



BS 3677 : 1982

UDC 621.327.534.2

© British Standards Institution. No part of this publication may be photocopied or otherwise reproduced without the prior permission in writing of BSI.

British Standard Specification for

High pressure mercury vapour lamps

Lampes à vapeur de mercure à haute pression — Spécifications

Quecksilberdampf-Hochdrucklampen

British Standards Institution

AVA Documents
Document Sharing Hub

BS 3677 : 1982

Contents

	Page		Page
Foreword	Inside front cover	Section two. Lamp data sheets	
Cooperating organizations	Back cover	8. General principles of numbering sheets	10
		9. List of specific lamp types	10
Specification		Section three. Maximum lamp outlines	
Section one. Requirements		10. General	23
1. Scope	1	11. List of maximum lamp outlines	23
2. Definitions	1	Appendices	
3. Marking	2	A. Torsion test	4
4. Lamp dimensions	2	B. Starting and warm-up tests	5
5. Caps	2	C. Methods of measuring electrical and luminous characteristics of the lamp	6
6. Starting and warm-up characteristics	2	D. Methods of measurement of the red ratio of high-pressure mercury vapour lamps	8
7. Electrical and luminous characteristics	2		

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Foreword

This British Standard has been prepared under the direction of the Electrical Illumination Standards Committee. It is technically equivalent to IEC Publication 188 : 1974 'High pressure mercury vapour lamps' and Amendments 1 and 2 published by the International Electrotechnical Commission (IEC) and therefore implements CENELEC Harmonization Document No. 82S4. It supersedes BS 3677 : 1974 which is now withdrawn.

The IEC identification of the data sheets has been retained for simplicity and to avoid any confusion in identification.

For ease of production the modified IEC text has been used throughout. Some terminology and certain conventions are not identical with those used in British Standards.

British Standard Specification for

High pressure mercury vapour lamps

SECTION ONE — REQUIREMENTS

1. Scope

This British Standard specifies requirements for high-pressure mercury vapour lamps with or without a red correcting fluorescent coating, operating on a.c. mains with a ballast complying with BS 4782.

Details of maximum lamp outlines are also included for guidance in luminaire design.

Notes 1.— A method of measurement of red ratio for lamps with a red fluorescent coating is included and a minimum value of red ratio will be specified by subsequent amendment action.

2.— The tests included in this specification are type tests.

2. Definitions

For the definitions of the general terms used in this standard, reference should be made to BS 4727: Part 4. For the purpose of this publication the following definitions shall apply:

2.1 *Rated wattage*

The wattage marked on the lamp.

2.2 *Lamp starting voltage*

The r.m.s. voltage at the lamp terminals at which the lamp starts.

2.3 *Minimum open circuit voltage for stable operation*

The minimum open circuit voltage to be provided by an inductive ballast for stable operation of the lamp.

2.4 *Initial readings*

The photometric and electrical measurements, made at the end of the ageing period.

2.5 *Red ratio*

The ratio of the luminous flux emitted by the lamp in the red portion of the visible spectrum to the total luminous emission of the lamp.

For the purpose of this standard, the red portion is defined by the part of the visible spectrum comprising the wavelengths above 600 nm.

2.6 *Rated luminous flux*

The rated luminous flux expressed in lumens, declared by the manufacturer or the responsible seller.

2.7 *Reference ballast*

A special inductive type ballast designed for use: *a)* in testing lamps, *b)* as a comparison standard for testing ballasts, and *c)* in the selection of reference lamps. It is essentially characterized by a stable voltage/current ratio which is relatively uninfluenced by variations in current, temperature and magnetic surroundings.

2.8 Lamp neck length

The distance measured parallel to the lamp axis between the bottom of the cap contact and that point on the lamp bulb where the diameter is 2 mm greater than the maximum neck diameter.

2.9 Calibration current

The value of the current on which the calibration and control of the reference ballast are based.

2.10 Type test

A test or a series of tests made on a type test sample for the purpose of checking compliance of the design of a given product with the requirements of the relevant specification.

2.11 Type test sample

A sample consisting of one or more similar units submitted by the manufacturer or the responsible vendor for the purpose of a type test.

3. Marking

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

- a) mark of origin. This may take the form of a trade mark, the manufacturer's identification mark or the name of the responsible seller;
- b) rated wattage.

4. Lamp dimensions

The lamp dimensions shall comply with the requirements given on the relevant lamp sheet.

5. Caps

- a) The cap on the finished lamp shall comply, as appropriate, with the requirements of sheet Nos. 7006 - 27, - 28, - 50 or - 52 of BS 5101 : Part 3 : 1975
- b) The cap shall be so constructed and attached to the bulb that it will withstand the torsion test specified in Appendix A.

6. Starting and warm-up characteristics

Before ageing, lamp starting and warm-up characteristics shall be checked as specified in Appendix B.

Note. — Normally it should be expected that at 100% of the rated supply voltage lamps will start satisfactorily at temperatures down to -18°C .

7. Electrical and luminous characteristics**7.1 Position of operation during ageing and testing**

The lamp shall operate in a vertical, cap up position.

7.2 Ageing

Before the initial readings are taken the lamp shall be aged for 100 h using the circuit and relevant requirements as specified in Appendix B. The supply voltage shall not vary by more than $\pm 10\%$ * and the frequency by not more than ± 1 Hz.

* This is to avoid the necessity of having a stabilized voltage and to permit the use of a normal mains supply.

7.3 *Lamp voltage and wattage*

- a) The voltage at the lamp terminals using the test conditions in Appendix C shall be within the limits specified in the relevant lamp sheet.
- b) The wattage dissipated by the lamp using the test conditions in Appendix C shall not exceed the maximum wattage specified in the relevant lamp sheet.

7.4 *Luminous flux*

The luminous flux of individual lamps shall be not less than 90% of the rated value using the test conditions in Appendix C.

7.5 *Red ratio (fluorescent coated lamps only)*

The red ratio shall be not less than 00% (value under consideration, see clause 1), using the test conditions in Appendix D.

7.6 *Lamp stability with rapidly reduced supply voltage*

Lamps shall not extinguish if the supply voltage falls from 100% to 90% of the rated voltage in not more than 0.5 s and remains at that value for at least 5 s.

APPENDIX A

TORSION TEST

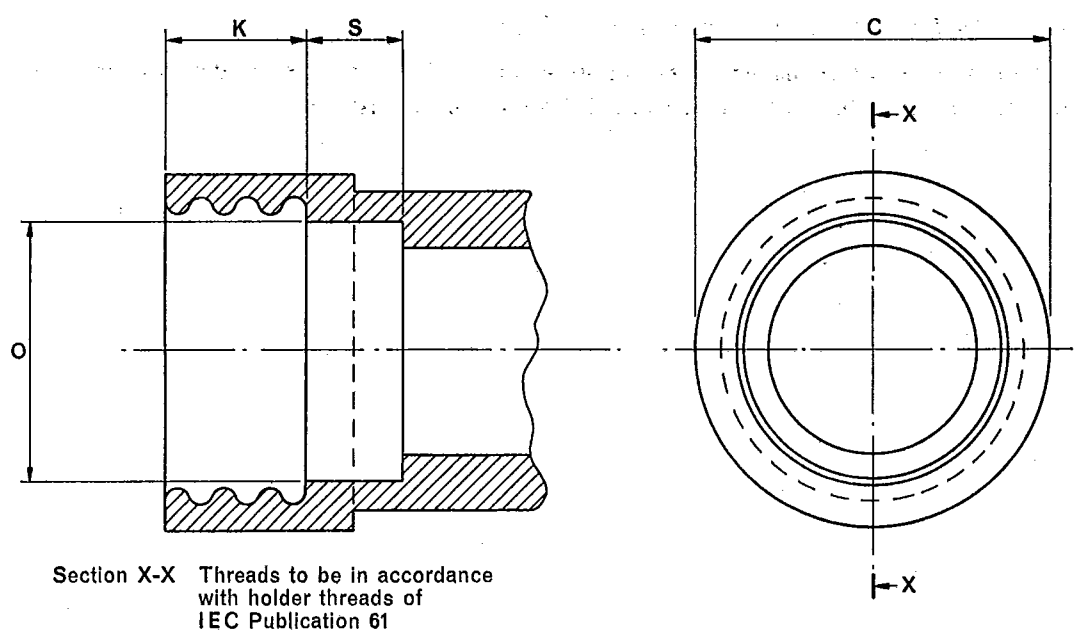
Torsion test holder for screw caps E27, E39 and E40

The torsion test shall be carried out using the special lampholders shown in Figure 1 and with the following values of torque gradually applied:

E27 3.0 Nm

E39 5.0 Nm

E40 5.0 Nm



(Dimensions in mm)

Dimension	E27	E39 & E40	Tolerance
C	32.0	47.0	Minimum
K	11.0	19.0	± 0.3
O	23.0	34.0	± 0.1
S	12.0	13.0	Minimum

FIGURE 1

APPENDIX B

STARTING AND WARM-UP TESTS

1. General

- 1.1 Lamps shall not be operated during the 5 h immediately prior to making this test.
- 1.2 They shall be tested and aged using a nominal 50 Hz or 60 Hz supply (in an ambient temperature between 20 °C and 30 °C) using the circuit shown in Figure 2.
- 1.3 The ballast shall be of the inductive type and shall satisfy the requirements of BS 4782.
- 1.4 During these tests, lamps shall be operated in a vertical, cap up position.

2. Starting test

- 2.1 The voltage V_1 shall be set to the starting voltage given in the relevant lamp sheet.
- 2.2 The voltmeter V_2 shall be open-circuited using switch S_1 .
- 2.3 The ammeter shall be short-circuited, using switch S_2 .

3. Warm-up test

- 3.1 Immediately after starting, the supply voltage shall be adjusted to maintain the warm-up lamp current specified in the relevant lamp sheet.
- 3.2 The supply voltage shall be varied during the warm-up time to maintain this current constant.
- 3.3 The lamp shall be considered satisfactory if the minimum warm-up voltage at lamp terminals is achieved within the time specified in the relevant lamp sheet.

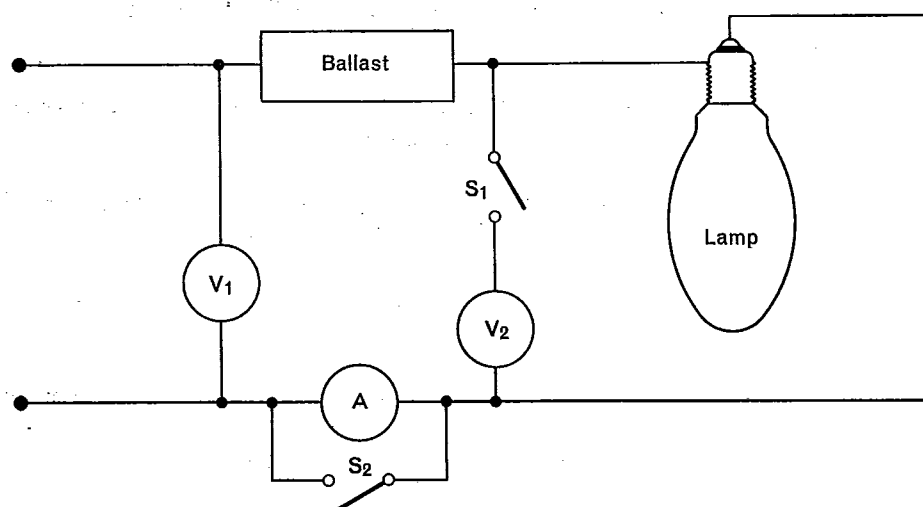


FIGURE 2

APPENDIX C

METHODS OF MEASURING ELECTRICAL AND LUMINOUS CHARACTERISTICS OF THE LAMP

1. General

- 1.1 Ballasts used for these tests shall be reference ballasts having a voltage-to-current ratio and power factor as specified in the relevant lamp sheets and meeting the general requirements for reference ballasts given in BS 4782.
- 1.2 Lamps shall be tested in a circuit as shown in Figure 3, page 19, using a nominal 50 Hz or 60 Hz supply as appropriate, at an ambient temperature of between 20 °C and 30 °C.

2. Supply

- 2.1 The frequency shall be that for which the ballast is designed with a tolerance of $\pm 0.5\%$.
- 2.2 The voltage at the supply terminals is adjusted to the rated value of the reference ballast used.
- 2.3 The total harmonic content of the supply voltage shall not exceed 3%, the harmonic content being defined as the root-mean-square (r.m.s.) summation of the individual harmonic components, using the fundamental as 100%.
Note. — This implies that the source of supply shall have sufficient power and that the supply circuit shall have a sufficiently low impedance compared with the ballast impedance and care should be taken that this applies under all conditions that occur during the measurement.
- 2.4 During the period of stabilization, the supply voltage and frequency should be stable within $\pm 0.5\%$, this tolerance being reduced to $\pm 0.2\%$ at the moment of measurement.

3. Instruments and measurements

- 3.1 Potential circuits of instruments connected across a lamp shall take not more than 3% of the objective lamp current.
- 3.2 Instruments connected in series with the lamp shall have a sufficiently low impedance such that the voltage drop shall not exceed 2% of the objective lamp voltage.
- 3.3 Instruments shall be of a precision appropriate to the requirements and essentially free from wave-form errors.
- 3.4 When measuring lamp voltage, the wattmeter potential circuit shall be open and the wattmeter current coil shall be short-circuited.
- 3.5 When measuring lamp power, the lamp voltmeter circuit shall be open and the ammeter shall be short-circuited. No correction shall be made for the power consumed by the wattmeter potential coil as the potential coil is connected on the lamp side of the current coil.

- 3.6 When measuring luminous flux, the potential circuits of the voltmeter V_2 and the wattmeter shall be open and the ammeter and wattmeter current coil shall be short-circuited.

Note. — The reference in Sub-clause 3.5 to the absence of a correction of the consumption of the voltage circuit of the wattmeter arises from an empirical observation which shows that in most cases, at the same supply voltage, the said consumption compensates approximately for the reduction of the power consumption of the lamp caused by the parallel connection of the voltage circuit of the wattmeter.

If any doubts are felt on this point, it will always be possible to evaluate the compensation error by repeating the measurements with other values of the load in parallel with the lamp.

This is done by adding resistances in parallel with the lamps and by reading each time the power measured by the wattmeter. It is then possible to extrapolate the results obtained in order to determine the true power in the absence of any parallel load.

- 3.7 The lamp shall be operated until the electrical characteristics are stable before any final readings on the lamp are taken.
- 3.8 The measurement of the red-ratio is detailed in Appendix D.

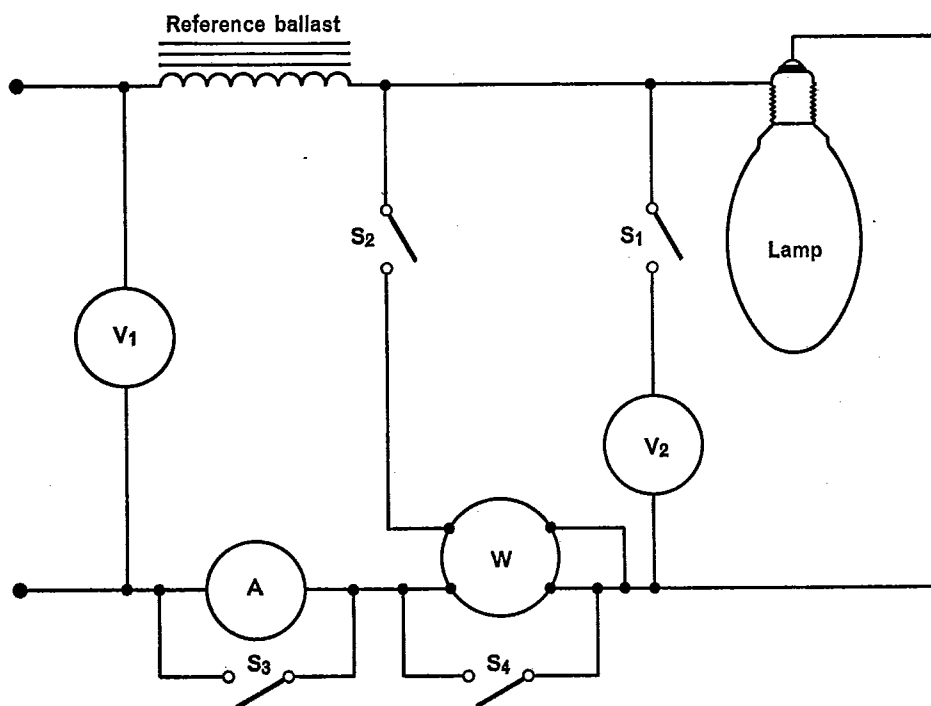


FIGURE 3

APPENDIX D

METHODS OF MEASUREMENT OF THE RED RATIO
OF HIGH-PRESSURE MERCURY VAPOUR LAMPS

1. Lamp and filter requirements

The method described makes use of:

1.1 A high-pressure mercury vapour lamp with fluorescent coating of known spectral distribution.

Let such a lamp be identified by N and let $E_{\lambda N}$ be the relative spectral distribution of the lamp's radiated energy (it will necessarily comprise concentrated energies at the spectral lines). The fluorescent coating of this standard lamp N should emit light of a similar spectral distribution to that of the unknown lamp to be compared with it. This is particularly necessary when the coatings emit principally in the red/orange region (around 610-625 nm).

Note. — Some manufacturers will supply lamps together with the spectral analysis of their radiation. There are also specialized laboratories which undertake such measurements.

1.2 A red filter

The exact type is not specified, but the filter shall comply with the following requirements for its spectral transmission factor:

- a) A value of less than 0.1% at 580 nm.
- b) A fairly high and substantially uniform value above 615-620 nm.

Notes 1. — The value at 580 nm is based on the requirement to show no appreciable transmission for the yellow doublet (577-579 nm) of the mercury spectrum.

- 2. — Even though catalogue data for a given type of filter may indicate it to be satisfactory, there is very often a spread of the spectral characteristics between filters bearing the same type number but coming from different batches. For this reason, the filter should always be selected to ensure compliance with the requirements listed above.

2. Method of measurement

The light of the lamp X to be tested shall be successively measured without and with interposition of the red filter. The ratio of the second measurement to the first one yields an uncorrected measurement r_{uX} of the red ratio.

Lamp N shall then be used to correct this measurement according to the following method:

The light of the lamp N shall be similarly measured without and with the filter and the ratio of these measurements gives a value r_{uN} . The knowledge of the spectral distribution of this lamp then allows its red ratio (r_N) to be computed.

The red ratio, as defined in Sub-clause 2.5, is the ratio of two integrals of the form $\int E_{\lambda} V(\lambda) d\lambda$ over the red band and over the whole of the visible spectrum.

The ratio $c = \frac{r_N}{r_{uN}}$ gives the correction factor required for obtaining the red ratio for lamp X. This red ratio will be given by $r_X = c \cdot r_{uX}$.

The factor c corrects for both:

- a) the relationship between a measurement made with a filter and the value of the red ratio as defined by the two integrals. This is inherent in the principle of the method;
- b) an allowance for the fact that the photo-receiver used for the measurement will not be, in general, ideally adapted to the relative luminous efficiency $V(\lambda)$.

The method assumes that the ratio between the red ratio according to the definition and its uncorrected measurement with the filter is the same for both lamps X and N.

It is this assumption which (as mentioned in Sub-clause 1.1 above) necessitates that the coatings of both lamps N and X emit light of similar spectral distributions.

Notes 1. — The manufacturers of a lamp will generally be able to state whether the types of lamps may or may not be tested with a Type N as reference.

The method also assumes that the spectral characteristic of the filter remains exactly the same when measuring both lamps N and X. Several types of red filters are very sensitive to temperature so that the slope of their spectral transmission factor relative to wavelengths shifts as the temperature varies. This phenomenon directly affects any response located within the region of this curve. This fact is of primary importance when considering the more recent types of coatings used. In such cases it is absolutely necessary to keep the filter at the same temperature when making measurements to be compared. Any significant heating should be avoided: for instance, by keeping the filter/photo-receiver assembly at sufficient distance from the light sources.

Also, if the filter is placed too near to the photo-receiver, inter-reflections may occur. These, however, will not result in any additional error provided that they remain the same for both comparative measurements. Consequently, since the filter is constantly being removed and inserted, it is necessary to make sure that it is always kept in the same position relative to the photo-receiver.

2. — The method does not require any determination of the spectral sensitivity of the photo-receiver. It is only necessary to check that the prescribed characteristics of the filter are obtained.

The method may be used either with an integrating (or Ulbricht) sphere or with directional measurements in a dark-room. In the latter case, a single measurement is sufficient if the fluorescent coating is homogeneous; otherwise, several measurements should be taken in different directions and the mean of the intensities used.

If an integrating sphere is used, a slight selectivity of its internal surface finish is immaterial as this is equivalent to an alteration of the spectral sensitivity of the photo-receiver.

3. — It is recommended that a spectrophotometric check of lamp(s) N should be made after a few hundred hours of operation in order to ascertain whether the spectral distribution is affected by ageing.