
Extinction current	1003
Effective luminous intensity	1004
Concentricity and dimensions of the light source	1005
Light output pulse rise time	1006
Light output pulse fall time	1007
Relative spectral distribution of the radiant output power	1008

These methods follow 2.7 in this standard.

2.5 Mechanical test procedures

2.5.1 Adhesion of base, base inserts, and cap

2.5.1.1 Purpose. The purpose of the test is to determine the adhesion of bases, base inserts and caps which are not integral parts of the tube envelope, but which are permanently attached to the envelope to constitute a complete tube. (These tests are not intended for purposes of testing glass to metal or ceramic to metal seals.)

2.5.1.2 Procedure. Gradually apply torque to the various items to the value specified in the following table.

Diameter of base or cap size	Torque
mm	N m
Bases less than 16.5	1.3
Bases between 16.5 and 40	2.3
Bases larger than 40	4.6
Medium, small or miniature caps	0.2
Caps larger than 12	0.4

When a base or cap is affixed to the tube envelope by cement the tube shall be subjected to one of the following immersion tests as appropriate.

(a) Bases less than 40 mm diameter. Immerse in boiling water for a minimum period of 6 h.

(b) Bases exceeding 40 mm diameter. Immerse in water at a minimum temperature of 50 °C for a minimum period of 18 h.

After immersion the tubes shall be allowed to cool to room temperature for a maximum period of 1 h, after which there shall be no movement of the cemented joints

when torque specified in the table above is applied.

2.5.2 Base pin solder depth

2.5.2.1 Purpose. The purpose of the test is to determine the depth of solder contact between the tube leads and base pins on those tubes which have rigid leads soldered into base joints.

2.5.2.2 Procedure. The depth of solder contact within the base pins shall be determined either by sectioning soldered joints or by the use of X-ray techniques.

The minimum depth of soldered contacts within the base pins shall be as follows:

Pin diameter	Minimum penetration
mm	mm
2.3	0.8
3.2	0.8
4	1.5
4.8	1.5
larger than 4.8	2.3

It shall be permitted to use tubes which are rejects for electrical or mechanical reasons.

2.6 Environmental test procedures

Tests shall be in accordance with BS 2011 : Part 2.1 with conditions as prescribed in the detail specification.

2.7 Endurance test procedures

2.7.1 Holding period. After completion of manufacture all tubes shall be held in storage for a specified holding period during which they shall not be operated. During this period, marking, potting, painting and gauging may be carried out.

Tubes shall undergo a minimum holding period of 24 h duration.

Those tests which are to be performed before and after completion of the holding period are specified in the detail specification. The remaining tests may, at the discretion of the manufacturer, be performed either before or after the holding period.

2.7.2 Operating endurance. For each tube type (account being taken of structural similarity) the following shall apply:

(a) tubes shall be operated as specified in the detail specification;

(b) at the conclusion of the stated number of hours of operation the tubes shall be subjected to the specified post-endurance tests;

(c) tubes defective on characteristics which are not the subject of post-endurance tests may be used.

When prescribed in the detail specification as a periodic test, the following table gives sample size in relation to annual production.

Annual production	Annual sample size
Less than 120	1
121 to 300	2
301 to 600	3
More than 600	1 per 200 (for intermediate quantities rounded up to the next whole number)