AUTOMOTIVE INDUSTRY STANDARD

Provisions concerning the Approval of Filament Light Sources for use in Approved Lamp of Power-driven Vehicles and their Trailers (Revision 3)

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ON BEHALF OF
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER
CENTRAL MOTOR VEHICLE RULES – TECHNICAL STANDING COMMITTEE

SET-UP BY
MINISTRY OF ROAD TRANSPORT & HIGHWAYS
GOVERNMENT OF INDIA

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INTRODUCTION

0.0 The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India, (ARAI), Pune, being the Secretariat of the AIS Committee, has published this standard. For better dissemination of this information ARAI may publish this document on their Web site.

0.1 Accordingly AIS-034 covering mandatory requirements regarding performance of automobile filament light sources and gas discharge light sources for use in vehicles has been published in 2004 and has been implemented thereafter in 2005.The standard was subsequently revised in 2010 and an Amendment no. 1 was further published in 2014.

0.2 With technological developments in filament light sources and Gas discharge light sources, AIS-034 was taken up for revision and now is prepared in two parts. This part covers approval of filament light sources for use in approved lamp on power driven vehicles and their trailers.

0.3 This part is based on ECE R37, Revision 7 Amend 11: Supplement 48 to the 03 series of amendments – Date of entry into force: 22nd June 2022.

0.4 While preparing this standard attempt have been made to align with the above ECE regulation. However, certain changes were necessary in the Indian context.

0.5 The following standards contain provisions, which through reference in this text constitute provisions of the standard

AIS-037	Procedure for Type Approval and Establishing Conformity of Production for Safety Critical Components
IEC Publication 60061,third edition,	Lamp Caps and Holders together with Gauges for the Control of Interchangeability and Safety - Part 1: Lamp Caps
IEC 60051	Direct acting Indicating AnalogueElectrical measuring Instruments and their Accessories.
IEC Publication 15.2 Colorimetry, 1986	CIE Recommendation on Colorimetry, 2nd edition.

0.6 The AISC panel and Automotive Industry Standards Committee (AISC) committee responsible for formulation of this standard is given in Annex L and M respectively.

Provisions concerning the Approval of Filament Light Sources for use in Approved light source of Power-driven Vehicles and their Trailers.

List of Annexes

Provisions concerning the Approval of Filament Light Sources for use in Approved Light Source of Power-driven Vehicles and their Trailers

1.0 SCOPE

This standard applies to filament light sources and their LED replacement light sources shown in Annex A and intended for use in approved lamps of power-driven vehicles and of their trailers.

2.0 ADMINISTRATIVE PROVISIONS

2.1 Definitions:

2.1.1 Definition of "category"

The term "category" is used in this standard to describe different basic design of standardized filament light sources, producing light by incandescent technology, and to describe different basic design of standardised LED replacement light sources, producing light by LED technology.

Each category has a specific designation, as for example: "H4", "P21W", "T4W", “PY21W” or “RR10W”; however, a LED replacement light source category has the same designation[(1)] as its counterpart filament light source category, as for example "H11".

2.1.2 Definition of "type"

2.1.2.1 Filament light sources of different [(2)] "types" are filament light sources within the same filament light source category which differ in such essential respects as:

2.1.2.1.1. Trade name or mark;

Note: Filament light sources bearing the same trade name or mark but produced by different manufacturers are considered as being of different types. Filament light sources produced by the same manufacturer differing only by the trade name or mark may be considered to be of the same type.

2.1.2.1.2 Bulb design and/or cap design, in so far as these differences affect the optical results;

2.1.2.1.3. Rated voltage;

2.1.2.1.4 Halogen.

(1) A LED replacement light source category has the same designation, as it is designed to replace its counterpart filament light source category with equivalent performance; however, it is a distinct category due to another light producing technology being used, described in a separate light source category data sheet shown in Annex 1.

(2) A selective-yellow bulb or an additional selective-yellow outer bulb, solely intended to change the colour but not the other characteristics of a filament light source emitting white light, does not constitute a change of type of the filament light source.

2.1.2.2. LED replacement light sources of different [3] "types" are LED replacement light sources within the same LED replacement light source category which differ in such essential respects as:

2.1.2.2.1 Trade name or mark;

LED replacement light sources bearing the same trade name or mark but produced by different manufacturers are considered as being of different types. LED replacement light sources produced by the same manufacturer differing only by the trade name or mark may be considered to be of the same type;

2.1.2.2.2. Light source design, in so far as these differences affect the optical results;

2.1.2.2.3. Rated voltage;

2.1.2.2.4. High-efficiency;

2.1.2.2.5. Particular electrical polarity;

2.1.2.2.6. Oversize cap.

2.1.2.3. LED replacement light sources and their counterpart filament light sources are considered as being of different types.

2.2. **Application for approval**

2.2.1. Application for approval shall be submitted by the owner of the trade name or mark, or by his duly accredited representative.

2.2.2. Every application for approval shall be accompanied (see also paragraph 2.4.2.) by:

2.2.2.1. Drawings in triplicate, sufficiently detailed to permit identification of the light producing technology and of the type;

2.2.2.2. A brief technical description, which:

2.2.2.2.1. In the case of a filament light source, shall include the shape of the filament if the relevant light source sheet specifies that a straight or V-shaped filament is allowed;

2.2.2.2.2. In the case of a LED replacement light source, shall include a statement whether the following conditions apply to LED replacement light source:

(a) It is a high-efficiency LED replacement light source,
(b) An AE device (Additional Electronics device as defined in R.E.5) is included for applications listed according to paragraph 4.2.2.1.2.,
(c) It has a particular electrical polarity,
(d) It is equipped with an oversize cap;

[3] An optional AE device for the LED replacement light source does not constitute a change of type of the LED replacement light source.

2.2.2.2.3. In the case of a high-efficiency LED replacement light source, shall include the range of the electrical current at test voltage; this range shall be below the objective minimum value of the electrical current as specified in the data sheet of Annex A, which does not apply to the high-efficiency LED replacement light source without or with disconnected AE device;

2.2.2.2.4 In the case of AE device(s) is/are included, shall include trade name(s) or mark(s) of the AE device(s), the rated voltage, the maximum wattage and the specific identification code(s), if already granted to other LED replacement light source(s) together with this/these AE device(s).

2.2.2.3 Five samples of each colour which has been applied for;

2.2.2.3.1 Five samples of AE device(s) if prescribed by the applicant according to paragraph 2.2.2.2.2;

2.2.2.4 Documents, in the case of LED replacement light sources, showing:

2.2.2.4.1. The information to be displayed on the packaging of LED replacement light sources;

2.2.2.4.2. The instructions to be contained by the packaging of LED replacement light sources if at least one of the conditions in paragraph 2.2.2.2.2. applies; an initial listing as described in paragraph 4.2.2.1 shall be included.

2.2.3. In the case of a type of light source, or AE device suitable to a type of LED replacement light source, differing only by the trade name or mark from a type of light source, or AE device suitable to a type of LED replacement light source, that has already been approved it shall be sufficient to submit:

2.2.3.1. A declaration by the manufacturer that the type submitted is identical (except in the trade name or mark) and has been produced by the same manufacturer as, the type already approved, the latter being identified by its approval code;

2.2.3.2. Two samples bearing the new trade name or mark.

2.2.4. The Testing Agency shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

2.3. **Inscriptions**

2.3.1. Light sources submitted for approval shall bear [(4)]

2.3.1.1. The trade name or mark of the filament light source manufacturer;

2.3.1.2. The rated voltage. However, for light sources for which only a 12 V type is standardized and the maximum allowed bulb diameter of which does not exceed 7.5 mm, the rated voltage need not be marked;

(4) The luminous characteristics shall not be adversely affected

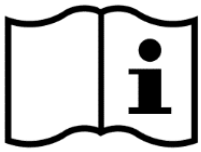
2.3.1.3. The designation of the relevant category. The wattage character "W" of this designation need not be marked if the maximum allowed bulb diameter of the light source type does not exceed 7.5 mm;

2.3.1.4. The rated wattage in the case of a filament light source, (in the sequence, high wattage/low wattage filament for dual-filament light sources); this need not be indicated separately if it is part of the international designation of the relevant filament light source category;

2.3.1.5. The character "ⱧE" [5] in the case of a high-efficiency LED replacement light source;

2.3.1.6. A space of sufficient size to accommodate the approval mark.

2.3.1.7. In the case of a LED replacement light sources for which at least one of the conditions in paragraph 2.2.2.2.2. applies, the following symbol: [6]



2.3.2. The space mentioned in 2.3.1.6. above shall be indicated in the drawings accompanying the application for approval.

2.3.3. Halogen filament light sources meeting the requirements of 3.7. below shall be marked with a "U".

2.3.4. LED replacement light sources shall be marked with "LEDr".

2.3.5. The AE device(s) or the cable(s) permanently fixed to the AE device(s), if any, shall bear:

2.3.5.1. The trade name or mark of the applicant;

2.3.5.2. The rated voltage and maximum wattage;

2.3.5.3. The specific identification code(s), or if it concerns a new application, a space sufficient to accommodate the specific identification code.

2.3.6. Reserved

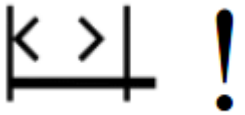
2.3.7. Reserved

2.3.8. LED replacement light sources with a particular electrical polarity that operate in only one position while by design the LED replacement light source or its electrical connector can be inserted in more than one position, shall be marked with the electrical polarity, which is to be connected to the respective terminals of the light source, using the symbols "+" or "⎓" according to the electrical polarity specification given in the relevant light source category data sheet, placed closely to or on the respective terminal.

[5] This character can be composed of "H" overlapping with "E" or of "Ⱨ" (Unicode 0370 Hex) connected to "E" (Unicode 0045 Hex).

[6] ISO 7000, symbol 1641

2.3.9. LED replacement light sources with an oversize cap, of which geometric dimensions of the cap, not relevant for interchangeability, exceed those specified in the relevant cap data sheet of IEC Publication 60061, but which are within maximum allowed deviations as specified in the relevant light source category data sheet, shall be marked with the following symbol,[7] followed by the exclamation mark, separated by a single character space, as follows:



2.3.10. Inscriptions other than those covered by paragraphs 2.3.1. and 2.4.3. may be affixed, on the condition that they do not adversely affect the luminous characteristics.

2.4. **Approval**

2.4.1. If all samples of a type of light source which are submitted in pursuance of 2.2.2.3. or 2.2.3.2. above meet the requirements of this standard, whereby for LED replacement light sources also the provision in paragraph 3.11.7.1. applies, approval shall be granted.

2.4.2. An approval mark shall be assigned to each type approved.

2.4.3. To every light source conforming to a type approved under this standard, there shall be affixed in the space referred to in 2.3.1.6., in addition to the inscriptions required under 2.3.1., approval mark assigned as per AIS-037.

2.4.3.1. Reserved

2.4.3.2. Reserved

2.4.4. Reserved

2.4.5. The marks and inscriptions specified in paragraphs 2.3.1., 2.3.5., 2.3.7., 2.3.8. and 2.4.3. shall be clearly legible and be indelible

2.4.6. Reserved

3.0 TECHNICAL REQUIREMENTS

3.1. **Definitions**

3.1.1. **Rated voltage:** voltage (in volts) marked on the filament light source;

3.1.2. **Rated wattage:** wattage (in watts) marked on the filament light source which may be incorporated into the international designation of the relevant category;

[7] ISO 7000, symbol 919

3.1.3. **Test voltage:** The voltage, at the input terminals of filament light source for which the electrical and photometric characteristics of the filament light source are intended and are to be tested.

3.1.4. **Objective values**: means design value(s) to be achieved, within the specified tolerances, when the filament light source is energized at specified test voltage(s);

3.1.5. **Standard (étalon) filament** light source: a special filament light source used for the testing of lighting and light-signalling devices. It has reduced tolerances for dimensional, electrical and photometric characteristics as specified on the relevant data sheet.

3.1.6. **Reference luminous flux:** means an accurately specified luminous flux value of a standard filament light source serving as a reference for the optical characteristics of a lighting or light signalling device;

3.1.7. **Measuring luminous flux**: specified value of the luminous flux for testing a filament light source in a standard headlamp as specified in paragraph 3.8 with an internal shield to produce the cut-off.

3.1.8. **Reference axis**: an axis defined with reference to the cap and to which certain dimensions of the filament light source are referred;

3.1.9. **Reference plane**: a plane defined with reference to the cap and to which certain dimensions of the filament light source are referred.

3.1.10. **Filament light source**: a light source where the only element for visible radiation is one or more filaments producing thermal radiation.

3.1.11. **Light source**: means one or more elements for visible radiation, with a base for mechanical and electrical connection, possibly assembled with one or more components to control the elements for visible radiation;

3.1.12. **LED replacement light source:** means a LED light source designed to replace in a device a counterpart light source with the same category designation, producing light by another light generating technology.

3.1.13. **AE device:** means an additional electronics device not integrated with, but designed to connect to, a high-efficiency LED replacement light source with the purpose to augment the electrical current without changing the other characteristics of this light source.

3.2. General specifications

3.2.1. Each sample submitted shall conform to the relevant specifications of this standard.

3.2.2. Light sources shall be so designed as to be and to remain in good working order when in normal use. They shall moreover exhibit no fault in design or manufacture.

Note: This is a general requirement and no verification is needed for this paragraph to approve the filament light source for compliance to this standard.

3.2.3 The filament(s) shall be the only element(s) of the filament light source that generate and emit light when energised.

The solid-state junction(s) and possibly one or more elements for fluorescence-based conversion shall be the only element(s) of the LED replacement light source that generate(s) and emit(s) light when energized.

3.3. **Manufacture**

3.3.1. Light sources shall exhibit no scores or spots which might impair their efficiency and their optical performance. This shall be verified for LED replacement light sources when commencing approval testing and when required in the respective clause(s) in this standard.

3.3.2. Light sources shall be equipped with standard caps complying with the cap data sheets of IEC Publication 60061, as specified on the individual data sheets of Annex A.

3.3.2.1. LED replacement light sources shall be equipped with a cap of the same cap designation as specified for its counterpart filament light sources with the same category designation.

3.3.2.2. Geometric dimensions of the cap of the LED replacement light source, not relevant for interchangeability, may deviate from those specified in the relevant cap data sheet of IEC Publication 60061 within maximum allowed values if these maximum deviations are specified in the relevant light source category data sheet (oversize cap).

3.3.3. The cap shall be strong and firmly secured to the bulb of the filament light source.

3.3.4. To ascertain whether light sources conform to the requirements of clauses 3.3.1.to 3.3.3. above, a visual inspection, a dimension check and, where necessary, a trial fitting into the holder as specified in IEC publication 60061 shall be carried out.

3.4. **Filament light sources (incandescent technology)**

3.4.1. **Tests**

3.4.1.1. Filament light sources shall first be aged at their test voltage for approximately one hour. For dual-filament light sources, each filament shall be aged separately. In the case of filament light sources, for which more than one test voltage is specified, the highest test voltage value shall be used for ageing

Note: In case of in house tests carried out by the filament light source manufacturer, the ageing time may be reduced from one hour to a value as per the manufacturer's practice.

3.4.2. In the case of a filament light source having a coated bulb, after the ageing period corresponding to 3.4.1.1., the surface of the bulb shall be lightly wiped

with a cotton cloth soaked in a mixture of 70 vol. per cent of n-heptane and 30 vol. per cent of toluol. After about five minutes, the surface shall be inspected visually. It shall not show any apparent changes.

3.4.3. The position and dimensions of the filament shall be measured with the filament light sources being supplied with current at from 90 per cent to 100 per cent of the test voltage. In the case of filament light sources, for which more than one test voltage is specified, the highest test voltage value shall be used for measurement of the position and dimensions of the filament.

3.4.4. Unless otherwise specified, electrical and photometric measurements shall be carried out at the test voltage(s).

3.4.5. Electrical measurements shall be carried out with instruments of at least class 0.2.

3.4.6 In the case where the selective-yellow colour is allowed, the luminous flux of the filament light source with the selective-yellow outer bulb shall be at least 85 per cent of the specified luminous flux of the relevant filament light source emitting white light.

3.5. **Filament position and dimensions**

3.5.1. The geometric shapes of the filament shall in principle be as specified on the filament light source data sheets of Annex A.

3.5.2. For line filaments the correct position and shape shall be checked as specified in the relevant data sheets.

3.5.3. If the filament is shown on the filament light source data sheet in at least one view as a point, the position of the luminous centre shall be determined in conformity with Annex D.

3.5.4. The length of a line filament shall be determined by its ends, defined - unless otherwise specified on the relevant data sheet - as the apices of the first and the last filament turn as seen in projection perpendicular to the reference axis of the filament light source. Such an apex shall comply with the requirement that the angle formed by the legs shall not exceed 90°. In the case of coiled-coil filaments the apices of the secondary turns shall be taken into account. Apices outside the point of connection to the current lead-in legs shall be disregarded for the determination of the filament length.

3.5.4.1. For axial filaments the extreme position of the apices considered shall be determined by rotating the filament light source about its reference axis. The length shall then be measured in a direction parallel to the reference axis.

3.5.4.2. For transverse filaments the filament axis shall be placed perpendicular to the direction of projection. The length shall be measured in a direction perpendicular to the reference axis.

3.6. **Colour**

3.6.1. The colour of the light emitted by the filament light source shall be white unless otherwise specified on the relevant data sheet.

3.6.2. The definitions of the colour of the light emitted, given in AIS-008 Rev.3. and its amendments in force at the time of application for type approval, shall apply to this standard.

3.6.3. The colour of the light emitted shall be measured by the method specified in Annex E. Each measured value shall lie within the required chromaticity area.(8) (For Conformity of Production purposes and for amber and red colour only, at least 80 per cent of the measuring results shall lie within the required chromaticity area.) Moreover, in the case of filament light sources emitting white light, the measured values shall not deviate more than 0.020 units in the x and/or y direction from a point of choice on the Planckian locus (CIE 015:2004, 3rd edition). Filament light sources for use in light-signalling devices shall meet the requirements as specified in paragraph 2.4.2. of IEC publication 60809, Edition 3.

3.7. **UV radiation**

The UV radiation of a halogen filament light source be such that:

$$K1 = \frac{\int_{\lambda=315\,nm}^{400\,nm} Ee(\lambda)\cdot d\lambda}{k_m \cdot \int_{\lambda=380\,nm}^{780\,nm} Ee(\lambda)\cdot V(\lambda)\cdot d\lambda} \le 2\cdot 10^{-4}\ W/lm$$

$$K2 = \frac{\int_{\lambda=250\,nm}^{315\,nm} Ee(\lambda)\cdot d\lambda}{k_m \cdot \int_{\lambda=380\,nm}^{780\,nm} Ee(\lambda)\cdot V(\lambda)\cdot d\lambda} \le 2\cdot 10^{-6}\ W/lm$$

where:

E_e (λ) (W/nm) is the spectral distribution of the radiant flux;

V (λ) (1) is the spectral luminous efficiency;

k_m = 683 (lm/W) is the photometric radiation equivalent;

λ (nm) is the wave length.

This value shall be calculated using intervals of five nanometers.

(8) For conformity of production purposes of amber and red colour only, at least 80% of the measuring results shall lie within the required chromaticity area.

3.8. **Observation concerning selective-yellow colour**

An approval of a filament light source type under this standard may be granted, pursuant to 3.6. above, for a filament light source emitting white light as well as selective-yellow light.

3.9. **Check on optical quality**

(Applies only to filament light sources with an internal shield to produce the cut-off except S2 bulb).

3.9.1. This check on optical quality shall be carried out at a voltage such that the measuring luminous flux is obtained; the specifications of 3.4.6. are to be observed accordingly.

3.9.2. For 12-Volt filament light sources emitting white light:

The sample which most nearly conforms to the requirements laid down for the standard filament light source shall be tested in a standard headlamp as specified in 3.9.5. and it shall be verified whether the assembly comprising the aforesaid headlamp and the filament light source being tested meets the light-distribution requirements laid down for the passing-beam in the relevant standards.

3.9.3. For 6-Volt and 24-Volt filament light sources emitting white light:

The sample which most nearly conforms to the nominal dimension values shall be tested in a standard headlamp as specified in 3.9.5. and it shall be verified whether the assembly comprising the aforesaid headlamp and the filament light source being tested meets the light-distribution requirements laid down for the passing-beam in the relevant standard. Deviations not exceeding 10 per cent of the minimum values will be acceptable.

3.9.4. Filament light sources emitting selective-yellow light shall be tested in the same manner as described in 3.9.2. and 3.9.3. in a standard headlamp as specified in 3.9.5. to ensure that the illumination complies with at least 85 per cent for 12-Volt filament light sources, and at least 77 per cent for 6-Volt and 24-Volt filament light sources, with the minimum values of the light-distribution requirements laid down for the passing-beam in the relevant standard. The maximum illumination limits remain unchanged.

In the case of a filament light source having a selective-yellow bulb, this test shall be left out if the approval is also given to the same type of filament light source emitting white light.

3.9.5. A headlamp shall be deemed to be a standard headlamp if:

3.9.5.1. It satisfies the pertinent conditions of approval;

3.9.5.2. It has an effective diameter of not less than 160 mm;

3.9.5.3. With a standard filament light source it produces at the various points and in the various zones specified for the headlamp type concerned, illumination equal to:

3.9.5.3.1. Not more than 90 per cent of the maximum limits;

3.9.5.3.2. Not less than 120 per cent of the minimum limits prescribed for the headlamp type concerned.

3.10. **Standard filament light sources**

Additional requirements for standard (étalon) filament light sources are given on the relevant data sheets of Annex A.

Bulbs of standard (étalon) filament light sources emitting white light shall not alter the CIE chromaticity coordinates of a luminous source having a colour temperature of 2,856 K by more than 0.010 units in the x and/or y direction.

For standard (étalon) filament light source emitting amber or red light, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices.

3.11 **LED replacement light sources (LED technology)**

3.11.1 Tests

3.11.1.1. LED replacement light sources shall first be aged at their test voltage for at least forty-eight hours. For LED replacement light sources with the counterpart being a dual filament light sources, each function shall be aged separately.

3.11.1.2. Unless otherwise specified, electrical and photometric measurements shall be carried out at the relevant test voltage(s).

3.11.1.3 Electrical measurements as specified in Annex K shall be carried out with instruments of at least class 0.2 (0.2 per cent full scale accuracy).

3.11.2. Position and dimensions of light emitting area

.3.11.2.1. The position and dimensions of the light emitting area shall conform to the requirements as given on the relevant data sheet of Annex A.

3.11.2.2. The measurement shall be made after ageing the LED replacement light source according to paragraph 3.11.1.1.

3.11.3. Luminous Flux

3.11.3.1 When measured according to the conditions specified in Annex K, the luminous flux shall be within the limits given on the relevant data sheet of Annex A.

3.11.3.2. The measurement shall be made after ageing the LED replacement light source according to 3.11.1.1.

3.11.4. Normalized luminous intensity distribution / cumulative luminous flux distribution.

3.11.4.1. When measured according to the test conditions specified in Annex K, the normalized luminous intensity distribution and/or cumulative luminous flux distribution shall be within the limits given on the relevant data sheet of Annex A.

3.11.4.2. The measurement shall be made after ageing the LED replacement light source according to paragraph 3.11.1.1.

3.11.5. Colour

3.11.5.1. The colour of the light emitted by the LED replacement light sources shall be specified on the relevant data sheet. The definitions of the colour of the light emitted given in AIS-008 Rev.3 as amended from time to time at the time of application for type approval shall apply to this standard.

3.11.5.2. The integral value of the chromaticity coordinates shall lie within the required chromaticity area; this shall be measured by the method specified in Annex K.

3.11.5.3. In the case of LED replacement light sources emitting white light and for use in forward lighting devices, the colour shall be measured in the same directions as where the luminous intensity distribution is specified in the relevant data sheet, but only where the specified minimum luminous intensity is exceeding 50 cd/klm. The measured values shall lie within the required chromaticity area for white light.

3.11.5.4. In the case of LED replacement light sources emitting white light, the minimum red content of the light shall be such that:

$$k_{red} = \frac{\int_{\lambda=610nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda}{\int_{\lambda=380nm}^{780nm} E_e(\lambda)V(\lambda)d\lambda} \geq 0,05$$

where:
$E_e(\lambda)$ (unit: W) is the spectral distribution of the irradiance;
$V(\lambda)$ (unit: 1) is the spectral luminous efficiency;
λ (unit: nm) is the wavelength.

This value k_{red} shall be calculated using intervals of one nanometer.

3.11.5.5. The correlated colour temperature [(9)] of LED replacement light sources emitting white light shall be no more than 3000 K, unless otherwise defined in the relevant data sheet of Annex A.

(9) CIE S 017/E: 2020: ILV: International Lighting Vocabulary, or eILV; term 17-23-068

3.11.6. UV-radiation

The UV-radiation of the LED replacement light source shall be such that the LED light source is of the low UV type complying with:

$$k_{UV} = \frac{\int_{\lambda=250\,nm}^{400\,nm} E_e(\lambda) S(\lambda) d\lambda}{k_m \int_{\lambda=380\,nm}^{780\,nm} E_e(\lambda) V(\lambda) d\lambda} \leq 10^{-5}\ W/lm$$

where:

$E_e(\lambda)$ (unit: W) is the spectral distribution of the irradiance;
$S(\lambda)$ (unit: 1) is the spectral weighting function;
$V(\lambda)$ (unit: 1) is the spectral luminous efficiency;
λ (unit: nm) is the wavelength
k_m = 683 lm/W is the maximum value of the luminous efficacy of radiation.

This value k_{UV} shall be calculated using intervals of one nanometer. The UV-radiation shall be weighted according to the values as indicated in the Table below:

(λ)	S(λ)		(λ)	S(λ)		(λ)	S(λ)
250	0.430		305	0.060		355	0.00016
255	0.520		310	0.015		360	0.00013
260	0.650		315	0.003		365	0.00011
265	0.810		320	0.001		370	0.00009
270	1.000		325	0.00050		375	0.000077
275	0.960		330	0.00041		380	0.000064
280	0.880		335	0.00034		385	0.000053
285	0.770		340	0.00028		390	0.000044
290	0.640		345	0.00024		395	0.000036
295	0.540		350	0.00020		400	0.000030
300	0.300						

Note: Values according to "IRPA/INIRC Guidelines on limits of exposure to ultraviolet radiation". Wavelengths (in nanometers) chosen are representative; other values should be interpolated.

3.11.7. Electrical characteristics

3.11.7.1. Electrical characteristics shall be tested at least at one sample and, in the case of a high-efficiency LED replacement light source, including and excluding the AE device(s), if any.

3.11.7.2. The electrical current of the LED replacement light source shall be measured at ambient temperature of (23 ± 2) °C in still air after 1 minute and after 30 minutes of operation at test voltage.

Measured values of the electrical current shall be within the limits as specified in the relevant data sheet of Annex A.

However, in the case of a high efficiency LED replacement light source, measured values of the electrical current shall be within the range(s) specified by the applicant according to paragraph 2.2.2.2.3.; if an AE device is prescribed by the applicant according to paragraph 2.2.2.2.2., measured values of the electrical current shall also be within the limits as specified in the relevant data sheet of Annex A with AE device(s) connected.

3.11.7.3. The LED replacement light source shall comply with the technical requirements to an electrical/electronic sub-assembly (ESA) as specified by AIS-004 (Part 3) (Rev.1) as amended from time to time at the time of application for type approval.

3.11.7.4. The LED replacement light source shall not emit light when energized for 2 milliseconds or shorter.

3.11.7.5. Modulated light, emitted by the LED replacement light source when operated at a pulse-width modulated (PWM) voltage having an effective value, which is equal to the value of the prescribed test voltage, at frequencies of 100 Hz, 125 Hz, 150 Hz, 175 Hz and 200 Hz and all with a 90% duty cycle,[(10)] shall not exhibit any frequency components lower than the applied PWM frequency.

3.11.7.6. If an objective luminous flux value for a dimming mode is specified in the relevant data sheet of Annex A, this shall be tested.

3.11.8. Cap temperature

The cap temperature of the LED replacement light source shall not exceed the maximum cap temperature value indicated in the relevant datasheet of Annex A. This shall be verified (except for high-efficiency types) by measurement according to the conditions specified in Annex K.

[(10)] ON time as percentage of the total time of one PWM cycle.

4.0 REQUIREMENTS TO THE PACKAGING OF LED REPLACEMENT LIGHT SOURCES

4.1. Each package shall display the following information:

4.1.1. The trade name or mark of the applicant;

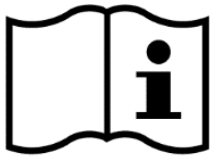
4.1.2. The rated voltage;

4.1.3. The designation of the LED replacement light source category and separated by a single character or line space "LEDr";

4.1.4. The approval code;

4.2. In the case of LED replacement light sources for which at least one of the conditions in paragraph 2.2.2.2.2. applies, the following requirements apply:

4.2.1. Each package shall also display the following symbol: [11]



4.2.2. Each package shall contain instructions:

4.2.2.1. Reserved

4.2.2.1.1. Stating that this LED replacement light source, including AE device(s), if listed, is suitable (or not) for fitment in these listed applications;

4.2.2.1.2. Providing information for these listed applications, necessary for installation and proper functioning of the LED replacement light source, aimed at the consumer, on the conditions that apply as stated by the applicant according paragraph 2.2.2.2.2.

4.2.2.2. Referring to professional maintenance or repair shops, if the applicability of the LED replacement light source is unclear;

4.2.2.3. Warning, clearly legible, that if this LED replacement light source is not used in accordance with the instructions with its package and with the instructions provided with the vehicle, this LED replacement light source may cause a fault in the vehicle's electrical system and/or pose an operational and/or traffic safety risk;

4.2.3. The applicant shall provide the instructions, as referred to in paragraph 4.2.2., for displaying purposes at the point of sales without opening the package.

5. CONFORMITY OF PRODUCTION

The conformity of production procedures shall comply with those set out in the AIS-037 with the following requirements:

5.1. Light sources approved under this standard shall be so manufactured as to conform to the type approved by meeting the inscriptions and technical requirements set forth in clause no. 3, Annex A and Annex D to this standard, in the case of LED replacement light sources also Annex K.

[11] ISO 7000, symbol 1641

5.2. The minimum requirements for quality procedures set fourth in Annex F to this standard shall be complied with.

5.3. The minimum requirements for spot checks by testing agency are set forth in Annex H to this standard shall be complied with.

5.4. The normal frequency of these verifications shall be once every two years.

5.5. Ensure that for each type of light source, at least the tests prescribed in Annex F to this standard are carried out;

5.6. Keep record of the information and listings, including the modifications and modification dates, published on its websites as described in paragraph 4.2.2.1.; this is the responsibility of the approval holder.

6. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

6.1. Penalties of non-conformity of production shall be as specified in AIS-037.

6.2. Reserved.

7. Reserved.

8. Reserved.

9. TRANSITIONAL PROVISIONS

9.1 The transitional provisions shall be as per AIS-000, as amended from time to time, unless otherwise stated, except as following.

9.1.1 In the case of 9.1, extensions shall be granted subject to the conditions of AIS-034 (Part 1) (Rev.3):2023. Such extensions shall be deemed to be compliance to AIS-034 (Part 1) (Rev.1):2010.

9.1.2 In the case of 9.1, extensions shall be granted subject to conditions of AIS-034 (Part 1) (Rev.1):2010 till the notified date of implementation of AIS-034 (Part 1) (Rev.3):2023.

9.2 Type approvals for compliance to AIS-037**,** already been granted, shall continue to be valid for AIS-034 (Part 1) (Rev. 3):2023.

Note: Necessary corrections to the reference of verification reports as per this standard shall be incorporated while issuing the next COP certificate. In the meantime for issuing of vehicle certificate, test/verification report as per this standard shall deemed to be the proof of compliance of AIS-037.

9.3 As from the date of notification of this revision of AIS-034 Part 1 till the period as indicated in the group 3 of Annex A, filament light sources of these categories or the types within these categories shall be permitted to be used in the lamps submitted for Type Approval.

9.4 However, for the period as indicated in the group 3 of Annex A, approval shall only be permitted for lamps in which filament light sources of these categories or of the types within these categories are intended as replacement parts for installation on vehicles in use.

10.0 EXTENSION OF TYPE APPROVAL

10.1 Every modification pertaining to the information, even if the changes are not technical in nature declared in accordance with 2.2.2 shall be intimated by the manufacturer to the testing agency.

If the changes are in parameters not related to the provisions, no further action need be taken.

If the changes are in parameters related to the provisions, the testing Agency, which has issued the certificate of compliance, shall then consider, whether,

10.1.1 The filaments light sources with the changed specifications still complies with provisions, or

10.1.2 Any further verification is required to establish compliance.

10.2 For considering whether testing is required or not, guidelines given in 10.5 (Criteria for Extension of Approval) shall be used.

10.3 In case of 10.1.2, tests for only those parameters which are affected by the modifications need be carried out

10.4 In case of fulfillment of criterion of 10.1.1 or after results of further verification as per 10.1.2 are satisfactory, the approval of compliance shall be extended for the changes carried out.

10.5 **Criteria for extension of approval**

The Criteria shall be as agreed between the testing agency and applicant.

11.0 ESTABLISHING COMPLIANCE OF "E"/"e" APPROVED FILAMENT LIGHT SOURCES TO THIS STANDARDS

11.1 As an exception to 7.4 of AIS-037, (or related administrative decisions) for certifying compliance of "E"/"e" approved filament light sources to this standard shall comply , the test for objective values Luminous flux as specified in relevant specification.

12.0 AMENDMENTS TO ECE REGULATIONS AFTER THE LEVEL DESCRIBED IN 0.3 OF INTRODUCTION

12.1 Supplements

In case of changes in ECE regulation, which are issued as supplements (Supplements do not affect the earlier type approvals) at the request of applicant, approval of compliance to this standard shall be issued taking into account the changes arising out of such supplement(s) to ECE regulation with approval from Chairman AISC.

This shall be incorporated in the test report.

Note : Such changes will be considered for inclusion in this standard at the time of its next revision.

12.2 Series of amendments

Changes in ECE regulation, which are issued as series of amendments (series of amendments may affect the earlier type approvals) will not be considered for issuing approval to this standard.

However, Chairman, AISC may, on a case to case basis, permit to accept latest series of amendments.

This shall be incorporated in the test report.

Note : Such changes will be considered for inclusion in this standard at the time of its next revision.

12.3 Acceptance of changes in UN regulations after the level described in 0.3 of introduction shall be as per AIS-000, as amended from time to time, as applicable, unless otherwise stated.

ANNEX A

(See 1.0)

SHEETS */ FOR FILAMENT LIGHT SOURCES AND THEIR LED REPLACEMENT LIGHT SOURCES

The sheets of the relevant light source category and the group in which this category is listed with restrictions on the use of this category applicable at the time of application for type approval of the light source:

Group 1

Without general restrictions:

Category	Sheet number(s)
H1*6/	H1/1 to 3
H3*6/	H3/1 to 4
H4	H4/1 to 5
H7	H7/1 to 4
H8	H8/1 to 4
H8B	H8/1 to 4
H9*3/	H9/1 to 4
H9B*3/	H9/1 to 4
H10	H10/1 to 3
H11	H11/1 to 4
H11B	H11/1 to 4
H13	H13/1 to 4
H15	H15/1 to 5
H16	H16/1 to 4
H16B	H16/1 to 4
H17	H17/1 to 6
H18	H18/1 to 4
H19	H19/1 to 5

H20	H20/1 to 4
H21W[*2]	H21W/1 to 2
H27W/1	H27W/1 to 3
H27W/2	H27W/1 to 3
HB3	HB3/1 to 4
HB4	HB4/1 to 4
HIR2	HIR2/1 to 3
HS1[*6/]	HS1/1 to 5
HS5[*5]	HS5/1 to 4
PSX24W[*2]	P24W/1 to 3
PSX26W[*2]	PSX26W/1 to 3
S2[*5*6/]	S1/S2/1 to 2

Group 2	
Only for use in signalling lamps, cornering lamps, reversing lamps and rear registration plate lamps:	
Category	Sheet number(s)
C5W [*6]	C5W/1
H6W	H6W/1
H10W/1	H10W/1 to 2
HY6W	H6W/1
HY10W	H10W/1 to 2
HY21W	H21W/1 to 2
P13W	P13W/1 to 3
P21W [*6]	P21W/1 to 2
P21/4W	P21/4W/1 (P21/5W/2 to 3)
P21/5W [*6]	P21/5W/1 to 3
P27W	P27W/1 to 2

P27/7W	P27/7W/1 to 3
PR21W	PR21W/1 (P21W/2)
PR21/5W	PR21/5W/1 (P21/5W/2 to 3)
PS19W	P19W/1 to 3
PS24W	P24W/1 to 3
PSY19W	P19W/1 to 3
PSY24W	P24W/1 to 3
PW13W	P13W/1 to 3
PW16W	PC16W/1 to 3
PWR16W	PC16W/1 to 3
PWY16W	PC16W/1 to 3
PW19W	P19W/1 to 3
PWR19W	P19W/1 to 3
PWY19W	P19W/1 to 3
PW24W	P24W/1 to 3
PWR24W	P24W/1 to 3
PWY24W	P24W/1 to 3
PY21W	PY21W/1 (P21W/2)
PY21/5W	PY21/5W/1 to 3
PY24W	P24W/1 to 3
PY27/7W	PY27/7W/1 (P27/7W/2 to 3)
R5W *6	R5W/1
R10W *6	R10W/1
RR5W	R5W/1
RR10W	R10W/1
RY10W*6/	R10W/1
T4W *6	T4W/1

W2.3W	W2.3W/1
W3W[*6]	W3W/1
W5W[*6]	W5W/1
W10W[*6]	W10W/1
W15/5W	W15/5W/1 to 3
W16W	W16W/1
W21W	W21W/1 to 2
W21/5W	W21/5W/1 to 3
WR5W	W5W/1
WR21/5W	WR21/5W/1 (W21/5W/2 to 3)
WT21W	WT21W/1 to 2
WT21/7W	WT21/7W/1 to 3
WTY21W	WT21W/1 to 2
WTY21/7W	WT21/7W/1 to 3
WY5W [*6]	W5W/1
WY10W[*6]	W10W/1
WY16W	W16W/1
WY21W	WY21W/1 to 2

Group 3[***9**]

Filament light source categories (or types within these categories) only for use in lamps as replacement parts for lamps on vehicles in use originally equipped with such lamps:

Category	Sheet number(s)	As specified by transitional provisions in paragraph (9.3)	As specified by transitional provisions in paragraph (9.4)
C5W[*7*8]	C5W/1	24 months	Unlimited
H1 [* 7]	H1/1 to 3	24 months	Unlimited
H3 [* 7]	H3/1 to 4	24 months	Unlimited

H12	H12/1 to 3	36 months	Unlimited
H13A	H13/1 to 4	36 months	Unlimited
H14	H14/1 to 4	24 months	Unlimited
HB3A	HB3/1 to 4	72 months	Unlimited
HB4A	HB4/1 to 4	72 months	Unlimited
HIR1 *3	HIR1/1 to 3	36 months	Unlimited
HS1 *7	HS1/1 to 5	24 months	Unlimited
HS2 *7	HS2/1 to 3	24 months	Unlimited
HS5A * 5	HS5A/1 to 3	36 months	Unlimited
HS6 * 4	HS6/1 to 4	72 months	Unlimited
P19W * 8	P19W/1 to 3	72 months	Unlimited
P21W * 7, *8	P21W/1 to 2	24 months	Unlimited
P24W *8	P24W/1 to 3	36 months	Unlimited
P21/5W *7, *8	P21/5W/1 to 3	24 months	Unlimited
PC16W *8	PC16W/1 to 3	72 months	Unlimited
PCR16W *8	PC16W/1 to 3	24 months	Unlimited
PCY16W *8	PC16W/1 to 3	72 months	Unlimited
PR19W * 8	P19W/1 to 3	24 months	Unlimited
PR21/4W *8	PR21/4W/1; (P21/5W/2 to 3)	36 months	Unlimited
PR24W *8	P24W/1 to 3	24 months	Unlimited
PR27/7W *8/	PR27/7W/1; (P27/7W/2 to 3)	36 months	Unlimited
PSR19W *8/	P19W/1 to 3	24 months	Unlimited
PSR24W *8/	P24W/1 to 3	24 months	Unlimited
PX24W *2	P24W/1 to 3	36 months	Unlimited
PY19W * 8/	P19W/1 to 3	72 months	Unlimited
R5W * 7, *8	R5W/1	24 months	Unlimited

R10W [*7, *8]	R10W/1	24 months	Unlimited
RY10W[*7, *8]	R10W/1	24 months	Unlimited
S2 [*7]	S1/S2/1 to 2	24 months	Unlimited
S3	S3/1	24 months	Unlimited
T1.4W [*8]	T1.4W/1	36 months	Unlimited
T4W [*7 *8]	T4W/1	24 months	Unlimited
W3W[*7, *8]	W3W/1	24 months	Unlimited
W5W*[7, *8]	W5W/1	24 months	Unlimited
W10W [*7, *8]	W10W/1	24 months	Unlimited
WP21W[*8]	WP21W/1 to 2	36 months	Unlimited
WPY21W[*8]	WP21W/1 to 2	36 months	Unlimited
WY2.3W[*8]	WY2.3W/1	36 months	Unlimited
WY5W [*7, *8]	W5W/1	24 months	Unlimited
WY10W [*7, *8]	W10W/1	24 months	Unlimited
C21W[*8]	C21W/1 to 2	None (Refer to SO 6108 (E) Dated 10th December 2018	Unlimited
R2	R2 / 1 to 3	None (Refer to SO 6108 (E) Dated 10th December 2018	Unlimited
S1	S1/S2/ 1 to 2	None (Refer to SO 6108 (E) Dated 10th December 2018	Unlimited
R10/5W	R10/5W/1	18 months	Unlimited

Group 4:
LED replacement light source categories[*10, *11]only for use in lamps approved with filament light source(s) with the same category designation

Category	Sheet number(s)
C5W	C5W_LEDr / 1 to 4
H11	H11_LEDr / 1 to 7

* Tables, Electrical and Photometric characteristics:
Voltage is expressed in V;
Wattage is expressed in W;
Luminous flux is expressed in lm.
In a case that for a category of filament light source more than one value of reference luminous flux is specified, the value at approximately 12 V for approval of a lighting device and 13.5 V for approval of a light-signalling device shall be applied unless otherwise specified by the standard used for the approval of the device.
*2 Not for use in passing beam headlamps.
*3 Not for use in front fog lamps marked "B" as defined in standard [AIS-012(Part 1) (Rev. 1)]
*4 Not for use in AIS-010 (Part 1) (Rev.1) headlamps and not for use in headlamps of Class A and Class B of AIS- 199.
*5 Not for use in headlamps other than AIS-010 (Part 2) (Rev.1) Class C headlamps and AIS-199 Class CS headlamps.
*6 All types except from 6V type.
*7 6V types only
*8 Only for use in signaling lamps, cornering lamps, reversing lamps and rear registration plate lamps
*9 As and when a filament light source category or the types within these categories is moved from group 1 or group 2 to group 3, from this revision of AIS-034 Part 1 onwards, the date would be at 1 September plus a transitional period in multiple of 12 months (i.e. at least one year or it could be two, three years and so on but not beyond that date).
*10 Not for use in type approval lamps
*11 Not for use in conformity of production control of lamps

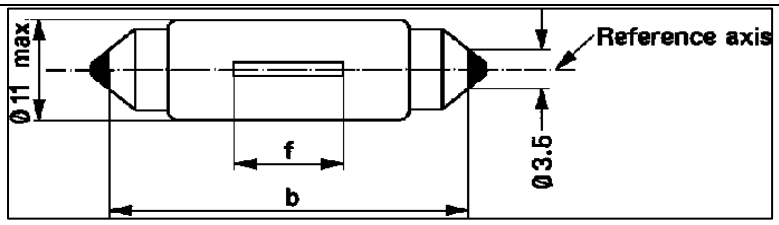
List of sheets for filament light source and their sequence in this annex:

HIR1/1 to 3	120-122
HIR2/1 to 3	123-125
HS1/1 to 5	126-130
HS2/1 to 3	131-133
HS5/1 to 4	134-137
HS5A/1 to 3	138-140
HS6/1 to 4	141-144
P13W/1 to 3	145-147
P19W/1 to 4	148-151
P21W/1 to 2	152-153
P21/4W/1	154
P21/5W/1 to 3	155-157
P24W/1 to 4	158-161
P27W/1 to 2	162-163
P27/7W/1 to 3	164-166
PC16W/1 to 3	167-169
PR21W/1	170
PR21/4W/1 to 2	171-172
PR21/5W/1	173
PR27/7W/1 to 2	174-175
PSX26W/1 to 3	176-178
PY21W/1 to 2	179-180
PY21/5W/1 to 3	181-183
PY27/7W/1 to 2	184-185
R2/1 to 3	186-188
R5W/1	189
R10W/1	190

S1/S2/1 to 2	191-192
S3/1	193
T1.4W/1	194
T4W/1	195
W2.3W/1	196
W3W/1	197
W5W/1	198
W10W/1	199
W15/5W/1 to 3	200-202
W16W/1	203
W21W/1 to 2	204-205
W21/5W/1 to 3	206-208
WP21W/ 1 to 2	209-210
WR21/5W/1	211
WT21W/1 to 2	212-213
WT21/7W/1 to 4	214-217
WY2.3W/1	218
WY21W/ 1 to 2	219-220
R10/5W/1 to 2	221-222
C5W_LEDr/1 to 5	223-227
H11_LEDr/1 to 8	228-235

CATEGORY C5W	**Sheet C5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source
		min.	nom.	max.	
b [1/]		34.0	35.0	36.0	35.0 ± 0.5
f [2/ 3/]		7.5 [4/]		15 [5/]	9 ± 1.5
Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	6	12	24	12
	Watts	5			5
Test voltage	Volts	6.75	13.5	28.0	13.5
Objective values	Watts	5.5 max.		7.7	5.5 max.
	Luminous flux	45 ± 20 %			
Reference luminous flux: 45 lm at approximately 13.5 V					

1/ This dimension corresponds to a distance between two apertures of 3.5 mm diameter each bearing against one of the caps.

2/ The filament shall be housed in a cylinder 19 mm long co-axial with the filament light source and placed symmetrically about the filament light source centre.

The diameter of the cylinder is for 6 V and 12 V filament light sources: d + 4 mm (for standard filament light sources: d + 2 mm) and for 24 V filament light sources: d + 5 mm, "d" being the nominal diameter of the filament as stated by the manufacturer.

3/ The deviation of the filament centre from the centre of the filament light source shall not be more than ± 2.0 mm (for standard filament light sources: ± 0.5 mm) measured in the direction of the reference axis.

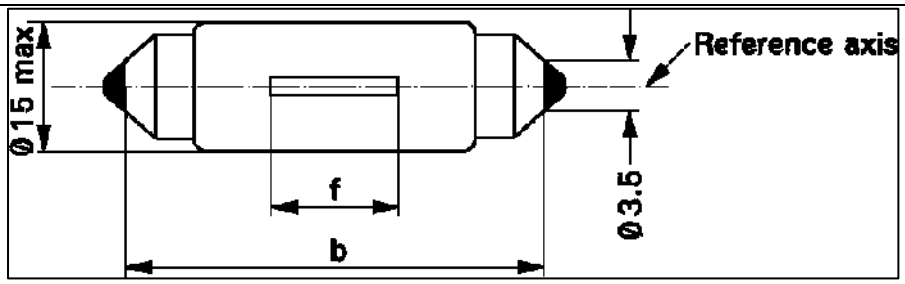
4/ 4.5 mm for 6 V filament light sources.

5/ 16.5 mm for 24 V filament light sources.

CATEGORY C21W	**Sheet C21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

Filament light source for reversing lamp only



Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
b [1/]	40.0	41.0	42.0	41.0 ± 0.5
f [2/]	7.5		10.5	8± 1.0

Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4)

ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS

Rated values	Volts	12	12
	Watts	21	21
Test voltage	Volts	13.5	13.5
Objective values	Watts	26.5 max.	26.5 max.
	Luminous flux	460 ± 15 %	

Reference luminous flux: 460 lm at approximately 13.5 V

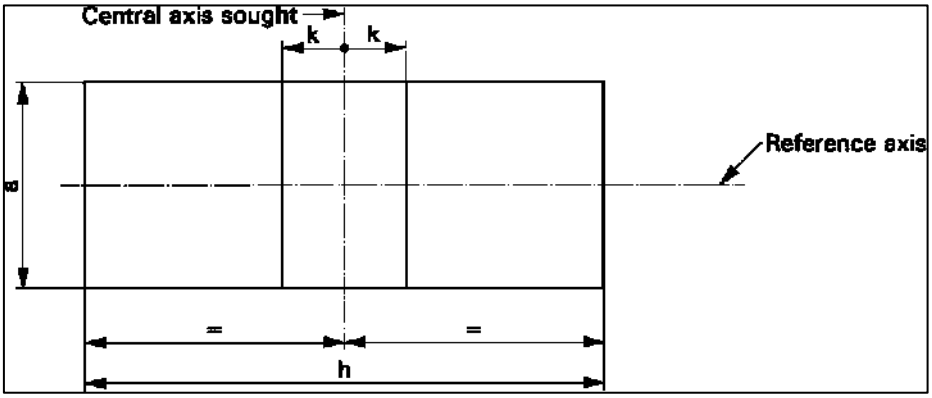
1/ This dimension corresponds to a distance between two apertures of 3.5 mm diameter.

2/ The position of the filament is checked by means of a "Box-System"; sheet C21W/2.

CATEGORY C21W	**Sheet C21W/2**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and to the centre of the filament light sources length, whether a filament light source complies with the requirements.



12 V	a	h	k
filament light sources of normal production	4.0 + d	14.5	2.0
standard filament light source	2.0 + d	14.5	0.5

d = nominal filament diameter as stated by the manufacturer. Test procedure and requirements.

1. The filament light source is placed in a holder (socket) capable of being so rotated through 360° about the reference axis that the front elevation is seen on the screen on to which the image of the filament is projected. The reference plane on the screen shall coincide with the centre of the filament light source. The central axis sought on the screen shall coincide with the centre of the filament light source length.

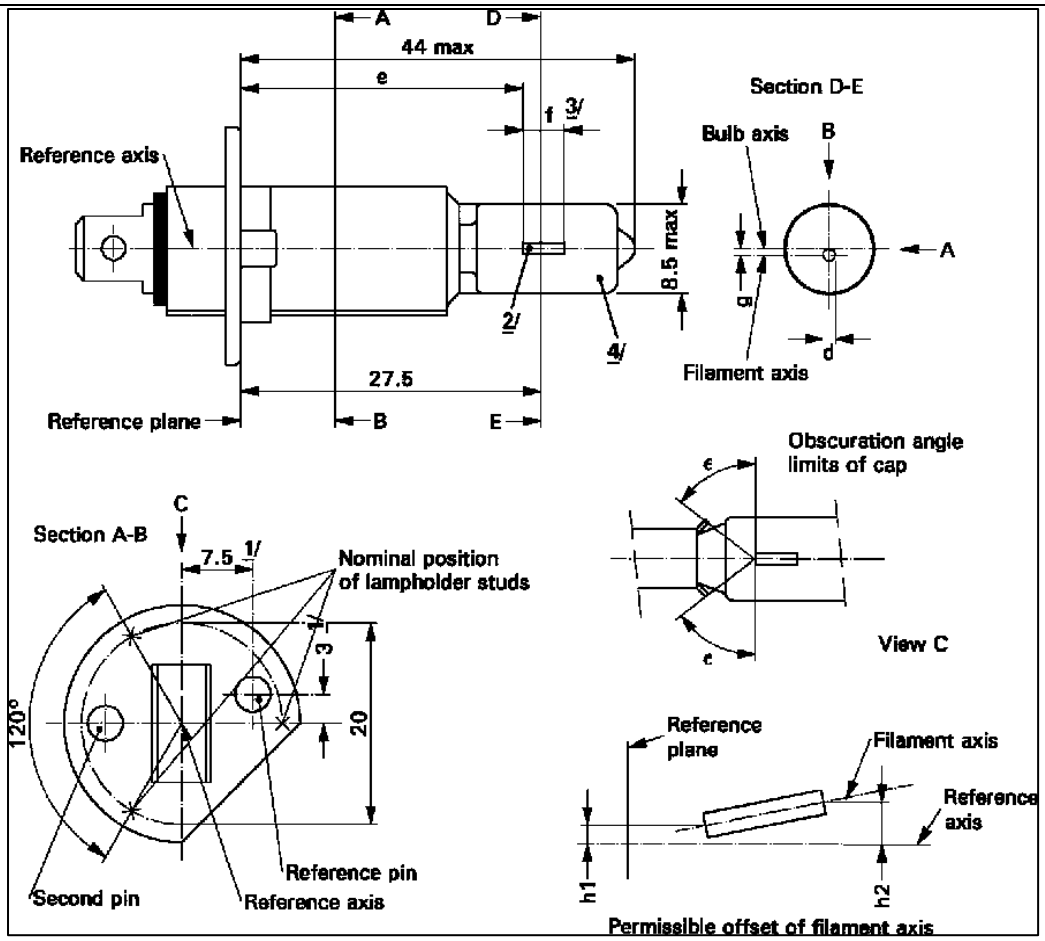
2. Front elevation

2.1. The projection of the filament shall lie entirely within the rectangle when the filament light source is rotated through 360°.

2.2. The centre of the filament shall not be offset by more than distance "k" from the central axis sought.

CATEGORY H1	**Sheet H1/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference axis is perpendicular to the reference plane and passes through the point defined by the dimensions marked with 1/.

2/ Both current lead-in electrodes shall be positioned in the bulb, the longer electrode above the filament (the filament light source being viewed as shown in the figure). The internal design should be then such that stray light images and reflections are reduced to the minimum, e.g. by fitting cooling jackets over the non-coiled parts of the filament.

3/ The cylindrical portion of the bulb over length 'f' shall be such as not to deform the projected image of the filament to such an extent as appreciably to affect the optical results.

4/ The colour of the light emitted shall be white or selective-yellow.

CATEGORY H1	**Sheet H1/2**

Dimensions in mm	Filament light sources of normal production			Standard filament light source
	6 V	12 V	24 V	12 V
e 6/ 10/		25.0 9/		25.0 ± 0.15
f 6/ 10/	4.5 ± 1.0	5.0 ± 0.5	5.5 ± 1.0	5.0 +0.50/- 0.00
g 7/ 8/		0.5 d ± 0.5 d		0.5 d ± 0.25 d
h1		9/		0 ± 0.20 5/
h2		9/		0 ± 0.25 5/
ε		45°± 12°		45°± 3°

Cap P14.5s in accordance with IEC publication 60061 (sheet 7004-46-2)

ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS

Rated values	Volts	6	12	24	12
	Watts		55	70	55
Test Voltage	Volts	6.3	13.2	28.0	13.2
Objective values	Watts	63 max.	68 max.	84 max.	68 max.
	Luminous flux ± %	1,350	1,550	1,900	
		15			

Reference luminous flux at approximately	12 V	1,150
	13.2 V	1,550

5/ The eccentricity is measured only in the horizontal and vertical directions of the filament light source as shown in the figure. The points to be measured are those where the projections of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

6/ The viewing direction is the perpendicular to the reference axis contained in the plane defined by the reference axis and the centre of the second pin of the cap.

7/ Offset of filament in relation to bulb axis measured at 27.5 mm from the reference plane.

8/ d: diameter of filament.

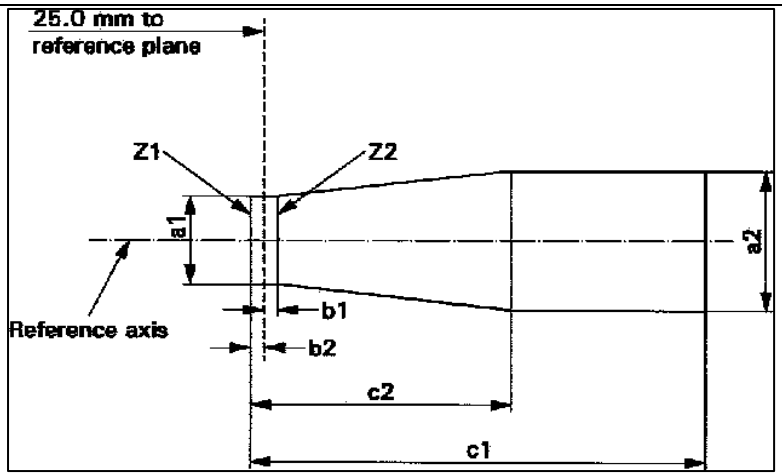
9/ To be checked by means of a "Box System", sheet H1/3.

10/ The ends of the filament are defined as the points where, when the viewing direction is as defined in note 6/ above, the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the reference axis.(special instructions for coiled-coil filaments are under consideration).

CATEGORY H1	**Sheet H1/3**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	a1	a2	b1	b2	c1	c2
6 V	1.4d	1.9 d	0.25		6	3.5
12 V					6	4.5
24 V					7	4.5

d = diameter of filament.

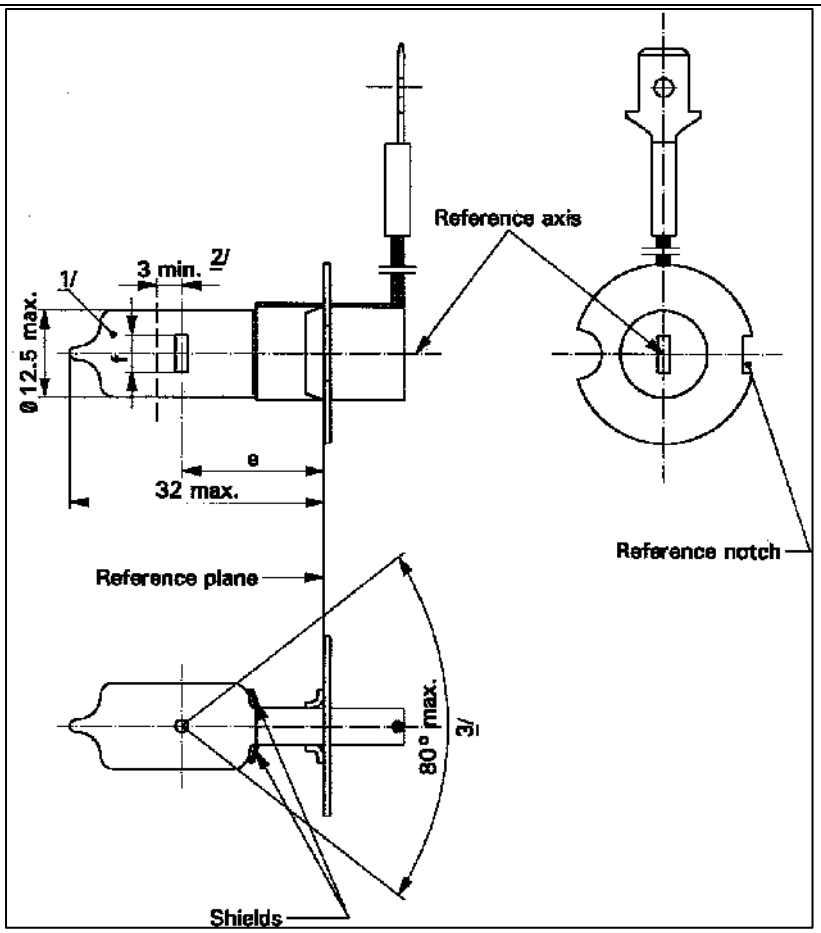
The filament position is checked solely in directions A and B as shown on sheet H1/1.

The filament shall lie entirely within the limits shown.

The beginning of the filament as defined on sheet H1/2, note 10/, shall lie between lines Z1 and Z2.

CATEGORY H3	Sheet H3/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

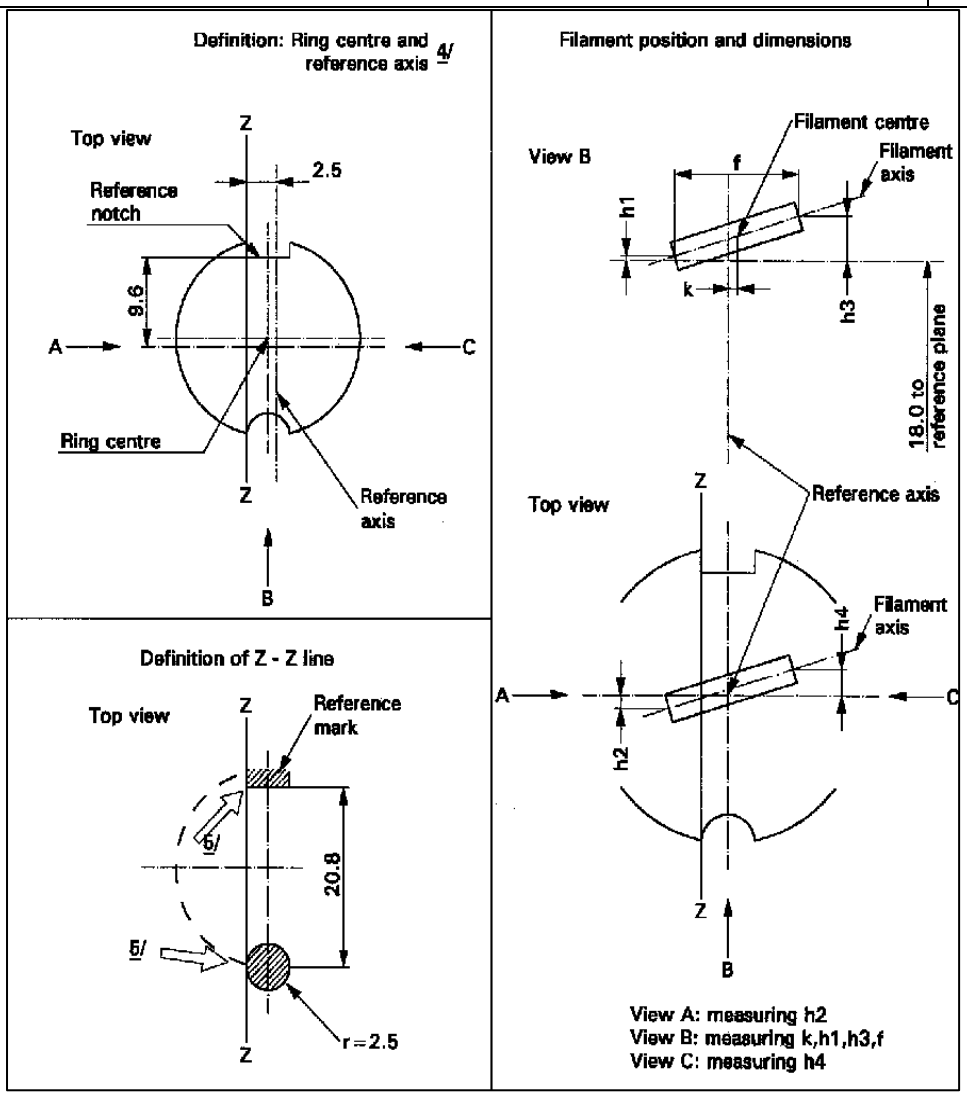


1/ The colour of the light emitted shall be white or selective-yellow.

2/ Minimum length above the height of the light emitting centre ("e") over which the bulb shall be cylindrical.

3/ The distortion of the base-end portion of the bulb shall not be visible from any direction outside the obscuration angle of 80° max. The shields shall produce no inconvenient reflections. The angle between the reference axis and the plane of each shield, measured on the bulb side, shall not exceed 90°.

CATEGORY H3	Sheet H3/2



4/ The permissible deviation of the ring centre from the reference axis is 0.5 mm in the direction perpendicular to the Z-Z line and 0.05 mm in the direction parallel to the Z-Z line.

5/ The cap shall be pressed in these directions.

Category H3	**Sheet H3/3**

Dimensions in mm		Filaments light sources of normal production			Standard filament light source
		6 V	12 V	24 V	12 V
E		18.0 6/			
F 8/		3.0 min.	4.0 min.		5.0 ± 0.50
K		0 6/			0 ± 0.20
h1,h3		0 6/			0 ± 0.15 7/
h2,h4		0 6/			0 ± 0.25 7/
Cap PK22s in accordance with IEC Publication 60061 (sheet 7004-47-4)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	6	12	24	12
	Watts	55		70	55
Test	Volts	6.3	13.2	28.0	13.2
Objective values	Watts	63 max.	68 max.	84 max.	68 max.
	Luminous flux	1,050	1,450	1,750	
		15			
Reference luminous flux at approximately				12 V	1,100
				13.2 V	1,450

6/ To be checked by means of a "Box-System"; sheet H3/4.

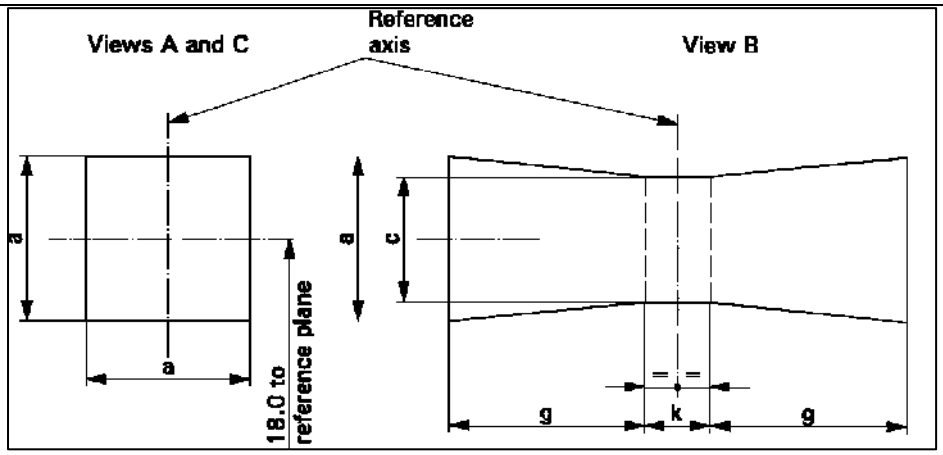
7/ For standard filament light sources the points to be measured are those where the projection of the outside of the end turns crosses the filament axis.

8/ The positions of the first and the last turn of the filament are defined by the intersections of the outside of the first and of the last light emitting turn, respectively, with the plane parallel to and 18 mm distant from the reference plane. (Additional instructions for coiled-coil filament are under consideration).

CATEGORY H3	**Sheet H3/4**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament complies with the requirements.



	a	c	k	g
6 V	1.8 d	1.6 d	1.0	2.0
12 V				2.8
24 V				2.9

d = diameter of filament

The filament shall lie entirely within the limits shown.

The centre of the filament shall lie within the limits of dimension k.

CATEGORY H4	**Sheet H4/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

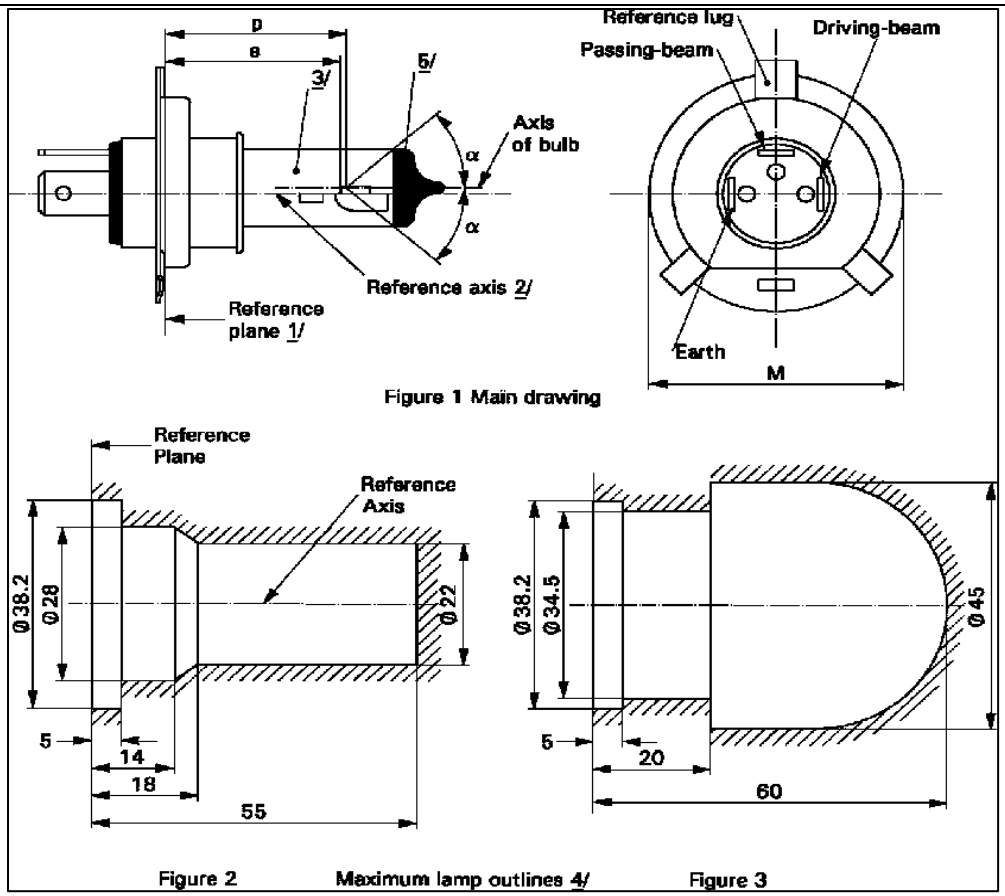


Figure 1 Main drawing

Figure 2 Maximum lamp outlines 4/ Figure 3

1/ The reference plane is the plane formed by the seating points of the three lugs of the cap ring.

2/ The reference axis is perpendicular to the reference plane and passes through the centre of the circle of diameter "M".

3/ The colour of the light emitted shall be white or selective-yellow.

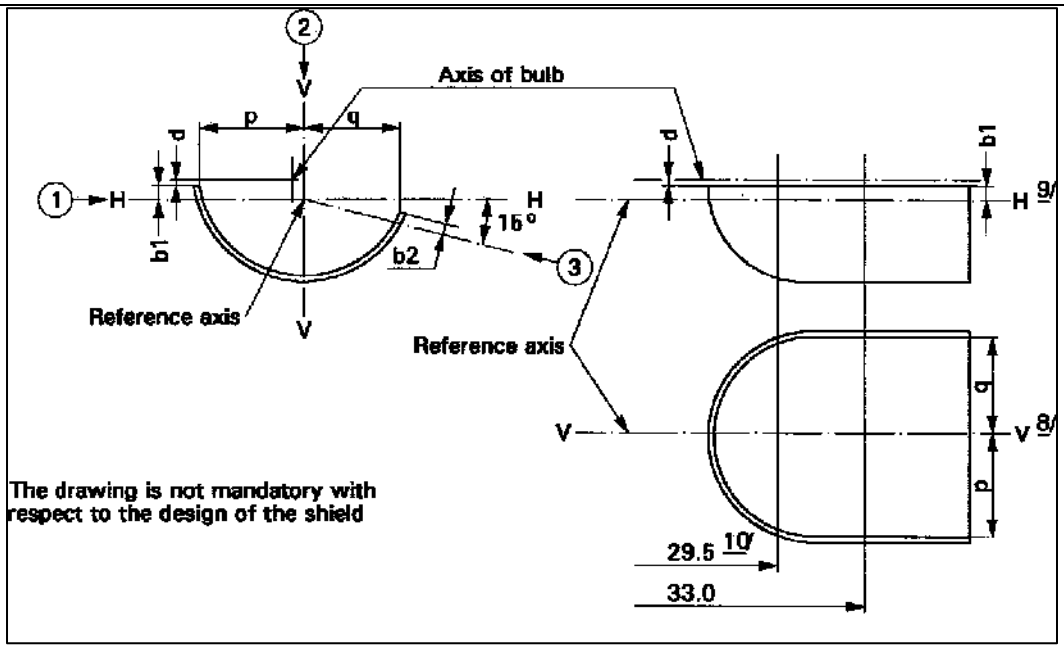
4/ The bulb and supports shall not exceed the envelope as in Figure 2. However, where a selective-yellow outer bulb is used the bulb and supports shall not exceed the envelope as in Figure 3.

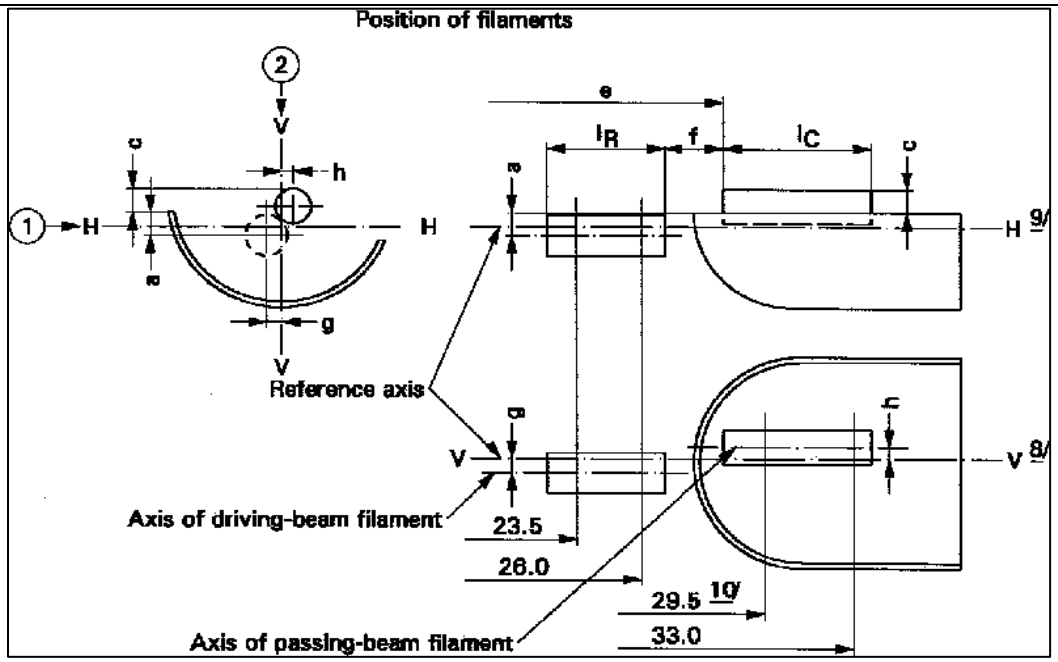
5/ The obscuration shall extend at least as far as the cylindrical part of the bulb. It shall also overlap the internal shield when the latter is viewed in a direction perpendicular to the reference axis.

<table>
<tr><td colspan="7">CATEGORY H4</td><td>Sheet H4/2</td></tr>
<tr><td colspan="2" rowspan="2">Dimensions in mm</td><td colspan="4">Filament light sources of normal production</td><td colspan="2">Standard filament light source</td></tr>
<tr><td colspan="2">12 V</td><td colspan="2">24 V</td><td colspan="2">12 V</td></tr>
<tr><td colspan="2">e</td><td colspan="2">28.5 +0.35/-0.25</td><td colspan="2">29.0 ± 0.35</td><td colspan="2">28.5 + 0.20/-0.00</td></tr>
<tr><td colspan="2">p</td><td colspan="2">28.95</td><td colspan="2">29.25</td><td colspan="2">28.95</td></tr>
<tr><td colspan="2">α</td><td colspan="4">max. 40°</td><td colspan="2">max. 40°</td></tr>
<tr><td colspan="8">Cap P43t in accordance with IEC Publication 60061 (sheet 7004-39-6)</td></tr>
<tr><td colspan="8">ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS</td></tr>
<tr><td rowspan="2">Rated values</td><td>Volts</td><td colspan="2">12 [6/]</td><td colspan="2">24 [6/]</td><td colspan="2">12 [6/]</td></tr>
<tr><td>Watts</td><td>60</td><td>55</td><td>75</td><td>70</td><td>60</td><td>55</td></tr>
<tr><td>Test voltage</td><td>Volts</td><td colspan="2">13.2</td><td colspan="2">28.0</td><td colspan="2">13.2</td></tr>
<tr><td rowspan="3">Objective values</td><td>Watts</td><td>75 max.</td><td>68 max.</td><td>85 max.</td><td>80 max.</td><td>75 max.</td><td>68 max.</td></tr>
<tr><td rowspan="2">Luminous flux ± %</td><td>1,650</td><td>1,000</td><td>1,900</td><td>1,200</td><td colspan="2"></td></tr>
<tr><td colspan="4">15</td><td colspan="2"></td></tr>
<tr><td colspan="2">Measuring flux [7/] lm</td><td>-</td><td>750</td><td>-</td><td>800</td><td colspan="2"></td></tr>
<tr><td colspan="4" rowspan="2">Reference luminous flux at approximately</td><td>12 V</td><td>1,250</td><td>750</td></tr>
<tr><td>13.2 V</td><td>1,650</td><td>1,000</td></tr>
<tr><td colspan="8">6/ The value indicated in the left hand column relate to the driving-beam filament. Those indicated in the right-hand column relate to the passing beam filament.</td></tr>
<tr><td colspan="8">7/ Measuring luminous flux for measuring according to 3.9. of this standard to the provisions for filament light sources with an internal shield to produce the cut-off.</td></tr>
</table>

CATEGORY H4	Sheet H4/3

Position of shield





CATEGORY H4	**Sheet H4/4**

Table of the dimensions (in mm) referred to in the drawings on sheet H4/3

Reference*/		Dimension**/		Tolerance		
				Filaments light sources of normal production		Standard filament light
12 V	24 V	12 V	24 V	12 V	24 V	12 V
a/26		0.8		± 0.35		± 0.20
a/23.5		0.8		± 0.60		± 0.20
b1/29.5	30.0	0		± 0.30	± 0.35	± 0.20
b1/33		b1/29.5	b1/30.0	± 0.30	± 0.35	± 0.15
b2/29.5	30.0	0		± 0.30	± 0.35	± 0.20
b2/33		b2/29.5	b2/30.0	± 0.30	± 0.35	± 0.15
c/29.5	30.0	0.6	0.75	± 0.35		± 0.20
c/33		c/29.5	c/30.0 mv	± 0.35		± 0.15
d		min. 0.1		-		-
e[13/]		28.5	29.0	+ 0.35 -0.25	± 0.35	+ 0.20 - 0.00
f[11/ 12/ 13/]		1.7	2.0	+ 0.50 - 0.30	± 0.40	+ 0.30 - 0.10
g/26		0		± 0.50		± 0.30
g/23.5		0		± 0.70		± 0.30
h/29.5	30.0	0		± 0.50		± 0.30
h/33		h/29.5	h/30.0	± 0.35		± 0.20
l_R[11/ 14/]		4.5	5.25	± 0.80		± 0.40
l_C[11/ 14/]		5.5	5.25	± 0.50	± 0.80	± 0.35
p/33		Depends on the shape of the shield		-		-
q/33		(p+q)/2		± 0.60		± 0.30

*/ "../26" means dimension to be measured at the distance from the reference plane indicated in mm after the stroke.

**/ “29.5 mv" or "30.0 mv" means the value measured at a distance of 29.5 or 30.0 mm from the reference plane.

CATEGORY H4	Sheet H4/5
8/ Plane V-V is the plane perpendicular to the reference plane and passing through the reference axis and through the intersection of the circle of diameter "M" with the axis of the reference lug.	
9/ Plane H-H is the plane perpendicular to both the reference plane and plane V-V and passing through the reference axis.	
10/ 30.0 mm for the 24-Volt type.	
11/ The end turns of the filament are defined as being the first luminous turn and the last luminous turn that are at substantially the correct helix angle. For coiled-coil filaments, the turns are defined by the envelope of the primary coil.	
12/ For the passing-beam filament, the points to be measured are the intersections, seen in direction 1, of the lateral edge of the shield with the outside of the end turns defined under footnote 11/.	
13/ "e" denotes the distance from the reference plane to the beginning of the passing beam filament as defined above.	
14/ For the driving-beam filament the points to be measured are the intersections, seen in direction 1, of a plane, parallel to plane H-H and situated at a distance of 0.8 mm below it, with the end turns defined under footnote 11/.	
Additional explanations to sheet H4/3	
The dimensions below are measured in three directions:	
1 for dimensions a, b1, c, d, e, f, l_R and l_C;	
2 for dimensions g, h, p and q;	
3 for dimension b2.	
Dimensions p and q are measured in planes parallel to and 33 mm away from the reference plane.	
Dimensions b1, b2, c and h are measured in planes parallel to and 29.5 mm (30.0 mm for 24 V filament light sources) and 33 mm away from the reference plane.	
Dimensions a and g are measured in planes parallel to and 26.0 mm and 23.5 mm away from the reference plane.	
Note : For the method of measurement, see Appendix E of IEC Publication 60809.	

CATEGORY H7	Sheet H7/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

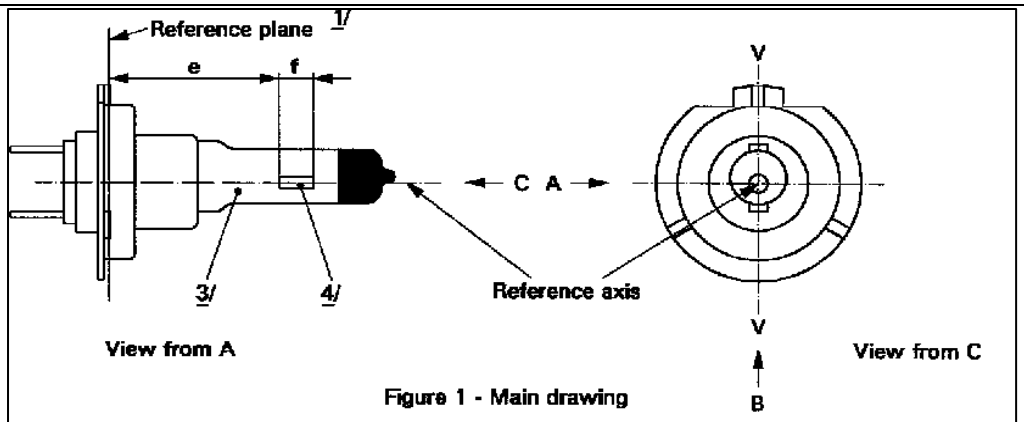


Figure 1 - Main drawing

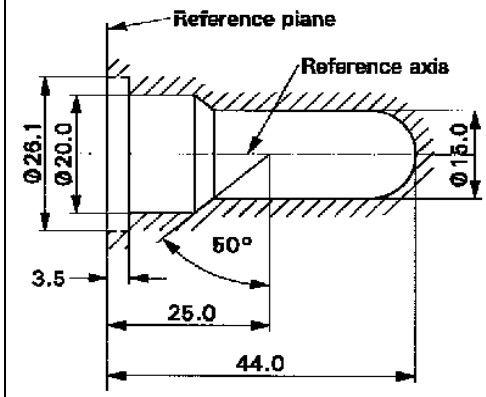


Figure 2 - Maximum lamp outline 5/

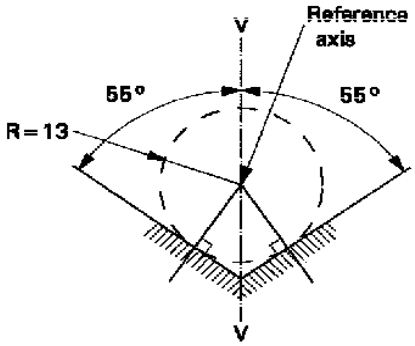


Figure 3 - Definition of reference axis 2/

1/ The reference plane is defined by the points on the surfaces of the holder on which the three supporting bosses of the cap ring will rest.

2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in Figure 3.

3/ The colour of the light emitted shall be white or selective-yellow.

4/ Notes concerning the filament diameter.

(a) No actual diameter restrictions apply but the objective for future developments is to have d max. = 1.3 mm for 12 V and d max. = 1.7 for 24V filament light sources.

(b) For the same manufacturer, the design diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.

5/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

CATEGORY H7	Sheet H7/2

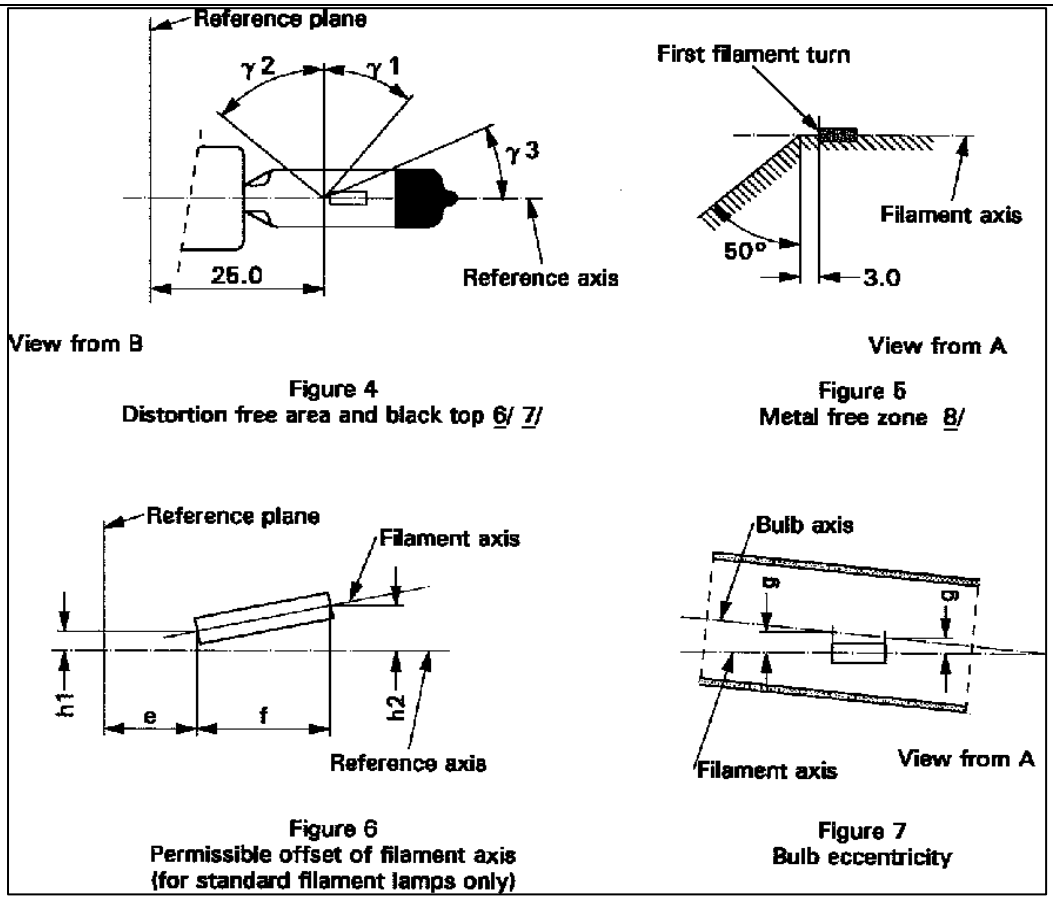


Figure 4
Distortion free area and black top 6/ 7/

Figure 5
Metal free zone 8/

Figure 6
Permissible offset of filament axis
(for standard filament lamps only)

Figure 7
Bulb eccentricity

6/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

7/ The obscuration shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall moreover extend at least to a plane parallel to the reference plane where γ3 crosses the outer bulb surface (view B as indicated on sheet H7/1).

8/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction. (View A as indicated in Figure 1 on sheet H7/1).

No metal parts other than filament turns shall be located in the shaded area as seen in Figure 5.

CATEGORY H7	Sheet H7/3

Dimensions in mm		Filaments light sources of normal production		Standard filament light sources
		12 V	24 V	12 V
e[9/]		25.0[10/]		25.0 ± 0.1
f[9/]		4.1[10/]	4.9[10/]	4.1 ± 0.1
g[12/]		0.5 min.		u.c.
h1[11/]		0[10/]		0 ± 0.10
h2[11/]		0[10/]		0 ± 0.15
γ1		40° min.		40° min.
γ 2		50° min.		50° min.
γ 3		30° min.		30° min.
Cap PX26d in accordance with IEC Publication 60061 (sheet 7004-5-7)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	12	24	12
	Watts	55	70	55
Test voltage	Volts	13.2	28.0	13.2
Objective values	Watts	58 max.	75 max.	58 max.
	Luminous flux	1,500 ± 10 %	1,750 ± 10%	
Reference luminous flux at approximately			12 V	1,100
			13.2 V	1,500

9/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown in Figure 1 on sheet H7/1, the projection of the outside of the end turns crosses the filament axis. (Special instructions for coiled-coil filaments are under consideration).

10/ To be checked by means of a "Box System", sheet H7/4.

11/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 in sheet H7/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

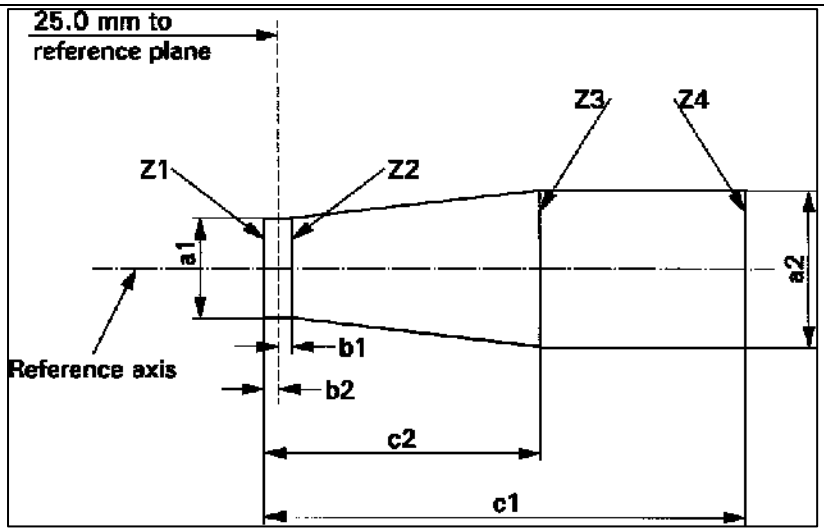
12/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

CATEGORY H7	**Sheet H7/4**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.

Dimensions in mm



	a1	a2	b1	b2	c1	c2
12 V	d + 0.30	d + 0.50	0.2		4.6	4.0
24V	d + 0.60	d + 1.00	0.25		5.9	4.4

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet H7/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H7/3, note 9/, shall lie between lines Z1 and Z2 and between Z3 and Z4.

CATEGORIES H8 AND H8B	**Sheet H8/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source

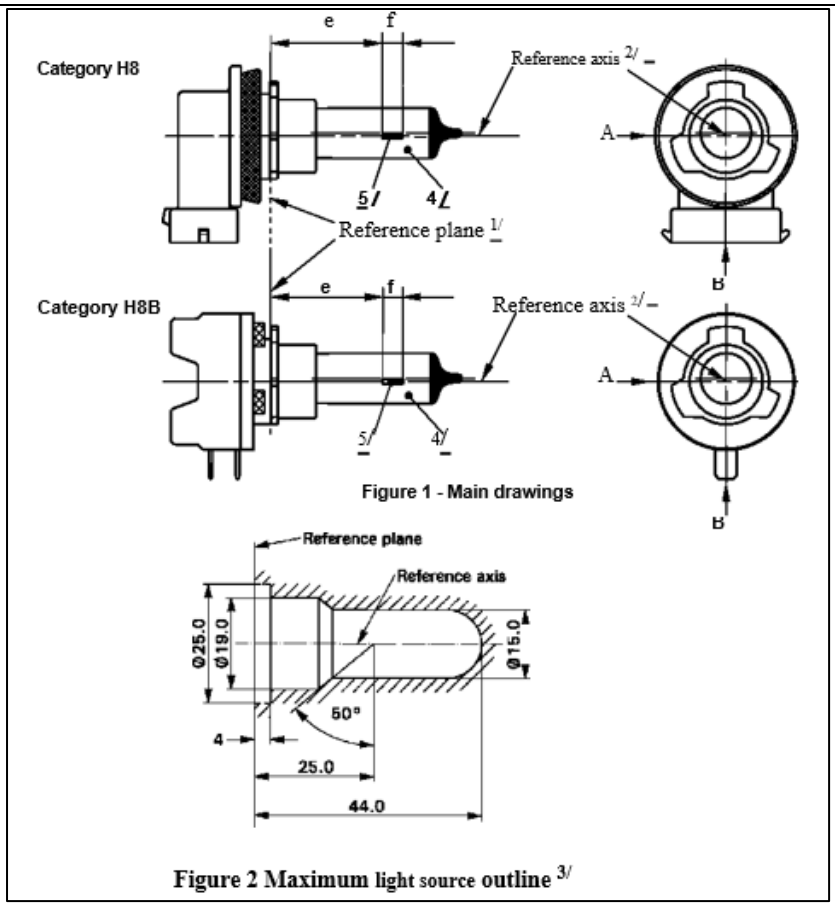


Figure 1 - Main drawings

Figure 2 Maximum light source outline 3/

1/ The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.

2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.

3/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

4/ The colour of the light emitted shall be white or selective-yellow.

5/ Notes concerning the filament diameter.

(a) No actual diameter restrictions apply but the objective for future developments is to have d max. = 1.2 mm.

(b) For the same manufacturer, the design diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.

CATEGORIES H8 AND H8B	Sheet H8/2

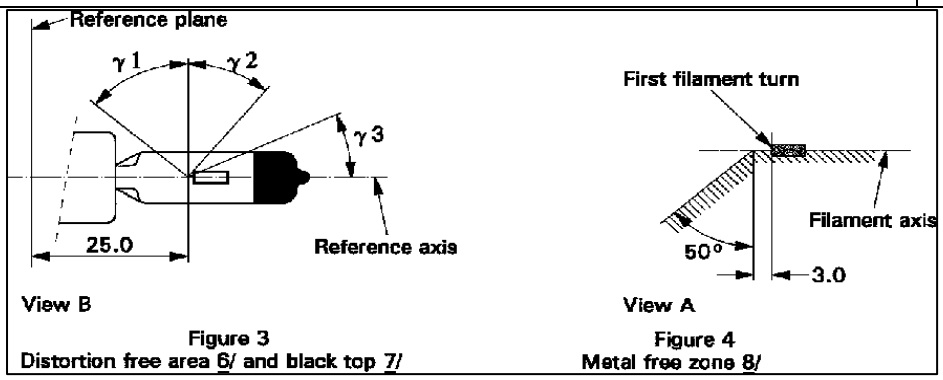


Figure 3
Distortion free area 6/ and black top 7/

Figure 4
Metal free zone 8/

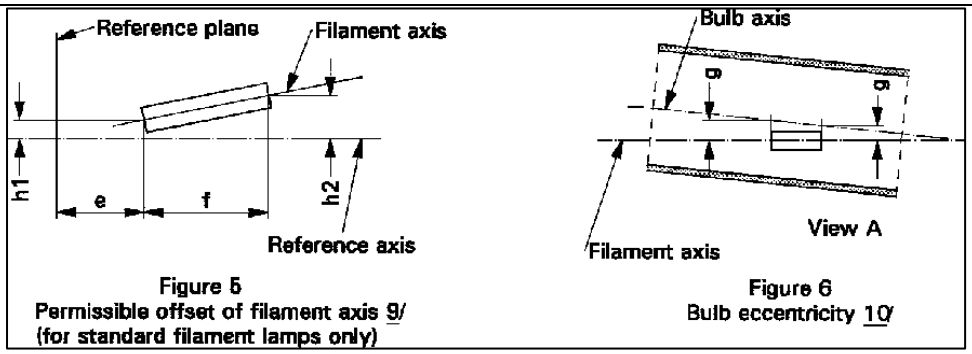


Figure 5
Permissible offset of filament axis 9/
(for standard filament lamps only)

Figure 6
Bulb eccentricity 10/

6/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

7/ The obscuration shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall moreover extend at least to a plane parallel to the reference plane where γ3 crosses the outer bulb surface (view B as indicated on sheet H8/1).

8/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction. (View A as indicated in Figure 1 on sheet H8/1). No metal parts other than filament turns shall be located in the shaded area as seen in Figure 4.

9/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 in sheet H8/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

10/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

CATEGORIES H8 AND H8B	Sheet H8/3

Dimensions in mm		Filaments light sources of normal production 12 V	Standard filament light sources 12 V
e [11/]		25.0[12/]	25.0 ± 0.1
f [11/]		3.7[12/]	3.7 ± 0.1
g		0.5 min.	u.c.
h1		0[12/]	0 ± 0.1
h2		0[12/]	0 ± 0.15
γ1		50° min.	50° min.
γ2		40° min.	40° min.
γ3		30° min.	30° min.
Cap: H8: PGJ19-1 in accordance with IEC Publication 60061 (sheet 7004-110-2)			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Volts	12	12
	Watts	35	35
Test voltage	Volts	13.2	13.2
Objective values	Watts	43 max.	43 max.
	Luminous flux	800 ± 15 %	
Reference luminous flux at approximately		12 V	600
		13.2 V	800

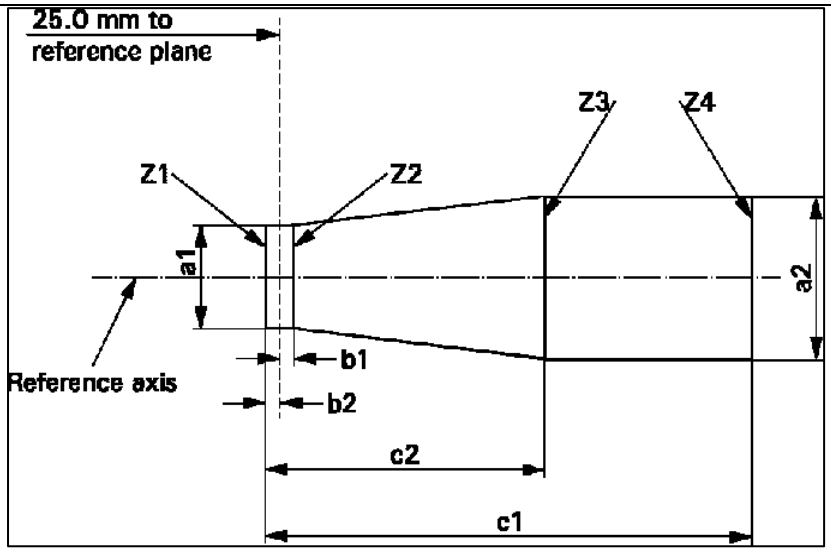
11/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown in Figure 1 on sheet H8/1, the projection of the outside of the end turns crosses the filament axis.

12/ To be checked by means of a "Box System"; sheet H8/4.

CATEGORIES H8 AND H8B	Sheet H8/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament complies with the requirements.



a1	a2	b1	b2	c1	c2
d + 0.50	d + 0.70	0.25		4.6	3.5

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet H8/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H8/3, note 11/, shall lie between lines Z1 and Z2 and between Z3 and Z4.

CATEGORIES H9 AND H9B	**Sheet H9/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source

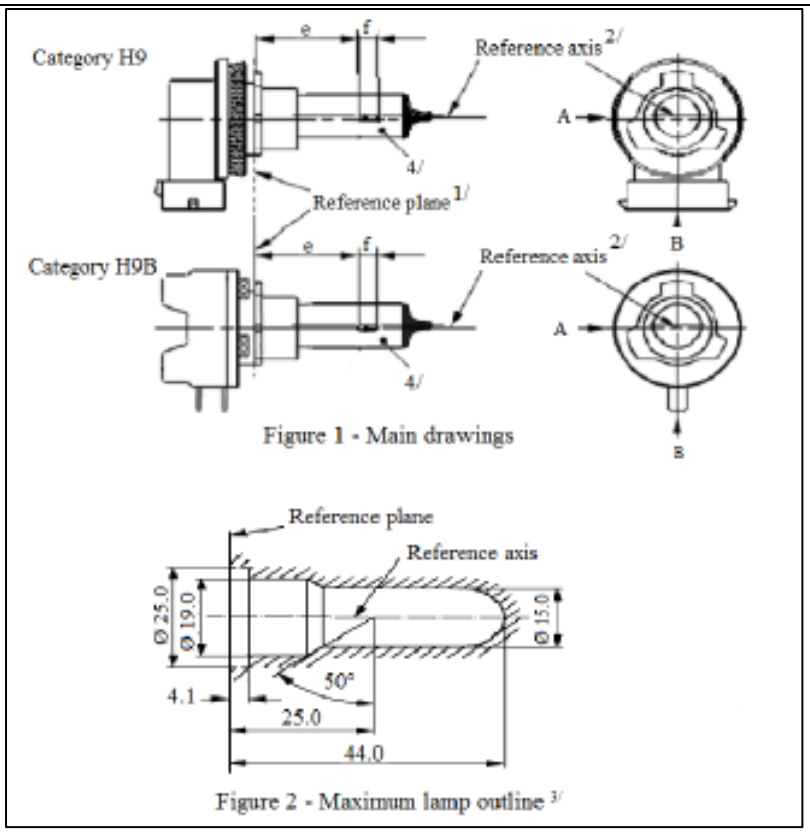


Figure 1 - Main drawings

Figure 2 - Maximum lamp outline 3/

1/ The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.

2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.

3/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

4/ Notes concerning the filament diameter.

(a) No actual diameter restrictions apply but the objective for future developments is to have d max. = 1.4 mm.

(b) For the same manufacturer, the design diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.

CATEGORIES H9 AND H9B	Sheet H9/2

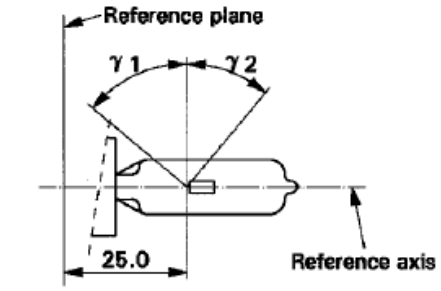


Figure 3
Distortion free area 5/

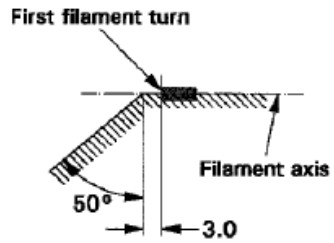


Figure 4
Metal free zone 6/

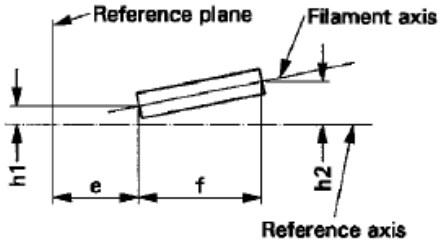


Figure 5
Permissible offset of filament axis 7/
(for standard filament lamps only)

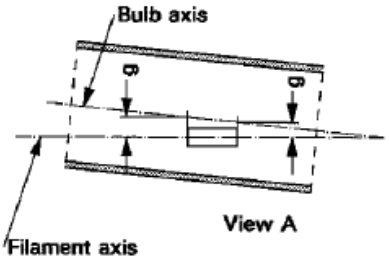


Figure 6
Bulb eccentricity 8/

5/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

6/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction. (View A as indicated in Figure 1, sheet H9/1). No metal parts other than filament turns shall be located in the shaded area as seen in Figure 4.

7/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 on sheet H9/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

8/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

CATEGORIES H9 AND H9B							**Sheet H9/3**
Dimensions in mm			Tolerances				
			Filaments light sources of normal production		Standard filament light sources		
			12 V		12 V		
e [9/ 10/]		25	[11/]		± 0.10		
f [9/ 10/]		4.8	[11/]		± 0.10		
g[9/]		0.7	± 0.5		± 0.30		
h1		0	[11/]		± 0.10[12/]		
h2		0	[11/]		±0.15[12/]		
γ1		50° min.	-		-		
γ2		40° min.	-		-		
Cap:	H9:	PGJ19-5	in accordance with IEC Publication 60061 (sheet 7004-110-2)				
	H9B:	PGJY19-5	in accordance with IEC Publication 60061 (sheet 7004-146-1)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS							
Rated values		Volts	12		12		
		Watts	65		65		
Test voltage		Volts	13.2	12.2	3.2	12.2	
Objective values		Watts	73 max.	65 max	73	65 max	
		Luminous flux	2,100 ± 10%	1650 ± 10%			
Reference luminous flux at approximately				12 V	1,500		
				12.2 V	1,650		
				13.2 V	2,100		

9/ The viewing direction is direction A as shown in Figure 1 on sheet H9/1.

10/ The ends of the filament are defined as the points where, when the viewing direction is as defined in note 9/ above, the projection of the outside of the end turns crosses the filament axis.

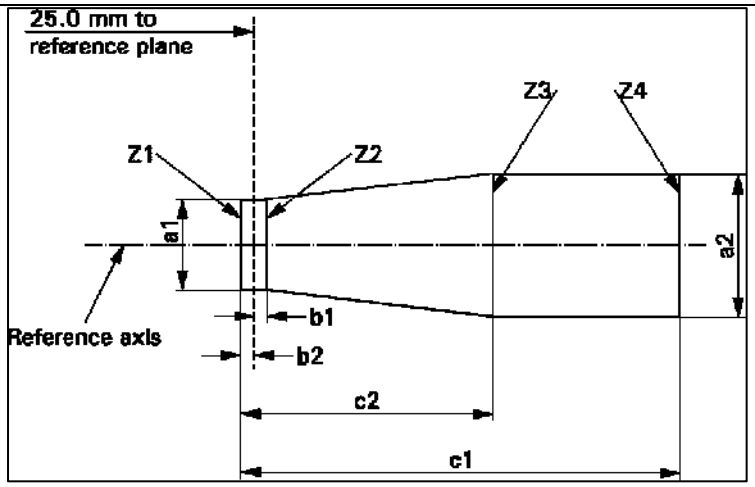
11/ To be checked by means of a "Box System"; sheet H9/4.

12/ The eccentricity is measured only in viewing directions A and B as shown in Figure 1 on sheet H9/1. The points to be measured are those where the projection of the outside of the end turns nearest or furthest from the reference plane crosses the filament axis.

CATEGORIES H9 AND H9B	Sheet H9/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament complies with the requirements.



a1	a2	b1	b2	c1	c2
d + 0.4	d + 0.7	0.25		5.7	4.6

d = diameter of filament

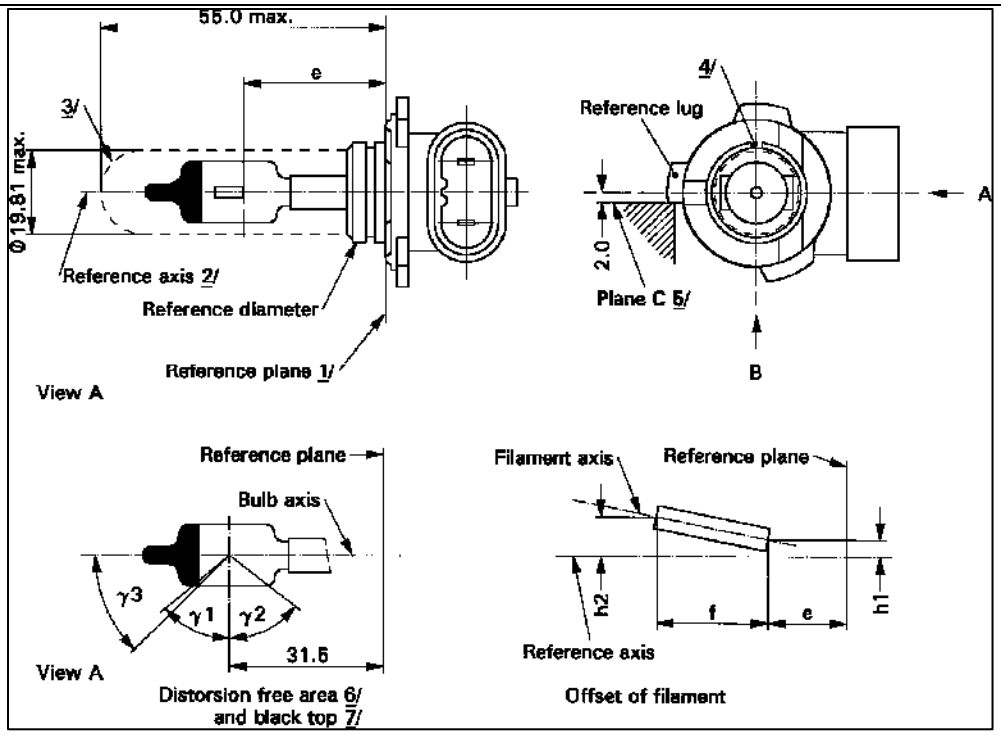
The filament position is checked solely in directions A and B as shown on sheet H9/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H9/3, footnote 10/, shall lie between lines Z1 and Z2 and between Z3 and Z4.

CATEGORIES H10 AND H10B	**Sheet H10/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is the plane defined by the meeting points of cap-holder fit.

2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.

3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the lamp key. The envelope is concentric to the reference axis.

4/ The keyway is mandatory.

5/ The filament light source shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

6/ Glass bulb periphery shall be optically distortion-free axially and cylindrically within the angles 'y1 and 'y2. This requirement applies to the whole bulb circumference within the angles 'y1 and 'y2 and does not need to be verified in the area covered by the obscuration.

7/ The obscuration shall extend to at least angle 'y3 and shall be at least as far as the undistorted part of the bulb defined by angle 'y1.

CATEGORIES H10 AND H10B				**Sheet H10/2**
Dimensions in mm 8/			Tolerance	
			Filament light sources of normal production	Standard filament light source
e 9/ 10/		28.9	11/	± 0.16
f 9/ 10/		5.2	11/	± 0.16
h1, h2		0	11/	± 0.15 12/
γ1		50° min.	-	-
γ 2		52° min.	-	-
γ 3		45°.	± 5°	± 5°
Cap PY20d in accordance with IEC Publication 60061 (sheet 7004-31-2)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values		Volts	12	12
		Watts	42	42
Test voltage		Volts	13.2	13.2
Objective values	Watts		50 max.	50 max.
	Luminous flux		850 ± 15 %	
Reference luminous flux at approximately			12 V	600
			13.2 V	850

8/ Dimensions shall be checked with O-ring removed.

9/ The viewing direction is direction */ B as shown in the figure on sheet H10/1.

10/ The ends of the filament are defined as the points where, when the viewing direction*/ as defined in note 9/ above, the projection of the outside of the end turns crosses the filament axis.

11/ To be checked by means of a "Box-System", sheet H10/3*/

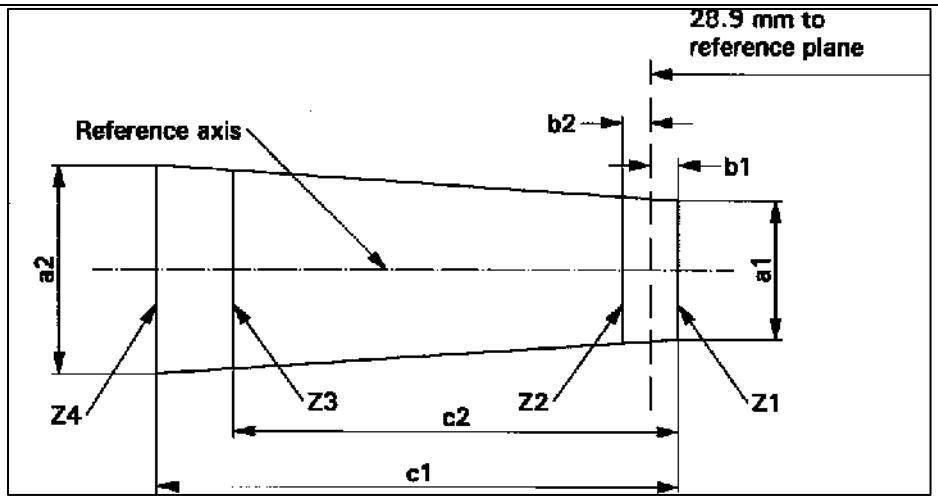
12/ The eccentricity is measured only in viewing directions*/ A and B as shown in the figure on sheet H10/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

*/ Manufacturers may choose another set of perpendicular viewing directions. The viewing directions specified by the manufacturer are to be used by the testing laboratory when checking filament dimensions and position.

CATEGORIES H10	**Sheet H10/3**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	a1	a2	b1 b2	c1	c2
12 V	1.4 d	1.8 d	0.25	6.1	4.9

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet H10/1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H10/2 footnote 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

CATEGORIES H11 AND H11B	Sheet H11/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

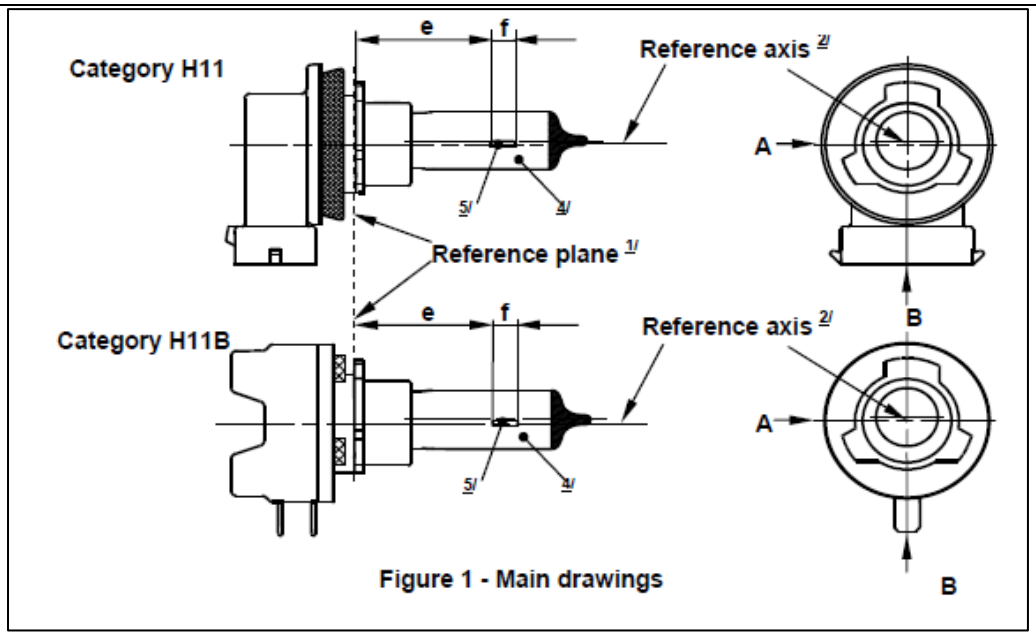
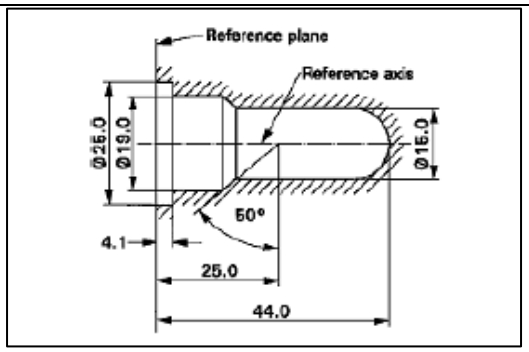
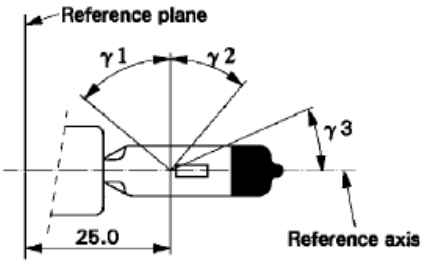


Figure 1 - Main drawings



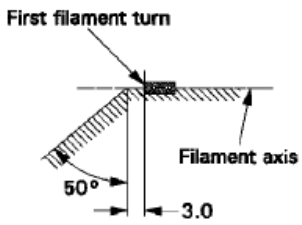
1/	The reference plane is the plane formed by the underside of the beveled lead-in flange of the cap.
2/	The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.
3/	Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.
4/	The colour of the light emitted shall be white or selective-yellow.
5/	Notes concerning the filament diameter.
(a)	No actual diameter restrictions apply but the objective for future developments is to have d max. = 1.4 mm.
(b)	For the same manufacturer, the design diameter of standard (étalon) filament light source and filament light source of normal production shall be the same

CATEGORIES H11 AND H11B	Sheet H11/2



View B

Figure 3
Distortion free area 6/ and black top 7/



View A

Figure 4
Metal free zone 8/

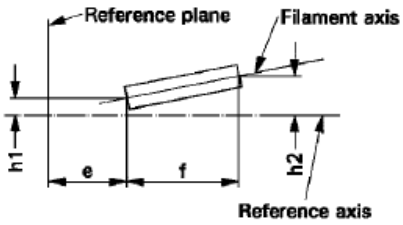


Figure 5
Permissible offset of filament axis 9/
(for standard filament lamps only)

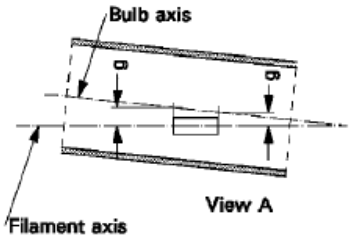


Figure 6
Bulb eccentricity 10/

6/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

7/ The obscuration shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall, moreover, extend at least to a plane parallel to the reference plane where γ3 crosses the outer bulb surface (view B as indicated on sheet H11/1).

8/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction (view A as indicated in Figure 1 on sheet H11/1). No metal parts other than filament turns shall be located in the shaded area as seen in Figure 4.

9/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 on sheet H11/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

10/ Eccentricity of bulb axis with respect to filament axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

CATEGORIES H11 AND H11B	**Sheet H11/3**

Dimensions in mm		Filaments light sources of normal production		Standard filament light source
		12 V	24 V	12 V
e [11/]		25.0[12/]		25.0 ± 0.1
f [11/]		4.5	5.3[12/]	4.5 ± 0.1
g		0.5 min.		u.c.
h1		0[12/]		0 ± 0.1
h2		0[12/]		0 ± 0.15
γ1		50° min.		50° min.
γ2		40° min.		40° min.
γ3		30° min.		30° min.
Cap:	H11:	PGJ19-2	in accordance with IEC Publication 60061 (sheet 7004-110-2)	

ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	12	24	12
	Watts	55	70	55
Test voltage	Volts	13.2	28.0	13.2
Objective values	Watts	62 max.	80 max.	62 max.
	Luminous flux	1350 ± 10 %	1600 ± 10 %	
Reference luminous flux at approximately			12 V	1,000
			13.2V	1,350

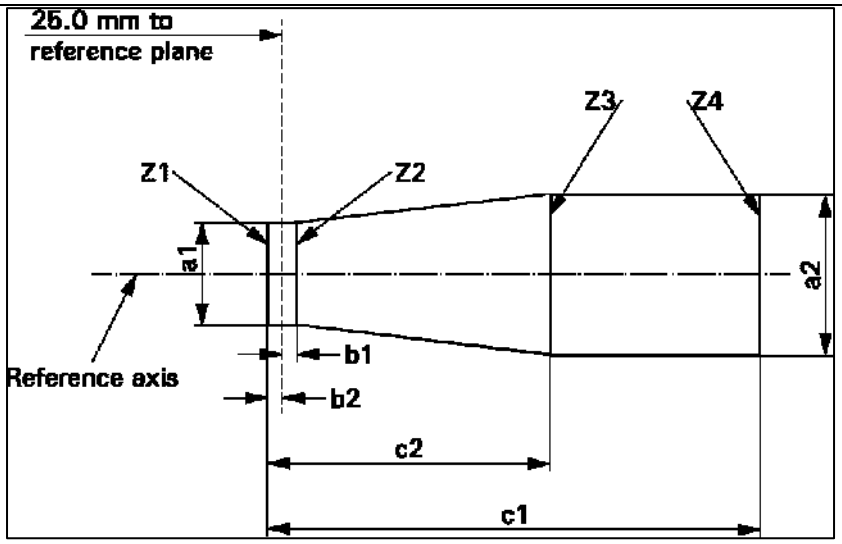
11/ The ends of the filament are defined as the points where, when the viewing direction is View A as shown in Figure 1 on sheet H11/1, the projection of the outside of the end turns crosses the filament axis.

12/ To be checked by means of a "Box System"; sheet H11/4.

CATEGORIES H11 AND H11B	Sheet H11/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament complies with the requirements.



	a1	a2	b1	b2	c1	c2
12 V	d + 0.3	d + 0.5	0.2		5.0	4.0
24 V	d + 0.6	d + 1.0	0.25		6.3	4.6

d = diameter of filament

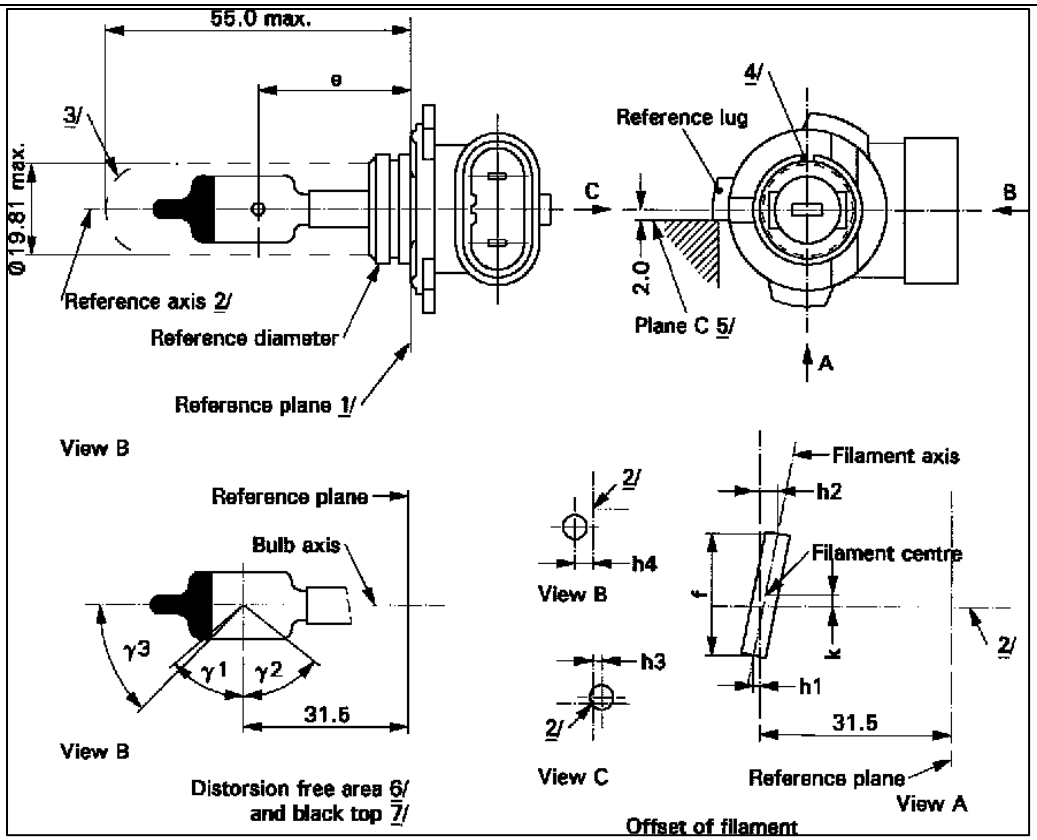
The filament position is checked solely in directions A and B as shown on sheet H11/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H11/3, footnote [11/], shall lie between lines Z1 and Z2 and between Z3 and Z4.

CATEGORIES H12	Sheet H12/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is the plane defined by the meeting points of cap-holder fit.

2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.

3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the light source key. The envelope is concentric to the reference axis.

4/ The keyway is mandatory.

5/ The filament shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

6/ Glass bulb periphery shall be optically distortion-free axially and cylindrically within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2 and does not need to be verified in the area covered by the obscuration.

7/ The obscuration shall extend to at least angle γ3 and shall be at least as far as the undistorted part of the bulb defined by angle γ1.

CATEGORIES H12			**Sheet H12/2**
Dimensions in mm [8/]		Tolerance	
		Filament light sources of normal production	Standard filament light
e [9/ 10/]	31.5	[11/]	± 0.16
f [9/ 10/]	5.5	4.8 min	± 0.16
h1, h2, h3, h4	0	[11/]	± 0.15 [12/]
k	0	[11/]	± 0.15 [13/]
γ1	50° min.	-	-
γ2	52° min.	-	-
γ3	45°	± 5°	± 5°
Cap PZ20d in accordance with IEC Publication 60061 (sheet 7004-31-2)			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Volts	12	12
	Watts	53	53
Test voltage	Volts	13.2	13.2
Objective values	Watts	61 max.	61 max.
	Luminous flux	1,050 ± 15 %	
Reference luminous flux at approximately		12 V	775
		13.2 V	1,050

8/ Dimensions shall be checked with O-ring removed.

9/ The viewing direction is direction A as shown in the figure on sheet H12/1.

10/ The ends of the filament are defined as the points where, when the viewing direction as defined in foot note 9/ above, the projection of the outside of the end turns crosses the filament axis.

11/ To be checked by means of a "Box-System"; sheet H12/3.

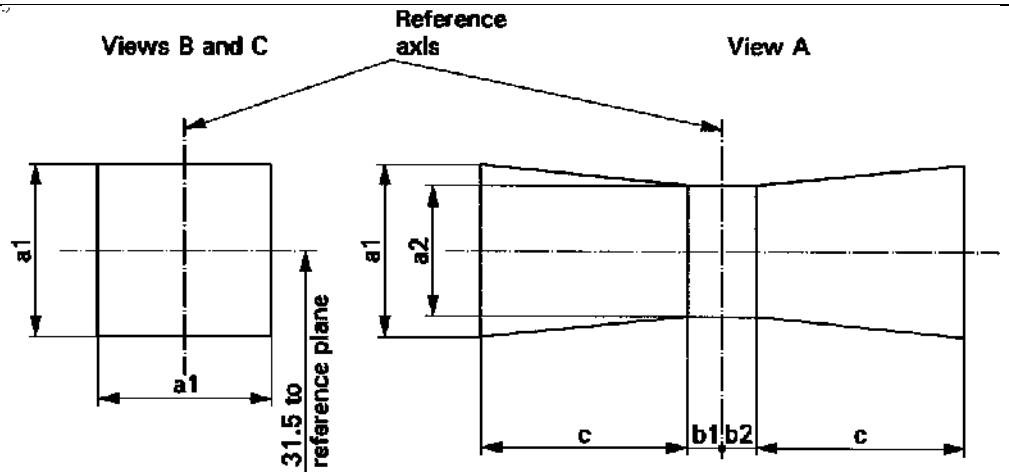
12/ Dimensions h1 and h2 are measured in viewing direction A, dimension h3 in direction C and dimension h4 in direction B as shown in the figure on sheet H12/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

13/ Dimension k is measured only in viewing direction A.

CATEGORIES H12	**Sheet H12/3**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



a1	a2	b1	b2	c
1.6 d	1.3 d	0.30	0.30	2.8

d = diameter of filament

For the directions of view A, B and C, see sheet H12/1.

The filament shall lie entirely within the limits shown.

The centre the filament shall lie between the limits of dimensions b1 and b2.

CATEGORIES H13 AND H13 A	Sheet H13/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source

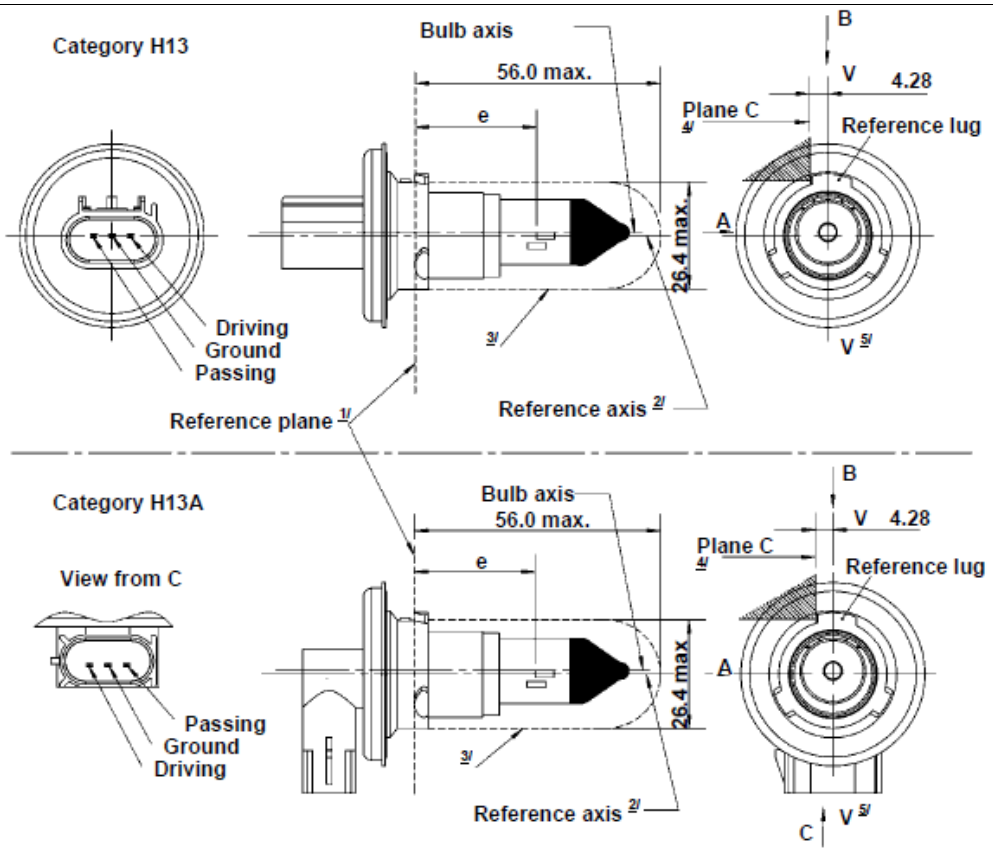


Figure 1 Main drawing

1/ The reference plane is the plane formed by the underside of the three radiused tabs of the cap.

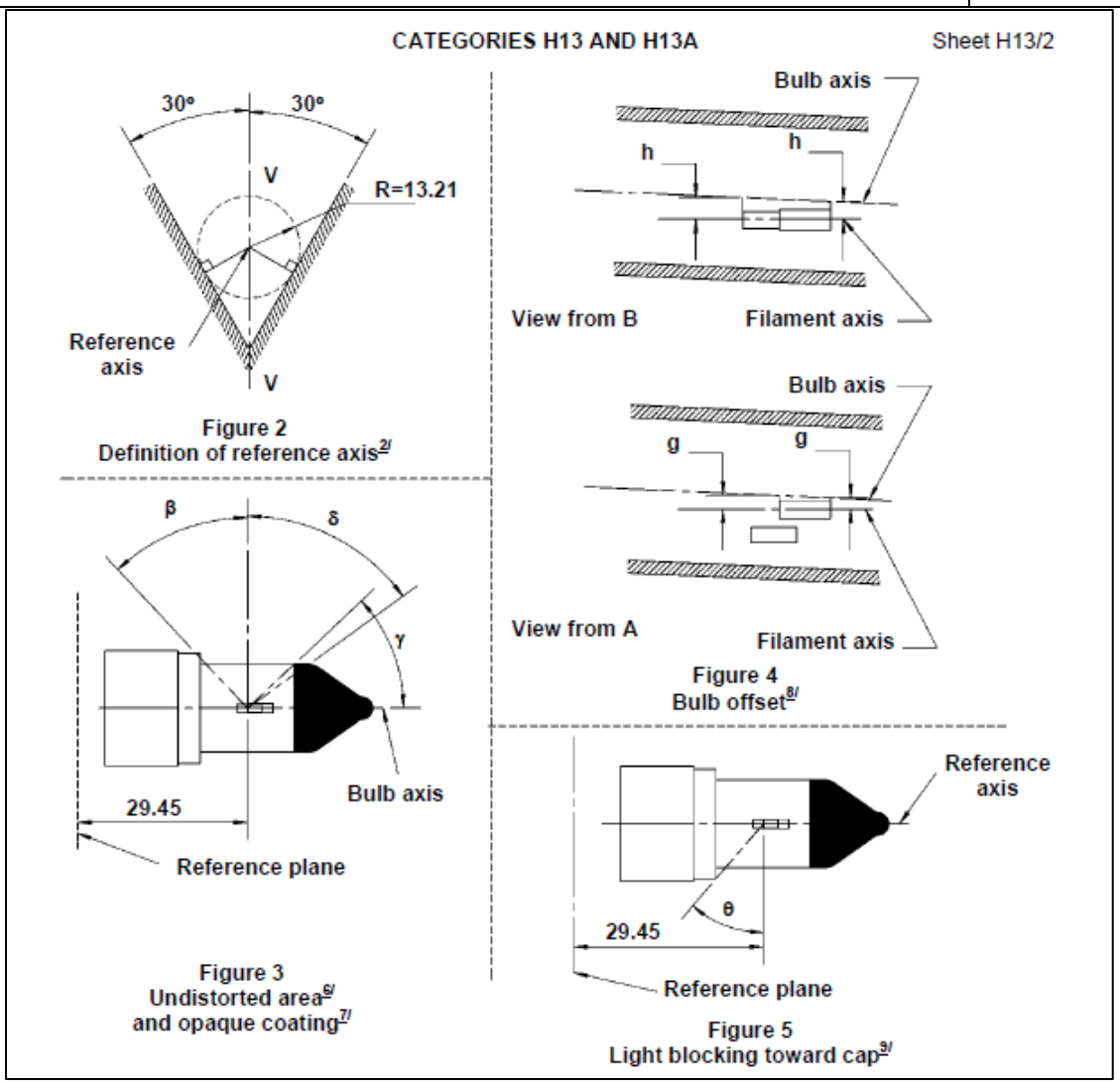
2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in Figure 2 on Sheet H13/2.

3/ Glass bulb and supports shall not exceed the envelope as indicated. The envelope is concentric to the reference axis.

4/ The filament light source shall be rotated in the measuring holder until the reference lug contacts Plane C of the holder.

5/ Plane V-V is the plane perpendicular to the reference plane passing through the reference axis and parallel to Plane C.

CATEGORIES H13 AND H13 A	Sheet H13/2



6/ Glass bulb shall be optically distortion-free axially and cylindrically within the angles β and δ. This requirement applies to the whole bulb circumference within the angles β and δ and does not need to be verified in the area covered by the opaque coating.

7/ The opaque coating shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall moreover extend at least to a plane parallel to the reference plane where γ crosses the outer bulb surface (view B as indicated on sheet H13/1).

8/ Offset of passing-beam filament in relation to the bulb axis is measured in two planes parallel to the reference plane where the projection of the outside end turns nearest to and farthest from the reference plane crosses the passing-beam filament axis.

9/ Light shall be blocked over the cap end of the bulb extending to angle θ. This requirement applies in all directions around the reference axis.

CATEGORIES H13 AND H13 A	Sheet H13/3

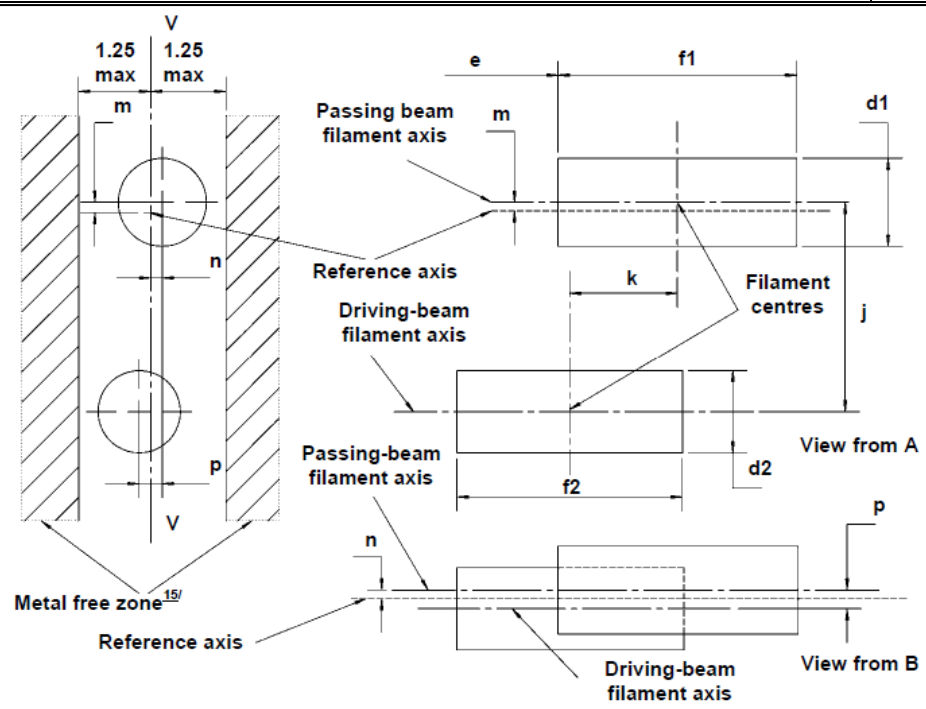


Figure 6
Position and dimensions of filaments10/11/12/13/14/

10/ Dimensions j, k and p are measured from the centre of the passing-beam filament to the centre of the driving-beam filament.

11/ Dimensions m and n are measured from the reference axis to the centre of the passing-beam filament.

12/ Both filaments axis are to be held within a 2º tilt with respect to the reference axis about the centre of the respective filament.

13/ Note concerning the filament diameters.

(a) For the same manufacturer, the design filament diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.

14/ For both the driving-beam and the passing-beam filament distortion shall not exceed ± 5 per cent of filament diameter from a cylinder.

15/ The metal free zone limits the location of lead wires within the optical path. No metal parts shall be located in the shaded area as seen in Figure 6.

CATEGORIES H13 AND H13 A				Sheet H13/4	
Dimensions in mm		**Tolerance**			
		Filaments light sources of normal production		**Standard filament light source**	
d1[13/ 17/]	1.8 max.	-		-	
d2[13/ 17/]	1.8 max.	-		-	
e[16/]	29.45	± 0.20		± 0.10	
f1[16/]	4.6	± 0.50		± 0.25	
f2[16/]	4.6	± 0.50		± 0.25	
g[8/ 17/]	0.5 d1	± 0.40		± 0.20	
h[8/]	0	± 0.30		± 0.15	
j[10/]	2.5	± 0.20		± 0.10	
k[10/]	2.0	± 0.20		± 0.10	
m[11/]	0	± 0.20		± 0.13	
n[11/]	0	± 0.20		± 0.13	
p[10/]	0	± 0.08		± 0.08	
β	42° min.	-		-	
δ	52° min.	-		-	
γ	43°	+0°/-5°		+0°/-5°	
θ[9/]	41°	±4°		±4°	
Cap: H13: P26.4t in accordance with IEC Publication 60061 (sheet 7004-128-3) H13A: PJ26.4t					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS 18/					
Rated values	Volts	12		12	
	Watts	55	60	55	60
Test voltage	Volts	13.2		13.2	
Objective values	Watts	68 max.	75 max.	68 max.	75 max.
	Luminous flux	1,100 ± 15%	1,700 ±15%		
Reference luminous flux at approximately			12 V	800	1,200
			13.2 V	1,100	1,700
16/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown on sheet H13/1, the projection of the outside of the end turns crosses the filament axis.					
17/ d1 is the actual diameter of the passing-beam filament. d2 is the actual diameter of the driving-beam filament.					
18/ The values indicated in the left-hand columns relate to the passing-beam filament and those indicated in the right-hand columns to the driving-beam filament.					

CATEGORY H14	Sheet H14/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

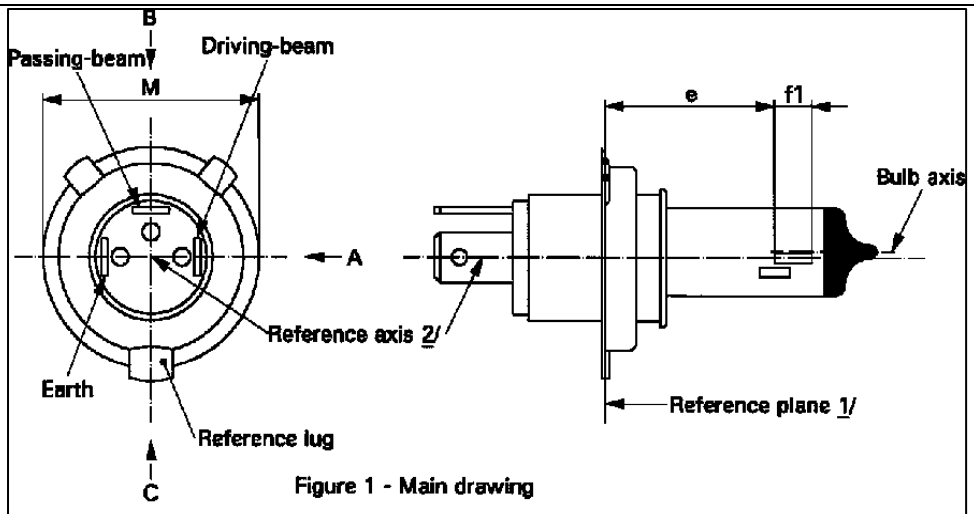


Figure 1 - Main drawing

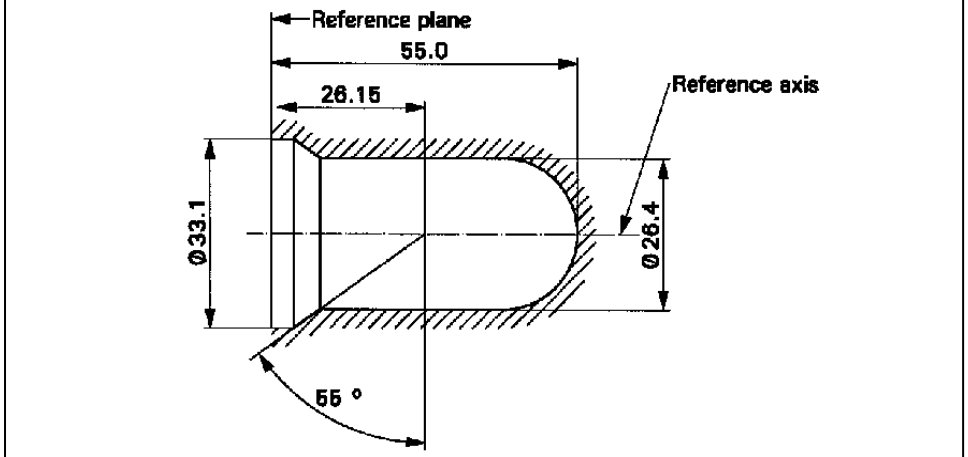


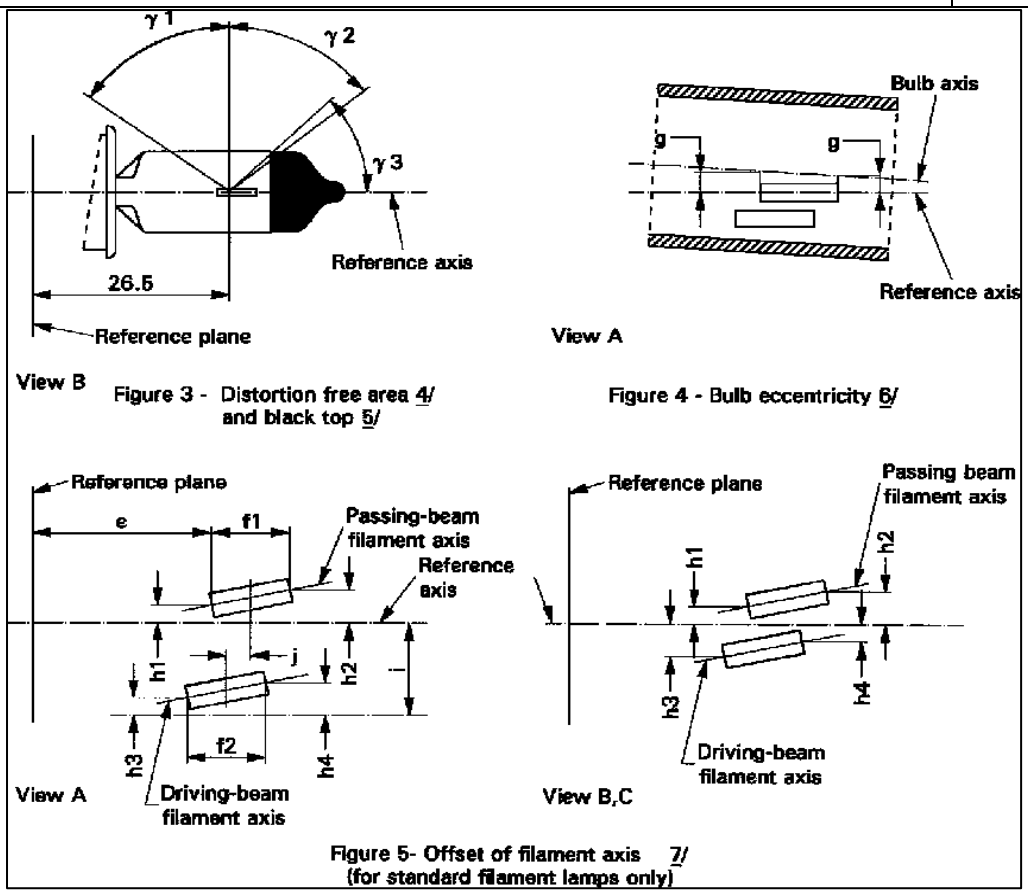
Figure 2 - Maximum lamp outline 3/

1/ The reference plane is defined by the points on the surface of the holder on which the three lugs of the cap ring will rest.

2/ The reference axis is perpendicular to the reference plane and passing through the centre of the cap ring diameter "M"'

3/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

CATEGORY H14	Sheet H14/2



4/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2 and does not need to be verified in the area covered by the obscuration.

5/ The obscuration shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall, moreover, extend at least to a plane parallel to the reference plane where γ3 crosses the outer bulb surface (view B as indicated on sheet H14/1).

6/ Eccentricity of bulb with respect to passing-beam filament axis is measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the passing-beam filament axis.

7/ The offset of the filaments with respect to the reference axis is measured only in viewing direction A, B and C as shown in Figure 1 on sheet H14/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filaments axis.

CATEGORY H14						**Sheet H14/3**
Dimensions in mm		Filament light source of normal production		Standard filament light sources		
e [8/]	26.15	[10/]		± 0.1		
f1 [8/ 9/]	5.3	[10/]		± 0.1		
f2 [8/ 9/]	5.0	[10/]		± 0.1		
g	0.3 min.					
h1	0	[10/]		± 0.1		
h2	0	[10/]		± 0.15		
h3	0	[10/]		± 0.15		
h4	0	[10/]		± 0.15		
i	2.7			-		
j	2.5	[10/]		± 0.1		
γ1	55° min.	-		-		
γ2	52° min.	-		-		
γ3	43°	0/-5°		0/-5°		
Cap P38t in accordance with IEC Publication 60061 (sheet 7004-133-1)						
ELECTRICAL AND PHOTOMETRIC CHARACTERISTCS						
Rated values	Volts	12		12		
	Watts	55	60	55	60	
Test voltage	Volts	13.2		13.2		
Objective values	Watts	68 max.	75 max.	68 max.	75 max.	
	Luminous flux	1,150 ± 15%	1,750 ± 15%			
Reference luminous flux at approximately			12 V	860	1,300	
			13.2 V	1,150	1,750	

CATEGORY H14	Sheet H14/4

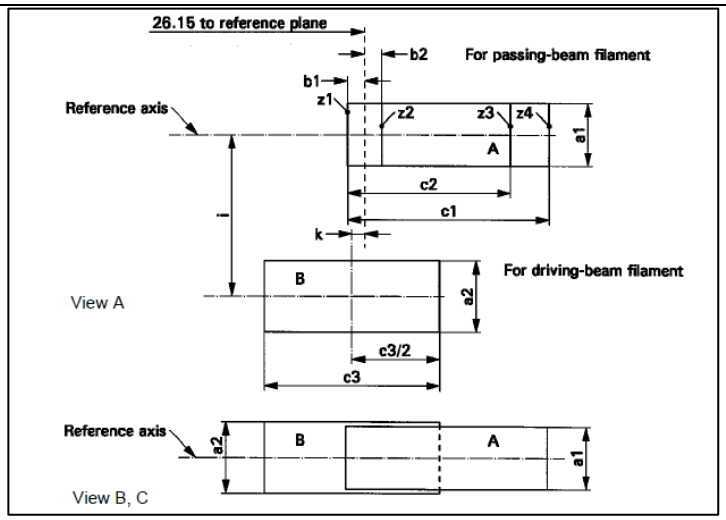
8/ The ends of the filaments are defined as the points where, when the viewing direction is direction A as shown in Figure 1 on sheet H14/1, the projection of the outside of the end turns crosses the filaments axis.

9/ "f1" represents the length of the passing-beam filament and "f2" represents the length of the driving-beam filament.

10/ To be checked by means of a “Box system"; sheet H14/4.

Screen Projection Requirements

This test is used to determine, by checking whether the filaments are correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



a1	a2	b1	b2	c1	c2	c3	i	k
d1 +0.5	1.6 * d2	0.2		5.8	5.1	5.75	2.7	0.15

d1 is diameter of the passing beam filament and d2 that of the driving beam filament.

Notes concerning the filaments diameter:

(a) No actual diameter restrictions apply but the objective for future developments is to have d1 max. = 1.6 mm and d2 max. = 1.6 mm.

(b) For the same manufacture, the design diameter of standard filament light sources and filament light sources of normal production shall be the same.

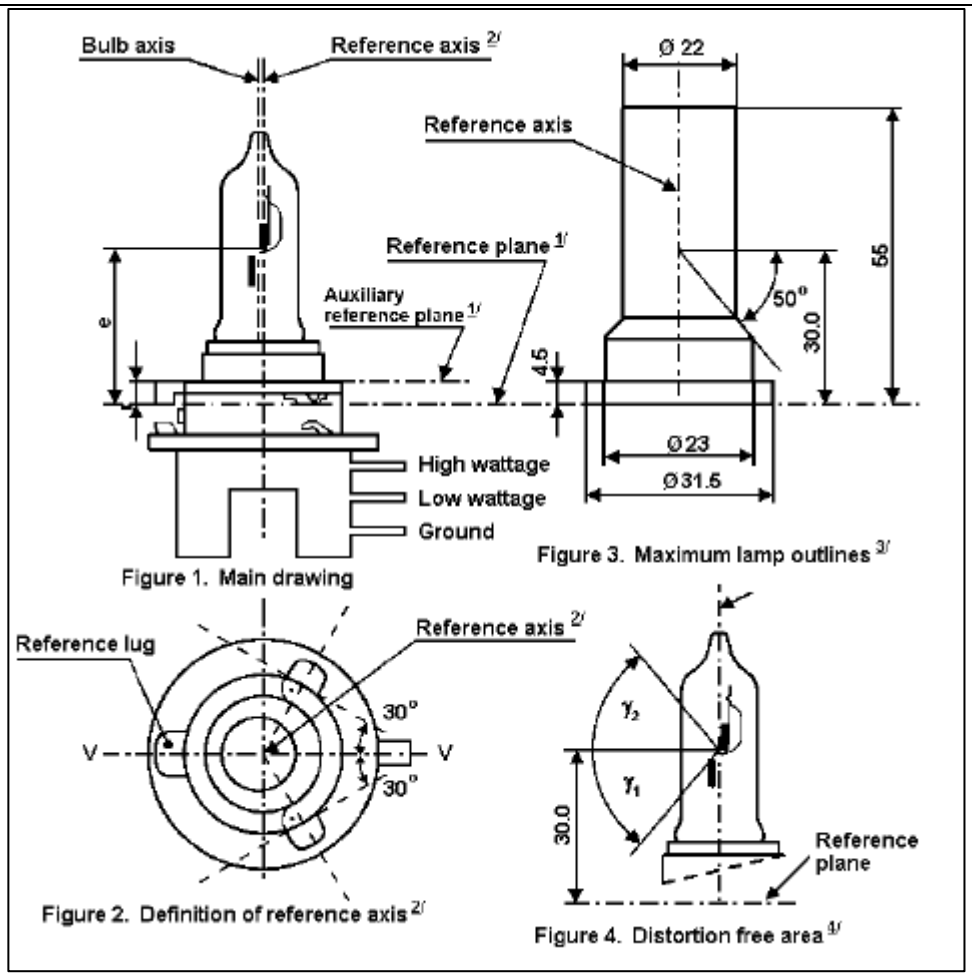
The positions of the filaments are checked solely in directions A, B and C as shown in Figure 1 on sheet H14/1.

The passing-beam filament shall lie entirely in the rectangle A and the driving beam filament entirely in rectangle B.

The ends of the passing-beam filament as defined on sheet H14/3, note 8/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

CATEGORY H15	**Sheet H15/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source



1/ The reference plane is defined by the points at which the holder touches the three lugs of the cap ring from the plug side. It is intended for use as an internal reference plane.

The auxiliary reference plane is defined by the points on the surface of the holder on which the three supporting bosses of the cap ring will rest. It is intended for use as an external reference plane.

The Cap is designed for use of the (internal) reference plane, but for certain applications the (external) auxiliary reference plane may be used instead.

2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in figure 2 on sheet H15/1.

3/ Glass bulb and supports shall not exceed the envelope as indicated in figure 3. The envelope is concentric to the reference axis.

4/ Glass bulb shall be optically distortion free within the angles Y1 and Y2 as indicated in figure 4. This requirement applies to the whole bulb circumference within the angles $\gamma 1$ and $\gamma 2$.

CATEGORY H15			**Sheet H15/2**
Dimensions in mm	Filament light sources of normal production		Standard filament light sources
	12 V	24 V	12V
e	30.0 +0.35/-0.25	30.0 +0.35/-0.25	30.0 +0.20/-0.15
γ1	50°min	50°min	50°min
γ2	50°min	50°min	50°min
r	For details see cap sheet		

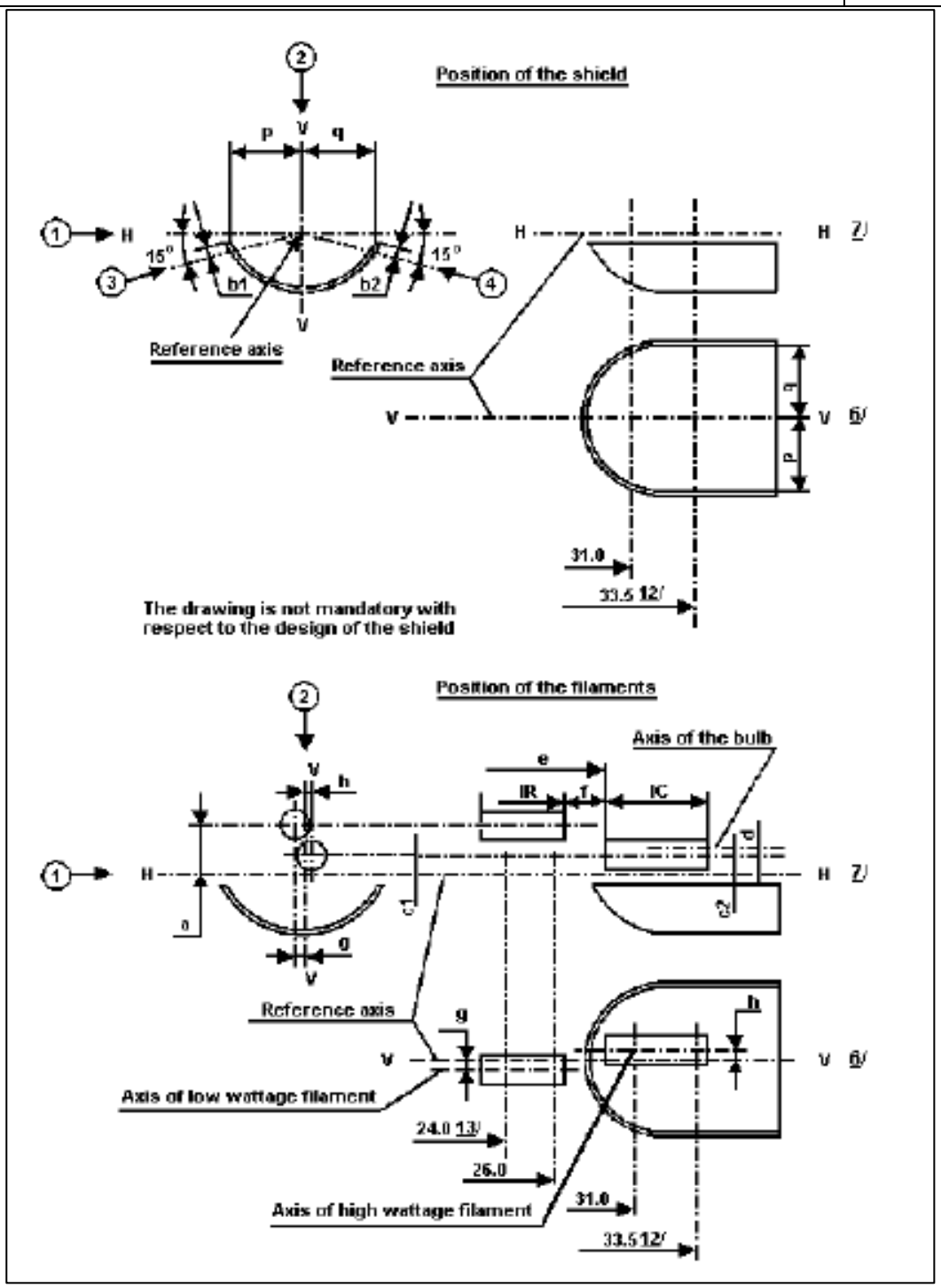
Cap PGJ23t-1 in accordance with IEC Publication 60061 (sheet 7004-155-1)

ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS

Rated values	Volts	12 5/		24 5/		12 5/	
	Watts	15	55	20	60	15	55
Test voltage	Volts	13.2		28.0		13.2	13.2
Objective values	Watts	19 max.	64 max.	24 max.	73 max.	19 max.	64 max.
	Luminous flux	260	1,350	300	1,500		
	± 10%						
Reference luminous flux at approximately 12 V							1,000
Reference luminous flux at approximately 13.2 V							1,350
Reference luminous flux at approximately 13.5 V						290	

5/ The values indicated in the left-hand columns relate to the low wattage filament. Those indicated in the right-hand columns relate to the high wattage filament.

CATEGORY H15	Sheet H15/3



CATEGORY H15								**Sheet H15/4**
Table of the dimensions (in mm) referred to in the drawings on sheet H15/3								
Reference */		Dimension **/		Tolerance				
				Filament light sources of normal production		Standard filament light source		
12 V	24 V	12 V	24 V	12 V	24 V	12 V	24 V	
a/24.0	a/24.5	1.8		± 0.35		± 0.20		
a/26.0		1.8		± 0.35		± 0.20		
b1/31.0		0		± 0.30		± 0.15		
b1/33.	b1/34.0	b1/31.0 mv		± 0.30		± 0.15		
b2/31.0		0		± 0.30		± 0.15		
b2/33.	b2/34.0	b2/31.0 mv		± 0.30		± 0.15		
c1/31.0		0		± 0.30	± 0.50	± 0.15	± 0.25	
c1/33.	c1/34.0	c1/31.0 mv		± 0.30	± 0.50	± 0.15	± 0.25	
c2/33.	c2/34.0	1.1		± 0.30	± 0.50	± 0.15	± 0.25	
d		min. 0.1		-		-		
f 8/ 9/ 10/		2.7		± 0.30	± 0.40	+ 0.20 - 0.10	+ 0.25 - 0.15	
g/24.0	g/24.5	0		± 0.50	± 0.70	± 0.25	± 0.35	
g/26.0		0		± 0.50	± 0.70	± 0.25	± 0.35	
h/31.0		0		± 0.50	± 0.60	± 0.25	± 0.30	
h/33.5	h/34.0	h/31.0 mv		± 0.30	± 0.40	± 0.15	± 0.20	
lR 8/ 11/		4.2	4.6	± 0.40	± 0.60	± 0.20	± 0.30	
lC 8/ 9/		4.4	5.4	± 0.40	± 0.60	± 0.20	± 0.30	
p/33.5	p/34.0	Depends on the shape of the shield		-		-		
q/33.5	q/34.0	p/33.5	p/34.0	± 1.20		± 0.60		
*/ ".../26.0" means dimension to be measured at the distance from the reference plane indicated in mm after the stroke.								
**/ "31.0 mv" means the value measured at a distance of 31.0 mm from the reference plane.								

CATEGORY H15	**Sheet H15/5**
6/ Plane V-V is the plane perpendicular to the reference plane and passing through the reference axis and through the axis of the reference lug.	
7/ Plane H-H is the plane perpendicular to both the reference plane and plane V-V and passing through the reference axis.	
8/ The end turns of the filament are defined as being the first luminous turn and the last luminous turn that are at substantially the correct helix angle.	
9/ For the high wattage filament, the points to be measured are the intersections, seen in direction 1, of the lateral edge of the shield with the outside of the end turns defined under footnote 8/.	
10/ "e" denotes the distance from the reference plane to the beginning of the driving beam filament as defined above.	
11/ For the low wattage filament the points to be measured are the intersections, seen in direction 1, of a plane, parallel to plane H-H and situated at a distance of 1.8 mm above it, with the end turns defined under footnote 8/.	
12/ 34.0 for the 24 V type.	
13/ 24.5 for the 24 V type.	
Additional explanations to sheet H15/3	
The dimensions below are measured in four directions:	
1) for dimensions a, c1, c2, d, e, f, l_R and l_C;	
2) for dimensions g, h, p and q;	
3) for dimension b1;	
4) for dimension b2.	
Dimensions b1, b2, c1 and h are measured in planes parallel to the reference plane at distances of 31.0 mm and 33.5 mm (34.0 mm for 24 V types).	
Dimensions c2, p and q are measured in a plane parallel to the reference plane at a distance of 33.5 mm (34.0 mm for 24 V types).	
Dimensions a and g are measured in planes parallel to the reference plane at distances of 24.0 mm (24.5 mm for 24 V types) and 26.0	

Categories H16 and H16B	**Sheet H16/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

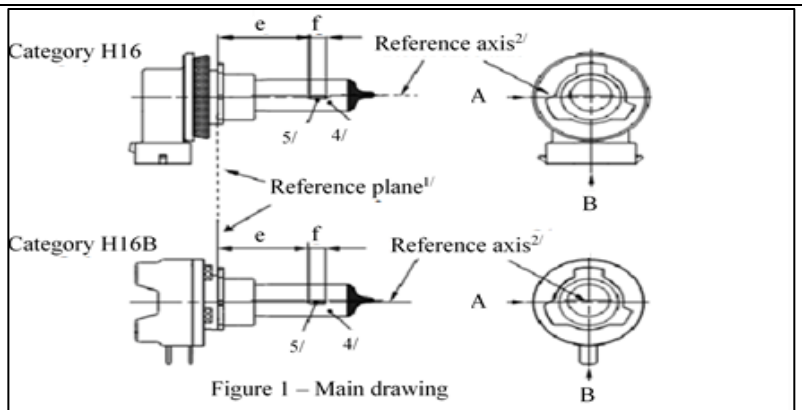


Figure 1 – Main drawing

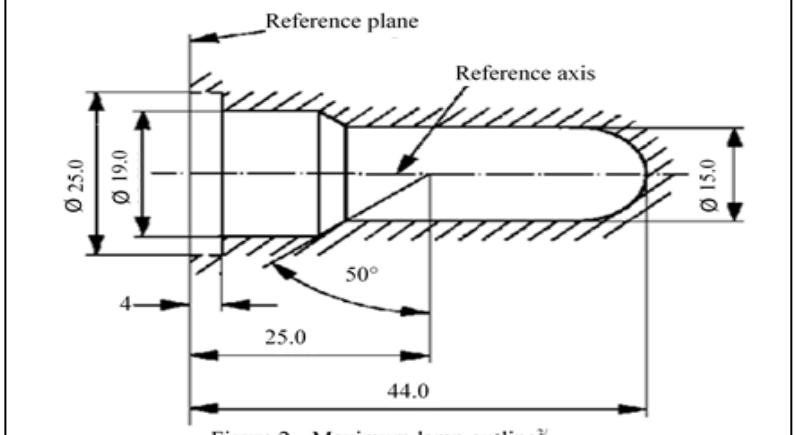


Figure 2 - Maximum lamp outline3/

1/ The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.

2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.

3/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

4/ The light emitted shall be white or selective yellow.

5/ Notes concerning the filament diameter.

(a) No actual diameter restrictions apply but the objective for future developments is to have d max. = 1.1 mm.

(b) For the same manufacturer, the design diameter of standard (étalon) filament light sources and filament light source of normal production shall be the same.

Categories H16 and H16B	Sheet H16/2

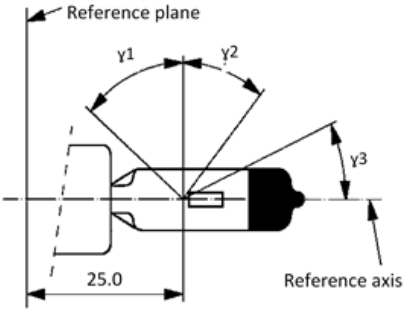


Figure 3 - Distorsion free area[6/] and black top[7/]

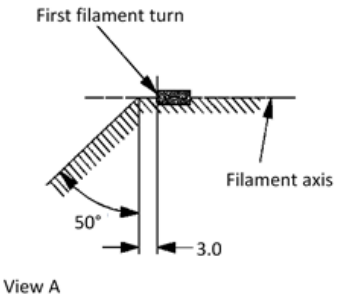


Figure 4 – Metal free zone[8/]

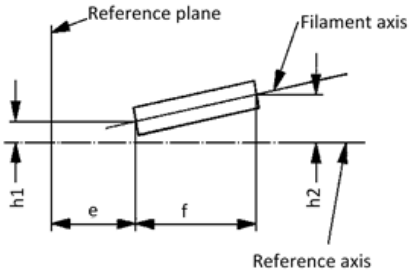


Figure 5 – Permissible offset of filament axis[9/] (for standard filament light sources only)

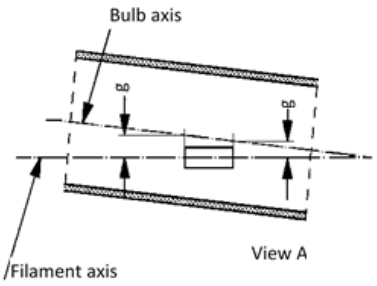


Figure 6 – Bulb eccentricity[10/]

6/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

7/ The obscuration shall extend at least to angle γ3 and shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference.

8/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction. (View A as indicated in Figure 1 on sheet H16/1). No metal parts other than filament turns shall be located in the shaded area as seen in Figure 4.

9/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 in sheet H16/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

10/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

Categories H16 and H16B				Sheet H16/3
Dimensions in mm			**Filament light sources of normal production**	**Standard filament light source**
			12 V	**12 V**
e [11/]			25.0 [12/]	25.0 ± 0.1
f [11/]			3.2 [12/]	3.2 ± 0.1
g			0.5 min.	u.c.
h1			0 [12/]	0 ± 0.1
h2			0 [12/]	0 ± 0.15
γ1			50° min.	50° min.
γ2			40° min.	40° min.
γ3			30° min.	30° min.
Cap:	H16: PGJ19-3		in accordance with IEC Publication 60061 (sheet 7004-110-2)	
	H16B: PGJY19-3		in accordance with IEC Publication 60061 (sheet 7004-146-1)	
Electrical and photometric characteristics				
Rated values		Volts	12	12
		Watts	19	19
Test voltage		Volts	13.2	13.2
Objective values		Watts	26 max.	26 max.
		Luminous flux	500 +10 % / -15 %	
Reference luminous flux: 370 lm at approximately 12 V				370 lm
Reference luminous flux: 500 lm at approximately 13.2 V				500 lm
Reference luminous flux: 550 lm at approximately 13.5 V				550 lm

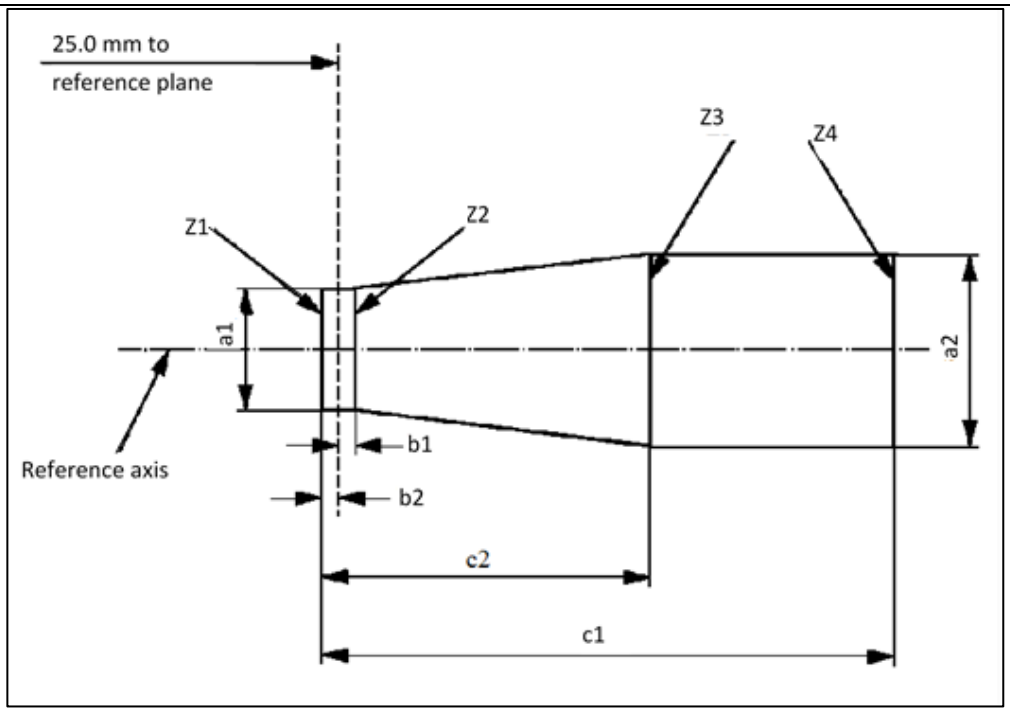
11/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown in Figure 1 on sheet H16/1, the projection of the outside of the end turns crosses the filament axis.

12/ To be checked by means of a "Box system"; sheet H16/4.

Categories H16 and H16B	Sheet H16/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament complies with the requirements.



a1	a2	b1	b2	c1	c2
d + 0.50	d + 0.70	0.25		3.6	2.6

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet H16/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H16/3, footnote 11/, shall lie between lines Z1 and Z2 and between Z3 and Z4.

Category H17	Sheet H17/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

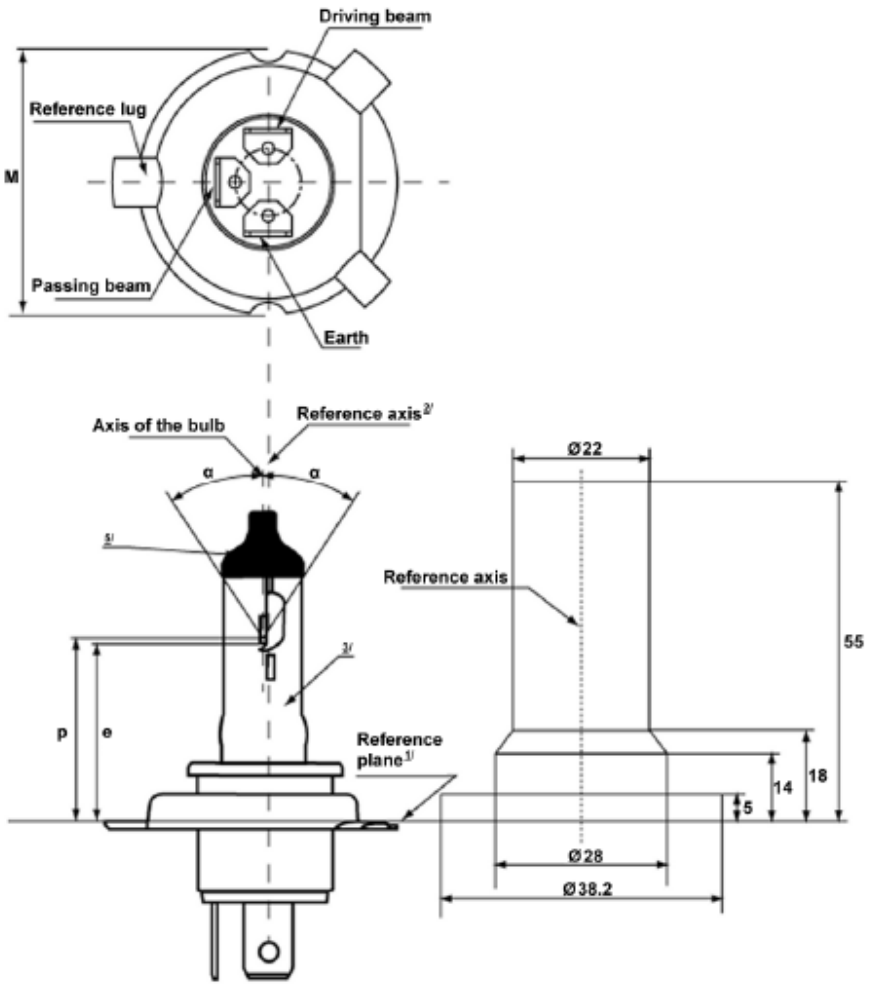


Figure 1

Main Drawing

Figure 2

Maximum Lamp Outlines 4/

For the notes see Sheet H17/6

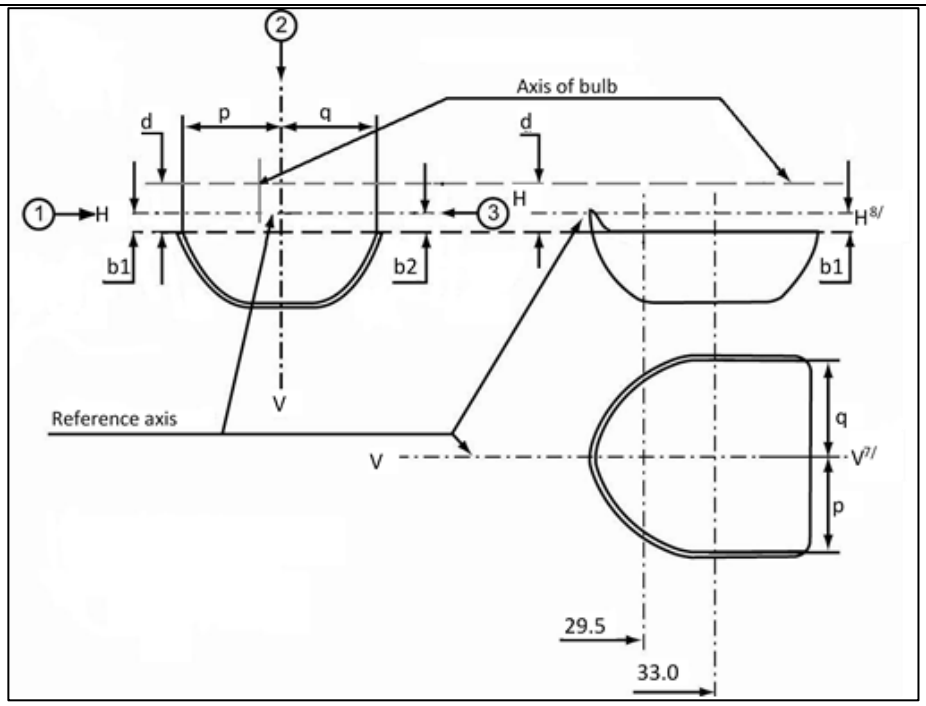
Category H17	**Sheet H17/2**

Dimensions in mm		Filament light sources of normal production		Standard filament light source	
		12 V		12 V	
e		28.5 + 0.35 / - 0.15		28.5 + 0.20 / - 0.0	
p		28.95		28.95	
α		max. 40°		max. 40°	
Cap PU43t-4 in accordance with IEC Publication 60061 (sheet 7004-171-2)					
Electrical and photometric characteristics					
Rated values	Volts	12 [6/]		12 [6/]	
	Watts	35	35	35	35
Test	Volts	13.2	13.2	13.2	13.2
Objective values	Watts	37 max.	37 max.	37 max.	37 max.
	Luminous flux	900 ± 10 %	600 ± 10 %		
Reference luminous flux at approximately			12.0 V	700	450
			13.2 V	900	600

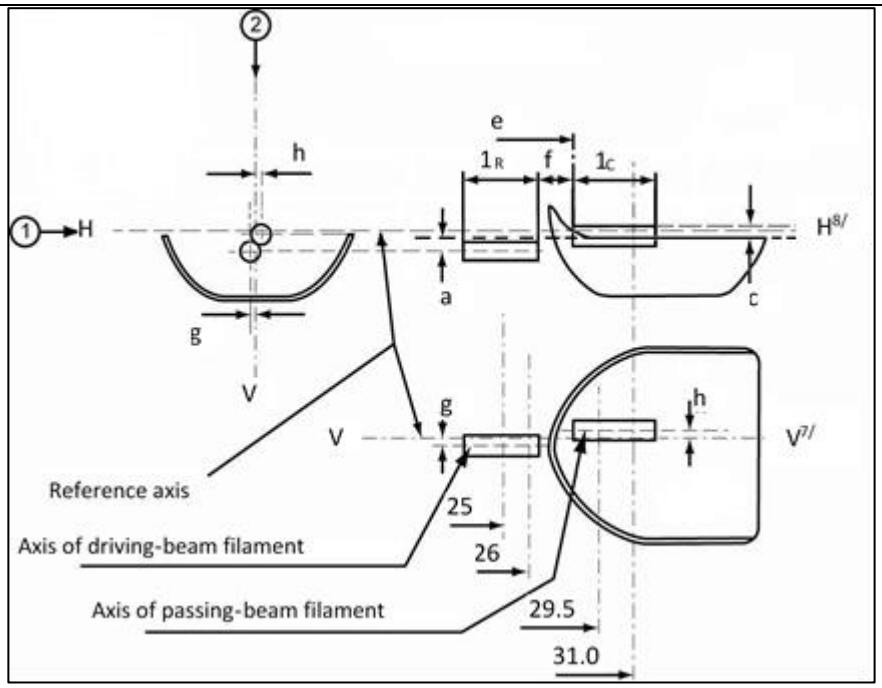
For note 6/ see sheet H17/6

Category H17	Sheet H17/3

Position of the shield



Category H17	Sheet H17/4
Position of filaments	



Category H17	**Sheet H17/5**

Table of the dimensions (in mm) referred to in the drawings on sheets H17/3 and H17/4

Reference*	Dimension**	Tolerance	
		Filament light sources of normal production	Standard filament light source
a/25.0	0.3	±0.40	±0.20
a/26.0	0.3	±0.35	±0.20
b1/29.5	0.0	±0.30	±0.25
b1/33.0	b1/29.5 mv	±0.30	±0.15
b2/29.5	0.0	±0.30	±0.25
b2/33.0	b2/29.5 mv	±0.30	±0.15
c/29.5	0.5	±0.25	±0.15
c/31.0	c/29.5 mv	±0.25	±0.15
d	min. 0.1	-	-
e [11/]	28.5	+0.35 / -0.15	+0.20 / -0.0
f [9/, 10/, 11/]	1.7	±0.30	±0.15
g/25.0	0	±0.50	±0.30
g/26.0	0	±0.40	±0.25
h/29.5	0	±0.40	±0.25
h/31.0	h/29.5 mv	±0.30	±0.15
lR [9/, 12/]	4.0	±0.40	±0.20
lC [9/, 10/]	4.2	±0.40	±0.20
p/33.0	Depends on the shape of the shield	-	-
q/33.0	(p+q)/2	±0.60	±0.30

* "../25.0" means dimension to be measured at the distance from the reference plane indicated in mm after the stroke.

** "29.5 mv" means the value measured at a distance of 29.5 mm from the reference plane.

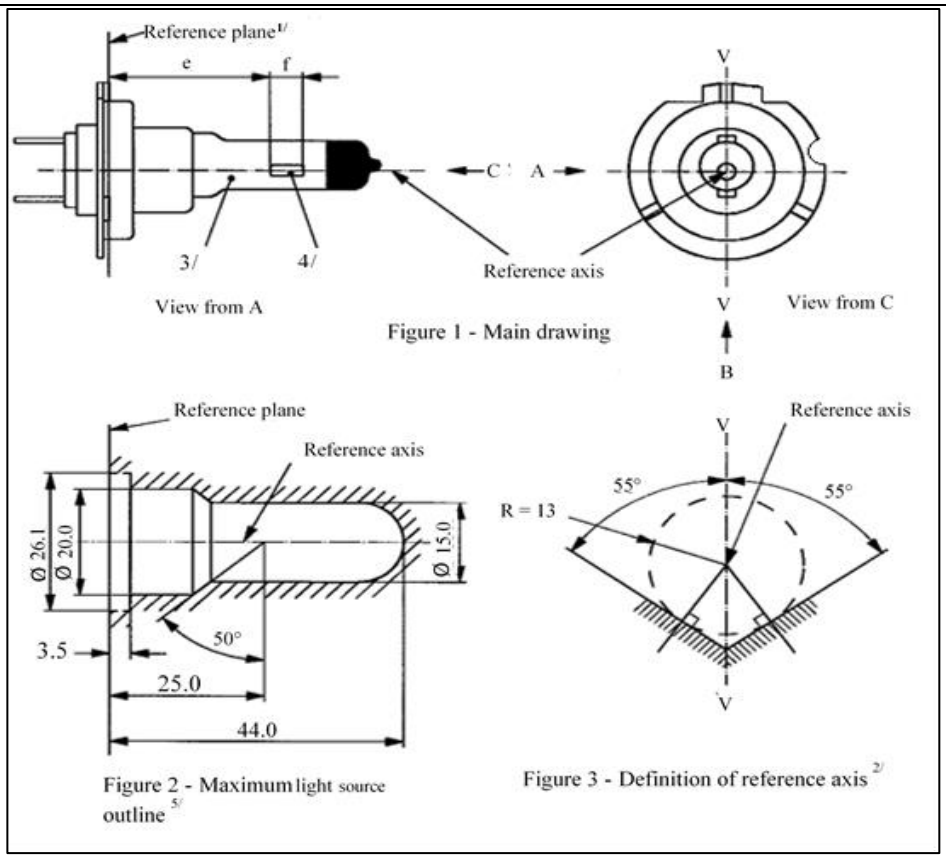
For the notes see sheet H17/6

Category H17	**Sheet H17/6**
1/ The reference plane is the plane formed by the seating points of the three lugs of the cap ring.	
2/ The reference axis is perpendicular to the reference plane and passes through the centre of the circle of diameter "M".	
3/ The light emitted from standard filament light sources and from normal production light sources shall be white.	
4/ The bulb and supports shall not exceed the envelope as in Figure 2.	
5/ The obscuration shall extend at least as far as the cylindrical part of the bulb. It shall also overlap the internal shield when the latter is viewed in a direction perpendicular to the reference axis.	
6/ The value indicated in the left hand column relate to the driving beam filament. Those indicated in the right-hand column relate to the passing-beam filament.	
7/ Plane V-V is the plane perpendicular to the reference plane and passing through the reference axis and through the intersection of the circle of diameter "M" with the axis of the reference lug.	
8/ Plane H-H is the plane perpendicular to both the reference plane and plane V-V and passing through the reference axis.	
9/ The end turns of the filament are defined as being the first luminous turn and the last luminous turn that are at substantially the correct helix angle.	
10/ For the passing beam filament, the points to be measured are the intersections, seen in direction 1, of the lateral edge of the shield with the outside of the end turns defined under note 9/.	
11/ "e" denotes the distance from the reference plane to the beginning of the passing filament as defined above.	
12/ For the driving beam filament the points to be measured are the intersections, seen in direction 1, of a plane, parallel to plane H-H and situated at a distance of 0.3 mm below it, with the end turns defined under note 9/.	
Additional explanations to sheets H17/3 and H17/4	
The dimensions below are measured in three directions:	
1 For dimensions b1, a, c, d, e, f, lR and lC.	
2 For dimensions g, h, p and q.	

Category H17	**Sheet H17/7**
3 For dimension b2.	
Dimensions p and q are measured in planes parallel to and 33.0 mm away from the reference plane.	
Dimensions b1, b2 are measured in planes parallel to and 29.5 mm and 33.0 mm away from the reference plane.	
Dimensions c and h are measured in planes parallel to and 29.5 mm and 31.0 mm away from the reference plane.	
Dimensions a and g are measured in planes parallel to and 25.0 mm and 26.0 mm away from the reference plane.	
Note: For the method of measurement, see Appendix E to IEC Publication 60809.	

Category H18	Sheet H18/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is defined by the points on the surfaces of the holder on which the three supporting bosses of the cap ring will rest.

2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in Figure 3.

3/ The colour of the light emitted shall be white or selective-yellow.

4/ Notes concerning the filament diameter.

(a) No actual diameter restrictions apply but the design target is d max. = 1.3 mm.

(b) For the same manufacturer, the design diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.

5/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

Category H18	Sheet H18/2

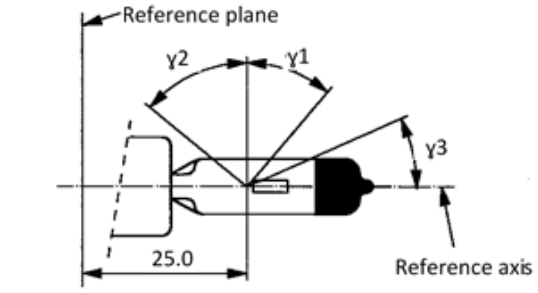


Figure 4 - Distortion free area and black top 6/, 7/

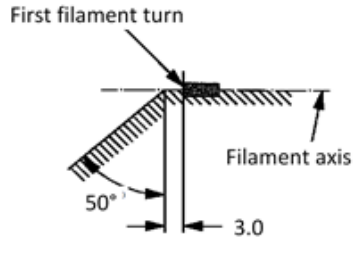


Figure 5 - Metal free zone 8/

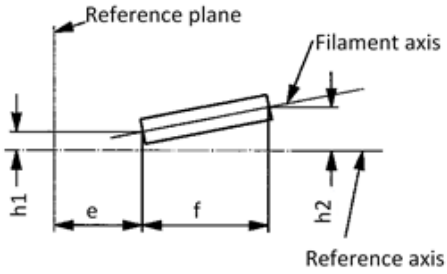


Figure 6 - Permissible offset of filament axis (for standard filament light sources only)

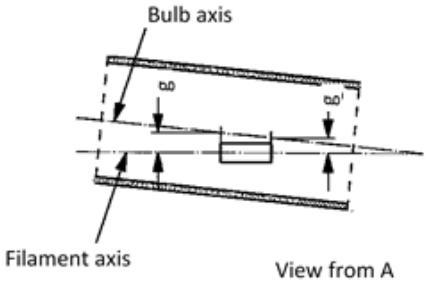


Figure 7 - Bulb eccentricity

6/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

7/ The obscuration shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall moreover extend at least to a plane parallel to the reference plane where γ3 crosses the outer bulb surface (view B as indicated on sheet H18/1).

8/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction. (View A as indicated in Figure 1 on sheet H18 /1).

No metal parts other than filament turns shall be located in the shaded area as seen in Figure 5.

Category H18	**Sheet H18/3**

		Filaments light sources of normal production	Standard filament light source
		12 V	12 V
e [9/]		25.0 [10/]	25.0 ± 0.1
f [9/]		4.8 [10/]	4.8± 0.1
g [12/]		0.5 min.	u.c.
h1 [11/]		0 [10/]	0 ± 0.10
h2 [11/]		0 [10/]	0 ± 0.15
γ1		40° min.	40° min.
γ2		50° min.	50° min.
γ3		30° min.	30° min.
Cap PY26d-1 in accordance with IEC Publication 60061 (sheet 7004-5-7)			
Electrical and photometric characteristics			
Rated values	Volts	12	12
	Watts	65	65
Test voltage	Volts	13.2	13.2
Objective values	Watts	69 max.	69 max.
	Luminous flux	1,700 ± 8 %	
Reference luminous flux at approximately	13.2 V		1,700

9/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown in Figure 1 on sheet H18/1, the projection of the outside of the end turns crosses the filament axis.

10/ To be checked by means of a "Box System", sheet H18/4.

11/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 in sheet H18/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

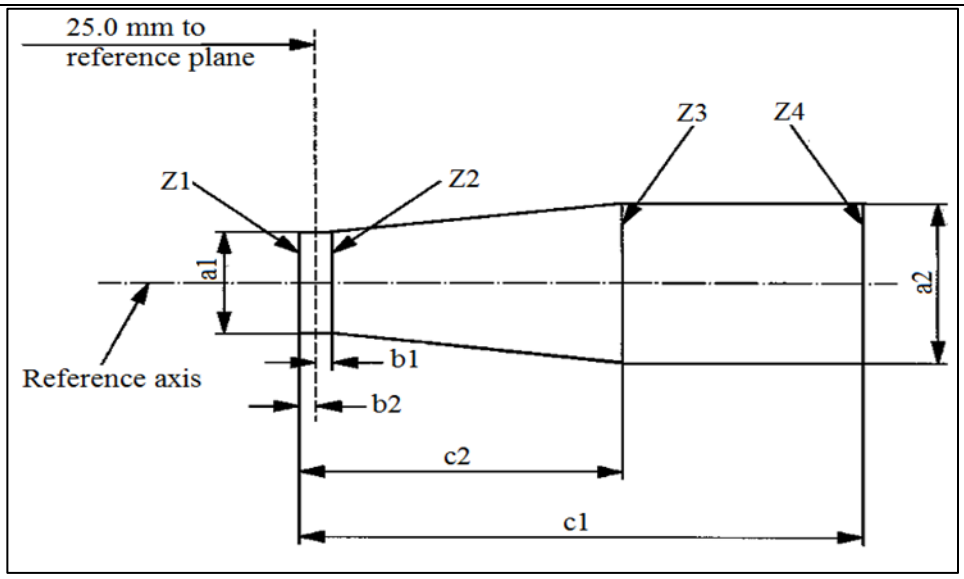
12/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

Category H18	Sheet H18/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.

Dimensions in mm



	a1	a2	b1	b2	c1	c2
12 V	d + 0.30	d + 0.50	0.2		5.3	4.7

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet H18/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H18/3, note 9, shall lie between lines Z1 and Z2 and between Z3 and Z4.

Category H19	**Sheet H19/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

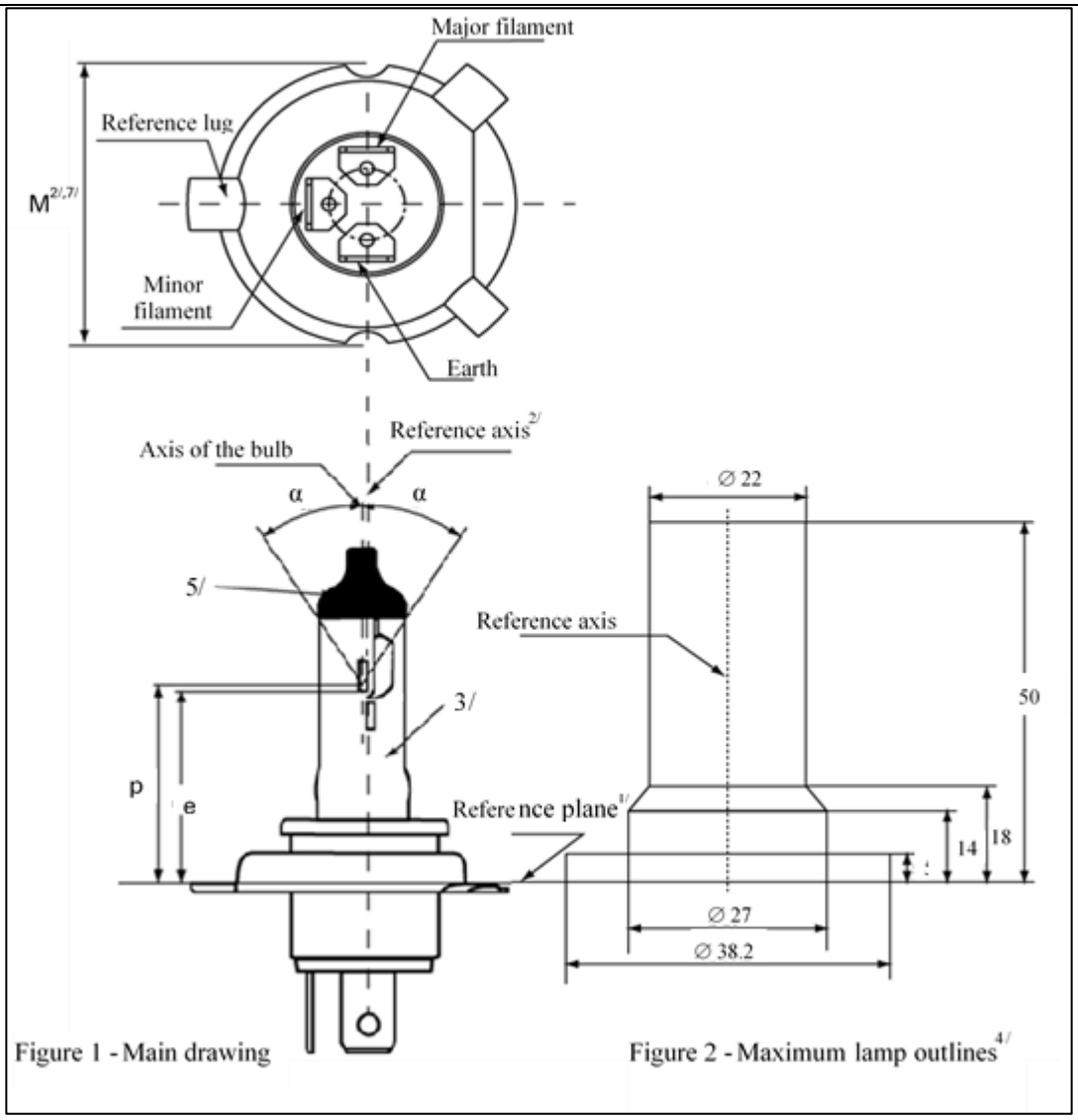


Figure 1 - Main drawing

Figure 2 - Maximum lamp outlines 4/

For the notes see sheet H19/5

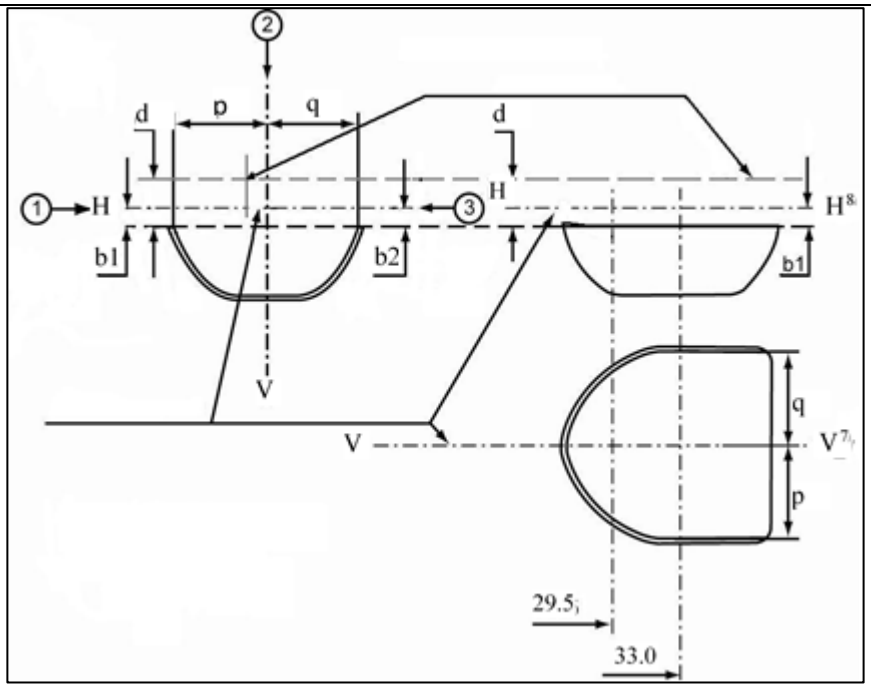
Category H19	Sheet H19/2

Dimensions in mm		Filament light sources of normal production		Standard filament light source	
		12 V		12 V	
e		28.5 + 0.35 / - 0.15		28.5 + 0.20 / - 0.0	
p		28.95		28.95	
α		max. 45°		max. 45°	
Cap PU43t-3 in accordance with IEC Publication 60061 (sheet 7004-171-1)					
Electrical and photometric characteristics					
Rated values	Volts	12[6/]		12[6/]	
	Watts	60	55	60	55
Test values	Volts	13.2	13.2	13.2	13.2
Objective values	Watts	72 max.	68 max.	72 max.	68 max.
	Luminous flux	1 750 ± 10%	1 200 ± 10%		
Reference luminous flux at approximately			13.2 V	1,750	1,200

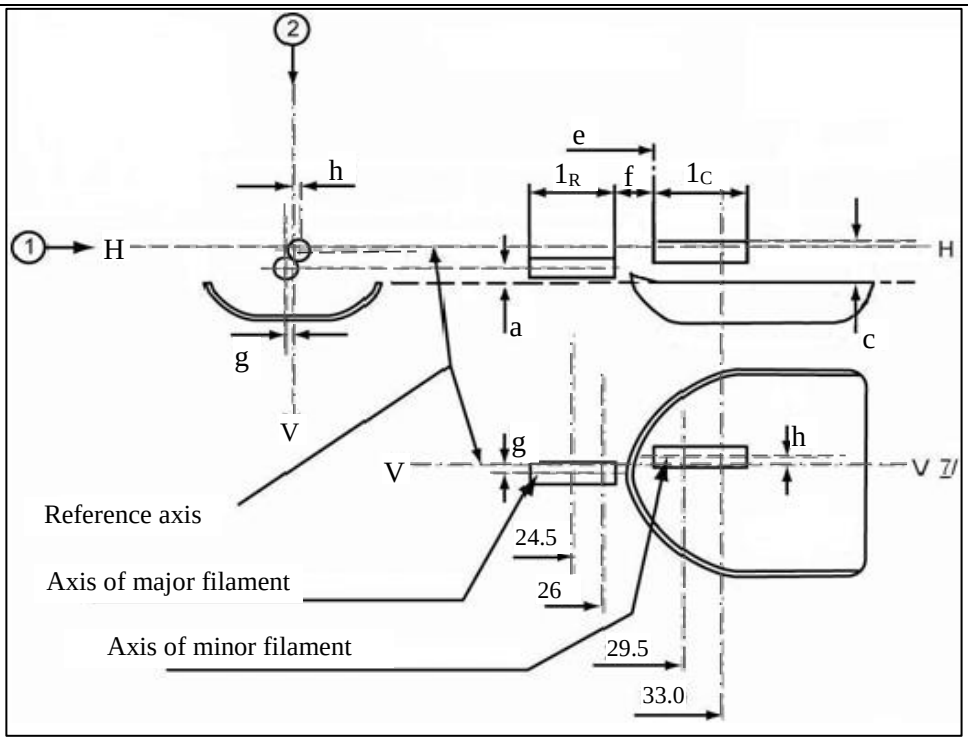
For note 6 see sheet H19/5.

Category H19	Sheet H19/3

Position of Shield



Position of Filament



Category H19	Sheet H19/4

Table of the dimensions (in mm) referred to in the drawings on sheet H19/3

Reference*	Dimension**	Tolerance	
		Filament light sources of normal production	Standard filament light source
a/26.0	0.7	±0.30	±0.20
a/24.5	0.7	±0.40	±0.20
b1/29.5	1.0	±0.30	±0.25
b1/33.0	b1/29.5 mv	±0.30	±0.15
b2/29.5	1.0	±0.30	±0.25
b2/33.0	b2/29.5 mv	±0.30	±0.15
c/29.5	1.7	±0.25	±0.15
c/33	c/29.5 mv	±0.25	±0.15
d	min. 1.1	-	-
e[11/]	28.5	+0.35 / -0.15	+0.20 / -0.0
f [9/, 10/, 11/]	1.4	±0.30	±0.15
g/26.0	0	±0.40	±0.30
g/24.5	0	±0.50	±0.25
h/29.5	0	±0.40	±0.25
h/33.0	h/29.5 mv	±0.30	±0.15
lR [9/, 12/]	4.0	±0.60	±0.30
lC [9/, 10/]	5.2	±0.60	±0.30
p/33.0	Depends on the shape of the shield	-	-
q/33.0	(p+q)/2	±0.60	±0.30

* "../24.5" means dimension to be measured at the distance from the reference plane indicated in mm after the stroke.

** "../29.5 mv" means the value measured at a distance of 29.5 mm from the reference plane.

For the notes see sheet H19/5.

Category H19	Sheet H19/5
1/ The reference plane is the plane formed by the seating points of the three lugs of the cap ring.	
2/ The reference axis is perpendicular to the reference plane and passes through the centre of the circle of diameter "M".	
3/ The light emitted from standard filament light sources and from normal production light sources shall be white.	
4/ The bulb and supports shall not exceed the envelope as in Figure 2.	
5/ The obscuration shall extend at least as far as the cylindrical part of the bulb. It shall also overlap the internal shield when the latter is viewed in a direction perpendicular to the reference axis.	
6/ The value indicated in the left hand column relate to the major filament. Those indicated in the right-hand column relate to the minor filament.	
7/ Plane V-V is the plane perpendicular to the reference plane and passing through the reference axis and through the intersection of the circle of diameter "M" with the axis of the reference lug.	
8/ Plane H-H is the plane perpendicular to both the reference plane and plane V-V and passing through the reference axis.	
9/ The end turns of the filament are defined as being the first luminous turn and the last luminous turn that are at substantially the correct helix angle.	
10/ For the minor filament, the points to be measured are the intersections, seen in direction 1, of either the lateral edge of the shield or the filament axis with the outside of the end turns defined under note 9.	
11/ "e" denotes the distance from the reference plane to the beginning of the minor filament as defined above.	
12/ For the major filament the points to be measured are the intersections, seen in direction 1, of a plane, parallel to plane H-H and situated at a distance of 0.3 mm below it, with the end turns defined under note 9.	
Additional explanations to sheet H19/3	
The dimensions below are measured in three directions:	
1 For dimensions b1, a, c, d, e, f, lR and lC.	
2 For dimensions g, h, p and q.	

Category H19	**Sheet H19/6**
3 For dimension b2.	
Dimensions p and q are measured in planes parallel to and 33.0 mm away from the reference plane.	
Dimensions b1, b2 are measured in planes parallel to and 29.5 mm and 33.0 mm away from the reference plane.	
Dimensions c and h are measured in planes parallel to and 29.5 mm and 33.0 mm away from the reference plane.	
Dimensions a and g are measured in planes parallel to and 24.5 mm and 26.0 mm away from the reference plane.	
Note: For the method of measurement, reference is made to Appendix E of IEC Publication 60809.	

Category H20	Sheet H20/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

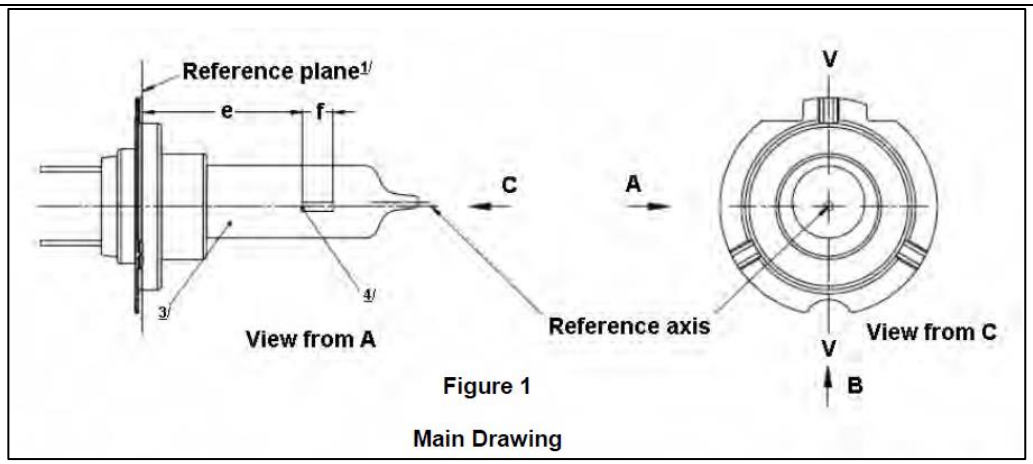


Figure 1

Main Drawing

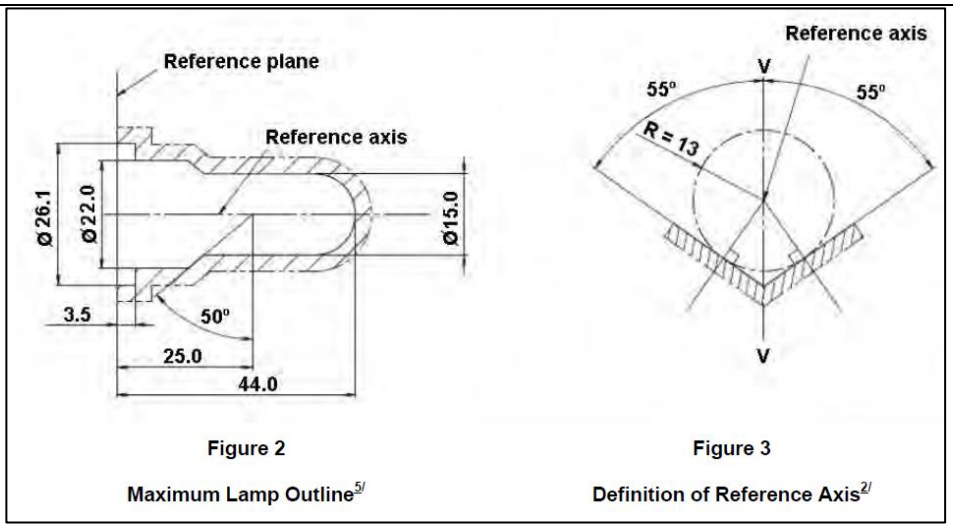


Figure 2

Maximum Lamp Outline5/

Figure 3

Definition of Reference Axis2/

1/ The reference plane is defined by the points on the surfaces of the holder on which the three supporting bosses of the cap ring will rest.

2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in Figure 3.

3/ The colour of the light emitted shall be white with the restriction according to sheet H20/3.

4/ Notes concerning the filament diameter:

(a) No actual diameter restrictions apply but the design target is to have d max. = 1.4 mm.

(b) For the same manufacturer, the design diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.

5/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 2. The envelope is concentric to the reference axis.

Category H20	Sheet H20/2

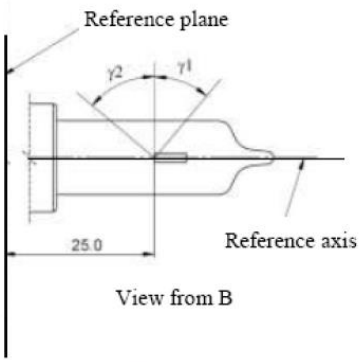


Figure 4

Distortion Free Area[6/]

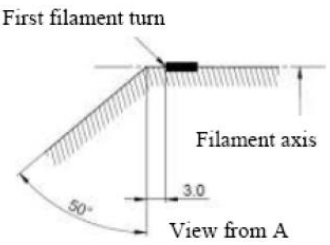


Figure 5

Metal Free Zone[7/]

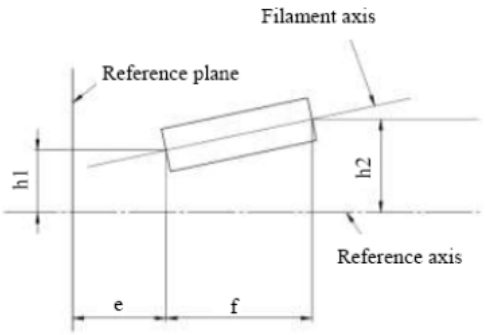


Figure 6

Permissible Offset of Filament Axis (For Standard Filament Lamps Only)

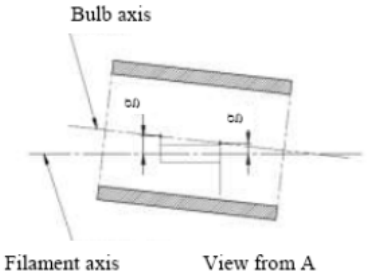


Figure 7

Bulb Eccentricity

6/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

7/ The internal design of the light source shall be such that stray light images and reflections are only located above the filament itself seen from the horizontal direction. (View A as indicated in Figure 1 on sheet H20/1).

No metal parts other than filament turns shall be located in the shaded area as seen in Figure 5.

Category H20	Sheet H20/3

Dimensions in mm				Filaments light sources of normal production	Standard filament light source
				12 V	12 V
e [8/]				25.0 [9/]	25.0 ± 0.1
f [8/]				4.8 [9/]	4.8 ± 0.1
g [11/]				0.5 min.	0.5 min.
h1 [10/]				0 [9/]	0 ± 0.10
h2 [10/]				0 [9/]	0 ± 0.15
γ1				40° min.	40° min.
γ2				50° min.	50° min.
Cap PY26d-6 in accordance with IEC Publication 60061 (sheet 7004-5-7)					
Electrical and photometric characteristics					
Rated values	Volts			12	12
	Watts			70	70
Test voltage	Volts			13.2	13.2
Objective values	Watts			75 max.	75 max.
	Luminous flux			1 250 ± 10 %	
Reference luminous flux at approximately				12 V	900
				13.2 V	1250
Chromaticity Coordinates[12]	Objective			x=0.347	y=0.353
	Tolerance area	Boundaries		x=0.330	y=0.150+0.640x
				x=0.370	y=0.050+0.750x
		Intersection points		x=0.330	y=0.298
				x=0.370	y=0.327
				x=0.370	y=0.387
				x=0.330	y=0.361

8/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown in Figure 1 on sheet H20/1, the projection of the outside of the end turns crosses the filament axis. (Special instructions for coiled-coil filaments are under consideration).

9/ To be checked by means of a "Box System", sheet H20/4.

10/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 in sheet H20/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

11/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

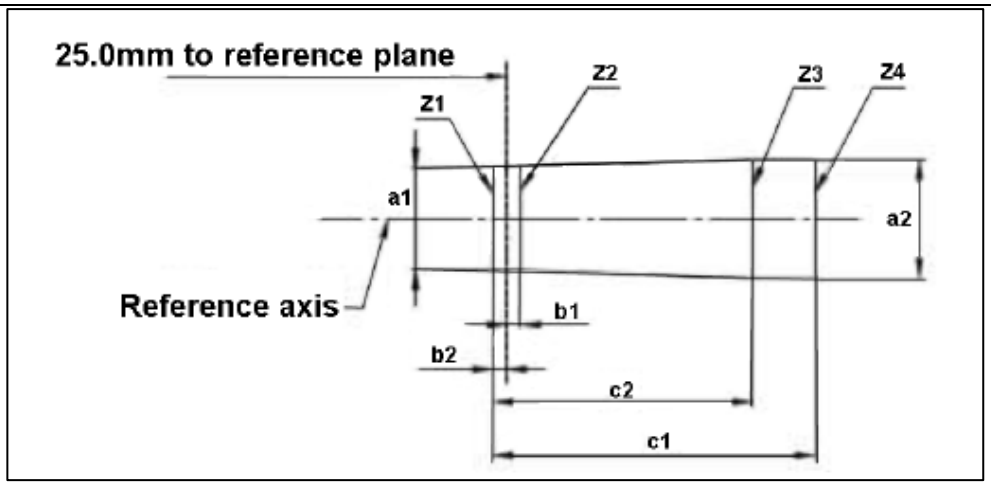
12/ See Annex 5.

Category H20	Sheet H20/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.

Dimensions in mm



a1	a2	b1	b2	c1	c2
d + 0.40	d + 0.70	0.25		5.7	4.6

d = diameter of filament

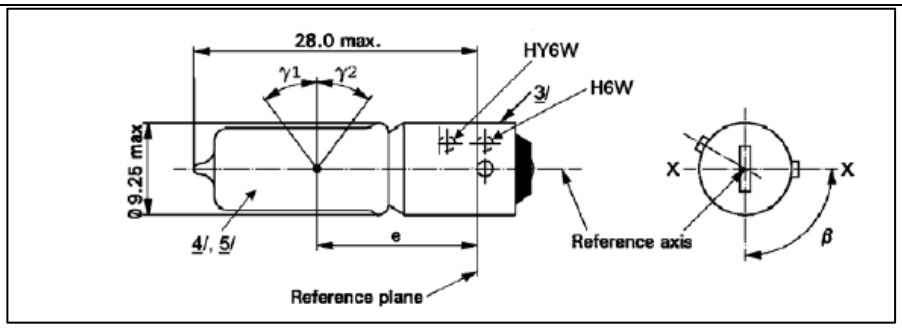
The filament position is checked solely in directions A and B as shown on sheet H20/1, Figure 1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H20/3, note 9, shall lie between lines Z1 and Z2 and between Z3 and Z4.

CATEGORIES H6W AND HY6W	**Sheet H6W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light
			min.	nom.	max.	
e			14.25	15.0	15.75	15.0 ± 0.25
Lateral deviation 1/					0.75	0.4 max
β			82.5°	90°	97.5°	90° ± 5°
γ1, γ 2 2/			30°			30° min.
Cap: H6W: BAX9s in accordance with IEC Publication 60061 (sheet 7004-8-1) HY6W: BAZ9s in accordance with IEC Publication 60061 (sheet 7004-150-1)						
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS						
Rated values	Volts		12			12
	Watts		6			6
Test	Volts		13.5			13.5
Objective values	Watts		7.35 max.			7.35 max.
	Luminous flux	H6W	125 ± 12 %			
		HY6W	75 ± 17 %			
Reference luminous flux at approximately 13.5 V						White:125 lm Amber:75 lm

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

2/ In the area between the outer legs of the angles γ1 and γ2, the bulb shall have no optically distorting areas and the curvature of the bulb shall have a radius not less than 50 per cent of the actual bulb diameter.

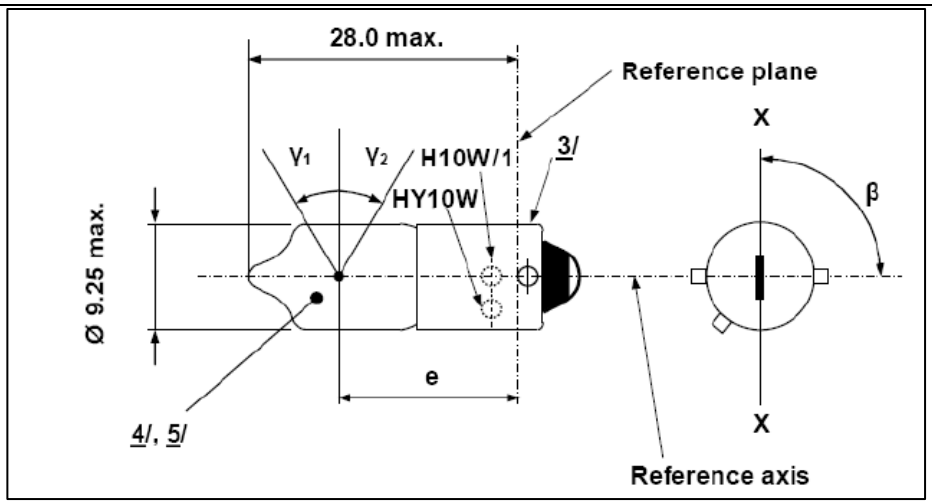
3/ Over the entire length of the cap there shall be no projections or soldering exceeding the permissible maximum diameter of the cap.

4/ The light emitted from filament light sources of normal production shall be white for category H6W and amber for category HY6W.

5/ The light emitted from standard filament light sources shall be white for category H6W and amber or white for category HY6W.

CATEGORIES H10W AND HY10W	**Sheet H10W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm	Filament light sources of normal production			Standard filament light sources
	min.	nom.	max.	
e	14.25	15.0	15.75	15.0 ± 0.25
Lateral deviation[1/]			0.75	0.4 max
β	82.5°	90°	97.5°	90° ± 5°
γ1, γ2 2/	30 °			30° min.

Cap: H10W/1 BAU9s in accordance with IEC Publication 60061 (sheet 7004-150A-1)

HY10W BAUZ9s in accordance with IEC Publication 60061 (sheet 7004-150B-1)

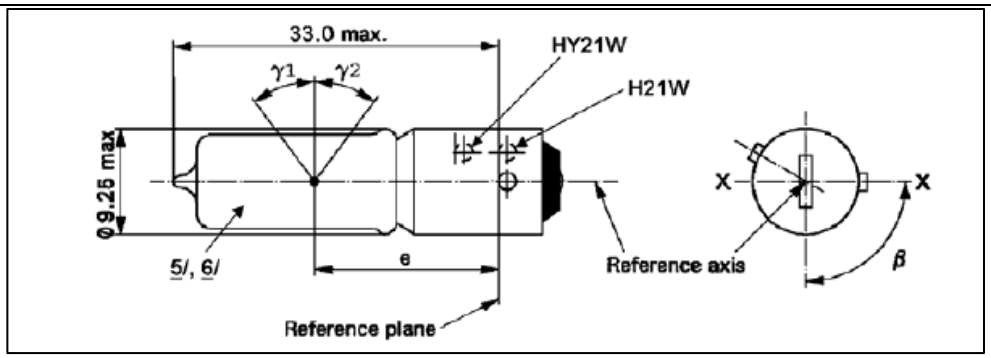
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS

Rated values	Volts		12	12
	Watts		10	10
Test	Volts		13.5	13.5
Objective values	Watts		12 max.	12 max.
	Luminous flux	H10W/1	200 ± 12 %	
		HY10W	120 ± 17 %	
Reference luminous flux at approximately 13.5 V				White: 200 lm
				Amber: 120 lm

CATEGORIES H10W AND HY10W	**Sheet H10W/2**
1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.	
2/ In the area between the outer legs of the angles γ1 and γ2, the bulb shall have no optically distorting areas and the curvature of the bulb shall have a radius not less than 50 % of the actual bulb diameter.	
3/ Over the entire length of the cap there shall be no projections or soldering exceeding the permissible maximum diameter of the cap.	
4/ The light emitted from filament light sources of normal production shall be white for category H10W/1 and amber for category HY10W.	
5/ The light emitted from standard filament light sources shall be white for category H10W/1 and amber or white for category HY10W. "	

CATEGORIES H21W AND HY21W	**Sheet H21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light source
			Min.	Nom.	Max.	
e				20.0 [1/]		20.0 ± 0.25
f	12 V				3.8	3.8 + 0 / -1
	24 V				4.5	
Lateral deviation [2/]					[1/]	0.0 ± 0.15 [3/]
β			82.5°	90°	97.5°	90° ± 5°
γ1, γ2 [4/]			45°			45° min.
Cap:	H21W:	BAY9s	in accordance with IEC Publication 60061 (sheet			
	HY21W:	BAW9s	in accordance with IEC Publication 60061 (sheet 7004-149-1)			

Electrical and photometric characteristics					
Rated values	Volts		12	24	12
	Watts		21	21	21
Test voltage	Volts		13.5	28.0	13.5
Objective values	Watts		26.25 max.	29.4 max.	26.25 max.
	Luminous flux	H21W	600 ± 12 %	600 ± 15 %	
		HY21W	300 ± 17 %	300 ± 20 %	
Reference luminous flux at approximately				12 V	White: 415 lm
				13.2 V	White: 560 lm
				13.5 V	White: 600 lm Amber: 300 lm

1/ To be checked by means of a "Box system", sheet H21W/2.

2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

3/ The lateral deviation with respect to the plane perpendicular to axis X-X is measured in the position described in 1. of the test procedure specified on sheet H21W/2.

4/ In the area between the outer legs of the angles γ1 and γ2, the bulb shall have no optical distorting areas and the curvature of the bulb shall have a radius not less than 50 per cent of the actual bulb diameter.

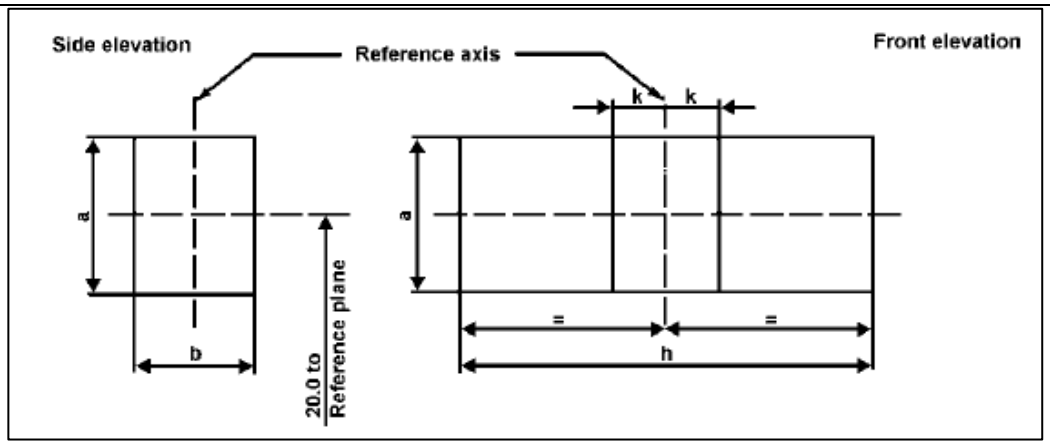
5/ The light emitted from filament light sources of normal production shall be white for category H21W and amber for category HY21W.

6/ The light emitted from standard filament light sources shall be white for category H21W and amber or white for category HY21W.

CATEGORIES H21W AND HY21W	Sheet H21W/2

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within 7.5°, to the plane through the centre line of the reference pin and the reference axis, whether a filament light source complies with the requirements



Reference	a	b	h	k
Dimension	d + 1.0	d +1.0	f + 1.2	0.50

d = actual filament diameter
f = actual filament length

Test procedures and requirements.

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits.

2. Side elevation

The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

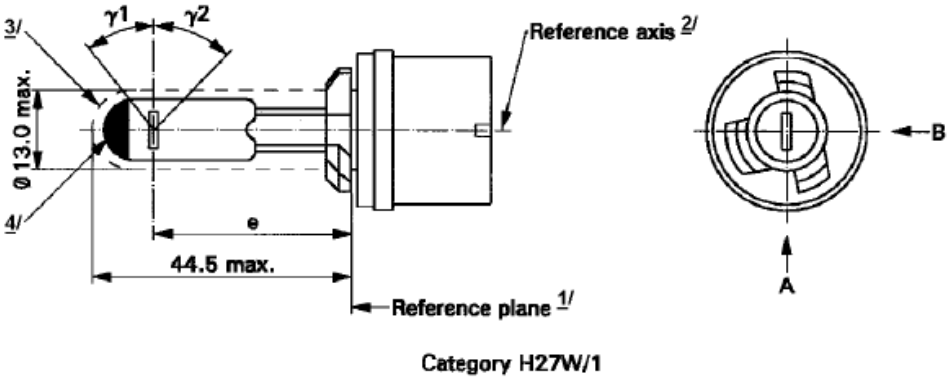
The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament;

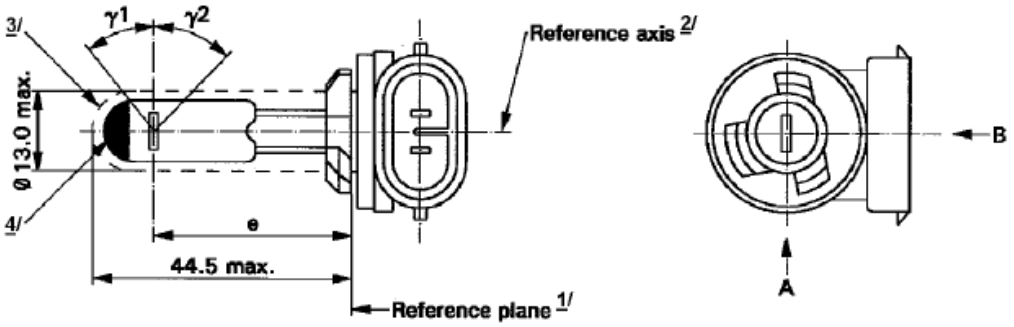
3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

CATEGORIES H27W/1 AND HY27W/2	Sheet H27W/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Category H27W/1



Category H27W/2

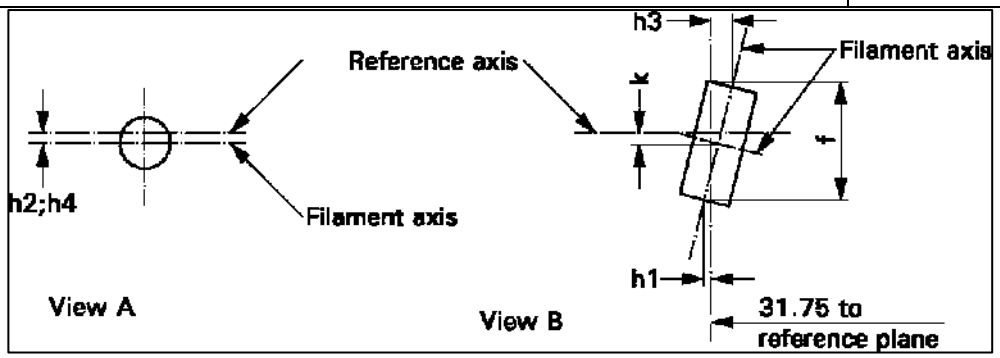
1/ The reference plane is defined by the plane formed by the underside of the bevelled lead-in flange of the cap.

2/ The reference axis is perpendicular to the reference plane and passes through the centre of the 13.10 mm cap diameter.

3/ Glass bulb and supports shall not exceed the size of a theoretical cylinder centred on the reference axis.

4/ The obscuration shall extend over the whole bulb top including the bulb cylindrical portion up to the intersection with $\gamma 1$.

CATEGORIES H27W/1 AND H27W/2	Sheet H27W/2



Filament dimensions and position

(Dimensions f for all filament light sources)

(Dimensions h1, h2, h3, h4 and k for standard filament light sources only)

Dimensions in mm	Filament light source of normal production	Standard filament light source
e	31.75 6/	31.75 ± 0.25
f 8/	4.8 max.	4.2 ± 0.20
k	0 6/	0.0 ± 0.25
h1, h2, h3, h4 7/	0 6/	0.0 ± 0.25
γ1 5/	38° nom.	38° nom.
γ2 5/	44° nom.	44° nom.

Cap: H27W/1: PG13 in accordance with IEC Publication 60061 (sheet 7004-107-4)
H27W/2: PGJ13

Electrical and photometric characteristics

Rated values	Volts	12	12
	Watts	27	27
Test voltage	Volts	13.5	13.5
Objective values	Watts	31 max.	31 max.
	Luminous flux	477 ± 15 %	

Reference luminous flux at approximately	12 V	350 lm
	13.2 V	450 lm
	13.5 V	477 lm

5/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

6/ To be checked by means of a "Box System", sheet H27W/3.

7/ For standard filament light sources, the points to be measured are those where the projection of the outside of the end turns crosses the filament axis.

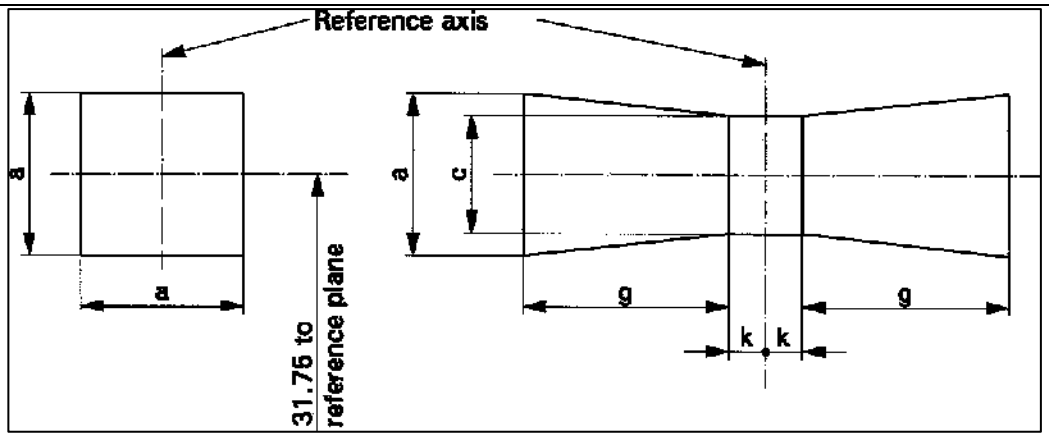
8/ The ends of the filament are defined by the intersections of the outside of the first and of the last light emitting turn, respectively, with the plane parallel to and 31.75 mm from the reference plane.

CATEGORIES H27W/1 AND H27W/2	**Sheet H27W/3**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.

Dimensions in mm



Reference	a	c	k	g
Dimensions	d + 1.2	d + 1.0	0.5	2.4

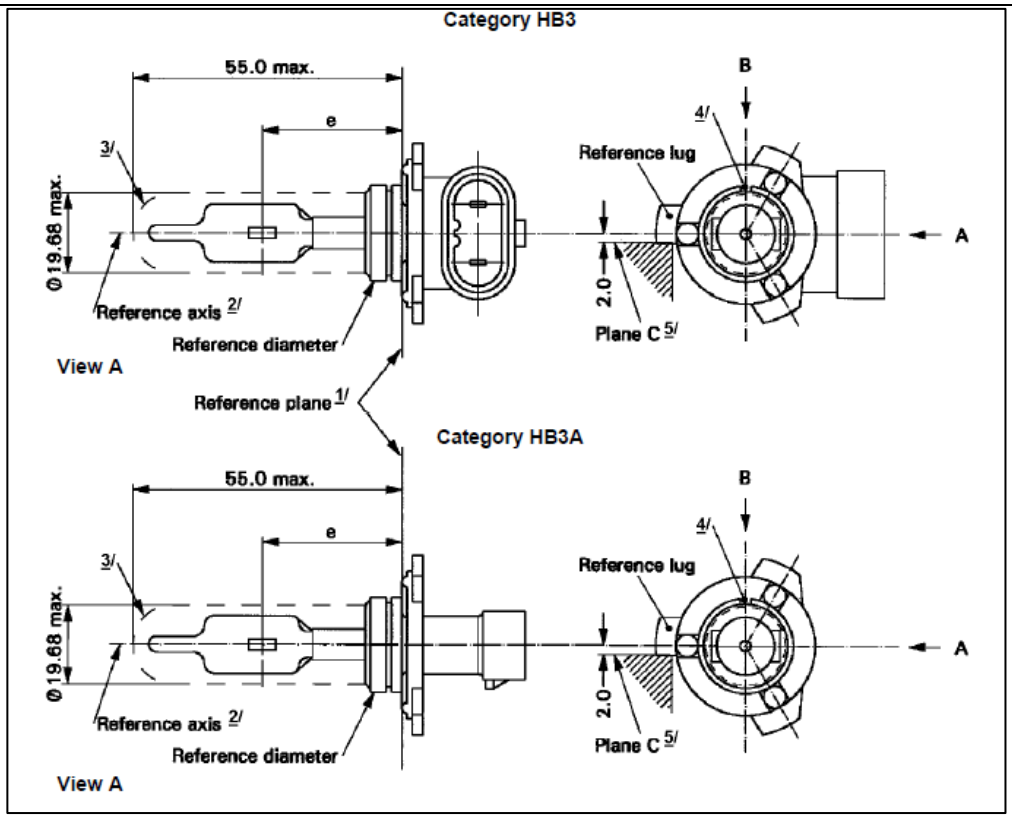
d = actual diameter of filament

The filament shall lie entirely within the limits shown.

The centre of the filament shall lie within the limits of dimension k.

Categories HB3 and HB3A	Sheet HB3/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is the plane defined by the meeting points of cap-holder fit.

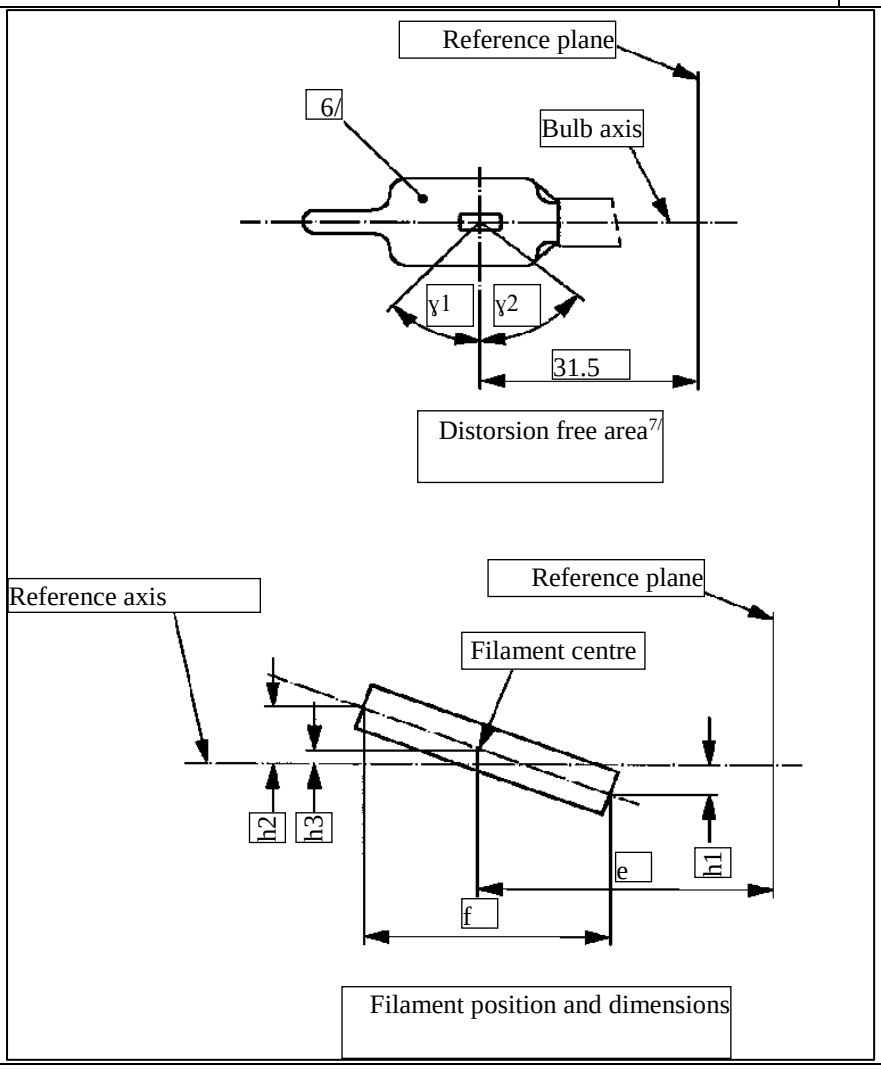
2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.

3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the lamp key.

4/ The keyway is mandatory for category HB3A and optional for category HB3.

5/ The filament light source shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

Categories HB3 and HB3A	Sheet HB3/2



6/ The colour of the light emitted shall be white or selective-yellow.

7/ Glass bulb periphery shall be optically distortion-free axially within the angles γ1 and γ2.
This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

Categories HB3 and HB3A			Sheet HB3/3
Dimensions in mm [12/]		Tolerance	
		Filament light sources of normal production	Standard filament light source
e [9/, 11/]	31.5	[10/]	±0.16
f [9/, 11/]	5.1	[10/]	±0.16
h1, h2	0	[10/]	±0.15 [8/]
h3	0	[10/]	±0.08 [8/]
γ1	45° min.	-	-
γ2	52° min.	-	-
Cap P20d in accordance with IEC Publication 60061 (sheet 7004-31-2) [13/]			
Electrical and photometric characteristics			
Rated values	Volts	12	12
	Watts	60	60
Test voltage	Volts	13.2	13.2
Objective values	Watts	73 max.	73 max.
	Luminous flux	1,860 ± 12 %	
Reference luminous flux at approximately		12 V	1,300
		13.2 V	1,860

8/ The eccentricity is measured only in viewing directions* A and B as shown in the figure on sheet HB3/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

9/ The viewing direction is direction* B as shown in the figure on sheet HB3/1.

10/ To be checked by means of a "Box system"; sheet HB3/4*.

11/ The ends of the filament are defined as the points where, when the viewing direction* as defined in footnote 9/ above, the projection of the outside of the end turns crosses the filament axis.

12/ Dimensions shall be checked with O-ring removed.

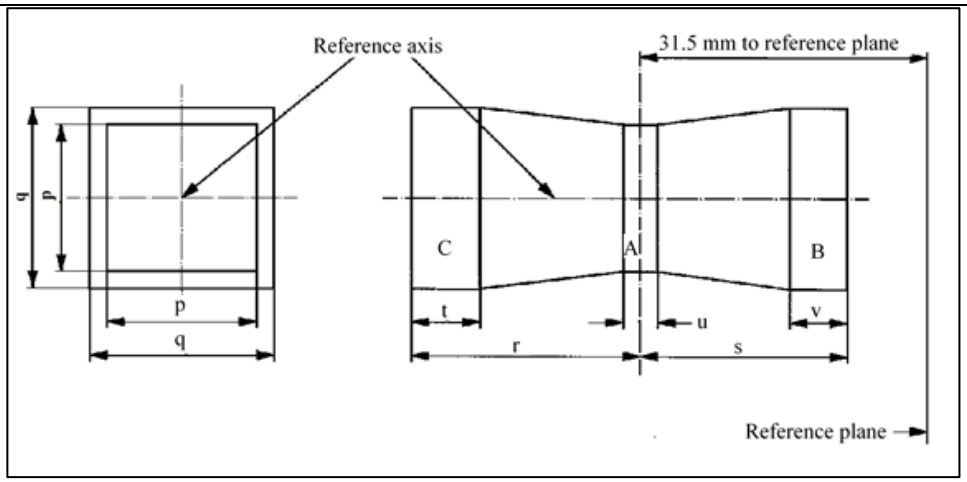
13/ Filament light source HB3 shall be equipped with the right-angle cap and filament light source HB3A with the straight cap.

* Manufacturers may choose another set of perpendicular viewing directions. The viewing directions specified by the manufacturer are to be used by the testing laboratory when checking filament dimensions and position.

Categories HB3 and HB3A	**Sheet HB3/4**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	p	q	r	s	t	u	v
12 V	1.3 d	1.6 d	3.0	2.9	0.9	0.4	0.7

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet HB3/1.

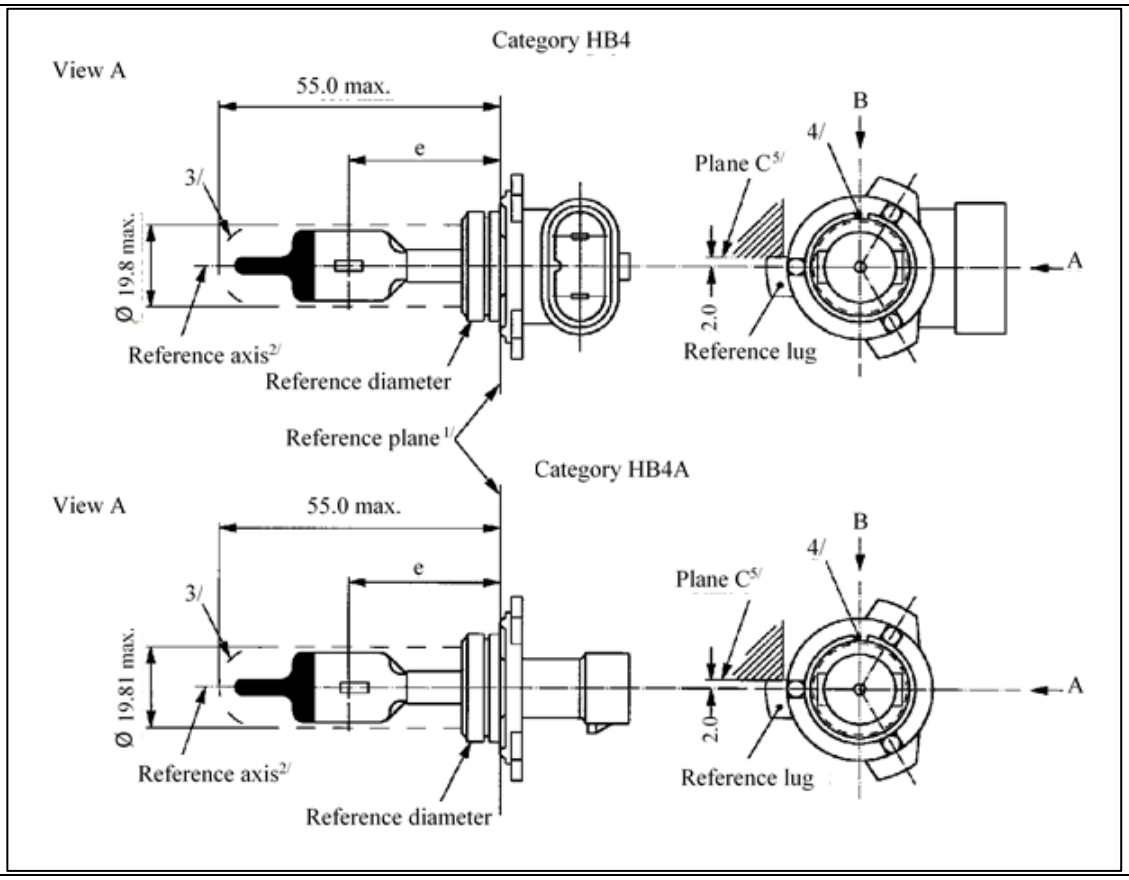
The filament shall lie entirely within the limits shown.

The beginning of the filament, as defined on sheet HB3/3, footnote 11/, shall lie in volume "B" and the end of the filament in volume "C".

Volume "A" does not involve any filament centre requirement.

Categories HB4 and HB4A	Sheet HB4/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is the plane defined by the meeting points of cap-holder fit.

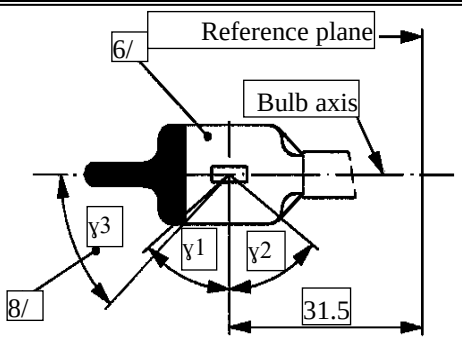
2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.

3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the lamp key. The envelope is concentric to the reference axis.

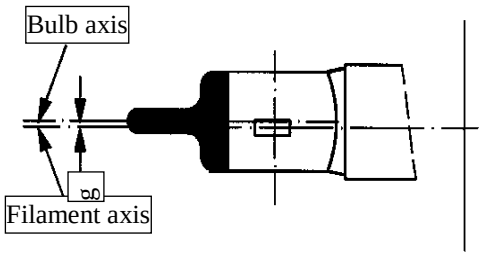
4/ The keyway is mandatory for category HB4A and optional for category HB4.

5/ The filament shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

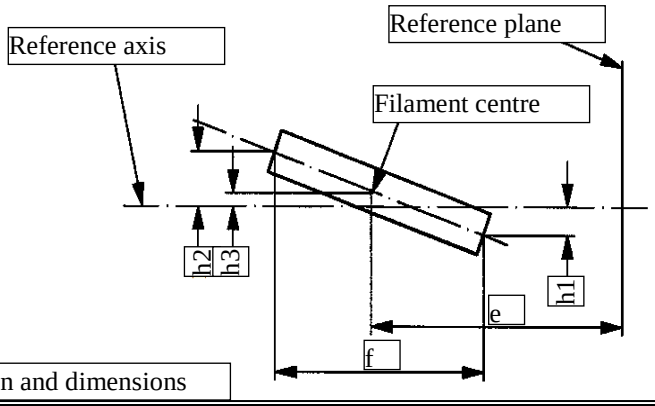
Categories HB4 and HB4A	Sheet HB4/2



Distorsion free area[7/] and black top[8/]



Bulb eccentricity



Filament position and dimensions

6/ The colour of the light emitted shall be white or selective-yellow.

7/ Glass bulb periphery shall be optically distortion-free axially and cylindrically within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2 and does not need to be verified in the area covered by the obscuration.

8/ The obscuration shall extend to at least angle γ3 and shall be at least as far as the undistorted part of the bulb defined by angle γ1.

Categories HB4 and HB4A			**Sheet HB4/3**
Dimensions in mm [13/]		Tolerance	
		Filament light sources of normal production	Standard filament light source
e [10/, 12/]	31.5	[11/]	±0.16
f [10/, 12/]	5.1	[11/]	±0.16
h1, h2	0	[11/]	±0.15 [9/]
h3	0	[11/]	±0.08 [9/]
g [10/]	0.75	±0.5	±0.3
γ1	50° min.	-	-
γ2	52° min.	-	-
γ3	45°	±5°	±5°
Cap P22d in accordance with IEC Publication 60061 (sheet 7004-32-2) [14/]			
Electrical and photometric characteristics			
Rated values	Volts	12	12
	Watts	51	51
Test voltage	Volts	13.2	13.2
Objective values	Watts	62 max.	62 max.
	Luminous flux	1,095 ± 15 %	
Reference luminous flux at approximately		12 V	825
		13.2 V	1,095

9/ The eccentricity is measured only in viewing directions* A and B as shown in the figure on sheet HB4/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

10/ The viewing direction is direction* B as shown in the figure on sheet HB4/1.

11/ To be checked by means of a "Box system"; sheet HB4/4*.

12/ The ends of the filament are defined as the points where, when the viewing direction* as defined in footnote 10/ above, the projection of the outside of the end turns crosses the filament axis.

13/ Dimensions shall be checked with O-ring removed.

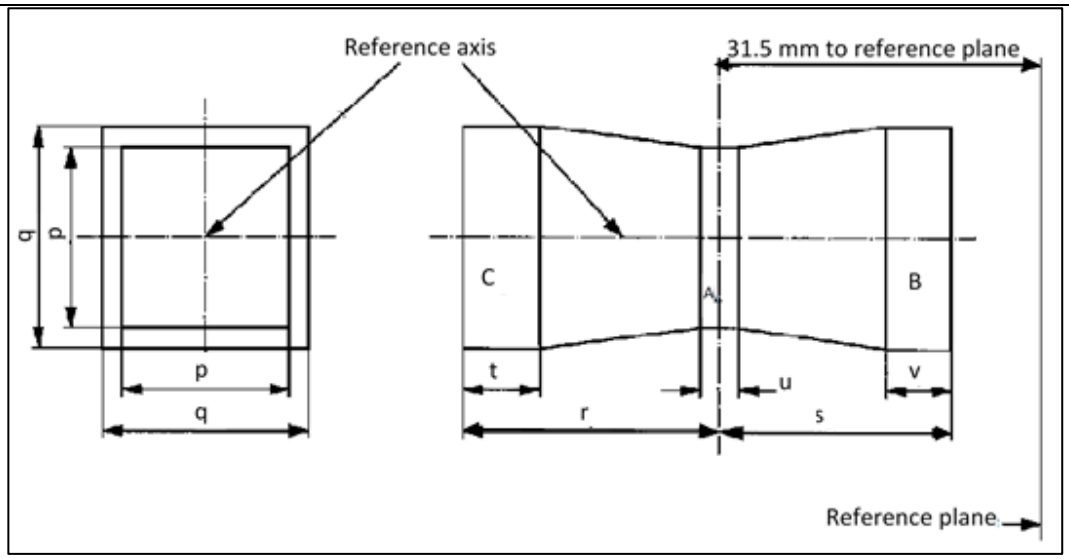
14/ Filament light source HB4 shall be equipped with the right-angle cap and filament light source HB4A with the straight cap.

* Manufacturers may choose another set of perpendicular viewing directions. The viewing directions specified by the manufacturer are to be used by the testing laboratory when checking filament dimensions and position.

Categories HB4 and HB4A	Sheet HB4/4

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	p	q	r	s	t	u	v
12 V	1.3 d	1.6 d	3.0	2.9	0.9	0.4	0.7

d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet HB4/1.

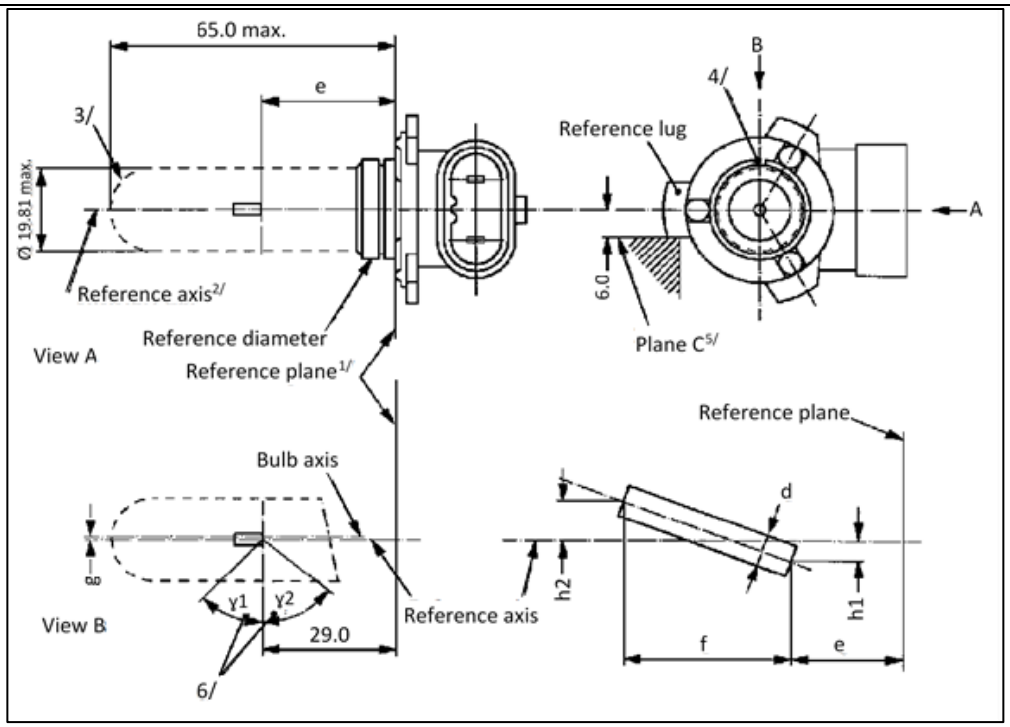
The filament shall lie entirely within the limits shown.

The beginning of the filament as defined on sheet HB4/3 footnote 12/ shall lie in volume "B" and the end of the filament in volume "C".

Volume "A" does not involve any filament centre requirement.

Category HIR1	**Sheet HIR1/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is the plane defined by the three supporting bosses on the cap flange.

2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.

3/ Glass bulb and supports shall not exceed the envelope. The envelop is concentric to the reference axis.

4/ The keyway is mandatory.

5/ The filament shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

6/ Glass bulb periphery shall be optically distortion-free axially within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

Category HIR1	**Sheet HIR1/2**

Dimensions in mm [11/]		Tolerance	
		Filament light sources of normal production	Standard filament light source
e [8/, 10/]	29	[9/]	±0.16
f [8/, 10/]	5.1	[9/]	±0.16
g [8/]	0	+0.7 / -0.0	+0.4 / -0.0
h1, h2	0	[9/]	±0.15 [7/]
d	1.6 max.		
γ1	50° min.	-	-
γ2	50° min.	-	-
Cap PX20d in accordance with IEC Publication 60061 (sheet 7004-31-2)			
Electrical and photometric characteristics			
Rated values	Volts	12	12
	Watts	65	65
Test voltage	Volts	13.2	13.2
Objective values	Watts	73 max.	73 max.
	Luminous flux	2,500 ± 15 %	
Reference luminous flux at approximately		12 V	1,840
		13.2 V	2,500

7/ The eccentricity is measured only in viewing directions A and B as shown in the figure on sheet HIR1/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

8/ The viewing direction is direction B as shown in the figure on sheet HIR1/1.

9/ To be checked by means of a "Box system"; sheet HIR1/3.

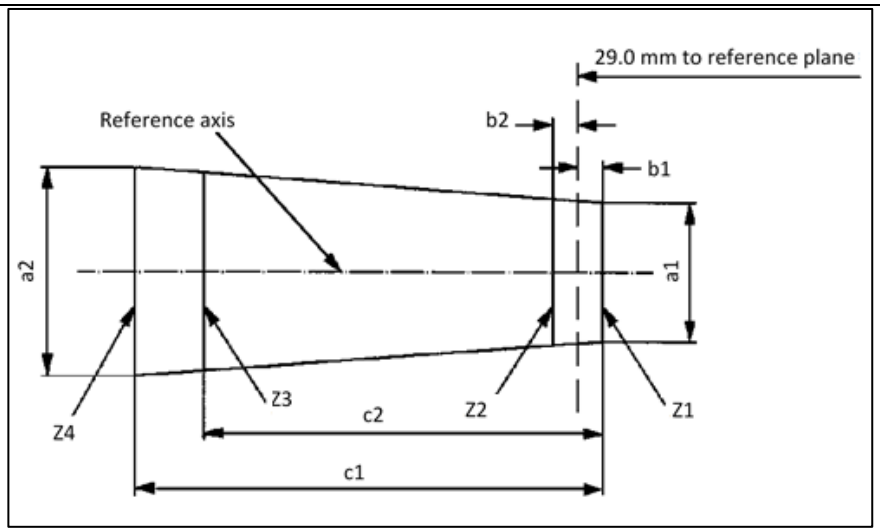
10/ The ends of the filament are defined as the points where, when the viewing direction as defined in footnote 8/ above, the projection of the outside of the end turns crosses the filament axis.

11/ Dimensions shall be checked with O-ring mounted.

Category HIR1	Sheet HIR1/3

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	a1	a2	b1	b1	b2	c1	c2
12 V	d + 0.4	d + 0.8	0.35			6.1	5.2

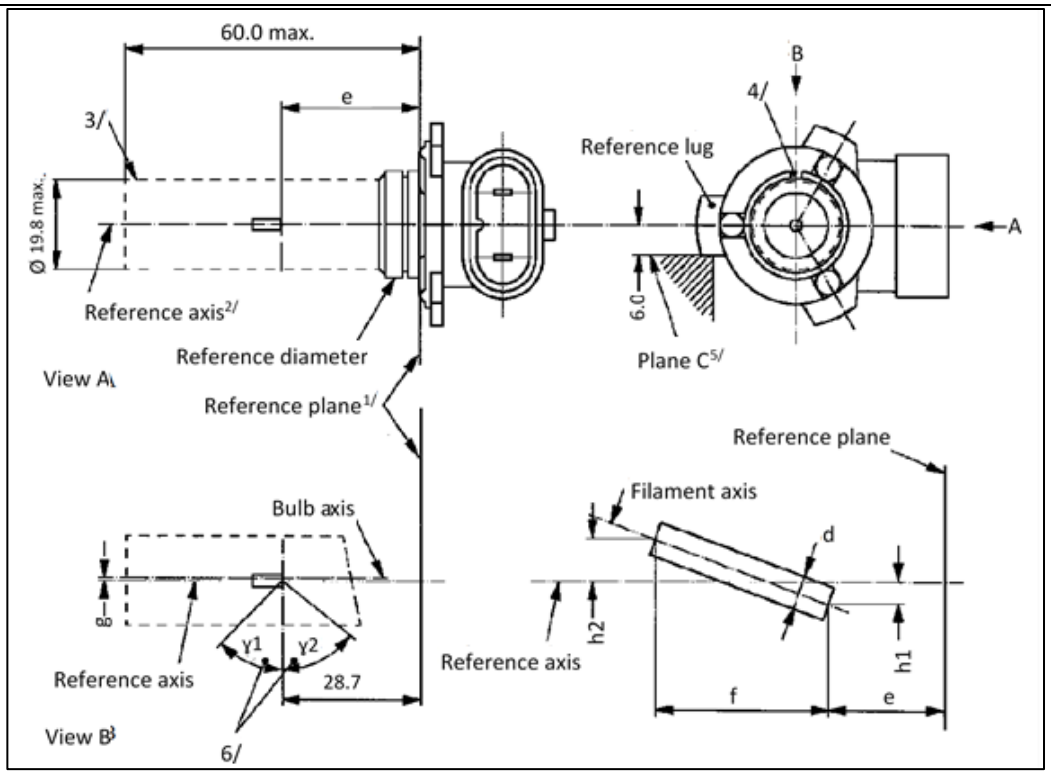
d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet HIR1/1.

The ends of the filament as defined on sheet HIR1/2 footnote 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

Category HIR2	**Sheet HIR2/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source



1/ The reference plane is the plane defined by the three meeting points of the cap holder fit.

2/ The reference axis is perpendicular to the reference plane and passes through the centre of the reference diameter of the cap.

3/ Glass bulb and supports shall not exceed the envelope. The envelop is concentric to the reference axis.

4/ The keyway is mandatory.

5/ The filament light source shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

6/ Glass bulb periphery shall be optically distortion-free axially within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

Category HIR2	**Sheet HIR2/2**

Dimensions in mm [11/]		Tolerances	
		Filament light sources of normal production	Standard filament light source
e [8/ 10/]	28.7	[9/]	± 0.16
f [8/ 10/]	5.3	[9/]	± 0.16
g [8/]	0	+ 0.7 / - 0.0	+ 0.4 / - 0.0
h1, h2	0	[9/]	± 0.15 [7/]
d	1.6 max.	-	-
γ1	50° min.	-	-
γ2	50° min.	-	-
Cap PX22d in accordance with IEC Publication 60061 (sheet 7004-32-2)			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Volts	12	12
	Watts	55	55
Test voltage	Volts	13.2	13.2
Objective values	Watts	63 max.	63 max.
	Luminous flux	1,875 ± 15 %	
Reference luminous flux at approximately		12 V	1,355
		13.2 V	1,875

7/ The eccentricity is measured only in viewing directions A and B as shown in the figure on sheet HIR2/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

8/ The viewing direction is direction B as shown in the figure on sheet HIR2/1.

9/ To be checked by means of a "Box system"; sheet HIR2/3.

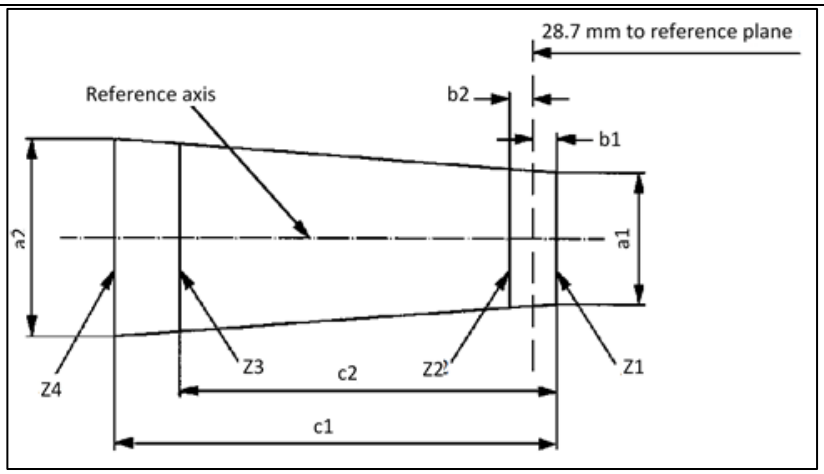
10/ The ends of the filament are defined as the points where, when the viewing direction as defined in footnote 8/ above, the projection of the outside of the end turns crosses the filament axis.

11/ Dimensions shall be checked with O-ring removed.

Category HIR2	Sheet HIR2/3

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	a1	a2	b1	b2	c1	c2
12 V	d + 0.4	d + 0.8	0.35		6.6	5.7

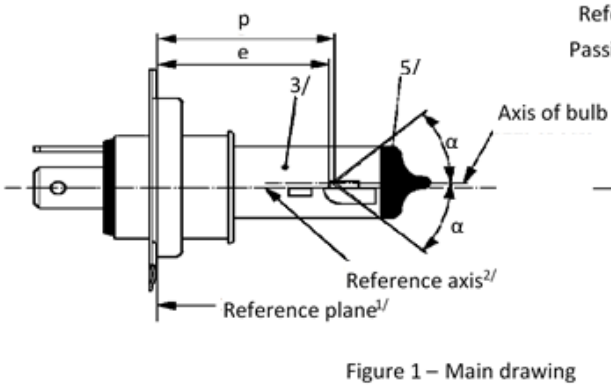
d = diameter of filament

The filament position is checked solely in directions A and B as shown on sheet HIR2/1.

The ends of the filament as defined on sheet HIR2/2 footnote 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

Category HS1	**Sheet HS1/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



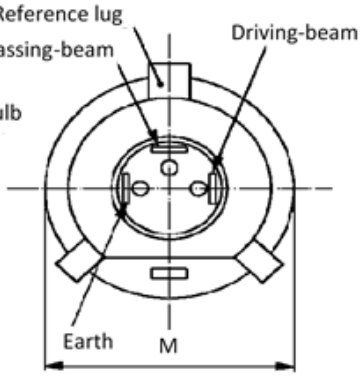


Figure 1 – Main drawing

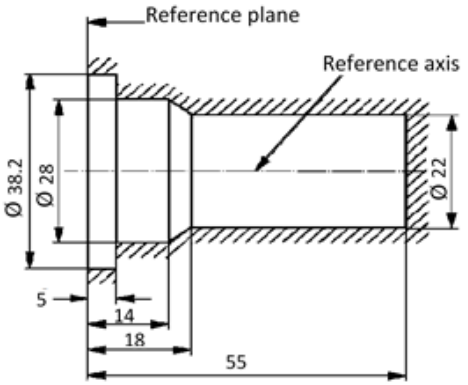


Figure 2

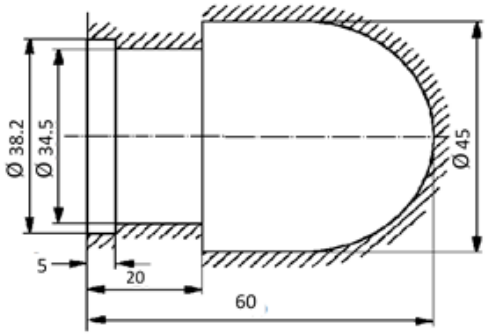


Figure 3

Maximum lamp outlines4/

1/ The reference plane is the plane formed by the seating points of the three lugs of the cap ring.

2/ The reference axis is perpendicular to the reference plane and passes through the centre of the circle of diameter "M".

3/ The colour of the light emitted shall be white or selective-yellow.

4/ The bulb and supports shall not exceed the envelope as in Figure 2. However, where a selective-yellow outer bulb is used the bulb and supports shall not exceed the envelope as in Figure 3.

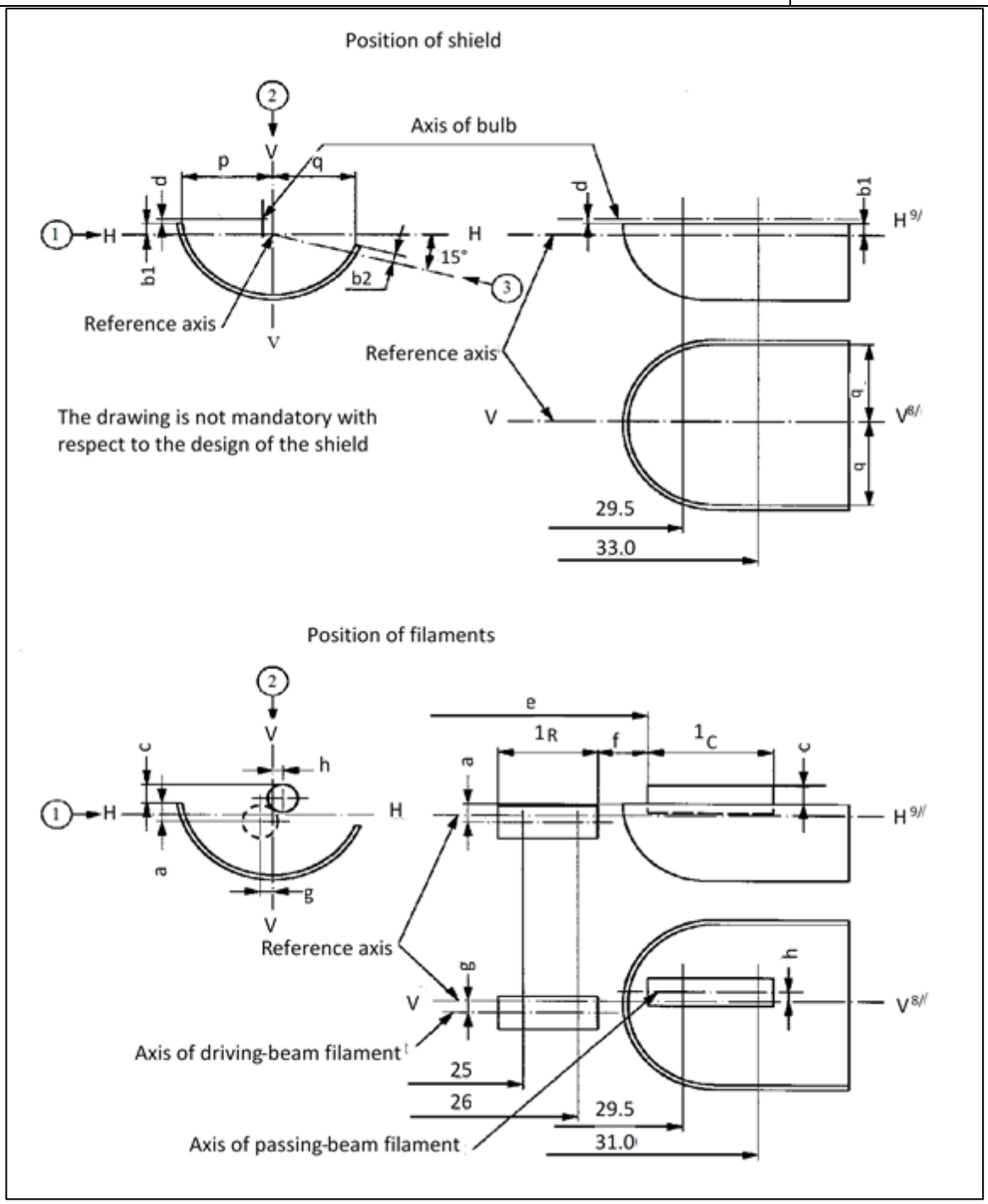
5/ The obscuration shall extend at least as far as the cylindrical part of the bulb. It shall also overlap the internal shield when the latter is viewed in a direction perpendicular to the reference axis.

Category HS1								**Sheet HS1/2**	
Dimensions in mm		Filament light sources of normal production						Standard filament light source	
		6 V		12 V				12 V	
e		28.5 + 0.45/ - 0.25						28.5 + 0.20/-0.00	
p		28.95						28.95	
α		max. 40°						max. 40°	
Cap PX43t in accordance with IEC Publication 60061 (sheet 7004-34-2)									
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS									
Rated values	Volts	6[6/]		12 [6/]				12[6/]	
	Watts	35	35	35	35			35	35
Test voltage	Volts	6.3		13.2				13.2	
Objective values	Watts	35	35	35	35			35	35
	±%	5						5	
	Luminous flux	700	440	825	525				
	±%	15							
Measuring flux [7/] lm		-		-	450				
Reference luminous flux at approximately						12 V		700	450
						13.2 V		825	525

6/ The values indicated in the left hand column relate to the driving-beam. Those indicated in the right-hand column relate to the passing-beam.

7/ Measuring luminous flux according to clause 3.9. of this standard with an internal shield to produce the cut-off.

Category HS1	Sheet HS1/3



Category HS1	**Sheet HS1/4**

Table of the dimensions (in mm) referred to in the drawings on sheet HS1/3

Reference */ */		Dimensions **/		Tolerance		
				Filaments light sources of normal production		Standard filament light sources
6 V	12 V	6 V	12 V	6 V	12 V	12 V
a/26		0.8		± 0.35		± 0.20
a/25		0.8		± 0.55		± 0.20
b1/29.5		0		± 0.35		± 0.20
b1/33		b1/29.5 mv		± 0.35		± 0.15
b2/29.5		0		± 0.35		± 0.20
b2/33		b2/29.5 mv		± 0.35		± 0.15
c/29.5		0.6		± 0.35		± 0.20
c/31		c/29.5 mv		± 0.30		± 0.15
d		min. 0.1 / max. 1.5		-		-
e 13/		28.5		+ 0.45 / - 0.25		+0.20 / -0.00
f 11/ 12/ 13/		1.7		+ 0.50 / -0.30		+ 0.30 / - 0.10
g/26		0		± 0.50		± 0.30
g/25		0		± 0.70		± 0.30
h/29.5		0		± 0.50		± 0.30
h/31		h/29.5 mv		± 0.30		± 0.20
l_R 11/ 14/		3.5	4.0	± 0.80		± 0.40
l_C 11/ 12/		3.3	4.5	± 0.80		± 0.35
p/33		Depends on the shape of		-		-
q/33		(p+q)/2		± 0.60		± 0.30

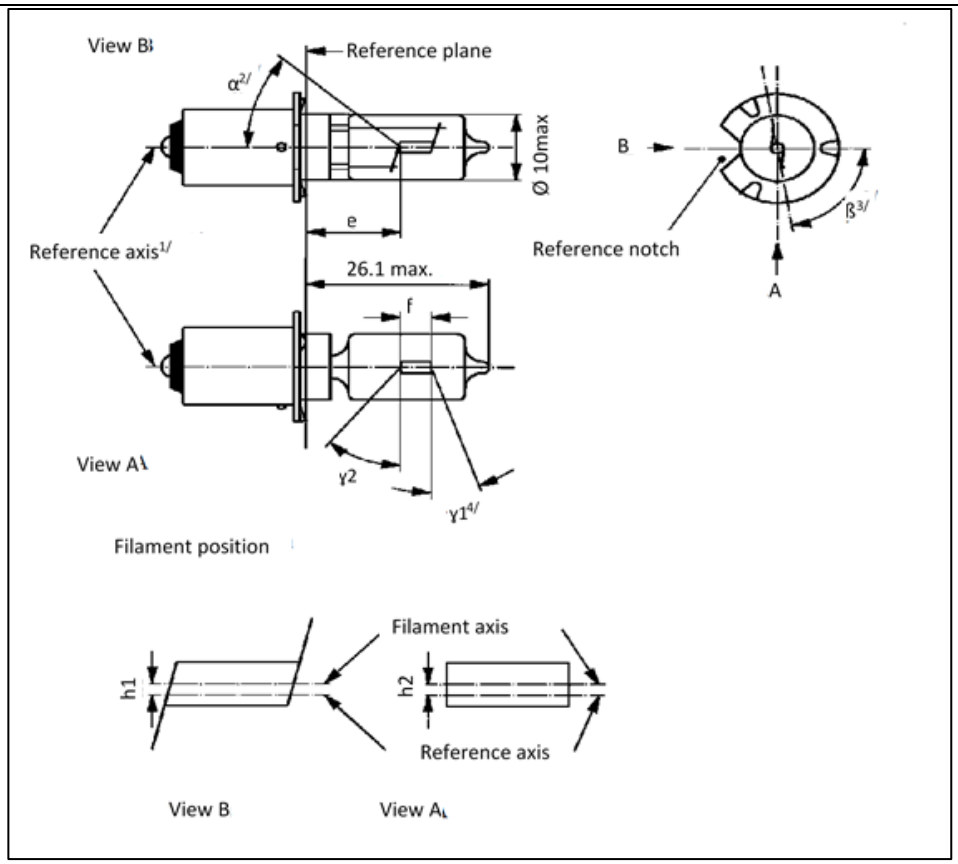
* "../26" means dimension to be measured at the distance from the reference plane indicated in mm after the stroke.

** "29.5 mv" means the value measured at a distance of 29.5 mm from the reference plane.

Category HS1	Sheet HS1/5
8/ Plane V-V is the plane perpendicular to the reference plane and passing through the reference axis and through the intersection of the circle of diameter "M" with the axis of the reference lug.	
9/ Plane H-H is the plane perpendicular to both the reference plane and plane V-V and passing through the reference axis.	
10/ (Blank).	
11/ The end turns of the filament are defined as being the first luminous turn and the last luminous turn that are at substantially the correct helix angle. For coiled-coil filaments, the turns are defined by the envelope of the primary coil.	
12/ For the passing-beam filament, the points to be measured are the intersections, seen in direction 1, of the lateral edge of the shield with the outside of the end turns defined under footnote 11/.	
13/ "e" denotes the distance from the reference plane to the beginning of the passing-beam filament as defined above.	
14/ For the driving-beam filament the points to be measured are the intersections, seen in direction 1, of a plane, parallel to plane H-H and situated at a distance of 0.8 mm below it, with the end turns defined under footnote 11/.	
Additional explanations to sheet HS1/3	
The dimensions below are measured in three directions:	
1 For dimensions a, b1, c, d, e, f, I_R and I_C;	
2 For dimensions g, h, p and q;	
3 For dimension b2.	
Dimensions p and q are measured in planes parallel to and 33 mm away from the reference plane.	
Dimensions b1 and b2 are measured in planes parallel to and 29.5 mm and 33 mm away from the reference plane.	
Dimensions a and g are measured in planes parallel to and 25.0 mm and 26.0 mm away from the reference plane.	
Dimensions c and h are measured in planes parallel to and 29.5 mm and 31 mm away from the reference plane.	
Note: For the method of measurement, see Appendix E of IEC Publication 60809.	

Category HS2	Sheet HS2/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference axis is perpendicular to the reference plane and passes through the intersection of this plane with the axis of the cap ring.

2/ All parts which may obscure the light or may influence the light beam shall lie within angle α.

3/ Angle β denotes the position of the plane through the inner leads with reference to the reference notch.

4/ In the area between the outer legs of the angles $\gamma 1$ and $\gamma 2$, the bulb shall have no optically distorting areas and the curvature of the bulb shall have a radius not less than 50 per cent of the actual bulb diameter.

Category HS2	**Sheet HS2/2**

Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e			11.0 [5/]		11.0 ± 0.15
f [6/]	6 V	1.5	2.5	3.0	2.5 ± 0.15
	12 V	2.0	3.0	4.0	
h1, h2			[5/]		0 ± 0.15
α [2/]				40°	
β [3/]		75°	90°	105°	90° ± 5°
γ1 [4/]		15°			15° min.
γ2 [4/]		40°			40° min.
Cap PX13.5s in accordance with IEC Publication 60061 (sheet 7004-35-2)					
Electrical and photometric characteristics					
Rated values	Volts	6	12		6
	Watts	15			15
Test voltage	Volts	6.75	13.5		6.75
Objective values	Watts	15 ± 6 %			15 ± 6 %
	Luminous flux	320 ± 15 %			
Reference luminous flux: 320 lm at approximately 6.75 V					

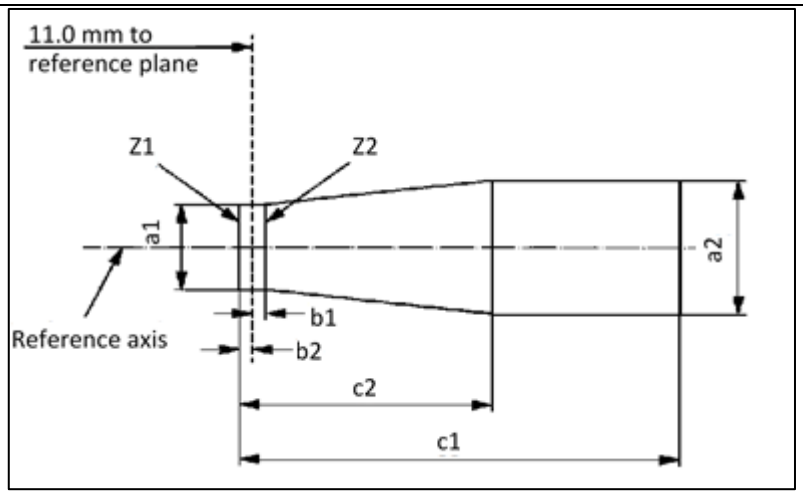
5/ To be checked by means of the "Box system", sheet HS2/3.

6/ In order to avoid rapid filament failure, the supply voltage shall not exceed 8.5 V for 6 V filament light sources and
15 V for 12 V types.

Category HS2	Sheet HS2/3

Screen projection requirements

This test is used to determine, by checking whether the filament light source complies with the requirements by checking whether the filament light source is correctly positioned relative to the reference axis and reference plane.



Reference	a1	a2	b1	b2	c1 (6 V)	c1 (12V)	c2
Dimension	d + 1.0	d + 1.4	0.25	0.25	4.0	4.5	1.75

d= actual filament diameter

The filament shall lie entirely within the limits shown.

The beginning of the filament shall lie between the lines Z1 and Z2.

Category HS5	**Sheet HS5/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

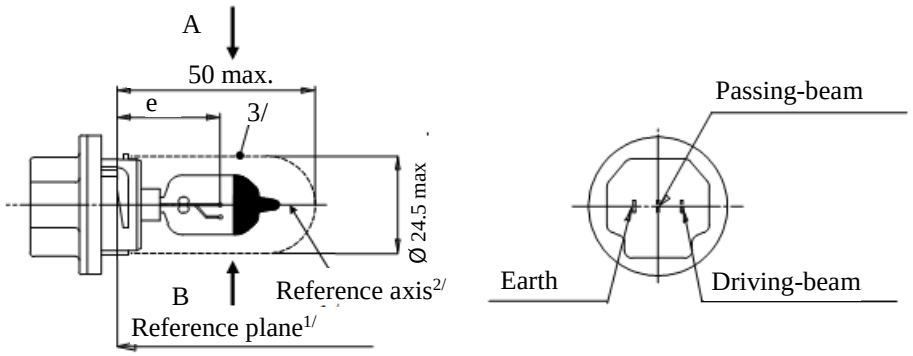


Figure 1 – Main drawing

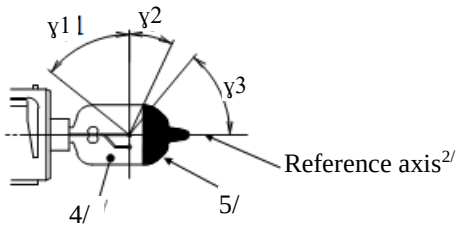


Figure 2 - Distorsion free area4/ and black top5/

1/	The reference plane is defined by the three ramp inside surface.
2/	The reference axis is perpendicular to the reference plane and passing through the centre of the 23 mm cap diameter.
3/	Glass bulb and supports shall not exceed the envelope as indicated in Figure 1. The envelope is concentric to the reference axis.
4/	Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.
5/	The obscuration shall extend at least to angle γ3 and shall extend at least to the cylindrical part of the bulb on the whole top circumference.

Category HS5	Sheet HS5/2

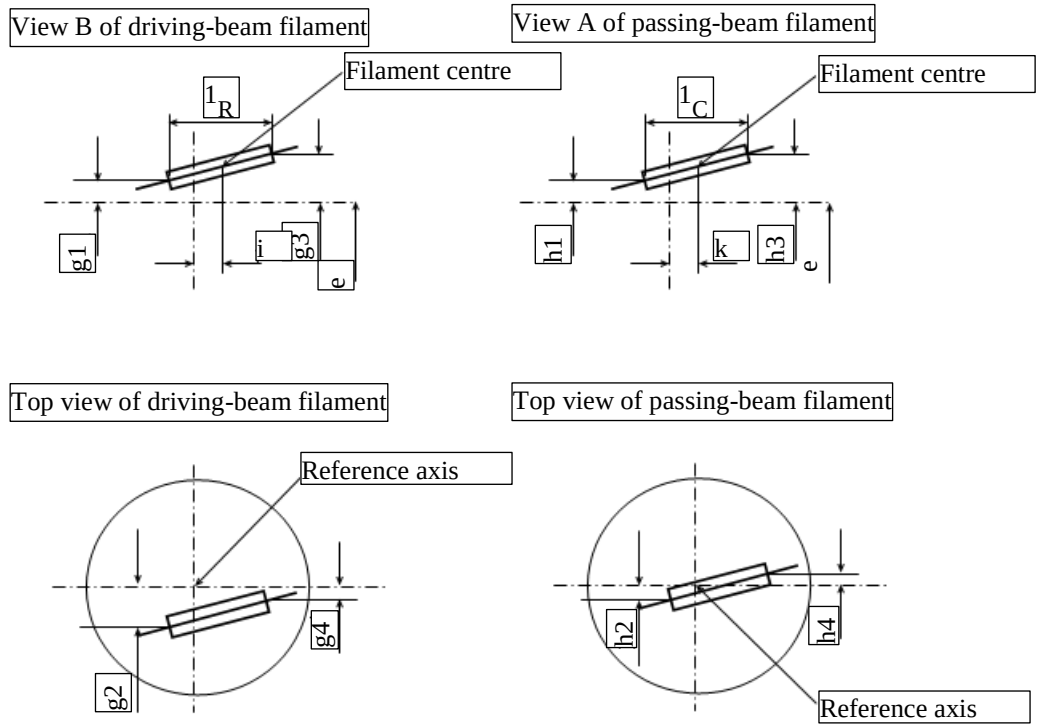


Figure 3 – Filament position and dimensions

Category HS5							**Sheet HS5/3**
Dimensions in mm			Filament light sources of normal production		Standard filament light source.		
			12V		12V		
e	26		6/		± 0.15		
lC[7/]	4.6				± 0.3		
k	0				± 0.2		
h1,h3	0				± 0.15		
h2,h4	0				± 0.20		
lR [7/]	4.6				± 0.3		
j	0				± 0.2		
g1,g3	0				± 0.30		
g2,g4	2.5				± 0.40		
γ1	50° min.				-		
γ2	23° min.		-		-		
γ3	50° min.		-		-		
Cap P23t in accordance with IEC Publication 60061 (sheet 7004-138-2)							
ELECTRICAL AND PHOTOMETRIC CHARACTERISTCS							
Rated values	Voltage	V	12			12	
	Wattage	W	35	30	35		30
Test voltage		V	13.2		13.2		
Objective Values	Wattage	W	40 max.	37 max.	40 max.		37 max.
	Luminous flux	lm	620	515			
		±%	15	15			
Reference luminous at approximately				12 V	460		
				13.2 V	620		

6/ To be checked by means of a "Box system". Sheet HS5/4.

7/ The positions of the first and the last turn of the filament are defined by the intersections of the outside of the first and the outside of the last light-emitting turn, respectively, with the plane parallel to and 26 mm distant from the reference plane.

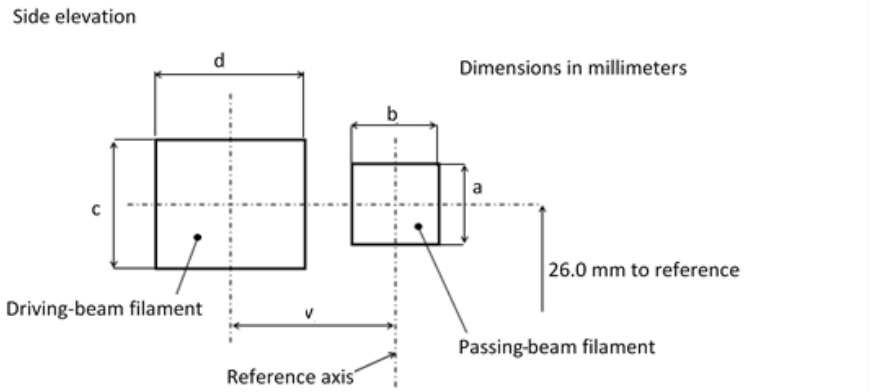
Category HS5	Sheet HS5/4

Screen projection requirement

This test is used to determine whether a filament light source complies with the requirements by checking whether:

(a) The passing-beam filament is correctly positioned relative to the reference axis and the reference plane; and whether

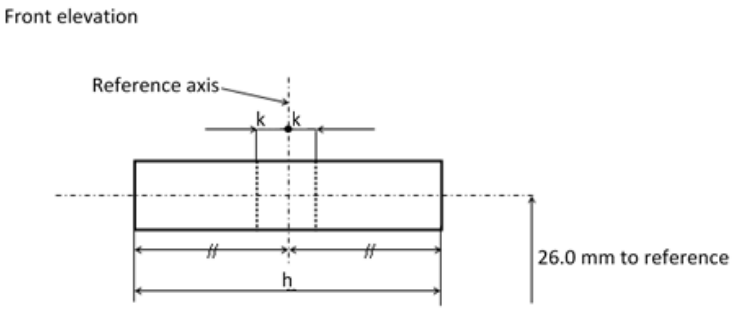
(b) The driving-beam filament is correctly positioned relative to the passing-beam filament.



Reference	a	b	c	d	v
Dimensions	d1+0.6	d1+0.8	d2+1.2	d2+1.6	2.5

d1 : Diameter of the passing-beam filament

d2 : Diameter of the driving-beam filament



Reference	h	k
Dimensions	6.0	0.5

The filaments shall lie entirely within the limits shown.

The centre of the filament shall lie within the limits of dimension k.

Category HS5A	Sheet HS5A/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

Filament light source for motorcycles

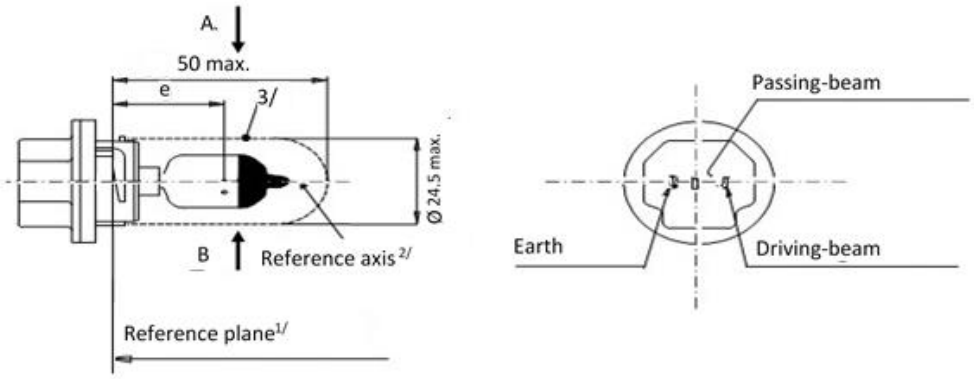


Figure 1 – Main drawing

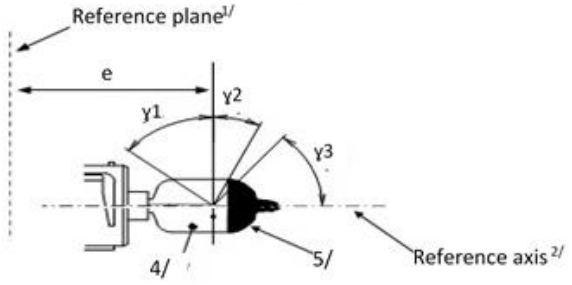


Figure 2 - Distorsion free area4/ and black top5/

1/ The reference plane is defined by three ramps inside surface.

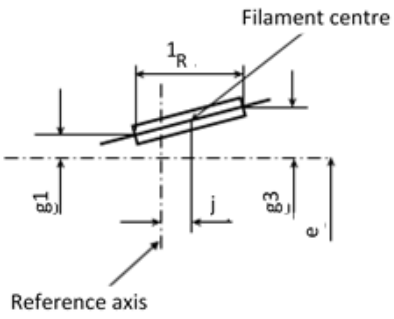
2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 23 mm cap diameter.

3/ Glass bulb and supports shall not exceed the envelope as indicated in Figure 1. The envelope is concentric to the reference axis.

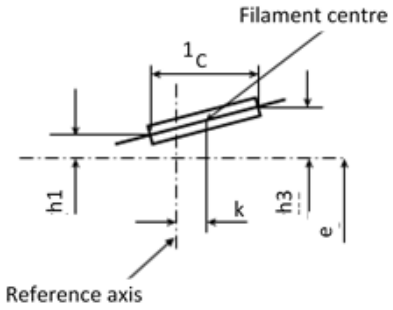
4/ Glass bulb shall be optically distortion free within the angles γ1 and γ2. This requirement applies to the whole bulb circumference within the angles γ1 and γ2.

5/ The obscuration shall extend at least to angle γ3 and shall extend at least to the cylindrical part of the bulb on the whole top circumference.

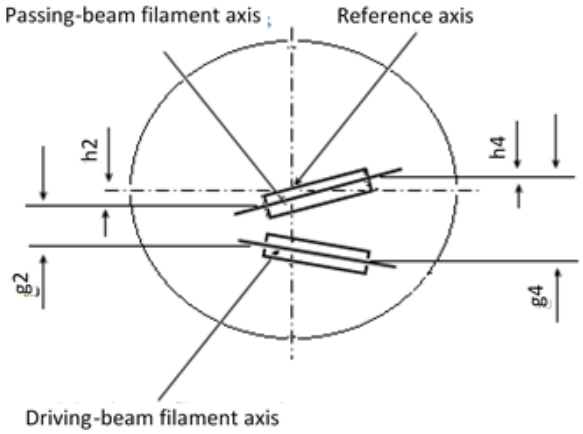
Category HS5A	Sheet HS5A/2



View B - Driving-beam filament



View A - Passing-beam filament



Top view of driving-beam and passing-beam filament

Figure 3 – Filament position and dimensions

Category HS5A	**Sheet HS5A/3**

Dimensions in mm		Filament light source of normal production	Standard filament light source
		12 V	12 V
e	26	-	-
l_C 6/	4.6	±0.5	±0.3
k	0	±0.4	±0.2
h1, h3	0	±0.3	±0.15
h2, h4	0	±0.4	±0.2
l_R 6/	4.6	±0.5	±0.3
j	0	±0.6	±0.3
g1, g3	0	±0.6	±0.3
g2, g4	2.5	±0.4	±0.2
γ1	50° min.	-	-
γ2	23° min.	-	-
γ3	50° min.	-	-
Cap PX23t in accordance with IEC Publication 60061 (sheet 7004-138A-1)			
Electrical and photometric characteristics			

Rated values	Voltage	V	12 7/		12 7/	
	Wattage	W	45	40	45	40
Test voltage		V	13.2		13.2	
Objective Values	Wattage	W	50 max.	45 max.	50 max.	45 max.
	Luminous flux	lm	750	640		
		± %	15	15		
Reference luminous at approximately			12 V		550 lm	470 lm
			13.2 V		750 lm	640 lm

6/ The positions of the first and the last turn of the filament are defined by the intersections of the outside of the first and the outside of the last light-emitting turn, respectively, with the plane parallel to and 26 mm distant from the reference plane.

7/ The values indicated in the left-hand columns relate to the driving-beam filament and those indicated in the right-hand columns to the passing-beam filament.

Category HS6	**Sheet HS6/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

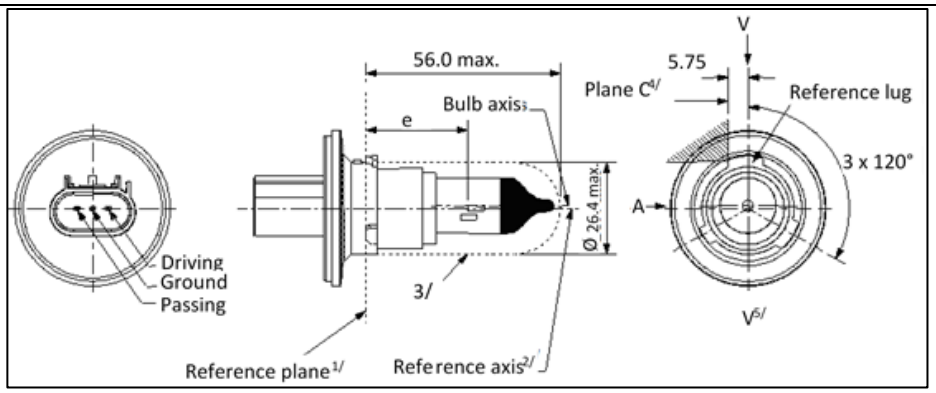


Figure 1 - Main drawings

1/ The reference plane is the plane formed by the underside of the three radiused tabs of the cap.

2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in Figure 2 on sheet HS6/2.

3/ Glass bulb and supports shall not exceed the envelope as indicated. The envelope is concentric to the reference axis.

4/ The filament light source shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

5/ Plane V-V is the plane perpendicular to the reference plane passing through the reference axis and parallel to plane C.

Category HS6	Sheet HS6/2

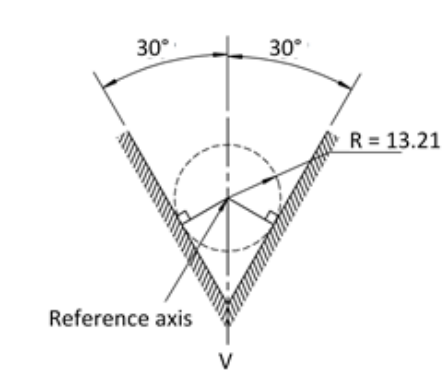


Figure 2 – Definition of reference axis 2/

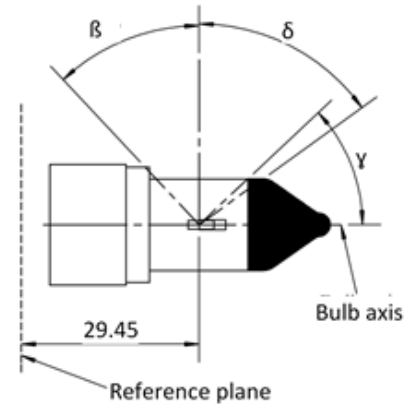
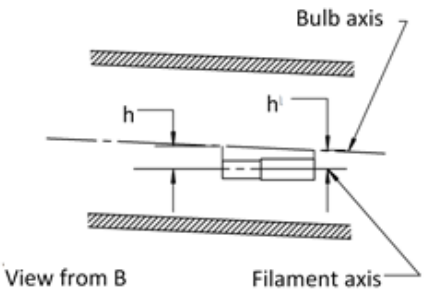


Figure 3 - Undistorted area6/ and opaque coating7/



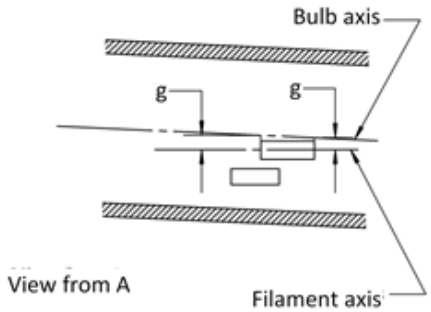


Figure 4 – Bulb offset8/

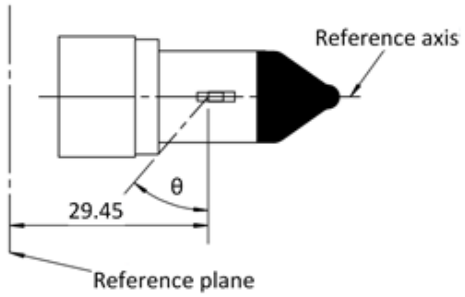


Figure 5 – Light blocking toward9/ cap

6/ Glass bulb shall be optically distortion-free axially and cylindrically within the angles β and δ. This requirement applies to the whole bulb circumference within the angles β and δ and does not need to be verified in the area covered by the opaque coating.

7/ The opaque coating shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference. It shall moreover extend at least to a plane parallel to the reference plane where γ crosses the outer bulb surface as shown in Figure 3 (view in direction B as indicated on sheet HS6/1).

8/ Offset of passing-beam filament in relation to the bulb axis is measured in two planes parallel to the reference plane where the projection of the outside end turns nearest to and farthest from the reference plane crosses the passing-beam filament axis.

9/ Light shall be blocked over the cap end of the bulb extending to angle θ. This requirement applies in all directions around the reference axis.

Category HS6	Sheet HS6/3

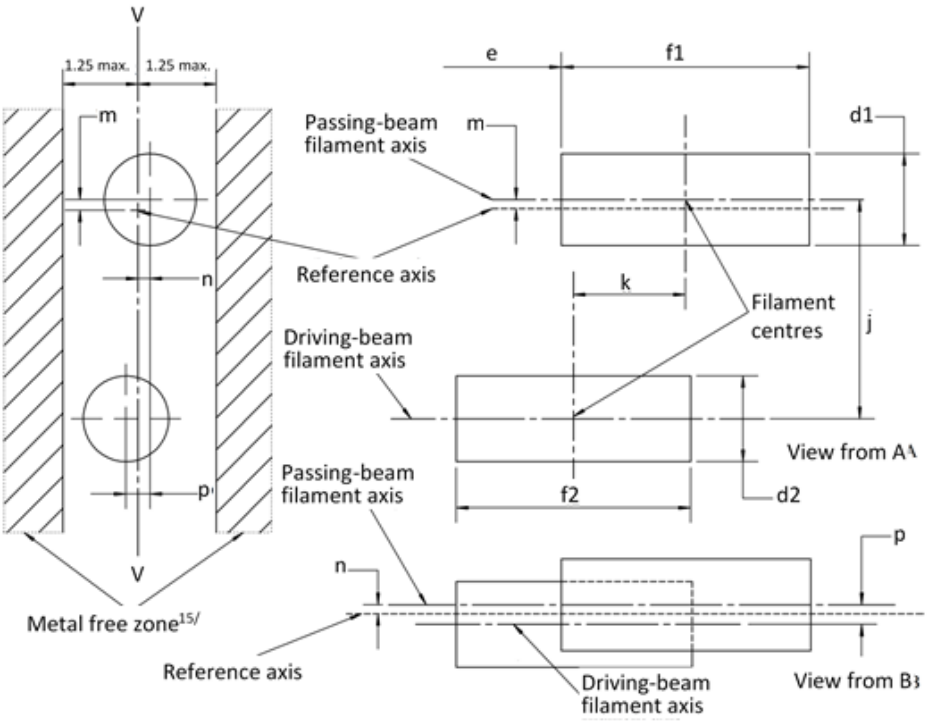


Figure 6 – Position and dimensions of filaments[10/, 11/, 12/, 13/, 14/]

10/	Dimensions j, k and p are measured from the centre of the passing-beam filament to the centre of the driving-beam filament.
11/	Dimensions m and n are measured from the reference axis to the centre of the passing-beam filament.
12/	Both filaments axis are to be held within a 2° tilt with respect to the reference axis about the centre of the respective filament.
13/	Note concerning the filament diameters: for the same manufacturer, the design filament diameter of standard (étalon) filament light source and filament light source of normal production shall be the same.
14/	For both the driving-beam and the passing-beam filament distortion shall not exceed ±5 per cent of filament diameter from a cylinder.
15/	The metal free zone limits the location of lead wires within the optical path. No metal parts shall be located in the shaded area as seen in Figure 6.

Category HS6				**Sheet HS6/4**	
Dimensions in mm		Tolerance			
		Filaments light sources of normal production		Standard filament light source.	
d1[13/ 17/]	1.4 max.	-		-	
d2[13/ 17/]	1.4 max.	-		-	
e[16/]	29.45	± 0.20		± 0.10	
f1[16/]	4.4	± 0.50		± 0.25	
f2[16/]	4.4	± 0.50		± 0.25	
g[8/ 17/]	0.5 d1	± 0.50		± 0.30	
h[8/]	0	± 0.40		± 0.20	
j[10/]	2.5	± 0.30		± 0.20	
k[10/]	2.0	± 0.20		± 0.10	
m[11/]	0	± 0.24		± 0.20	
n[11/]	0	± 0.24		± 0.20	
p[10/]	0	± 0.30		± 0.20	
β	42° min.	-		–	
δ	52° min.	-		–	
γ	43°	+0° / -5°		+0° / –5°	
θ [9/]	41°	± 4°		± 4°	
Cap: PX26.4t in accordance with IEC Publication 60061 (sheet 7004-128-3)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS[18/]					
Rated values	Volts	12		12	
	Watts	40	35	40	35
Test voltage	Volts	13.2		13.2	
Objective values	Watts	45 max.	40 max.	45 max	40 max.
	Luminous	900 ± 15 %	600 ± 15 %		
Reference luminous flux at approximately		12 V		630/420	
		13.2 V		900/600	

16/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown on sheet HS6/1, the projection of the outside of the end turns crosses the filament axis.

17/ d1 is the actual diameter of the passing-beam filament. d2 is the actual diameter of the driving-beam filament.

18/ The values indicated in the left-hand columns relate to the driving-beam filament and those in the right-hand columns to the passing-beam filament.

Categories P13W and PW13W	**Sheet P13W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

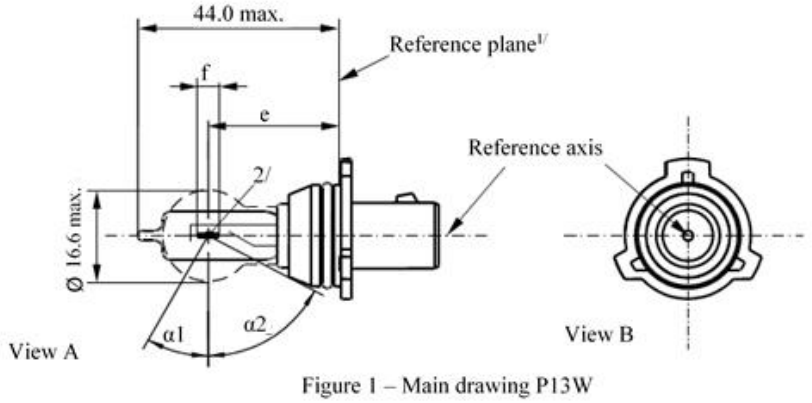


Figure 1 – Main drawing P13W

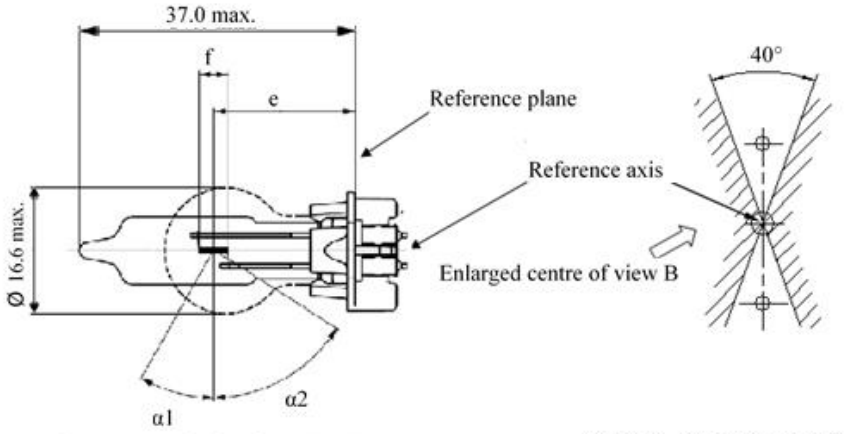


Figure 3 – Main drawing PW13W

Figure 2 – Metal free zone3/

1/ The reference plane is defined by the meeting points of the cap-holder fit.

2/ No actual filament diameter restrictions apply but the objective is d max. = 1.0 mm.

3/ No opaque parts other than filament turns shall be located in the shaded area indicated in Figure 2. This applies to the rotational body within the angles $\alpha 1 + \alpha 2$.

Categories P13W and PW13W	**Sheet P13W/2**

Dimensions in mm	Filament light sources of normal production	Standard filament light source
e[5/]	25.0[4/]	25.0 ± 0.25
f[5/]	4.3[4/]	4.3 ± 0.25
α_1[6/]	30.0° min.	30.0° min.
α_2[6/]	58.0° min.	58.0° min.

P13W Cap PG18.5d-1 in accordance with IEC Publication 60061 (sheet 7004-147-1)
PW13W Cap WP3.3x14.5-7 in accordance with IEC Publication 60061 (sheet 7004-164-1)

ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS

Rated values	Voltage	V	12	12
	Wattage	W	13	13
Test voltage		V	13.5	13.5
Objective values	Wattage	W	19 max.	19 max.
	Luminous flux	lm	250	
		±	+15% / –20%	
Reference luminous flux at approximately 13.5V				250 lm

4/ To be checked by means of a "Box system"; sheet P13W/3.

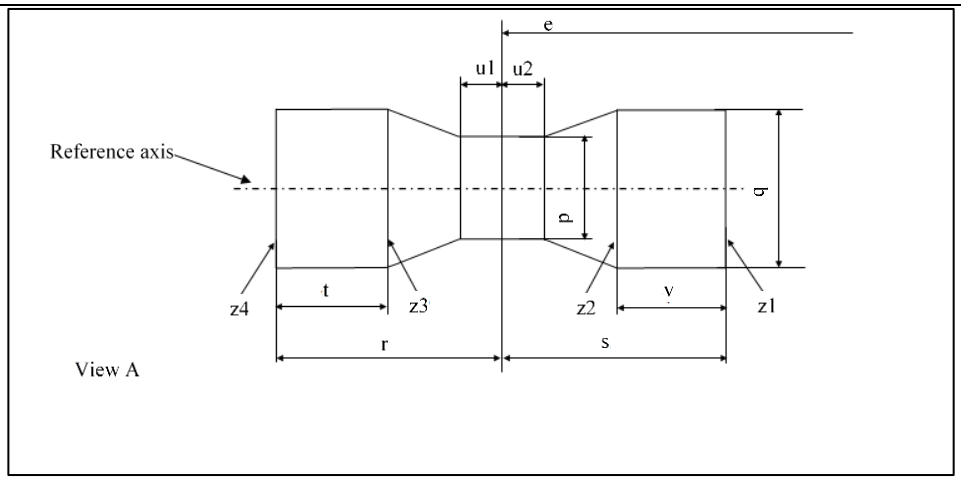
5/ The ends of the filament are defined as the points where, when the viewing direction is perpendicular to the plane through the filament lead-in wires, the projection of the outside of the end turns crosses the filament axis.

6/ No part of the cap beyond the reference plane shall interfere with angle $\alpha 2$ as shown in Figure 1 on sheet P13W/1. The bulb shall be optically distortion free within the angles $\alpha 1 + \alpha 2$.These requirements apply to the whole bulb circumference.

Categories P13W and PW13W	Sheet P13W/3

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	p	q	u1,u2	r,s	t,v
Filament light sources of normal production	1.7	1.9	0.3	2.6	0.9
Standard filament light sources	1.5	1.7	0.25	2.45	0.6

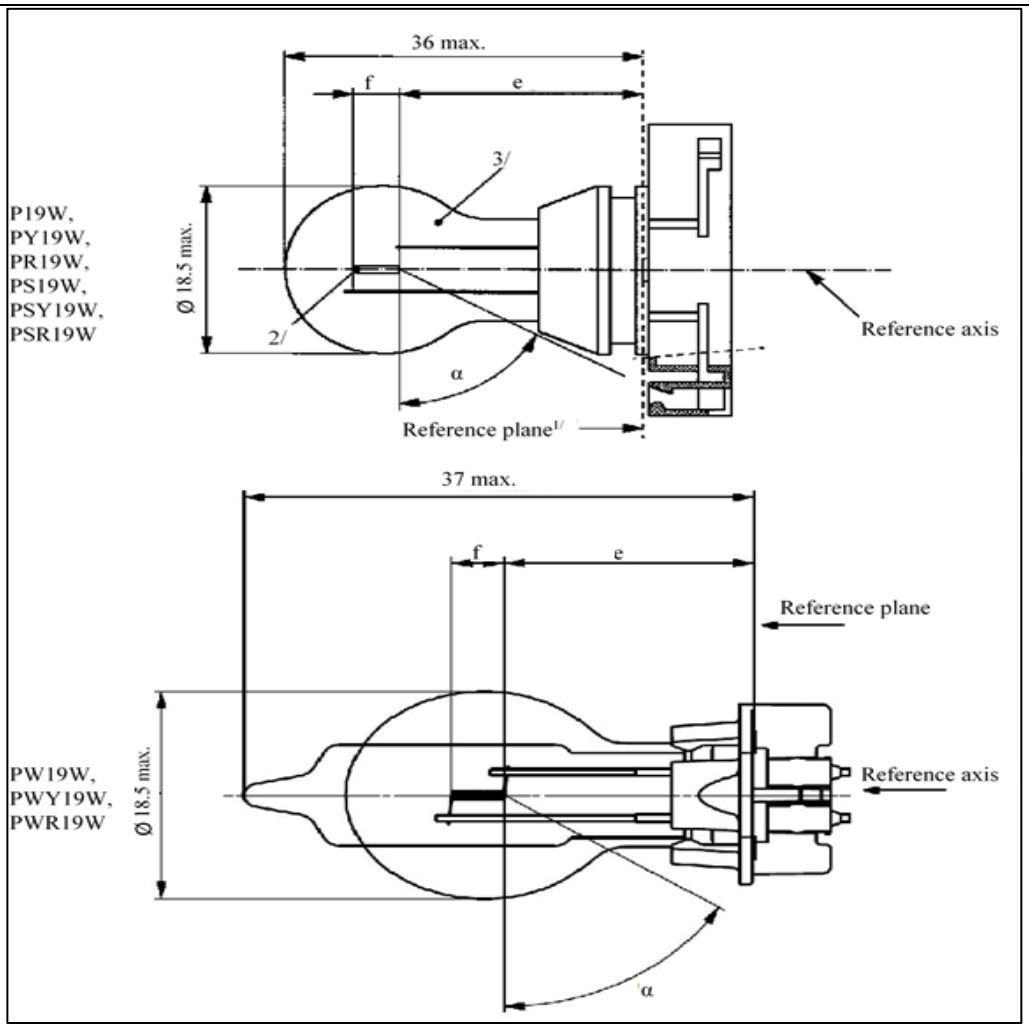
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

The ends of the filament as defined on sheet P13W/2, footnote 4/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

The filament shall lie entirely within the limits shown.

Categories P19W, PY19W, PR19W, PS19W, PSY19W, PSR19W, PW19W, PWY19W and PWR19W	**Sheet P19W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is defined by the meeting points of the cap-holder fit.

2/ No actual filament diameter restrictions apply but the objective is d max. = 1.1 mm.

3/ The light emitted from normal production lamps shall be white for categories P19W, PS19W and PW19W; amber for categories PY19W, PSY19W and PWY19W; red for categories PR19W, PSR19W and PWR19W (see also footnote 8/).

Categories P19W, PY19W, PR19W, PS19W, PSY19W, PSR19W, PW19W, PWY19W and PWR19W	**Sheet P19W/2**

Dimensions in mm [4/]		Filament light sources of normal production			Standard filament light source [8/]
		Min.	Nom.	Max.	
e [5/, 6/]	P19W, PS19W, PY19W, PSY19W, PR19W, PSR19W		24.0		24.0
	PW19W, PWY19W, PWR19W		18.1		18.1
f [5/, 6/]			4.0		4.0 ± 0.2
α [7/]		58°			58° min.

P19W PY19W PR19W PS19W PSY19W PSR19W	Cap PGU20-1 Cap PGU20-2 Cap PGU20-5 Cap PG20-1 Cap PG20-2 Cap PG20-5	in accordance with IEC Publication 60061 (sheet 7004-127-2)
PW19W PWY19W PWR19W	Cap WP3.3x14.5-1 Cap WP3.3x14.5-2 Cap WP3.3x14.5-5	in accordance with IEC Publication 60061 (sheet 7004-164-1)

Electrical and photometric characteristics

Rated values	Volts		12	12
	Watts		19	19
Test voltage	Volts		13.5	13.5
Objective values	Watts		20 max.	20 max.
	Luminous flux	P19W PS19W PW19W	350 ± 15 %	
		PY19W PSY19W PWY19W	215 ± 20 %	
		PR19W PSR19W PWR19W	80 ± 20 %	
Reference luminous flux at approximately 13.5 V				White: 350 lm Amber:215 lm Red:80 lm

Categories P19W, PY19W, PR19W, PS19W, PSY19W, PSR19W, PW19W, PWY19W and PWR19W	Sheet P19W/3

4/ For categories PS19W, PSY19W and PSR19W, dimensions may be checked with O-ring removed to assure the correct mounting during testing.

5/ The filament position is checked by means of a "Box system"; sheet P19W/3.

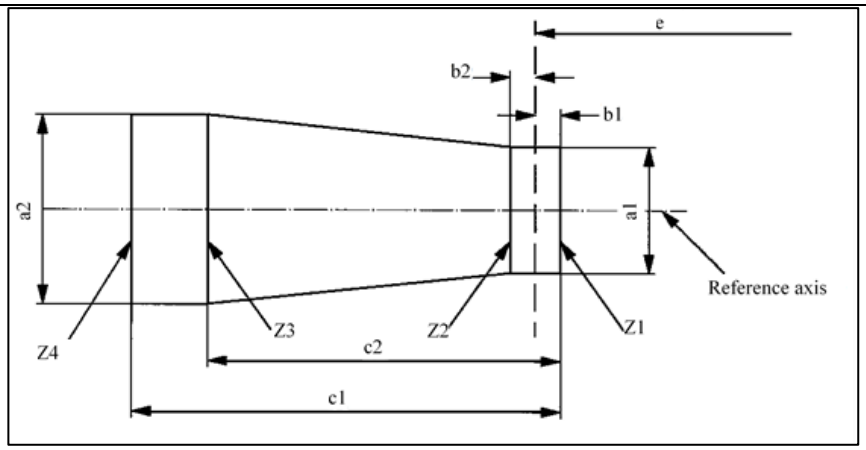
6/ The ends of the filament are defined as the points where, when the viewing direction is perpendicular to the plane through the filament lead-in wires as showed in the drawing on sheet P19W/1, the projection of the outside of the end turns crosses the filament axis.

7/ No part of the cap beyond the reference plane shall interfere with angle α. The bulb shall be optically distortion free within the angle $2\alpha + 180°$.

8/ The light emitted from standard filament light sources shall be white for categories P19W, PS19W and PW19W; white or amber for categories PY19W, PSY19W and PWY19W; white or red for categories PR19W, PSR19W and PWR19W.

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



P19W, PY19W, PR19W, PS19W, PSY19W, PSR19W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	2.9	3.9	0.5	5.2	3.8
Standard filament light sources	1.5	1.7	0.25	4.7	3.8

Categories P19W, PY19W, PR19W, PS19W, PSY19W, PSR19W, PW19W, PWY19W and PWR19W	Sheet P19W/4

PW19W, PWY19W and PWR19W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	2.5	2.5	0.4	5.2	3.8
Standard filament light sources	1.5	1.7	0.25	4.7	3.8

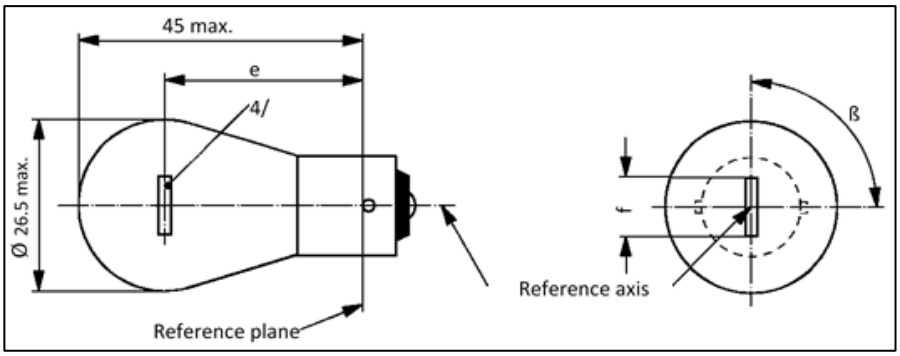
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

The ends of the filament as defined on sheet P19W/2, footnote 6/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

The filament shall lie entirely within the limits shown.

Category P21W	**Sheet P21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e	6, 12 V		31.8 3/		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V	5.5	6.0	7.0	6.0 ± 0.5
	6 V			7.0	
Lateral deviation 1/	6, 12 V			3/	0.3 max.
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap BA15s in accordance with IEC Publication 60061 (sheet 7004-11A-9) 2/					
Electrical and photometric characteristics					
Rated values	Volts	6	12	24	12
	Watts	21			21
Test voltage	Volts	6.75	13.5	28.0	13.5
Objective values	Watts	27.6 max.	26.5 max.	29.7 max.	26.5 max.
	Luminous flux	460 ± 15 %			
Reference luminous flux: 460 lm at approximately 13.5 V					

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the pins.

2/ Filament light sources with cap BA15d may be used for special purposes; they have the same dimensions.

3/ To be checked by means of a "Box system"; sheet P21W/2.

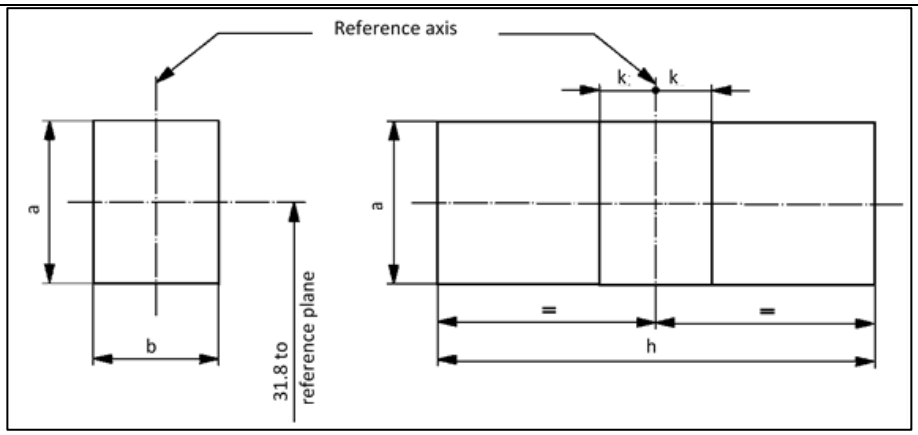
4/ In this view the filament of the 24 V type may be straight or V-shaped. This shall be indicated in the application of approval. If it is straight, the screen projection requirements, sheet P21W/2, apply. If it is V-shaped, the filament ends shall be at the same distance within ±3 mm from the reference plane.

Category P21W	**Sheet P21W/2**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centre line of the pins (P21W) or of the reference pin (PY21W and PR21W) and the reference axis, whether a filament light source complies with the requirements.

Side elevation Front elevation



Reference	a	b	h	k
Dimension	3.5	3.0	9.0	1.0

Test procedures and requirements

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits.

2. Side elevation

The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

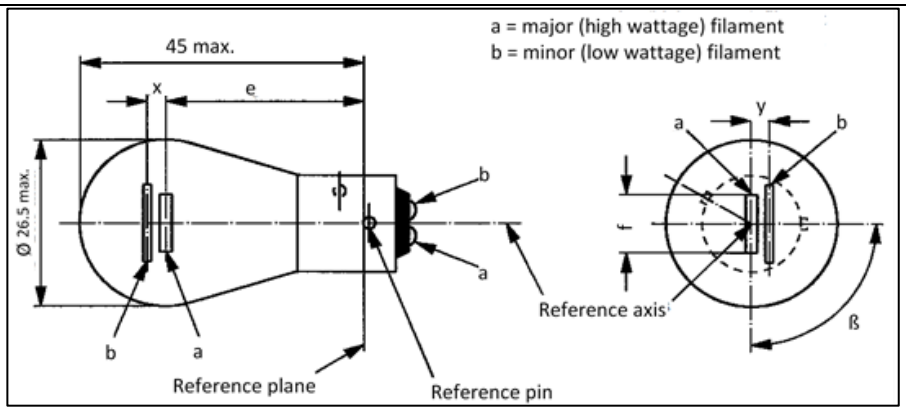
The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.

3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

Category P21/4W	**Sheet P21/4W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production				Standard filament light source
		Min.	Nom.	Max.		
e			31.8 1/			31.8 ± 0.3
f				7.0		7.0 + 0 /- 2
Lateral deviation				1/		0.3 max. 2/
x,y		1/				2.8 ± 0.5
β		75° 1/	90° 1/	105° 1/		90° ± 5°
Cap BAZ15d in accordance with IEC Publication 60061 (sheet 7004-11C-3)						
Electrical and photometric characteristics						
Rated values	Volts	12		24		12
	Watts	21	4	21	4	21/4
Test voltage	Volts	13.5		28.0		13.5
Objective values	Watts	26.5 max.	5.5 max.	29.7 max.	8.8 max.	26.5/5.5 max.
	Luminous flux	440	15	440	20	
	± %	15	20	15	20	
Reference luminous flux: 440 lm and 15 lm at approximately 13.5 V						

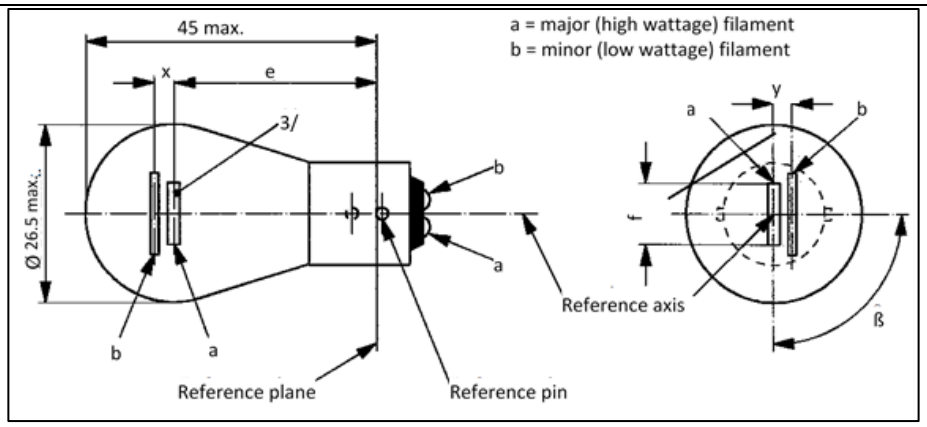
1/ These dimensions shall be checked by means of a "Box system"3/ based on the dimensions and tolerances shown above. "x" and "y" refer to the major (high wattage) filament, not to the reference axis. Means of increasing the positioning accuracy of the filament and of the cap-holder assembly are under consideration.

2/ Maximum lateral deviation of the major filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.

3/ The "Box system" is the same as for filament light source P21/5W.

Category P21/5W	**Sheet P21/5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e	6, 12 V		31.8 [1/]		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	6, 12 V			7.0	7.0 + 0 /- 2
Lateral deviation [2/]	6, 12 V			[1/]	0.3 max.
	24 V			1.5	
x, y	6, 12 V		[1/]		2.8 ± 0.3
x	24 V [3/]	-1.0	0	1.0	
y	24 V [3/]	1.8	2.8	3.8	
β		75°	90°	105°	90° ± 5°

Cap BAY15d in accordance with IEC Publication 60061 (sheet 7004-11B-7)

Electrical and photometric characteristics

Rated values	Volts	6		12		24		12
	Watts	21	5	21	5	21	5	21/5
Test	Volts	6.75		13.5		28.0		13.5
Objective values	Watts	27.6	6.6	26.5	6.6	29.7	11.0	26.5 and 6.6
	Luminous flux	440	35	440	35	440	40	
	± %	15	20	15	20	15	20	

Reference luminous flux: 440 and 35 lm at approximately 13.5 V

For the notes see sheet P21/5W/2

Category P21/5W	**Sheet P21/5W/2**
1/ These dimensions shall be checked by means of a "Box system". See sheets P21/5W/2 and P21/5W/3. "x" and "y" refer to the major (high wattage) filament, not to the reference axis.	
2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.	
3/ In this view the filaments of the 24 V type may be straight or V-shaped. This shall be indicated in the application of approval. If the filaments are straight, the screen projection requirements apply. If they are V-shaped, the ends of each filament shall be at the same distance within ±3 mm from the reference plane.	
Screen projection requirements	
This test is used to determine, by checking whether:	
(a) The major (high wattage) filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centres of the pins and the reference axis; and whether	
(b) The minor (low wattage) filament is correctly positioned relative to the major (high wattage) filament, whether a filament light source complies with the requirements.	
Test procedure and requirements	
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. (i.e. 15°). The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits.	
2. Side elevation	
The filament light source placed with the cap down, the reference axis vertical, the reference pin to the right and the major filament seen end-on:	
2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;	
2.2. The projection of the minor filament shall lie entirely:	
2.2.1. Within a rectangle of width "c" and height "d" having its centre at a distance "v" to the right of and at a distance "u" above the theoretical position of the centre of the major filament;	
2.2.2. Above a straight line tangential to the upper edge of the projection of the major filament and rising from left to right at an angle of 25°.	
2.2.3. To the right of the projection of the major filament.	

Category P21/5W	**Sheet P21/5W/3**

3. Front elevation

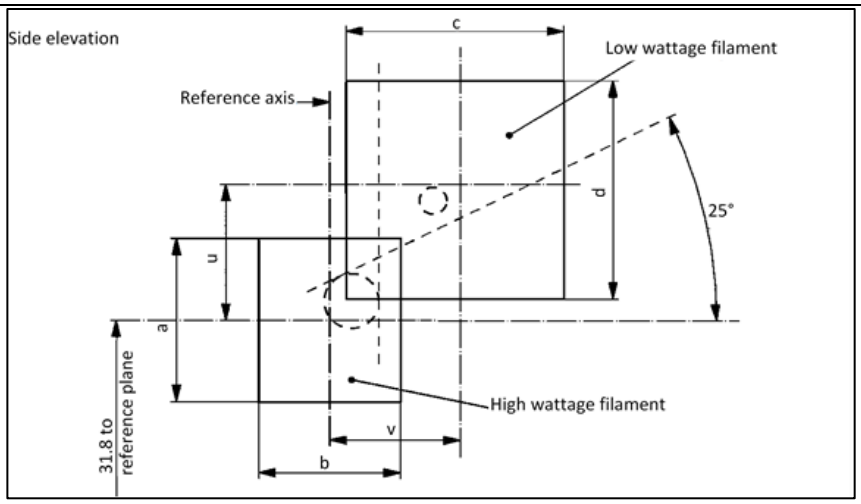
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:

3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;

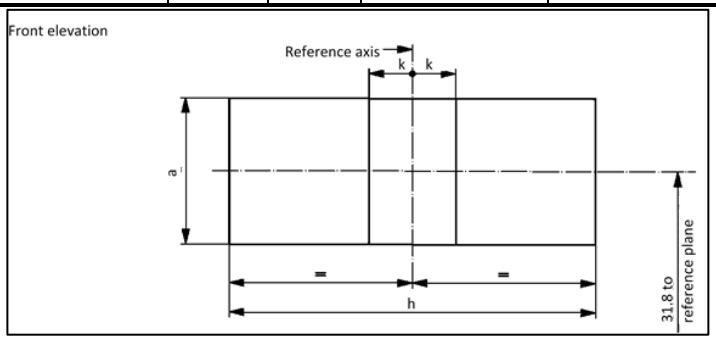
3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis.

3.3. The centre of the minor filament axis shall not be offset from the reference axis by more than ±2 mm (±0.4 mm for standard filament light sources).

Dimensions in mm



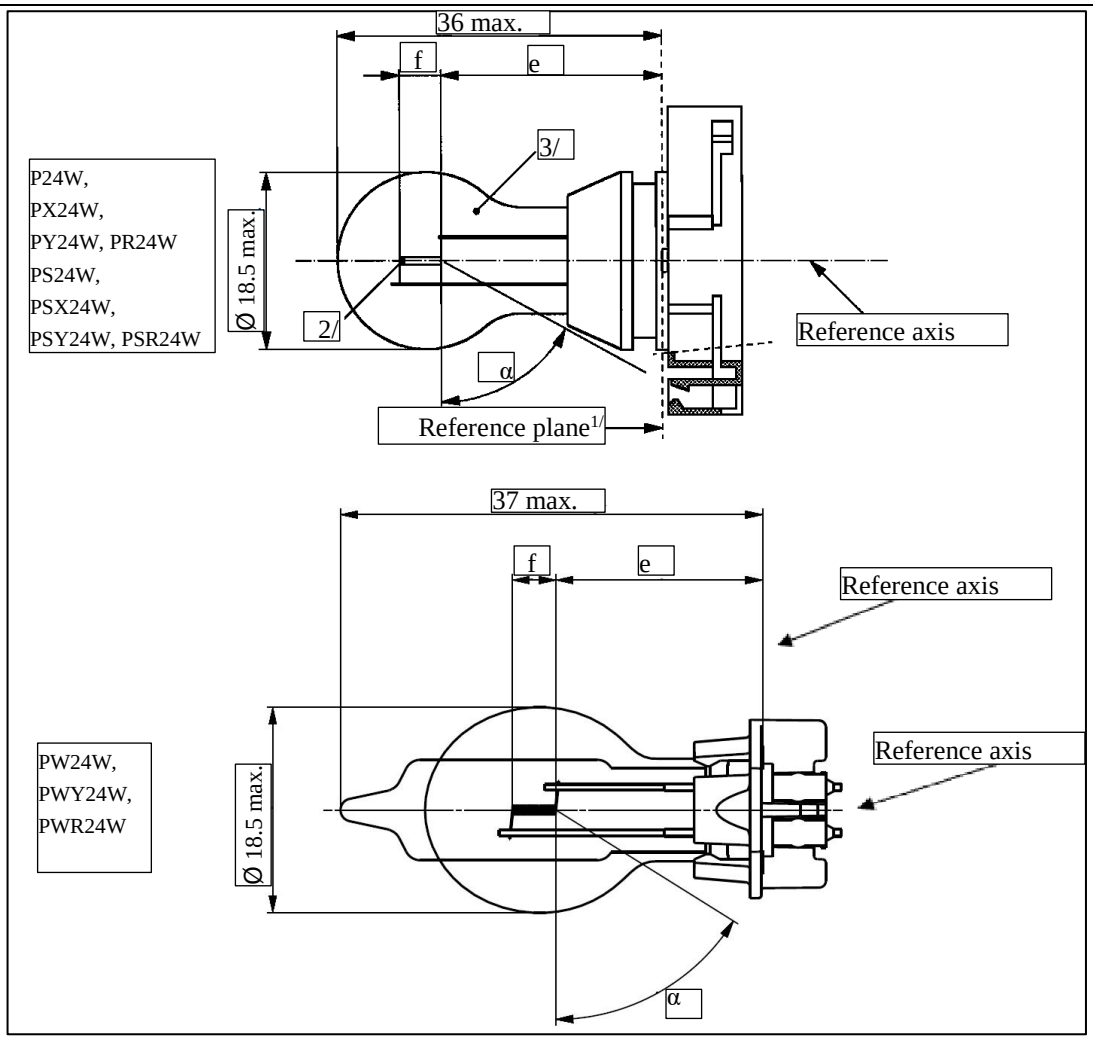
Reference	a	b	c	d	u	v
Dimensions	3.5	3.0	4.8		2.8	



Reference	a	h	k
Dimensions	3.5	9.0	1.0

Categories P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W, PSR24W, PW24W, PWY24W and PWR24W	**Sheet P24W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



1/ The reference plane is defined by the meeting points of the cap-holder fit.

2/ No actual filament diameter restrictions apply but the objective is d max. = 1.1 mm.

3/ The light emitted from normal production lamps shall be white for categories P24W, PX24W, PS24W, PSX24W and PW24W; amber for categories PY24W, PSY24W and PWY24W; red for categories PR24W, PSR24W and PWR24W (see also footnote 8/).

Categories P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W, PSR24W, PW24W, PWY24W and PWR24W	**Sheet P24W/2**

Dimensions in mm 4/		Filament light sources of normal production			Standard filament light source 8/
		Min.	Nom.	Max.	
e 5/ 6/	P24W, PY24W, PR24W, PS24W, PSY24W, PSR24W, PX24W, PSX24W		24.0		24.0
	PW24W, PWY24W, PWR24W		18.1		18.1
f 5/, 6/	P24W, PY24W, PR24W, PS24W, PSY24W, PSR24W, PW24W, PWY24W, PWR24W		4.0		4.0
	PX24W, PSX24W		4.2		4.2
α 7/		58.0°			58.0° min.

P24W Cap PGU20-3
PX24W Cap PGU20-7
PY24W Cap PGU20-4
PR24W Cap PGU20-6 in accordance with IEC Publication 60061 (sheet 7004-127-2) z
PS24W Cap PG20-3
PSX24W Cap PG20-7
PSY24W Cap PG20-4
PSR24W Cap PG20-6
PW24W Cap WP3.3x14.5-3
PWY24W Cap WP3.3x14.5-4 in accordance with IEC Publication 60061 (sheet 7004-164-1)
PWR24W Cap WP3.3x14.5-6

Electrical and photometric characteristics

Rated values	Volts		12	12
	Watts		24	24
Test voltage	Volts		13.5	13.5
Objective values	Watts		25 max.	25 max.
	Luminous flux	P24W PS24W PW24W	500 +10/-20 %	
		PX24W PSX24W	500 +10/-15 %	

<table>
<tr><td colspan="5">Categories P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W, PSR24W, PW24W, PWY24W and PWR24W</td><td>Sheet P24W/3</td></tr>
<tr><td colspan="2" rowspan="2"></td><td>PY24W
PSY24W
PWY24W</td><td colspan="2">300 +15/-25 %</td><td></td></tr>
<tr><td>PR24W
PSR24W
PWR24W</td><td colspan="2">115 +15/-25 %</td><td></td></tr>
<tr><td colspan="4" rowspan="3">Reference luminous flux at approximately</td><td>12 V</td><td>White: 345 lm</td></tr>
<tr><td>13.2 V</td><td>White: 465 lm</td></tr>
<tr><td>13.5 V</td><td>White: 500 lm
Amber:300 lm
Red:115 lm</td></tr>
</table>

4/ For categories PS24W, PSX24W, PSY24W and PSR24W, dimensions may be checked with O-ring removed to assure the correct mounting during testing.

5/ The filament position is checked by means of a "Box system"; sheet P24W/3.

6/ The ends of the filament are defined as the points where, when the viewing direction is perpendicular to the plane through the filament lead-in wires as showed in the drawing on sheet P24W/1, the projection of the outside of the end turns crosses the filament axis.

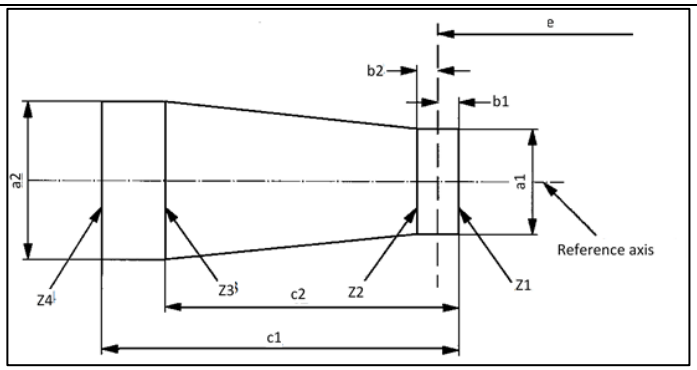
7/ No part of the cap beyond the reference plane shall interfere with angle α. The bulb shall be optically distortion free within the angle $2\alpha + 180°$.

8/ The light emitted from standard filament light sources shall be white for categories P24W, PX24W, PS24W, PSX24W and PW24W; white or amber for categories PY24W, PSY24W and PWY24W; white or red for categories PR24W, PSR24W and PWR24W.

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.

Categories P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W, PSR24W, PW24W, PWY24W and PWR24W	**Sheet P24W/4**



P24W, PY24W, PR24W, PS24W, PSY24W, PSR24W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	2.9	3.9	0.5	5.2	3.8
Standard filament light sources	1.5	1.7	0.25	4.7	3.8

PW24W, PWY24W, PWR24W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	2.5	2.5	0.4	5.0	3.8
Standard filament light sources	1.5	1.7	0.25	4.7	3.8

PX24W, PSX24W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	1.9	1.9	0.35	5.0	4.0
Standard filament light sources	1.5	1.5	0.25	4.7	4.0

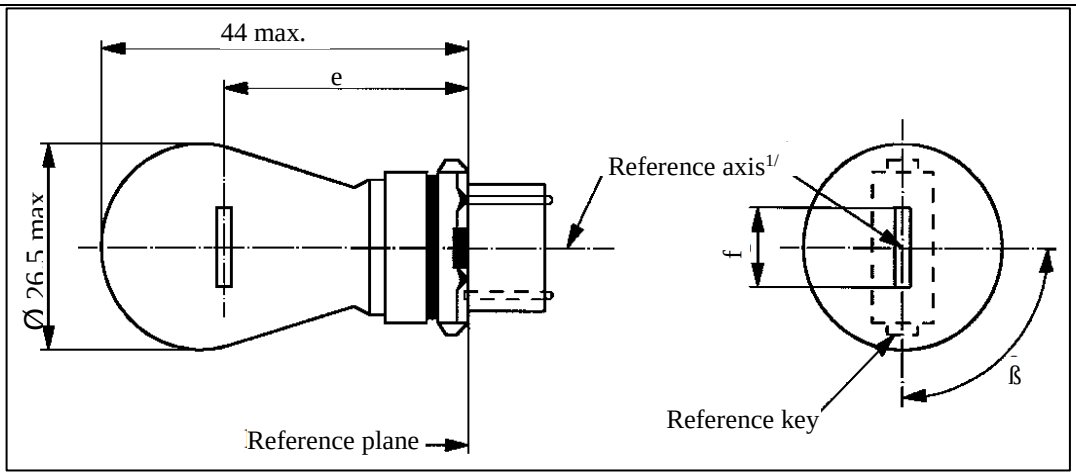
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

The ends of the filament as defined on sheet P24W/2, footnote 6/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

The filament shall lie entirely within the limits shown.

Category P27W	**Sheet P27W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e			27.9 3/		27.9 ± 0.3
f				9.9	9.9 + 0 / - 2
Lateral deviation 2/				3/	0.0 ± 0.4
β		75° 3/	90°	105° 3/	90° ± 5°
Cap W2.5x16d in accordance with IEC Publication 60061 (sheet 7004-104-1)					
Electrical and photometric characteristics					
Rated values	Volts	12			12
	Watts	27			27
Test voltage	Volts	13.5			13.5
Objective values	Watts	32.1 max.			32.1 max.
	Luminous flux	475 ± 15 %			
Reference luminous flux: 475 lm at approximately 13.5 V					

1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.

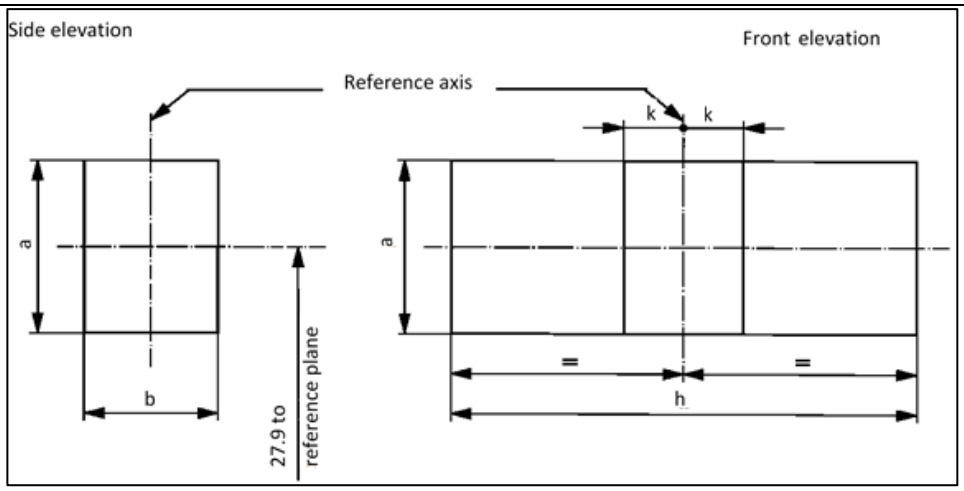
2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.

3/ To be checked by means of a "Box system", sheet P27W/2.

Category P27W	**Sheet P27W/2**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centres of the keys and the reference axis, whether a filament light source complies with the requirements.



Reference	a	b	h	k
Dimension	3.5	3.0	11.9	1.0

Test procedures and requirements.

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits.

2. Side elevation

   The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

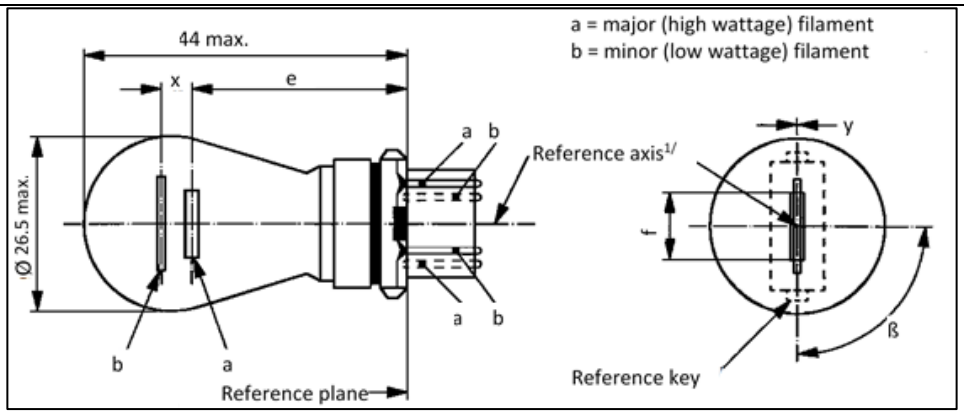
   The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.

3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

Category P27/7W	**Sheet P27/7W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source	
		Min.	Nom.	Max.		
e			27.9 3/		27.9 ± 0.3	
f				9.9	9.9 + 0 / -2	
Lateral deviation 2/				3/	0.0 ± 0.4	
x 4/			5.1 3/		5.1 ± 0.5	
y 4/			0.0 3/		0.0 ± 0.5	
β		75° 3/	90°	105° 3/	90° ± 5°	
Cap W2.5x16q in accordance with IEC Publication 60061 (sheet 7004-104-1)						
Electrical and photometric characteristics						
Rated values	Volts	12			12	
	Watts	27	7		27	7
Test voltage	Volts	13.5			13.5	
Objective values	Watts	32.1 max.	8.5 max.		32.1 max.	8.5 max.
	Luminous flux	475 ± 15 %	36 ± 15 %			
Reference luminous flux: 475 and 36 lm at approximately 13.5 V						

1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.

2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.

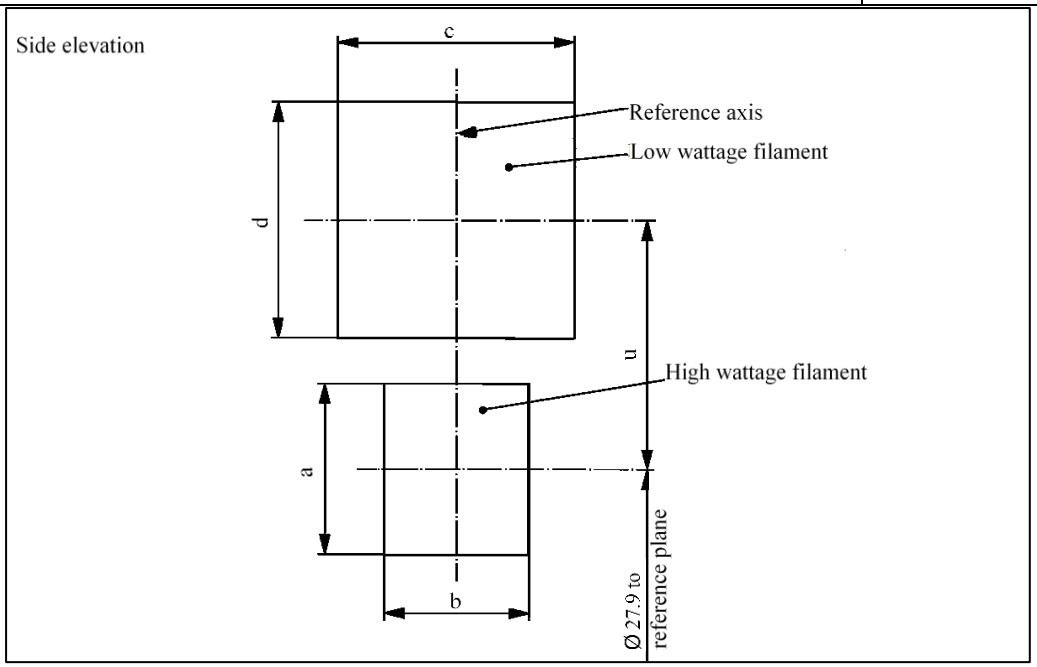
3/ To be checked by means of a "Box system", sheets P27/7W/2 and 3.

4/ "x" and 'y" denote the offset of the axis of the minor (low wattage) filament with respect to the axis of the major (high wattage) filament.

Category P27/7W	**Sheet P27/7W/2**
Screen projection requirements	
This test is used to determine, by checking whether:	
(a) The major (high wattage) filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centres of the keys and the reference axis; and whether:	
(b) The minor (low wattage) filament is correctly positioned relative to the major (high wattage) filament, whether a filament light source complies with the requirements.	
Test procedure and requirements.	
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits.	
2. Side elevation	
The filament light source placed with the cap down, the reference axis vertical, the reference key to the right and the major filament seen end-on:	
2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;	
2.2. The projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having its centre at a distance "u" above the theoretical position of the centre of the major filament.	
3. Front elevation	
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:	
3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;	
3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis;	
3.3. The centre of the minor filament axis shall not be offset from the reference axis by more than ±2 mm (±0.4 mm for standard filament light sources).	

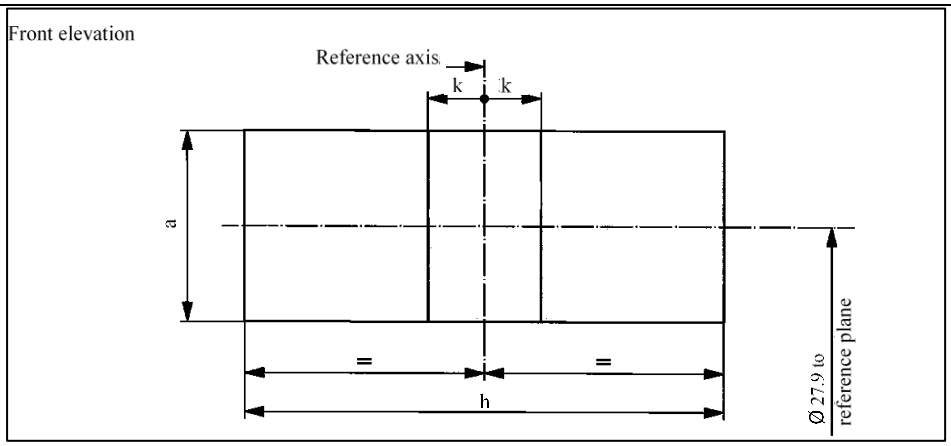
Category P27/7W	**Sheet P27/7W/3**

Side elevation



Reference	a	b	c	d	u
Dimension	3.5	3.0	4.8		5.1

Front elevation

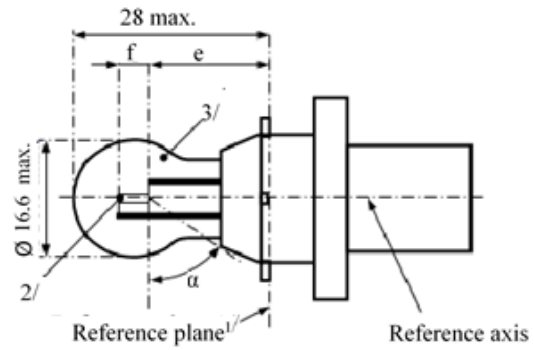


Reference	a	h	k
Dimension	3.5	11.9	1.0

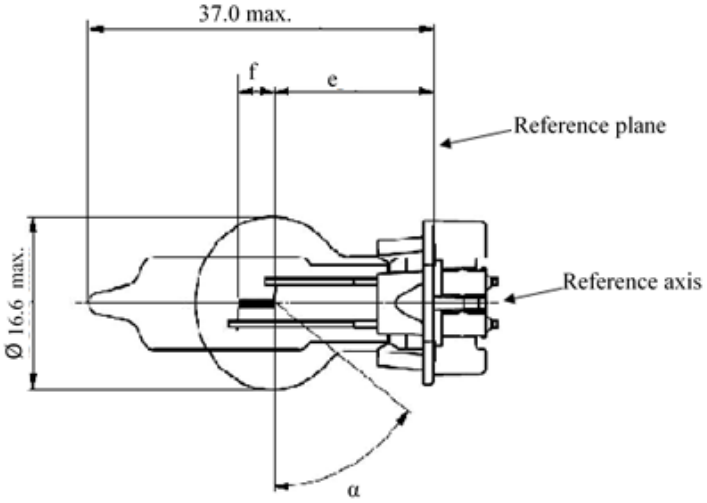
Categories PC16W, PCY16W, PCR16W, PW16W, PWY16W and PWR16W	**Sheet PC16W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

PC16W,
PCY16W,
PCR16W



PW16W,
PWY16W,
PWR16W



1/ The reference plane is defined by the meeting points of the cap-holder fit.

2/ No actual filament diameter restrictions apply but the objective is d max. = 1.1 mm.

3/ The light emitted from normal production lamps shall be white for category PC16W and PW16W; amber for category PCY16W and PWY16W; red for category PCR16W and PWR16W. (See also footnote 7/).

Categories PC16W, PCY16W, PCR16W, PW16W, PWY16W and PWR16W	**Sheet PC16W/2**

Dimensions in mm		Filament light sources of normal production			Standard filament light source [7/]
		Min.	Nom.	Max.	
e [4/, 5/]	PC16W PCY16W PCR16W		18.5		18.5
	PW16W PWY16W PWR16W		17.1		17.1
f [4/, 5/]			4.0		4.0 ± 0.2
α [6/]		54°			54° min.

PC16W Cap PU20d-1 PCY16W Cap PU20d-2 PCR16W Cap PU20d-7	in accordance with IEC Publication 60061 (sheet 7004-158-1)
PW16W Cap WP3.3x14.5-8 PWY16W Cap WP3.3x14.5-9 PWR16W Cap WP3.3x14.5-10	in accordance with IEC Publication 60061 (sheet 7004-164-1)

Electrical and photometric characteristics

Rated values	Volts		12	12
	Watts		16	16
Test voltage	Volts		13.5	13.5
Objective values	Watts		17 max.	17 max.
	Luminous flux	PC16W PW16W	300 ± 15 %	
		PCY16W PWY16W	180 ± 20 %	
		PCR16W PWR16W	70 ± 20 %	

Reference luminous flux at approximately	13.5 V	White: 300 lm Amber: 180 lm Red: 70 lm

4/ The filament position is checked by means of a "Box system"; sheet PC16W/3.

Categories PC16W, PCY16W, PCR16W, PW16W, PWY16W and PWR16W	Sheet PC16W/3

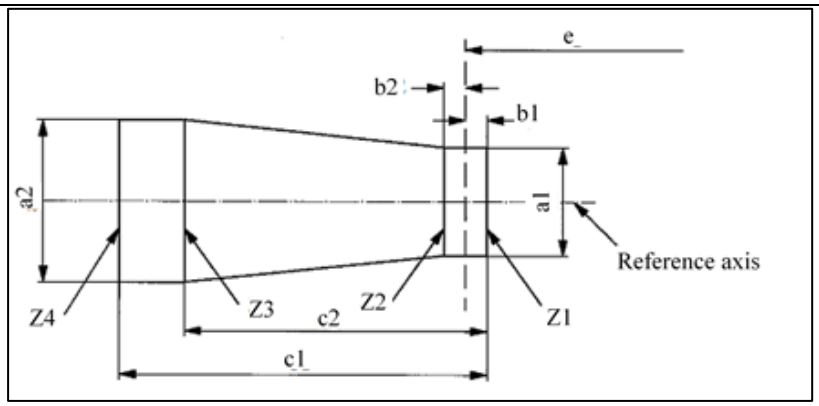
5/ The ends of the filament are defined as the points where, when the viewing direction is perpendicular to the plane through the filament lead-in wires as showed in the drawing on sheet PC16W/1, the projection of the outside of the end turns crosses the filament axis.

6/ No part of the cap beyond the reference plane shall interfere with angle α. The bulb shall be optically distortion free within the angle $2\alpha + 180°$.

7/ The light emitted from standard filament light sources shall be white for category PC16W and PW16W; white or amber for category PCY16W and PWY16W; white or red for category PCR16W and PWR16W.

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



PC16W, PCY16W, PCR16W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	2.9	3.9	0.5	5.2	3.8
Standard filament light sources	1.5	1.7	0.25	4.7	3.8

PW16W, PWY16W and PWR16W	a1	a2	b1, b2	c1	c2
Filament light sources of normal production	2.5	2.5	0.4	5.2	3.8
Standard filament light sources	1.5	1.7	0.25	4.7	3.8

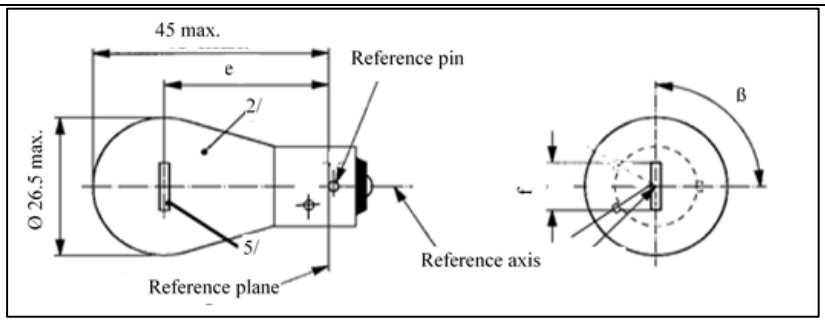
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

The ends of the filament as defined on sheet PC16W/2, footnote 5/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

The filament shall lie entirely within the limits shown.

Category PR21W	**Sheet PR21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source 4/
		Min.	Nom.	Max.	
e	12 V		31.8 3/		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V	5.5	6.0	7.0	6.0 ± 0.5
Lateral deviation 1/	12 V			3/	0.3 max
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap BAW15s in accordance with IEC Publication 60061 (sheet 7004-11E-1)					
Electrical and photometric characteristics					
Rated values:	Volts	12	24		12
	Watts	21			21
Test voltage:	Volts	13.5	28.0		
Objective values:	Watts	26.5 max.	29.7 max.		26.5 max.
	Luminous flux:	110 ± 20 %			
Reference luminous flux at approximately 13.5 V:					White: 460 lm Red: 110 lm

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.

2/ The light emitted from normal production lamps shall be red (see also footnote 4/).

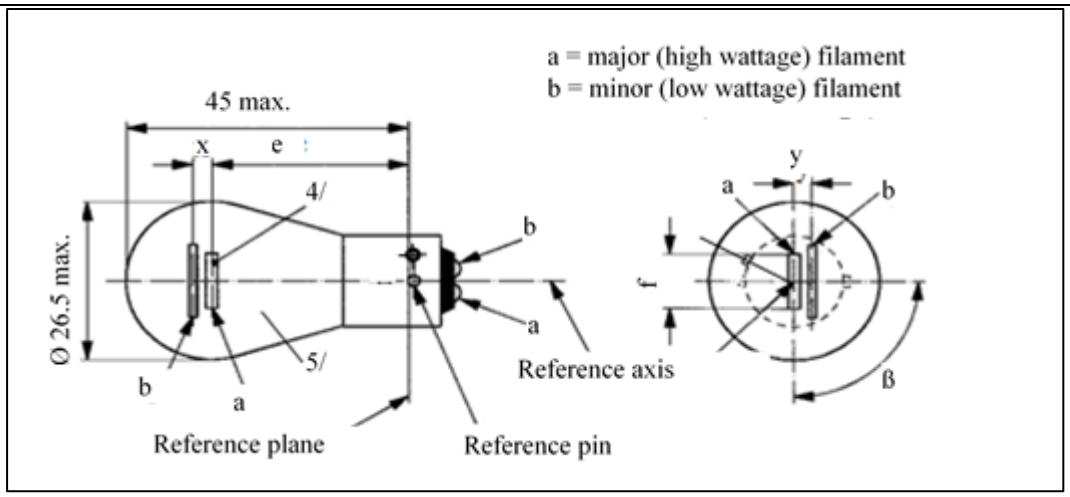
3/ To be checked by means of a "Box system", sheet P21W/2.

4/ The light emitted from standard filament light sources shall be white or red.

5/ In this view the filament of the 24 V type may be straight or V-shaped. This shall be indicated in the application of approval. If it is straight, the screen projection requirements, sheet P21W/2, apply. If it is V-shaped, the filament ends shall be at the same distance within ±3 mm from the reference plane.

Category PR21/4W	**Sheet PR21/4W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

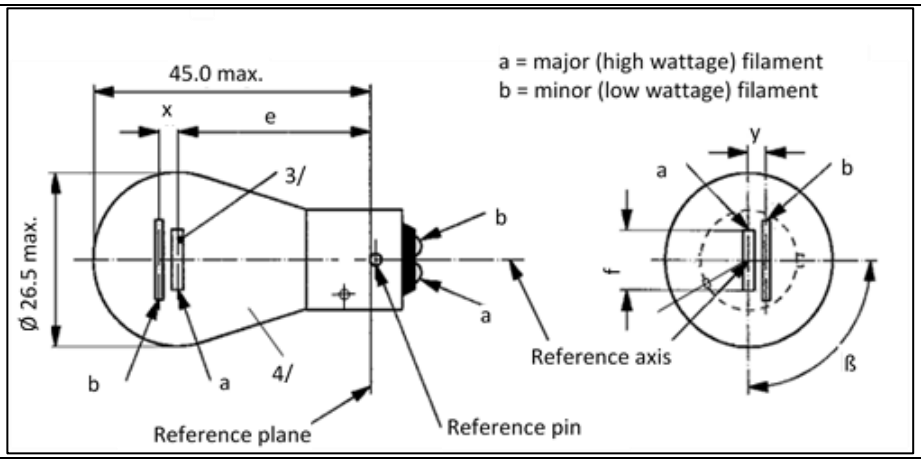


Dimensions in mm		Filament light sources of normal production [5/]				Standard filament light source [6/]
		Min.	Nom.	Max.		
e			31.8 [1/]			31.8 ± 0.3
f				7.0		7.0 + 0 / -2
Lateral deviation				[1/]		0.3 max.[2/]
x,y		[1/]				2.8 ± 0.5
β		75° [1/]	90° [1/]	105° [1/]		90° ± 5°
Cap BAU15d in accordance with IEC Publication 60061 (sheet 7004-19-2)						
Electrical and photometric characteristics						
Rated values	Volts	12		24 [4/]		12
	Watts	21	4	21	4	21/4
Test voltage	Volts	13.5		28.0		13.5
Objective values	Watts	26.5 max.	5.5 max.	29.7 max.	8.8 max.	26.5/5.5 max.
	Luminous flux	105	4	105	5	
	± %	20	25	20	25	
Reference luminous flux at approximately 13.5 V:						White: 440 lm and 15 lm Red:105 lm and 4 lm

Category PR21/4W	Sheet PR21/4W/2
1/ These dimensions shall be checked by means of a "Boxsystem"3 based on the dimensions and tolerances shown above. "x" and "y" refer to the major (high wattage) filament, not to the reference axis. Means of increasing the positioning accuracy of the filament and of the cap-holder assembly are under consideration.	
2/ Maximum lateral deviation of the major filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.	
3/ The "Box system" is the same as for filament light source P21/5W.	
4/ The 24-volt filament light source is not recommended for future embodiments.	
5/ The light emitted from normal production lamps shall be red (see also footnote 6/).	
6/ The light emitted from standard filament light sources shall be white or red.	

Category PR21/5W	**Sheet PR21/5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production 4/			Standard filament light source 5/
		Min.	Nom.	Max.	
e	12 V		31.8 1/		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V			7.0	7.0 + 0 / -2
Lateral deviation 2/	12 V			1/	0.3 max.
	24 V			1.5	
x, y	12 V		1/		2.8 ± 0.3
x	24 V 3/	-1.0	0	1.0	
y	24 V 3/	1.8	2.8	3.8	
β		75°	90°	105°	90° ± 5°

Cap BAW15d in accordance with IEC Publication 60061 (sheet 7004-11E-1)

Electrical and photometric characteristics

Rated values	Volts	12		24		12
	Watts	21	5	21	5	21/5
Test	Volts	13.5		28.0		13.5
Objective values	Watts	26.5	6.6	29.7	11.0	26.5 and 6.6
	Luminous	105	8	105	10	
	± %	20	25	20	25	

Reference luminous flux at approximately 13.5 V: White: 440 lm and 35 lm
Red: 105 lm and 8 lm

1/ See footnote 1/ on sheet P21/5W/2.

2/ See footnote 2/ on sheet P21/5W/2.

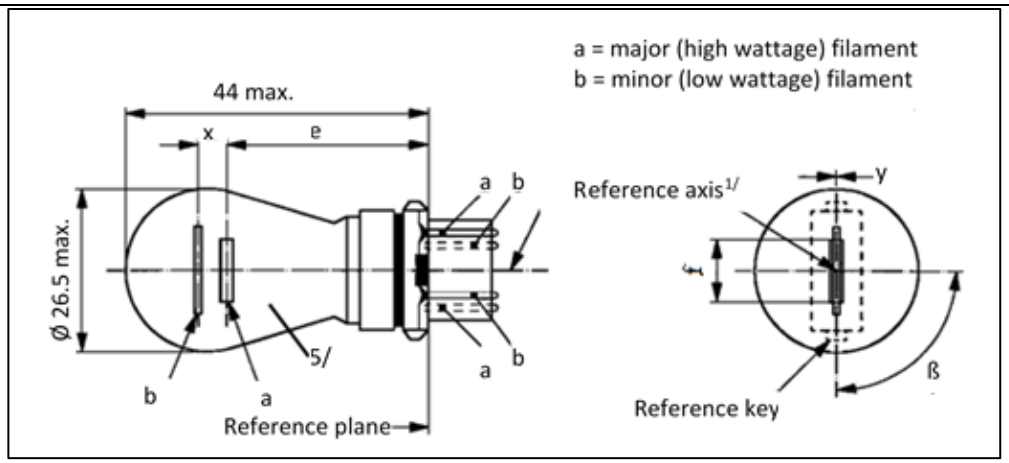
3/ See footnote 3/ on sheet P21/5W/2.

4/ The light emitted from normal production lamps shall be red (see also footnote 5/).

5/ The light emitted from standard filament light sources shall be white or red.

Category PR27/7W	**Sheet PR27/7W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm	Filament light sources of normal production			Standard filament light source 6/
	Min.	Nom.	Max.	
e		27.9 3/		27.9 ± 0.3
f			9.9	9.9 + 0 / -2
Lateral deviation 2/			3/	0.0 ± 0.4
x 4/		5.1 3/		5.1 ± 0.5
y 4/		0.0 3/		0.0 ± 0.5
β	75° 3/	90°	105° 3/	90° ± 5°

Cap WU2.5x16q in accordance with IEC Publication 60061 (sheet 7004-104D-1)

Electrical and photometric characteristics

Rated values	Volts	12		12	
	Watts	27	7	27	7
Test voltage	Volts	13.5		13.5	
Objective values	Watts	32.1 max.	8.5 max.	32.1 max.	8.5 max.
	Luminous	110 ± 20 %	9 ± 20 %		

Reference luminous flux at approximately 13.5 V: White:475 and 36 lm

Red: 110 and 9 lm

1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.

Category PR27/7W	**Sheet PR27/7W/2**
2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.	
3/ To be checked by means of a "Box system", sheets P27/7W/2 and 3.	
4/ "x" and 'y" denote the offset of the axis of the minor (low wattage) filament with respect to the axis of the major (high wattage) filament.	
5/ The light emitted from normal production lamps shall be red (see also footnote 6/).	
6/ The light emitted from standard filament light sources shall be white or red.	

Category PSX26W	Sheet PSX26W/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

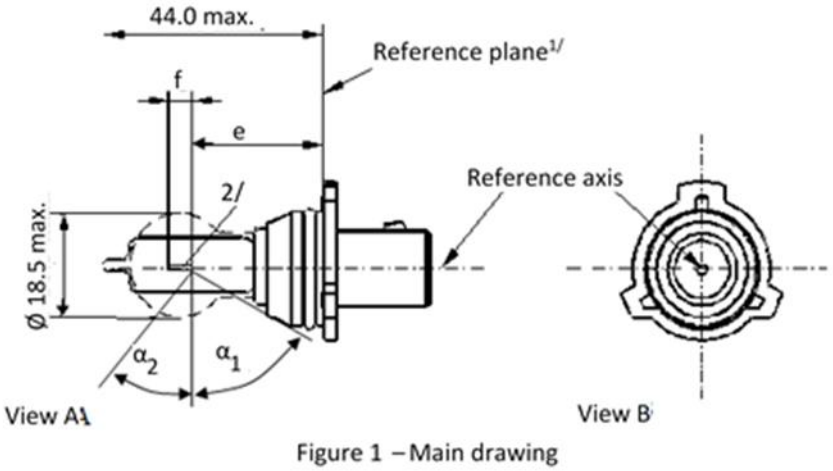


Figure 1 – Main drawing

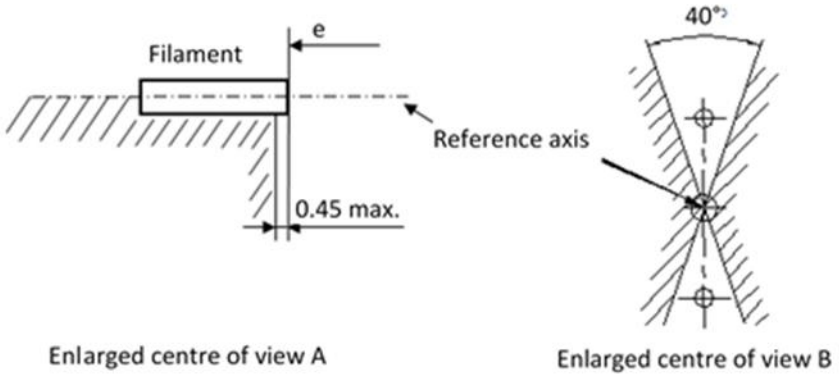


Figure 2 – Metal free zone 3/

1/ The reference plane is defined by the meeting points of the cap-holder fit.

2/ No actual filament diameter restrictions apply but the objective is d max. = 1.1 mm.

3/ No opaque parts other than filament turns shall be located in the shaded area indicated in Figure 2. This applies to the rotational body within the angles $\alpha 1 + \alpha 2$.

Category PSX26W	**Sheet PSX26W/2**

Dimensions in mm			Filament light sources of normal production	Standard filament light source
e 5/			24.0 4/	24.0 ± 0.25
f 5/			4.2 4/	4.2 ± 0.25
α_1 6/			35.0° min.	35.0° min.
α_2 6/			58.0° min.	58.0° min.
Cap PG18.5d-3 in accordance with IEC Publication 60061 (sheet 7004-147-1)				
Electrical and photometric characteristics				
Rated values	Voltage	V	12	12
	Wattage	W	26	26
Test voltage		V	13.5	13.5
Objective values	Wattage	W	26 max.	26 max.
	Luminous flux	lm	500	
		±	+10 % / -10 %	
Reference luminous flux at approximately 12 V				345 lm
Reference luminous flux at approximately 13.2 V				465 lm
Reference luminous flux at approximately 13.5 V				500 lm

4/ To be checked by means of a "Box system"; sheet PSX26W/3.

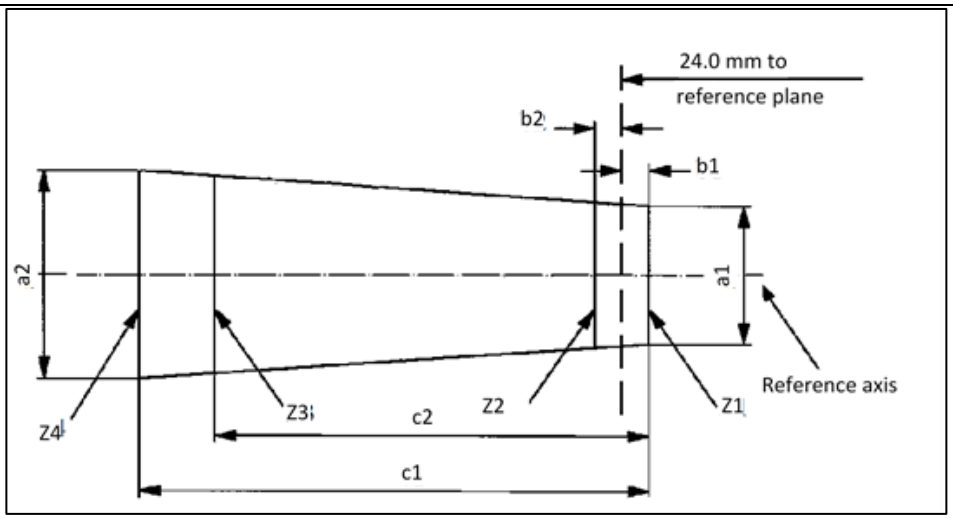
5/ The ends of the filament are defined as the points where, when the viewing direction is perpendicular to the plane through the filament lead-in wires, the projection of the outside of the end turns crosses the filament axis.

6/ No part of the cap beyond the reference plane shall interfere with angle $\alpha 2$ as shown in Figure 1 on sheet PSX26W/1. The bulb shall be optically distortion free within the angles $\alpha 1 + \alpha 2$. These requirements apply to the whole bulb circumference.

Category PSX26W	**Sheet PSX26W/3**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane, whether a filament light source complies with the requirements.



	a1	a2	b1,b2	c1	c2
Filament light sources of normal production	1.7	1.7	0.30	5.0	4.0
Standard filament light sources	1.5	1.5	0.25	4.7	4.0

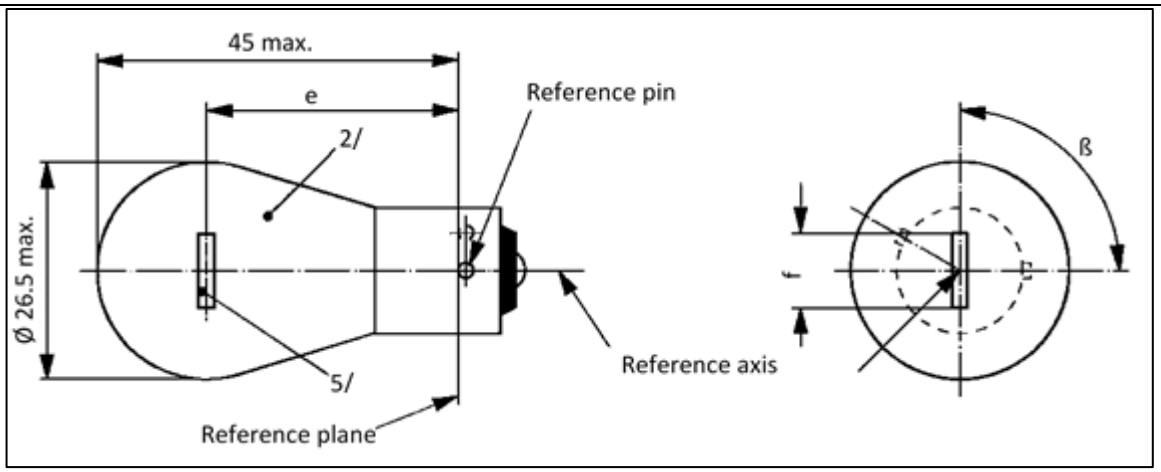
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

The ends of the filament as defined on sheet PSX26W/2, footnote 4/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

The filament shall lie entirely within the limits shown.

Category PY21W	**Sheet PY21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

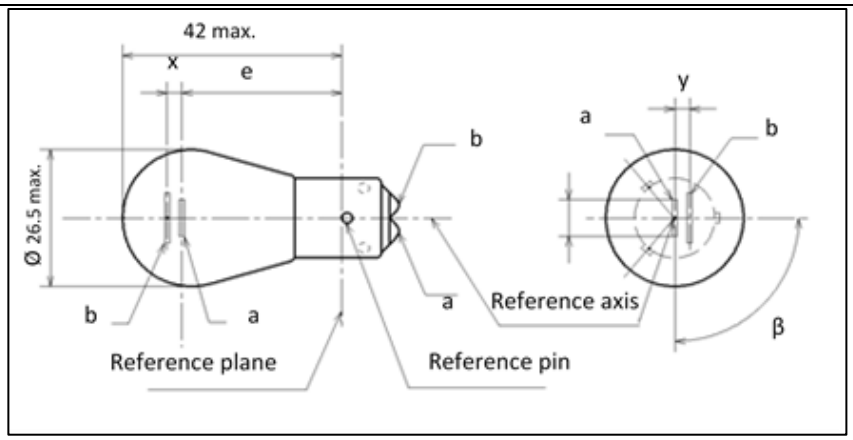


Dimensions in mm		Filament light sources of normal production			Standard filament light source [4/]
		Min.	Nom.	Max.	
e	12 V		31.8 [3/]		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V			7.0	7.0 +0 / -2
Lateral deviation [1/]	12 V			[3/]	0.3 max.
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap BAU15s in accordance with IEC Publication 60061 (sheet 7004-19-2)					
Electrical and photometric characteristics					
Rated values	Volts	12		24	12
	Watts	21			21
Test	Volts	13.5		28.0	13.5
Objective values	Watts	26.5 max.		29.7 max.	26.5 max.
	Luminous	280 ± 20 %			
Reference luminous flux at approximately 13.5 V:					White:460 lm Amber:280 lm

Category PY21W	**Sheet PY21W/2**
1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.	
2/ The light emitted from production lamps shall be amber (see also footnote 4/).	
3/ To be checked by means of a "Box system"; sheet P21W/2.	
4/ The light emitted from standard filament light sources shall be amber or white.	
5/ In this view the filament of the 24 V type may be straight or V-shaped. This shall be indicated in the application of approval. If it is straight, the screen projection requirements, sheet P21W/2, apply. If it is V-shaped, the filament ends shall be at the same distance within ±3 mm from the reference plane.	

Category PY21/5W	**Sheet PY21/5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production [3/]			Standard filament light source [4/]
		Min.	Nom.	Max.	
e			28.6 [1/]		28.6 ± 0.3
f				7.0	7.0 + 0/- 2
Lateral deviation [2/]				[1/]	0.3 max.
x, y			[1/]		2.8 ± 0.3
β		75°	90°	105°	90° ± 5°
Cap BA15d-3 (100°/130°) in accordance with IEC Publication 60061 (sheet 7004-173-1)					
Electrical and photometric characteristics					
Rated values	Volts	12			12
	Watts	21	5		21/5
Test voltage	Volts	13.5			13.5
Objective values	Watts	26.5 max.	6.6 max.		26.5 and 6.6 max.
	Luminous flux	270	21		
	± %	20	20		
Reference luminous flux at approximately 13.5 V					White: 440 lm and 35 lm Amber: 270 lm and 21 lm

Category PY21/5W	**Sheet PY21/5W/2**
1/ These dimensions shall be checked by means of a "Box system". See sheets PY21/5W/2 and PY21/5W/3. "x" and "y" refer to the major (high wattage) filament, not to the reference axis.	
2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.	
3/ The light emitted from normal production lamps shall be amber (see also note 4/).	
4/ The light emitted from standard filament light sources shall be white or amber.	
Screen projection requirements	
This test is used to determine, by checking whether:	
(a) The major (high wattage) filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centres of the pins and the reference axis; and whether	
(b) The minor (low wattage) filament is correctly positioned relative to the major (high wattage) filament, whether a filament light source complies with the requirements.	
Test procedure and requirements	
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. (i.e. 15°). The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits.	
2. Side elevation	
The filament light source placed with the cap down, the reference axis vertical, the reference pin to the right and the major filament seen end-on:	
2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;	
2.2. The projection of the minor filament shall lie entirely:	
2.2.1. Within a rectangle of width "c" and height "d" having its centre at a distance "v" to the right of and at a distance "u" above the theoretical position of the centre of the major filament;	
2.2.2. Above a straight line tangential to the upper edge of the projection of the major filament and rising from left to right at an angle of 25°.	
2.2.3. To the right of the projection of the major filament	

Category PY21/5W	**Sheet PY21/5W/3**

3. Front elevation

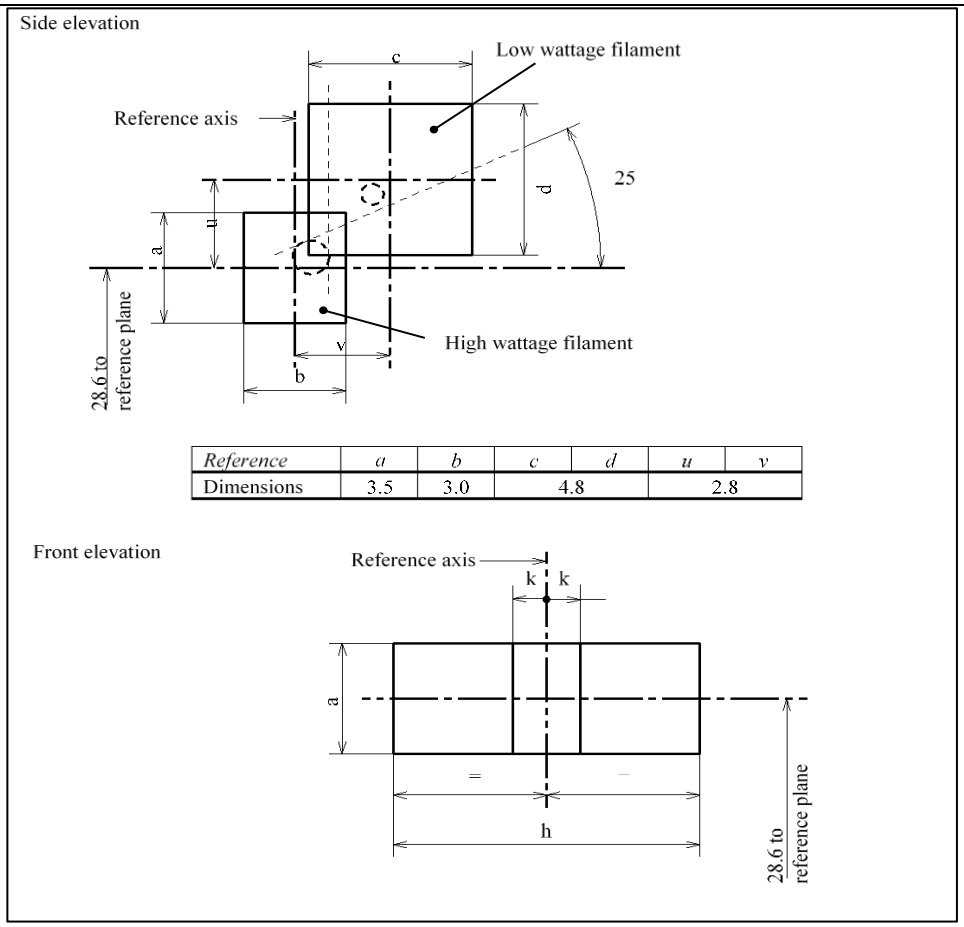
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:

3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;

3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis.

3.3. The centre of the minor filament axis shall not be offset from the reference axis by more than ±2 mm (±0.4 mm for standard filament light sources).

Dimensions in mm

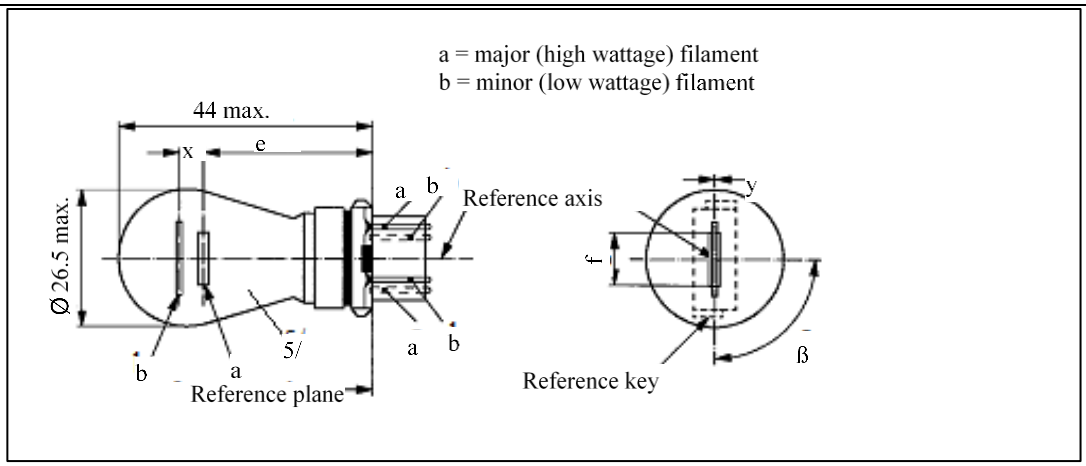


Reference	*a*	*b*	*c*	*d*	*u*	*v*
Dimensions	3.5	3.0	4.8		2.8	

Reference	a	h	k
Dimensions	3.5	9.0	1.0

Category PY27/7W	**Sheet PY27/7W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

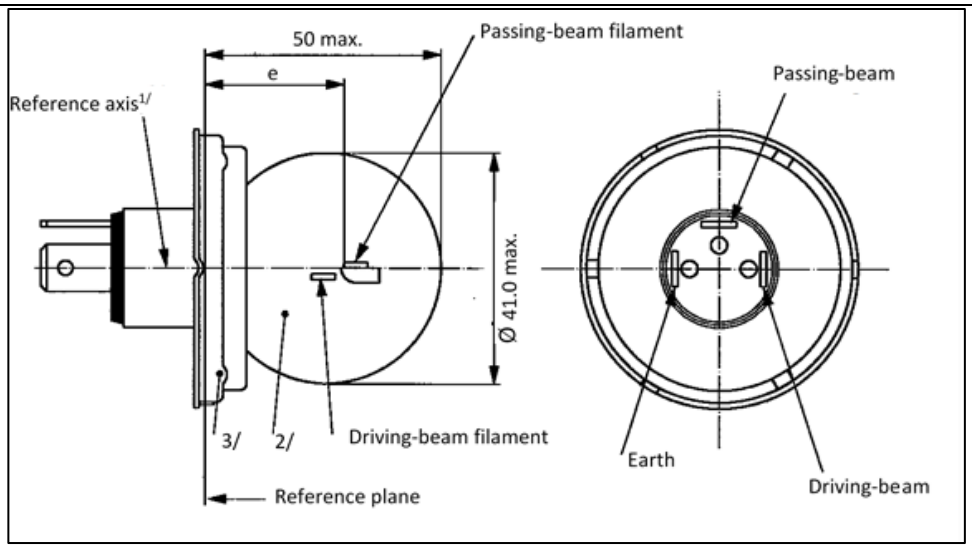


Dimensions in mm		Filament light sources of normal production			Standard filament light source 6/	
		Min.	Nom.	Max.		
e			27.9 3/		27.9 ± 0.3	
f				9.9	9.9 + 0 / -2	
Lateral deviation 2/				3/	0.0 ± 0.4	
x 4/			5.1 3/		5.1 ± 0.5	
y 4/			0.0 3/		0.0 ± 0.5	
β		75° 3/	90°	105°	90° ± 5°	
Cap WX2.5x16q in accordance with IEC Publication 60061 (sheet 7004-104A-1)						
Electrical and photometric characteristics						
Rated values	Volts	12			12	
	Watts	27	7		27	7
Test	Volts	13.5			13.5	
Objective values	Watts	32.1 max.	8.5 max.		32.1 max.	8.5 max.
	Luminous	280 ± 15 %	21 ± 15 %			
Reference luminous flux at approximately 13.5 V:					White: 475 and 36 lm Amber: 280 and 21 lm	

Category PY27/7W	**Sheet PY27/7W/2**
1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.	
2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.	
3/ To be checked by means of a "Box system", sheets P27/7W/2 and 3.	
4/ "x" and 'y" denote the offset of the axis of the minor (low wattage) filament with respect to the axis of the major (high wattage) filament.	
5/ The light emitted from filament light sources of normal production shall be amber (see also footnote 6/).	
6/ The light emitted from standard filament light sources shall be amber or white.	

Category R2	**Sheet R2/1**

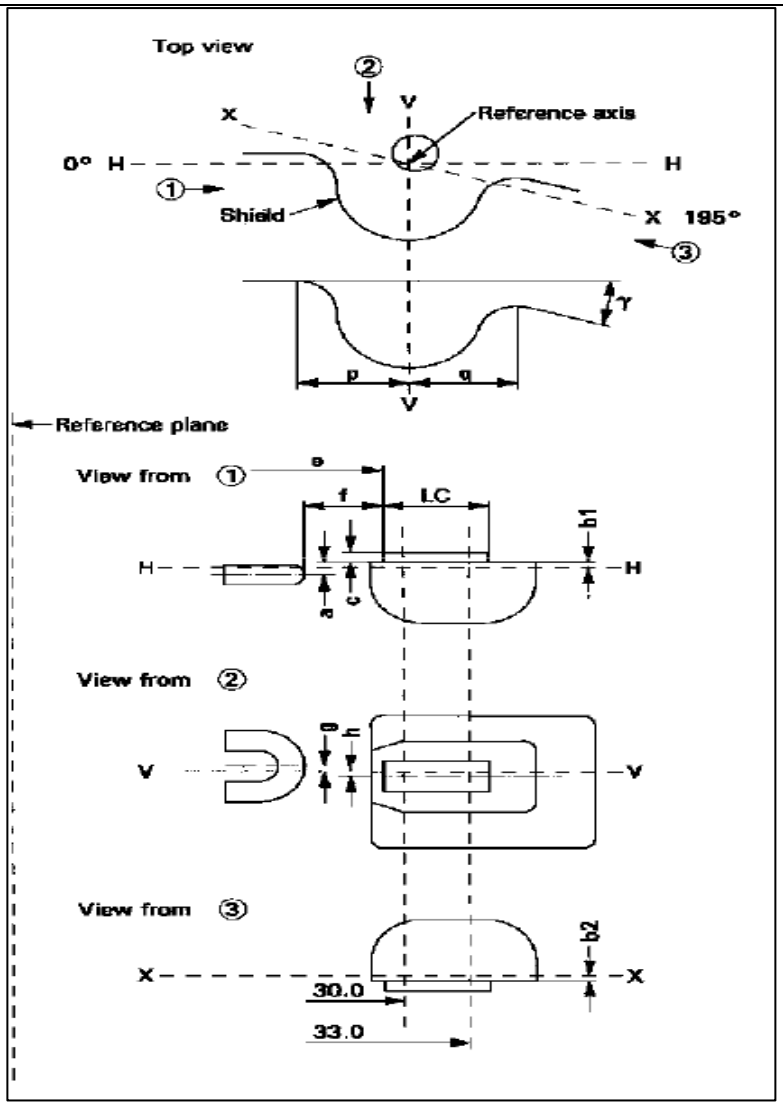
The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Electrical and photometric characteristics

		Filament light sources of normal production						Standard filament light source	
Rated values	Volts	6 4/		12 4/		24 4/		12 4/	
	Watts	45	40	45	40	55	50	45	40
Test voltage	Volts	6.3		13.2		28.0		13.2	
Objective values	Watts	53 max.	47 max.	57 max.	51 max.	76 max.	69 max.	52 +0 % -10 %	46 ±5 %
	Luminous flux	720 min.	570 ±15 %	860 min.	675 ±15 %	1,000 min.	860 ±15 %		
Measuring flux 5/		-	450	-	450	-	450		
Reference luminous flux at approximately 12 V								700	450

Category R2	Sheet R2/2
1/ The reference axis is perpendicular to the reference plane and passes through the centre of the 45 mm cap diameter.	
2/ The colour of the light emitted shall be white or selective-yellow.	
3/ No part of the cap shall, by reflection of light emitted by the passing-beam filament, throw any stray rising ray when the filament light source is in the normal operating position on the vehicle.	
4/ The values indicated on the left and on the right refer to the driving-beam filament and the passing-beam filament respectively.	
5/ Measuring luminous flux for measurements according to paragraph 3.9. of this Regulation.	
Position and dimensions (in mm) of shield and filaments	
The drawings are not mandatory with respect to the design of the shield and filaments.	



Category R2	**Sheet R2/3**

Position and dimensions (in mm) of shield and filaments

The drawings are not mandatory with respect to the design of the shield and filaments.

Filaments and shield position and dimensions [1/]

Dimensions in mm			Tolerance	
			Filament light sources of normal production	Standard filament light source
			6 V 12 V 24 V	12 V
a		0.60	±0.35	±0.15
b1/30.0 [2/] b1/33.0		0.20 b1/30.0 mv [3/]	±0.35	±0.15
b2/30.0 [2/] b2/33.0		0.20 b2/30.0 mv [3/]	±0.35	±0.15
c/30.0 [2/] c/33.0		0.50 c/30.0 mv [3/]	±0.30	±0.15
e	6, 12 V 24 V	28.5 28.8	±0.35	±0.15
f	6, 12 V 24 V	1.8 2.2	±0.40	±0.20
g		0	±0.50	±0.30
h/30.0 [2/] h/33.0		0 h/30.0 mv 3/	±0.50	±0.30
1/2(p-q)		0	±0.60	±0.30
IC		5.5	±1.50	±0.50
γ 4/		15° nom.		

Cap P45t-41 in accordance with IEC Publication 60061 (sheet 7004-95-5)

[1/] The position and dimensions of the shield and filaments shall be checked by means of the method of measurement as described in IEC Publication 60809.

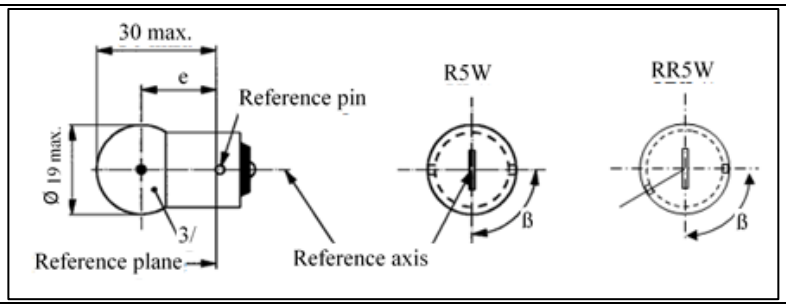
[2/] To be measured at the distance from the reference plane indicated in millimetres behind the stroke.

[3/] mv = measured value.

[4/] The angle γ is only for shield design and has not to be checked on finished filament light sources.

Category R5W and RR5W	**Sheet R5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light source [4/]
			Min.	Nom.	Max.	
e			17.5	19.0	20.5	19.0 ± 0.3
Lateral deviation [2/]					1.5	0.3 max.
β			60°	90°	120°	90° ± 5°
Cap: R5W: BA15s RR5W: BAW15s			in accordance with IEC Publication 60061			(sheet 7004-11A-9) [1/] (sheet 7004-11E-1)
Electrical and photometric characteristics						
Rated values		Volts	6 [5/]	12	24	12
		Watts	5			5
Test voltage		Volts	6.75	13.5	28.0	13.5
Objective values	Watts		5.5 max.		7.7 max.	5.5 max.
	Luminous flux	R5W	50 ± 20 %			
		RR5W	[5/]	12 ± 25 %		
Reference luminous flux at approximately 13.5 V:						White: 50 lm Red: 12 lm

1/ Filament light sources with cap BA15d may be used for special purposes; they have the same dimensions.

2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.

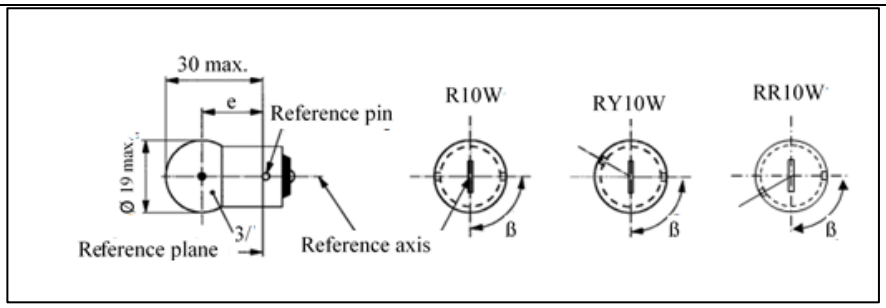
3/ The light emitted from filament light sources of normal production shall be white for category R5W and red for category RR5W (see also footnote 4/).

4/ The light emitted from standard filament light sources shall be white for category R5W; white or red for category RR5W.

5/ Within RR5W no 6 V rated voltage type specified.

Categories R10W, RY10W and RR10W	**Sheet R10W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light source 4/
			Min.	Nom.	Max.	
e			17.5	19.0	20.5	19.0 ± 0.3
Lateral deviation 2/					1.5	0.3 max.
β			60°	90°	120°	90° ± 5°
Cap	R10W: BA15s RY10W: BAU15s RR10W: BAW15s		in accordance with IEC Publication 60061			(sheet 7004-11A-9) 1/ (sheet 7004-19-2) (sheet 7004-11E-1)
Electrical and photometric characteristics						
Rated values		Volts	6 5/	12	24	12
		Watts	10			10
Test voltage		Volts	6.75	13.5	28	13.5
Objective values	Watts	R10W RY10W	11 max.		14 max.	11 max.
		RR10W	5/	11 max.		11 max.
	Luminous flux	R10W	125 ± 20 %			
		RY10W	75 ± 20 %			
		RR10W	5/	30 ± 25 %		
Reference luminous flux at approximately 13.5 V:						White:125 lm Amber: 75 lm Red: 30 lm

1/ Filament light sources R10W with cap BA15d may be used for special purposes; they have the same dimensions.

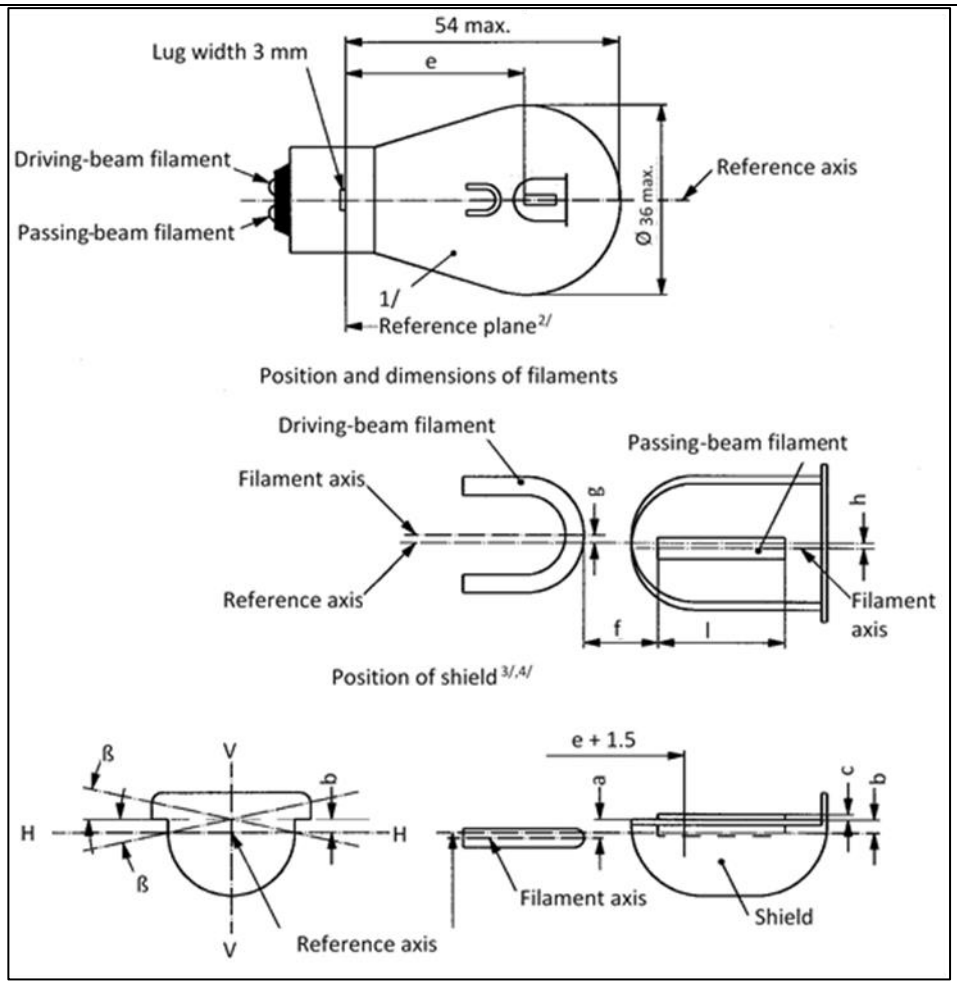
2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.

3/ The light emitted from filament light sources of normal production shall be white for category R10W, amber for category RY10W and red for category RR10W (see also footnote 4/)

4/ The light emitted from standard filament light sources shall be white for category R10W; white or amber for category RY10W; white or red for category RR10W.

5/ Within RR10W no 6 V rated voltage type specified.

Categories S1 and S2	Sheet S1/S2/1
The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.	
Filament light sources for motorcycles	



1/ The colour of the light emitted shall be white or selective-yellow.

2/ The reference plane is perpendicular to the reference axis and touches the upper surface of the lug having a width of 4.5 mm.

3/33/ Plane V-V contains the reference axis and the centre line of the lugs.

4/ Plane H-H (the normal position of the shield) is perpendicular to plane V-V and contains the reference axis.

Categories S1 and S2								**Sheet S1/S2/2**	
Dimensions in mm			Filament light sources of normal production					Standard filament light source	
			Min.		Nom.		Max.		
e			32.35		32.70		33.05	32.7 ± 0.15	
f			1.4		1.8		2.2	1.8 ± 0.2	
l			4.0		5.5		7.0	5.5 ± 0.5	
c [5/]			0.2		0.5		0.8	0.5 ± 0.15	
b [5/]			-0.15		0.2		0.55	0.2 ± 0.15	
a [5/]			0.25		0.6		0.95	0.6 ± 0.15	
h			-0.5		0		0.5	0 ± 0.2	
g			-0.5		0		0.5	0 ± 0.2	
β [5/, 6/]			-2°30'		0°		+2°30'	0° ± 1°	
Cap BA20d in accordance with IEC Publication 60061 (sheet 7004-12-7)									
Electrical and photometric characteristics									
Rated values	Volts	S1	6 [7/]				12 [7/]		6
		S2							12
	Watts	S1	25	25	25	25		25	25
		S2	35	35	35	35		35	35
Test voltage	Volts	S1	6.75		13.5			6.75	
		S2	6.3		13.5			13.5	
Objective values	Watts	S1	25 ± 5	25 ± 5	25 ± 5	25 ± 5		25 ± 5	25 ±
		S2	35 ± 5	35 ± 5	35 ± 5	35 ± 5		35 ± 5	35 ±
	Luminous flux	S1	435 ± 20 %	315 ± 20 %	435 ± 20 %	315 ± 20 %			
		S2	650 ± 20 %	465 ± 20 %	650 ± 20 %	465 ± 20 %			
Reference luminous flux		S1	at approximately				6 V	398	284
		S2	at approximately				12 V	568	426
							13.2 V	634	457
							13.5 V	650	465

5/ Dimensions a, b, c and β refer to a plane parallel to the reference plane and cutting the two edges of the shield at a distance of e + 1.5 mm.

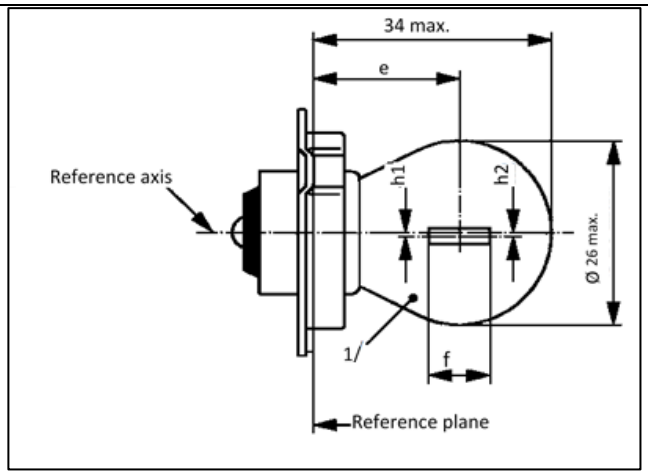
6/ Admissible angular deviation of the shield plane position from the normal position.

7/ Values in the left-hand column refer to the driving-beam filament. Values in the right-hand column to the passing-beam filament.

Category S3	**Sheet S3/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

Filament light source for mopeds



Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e [2/]		19.0	19.5	20.0	19.5 ± 0.25
f	6 V			3.0	2.5 ± 0.5
	12 V			4.0	
h1, h2 [3/]		-0.5	0	0.5	0 ± 0.3
Cap P26s in accordance with IEC Publication 60061 (sheet 7004-36-1)					
Electrical and photometric characteristics					
Rated values	Volts	6	12		6
	Watts	15			15
Test voltage	Volts	6.75	13.5		6.75
Objective values	Watts	15 ± 6 %			15 ± 6 %
	Luminous flux	240 ± 15 %			
Reference luminous flux: 240 lm at approximately 6.75 V					

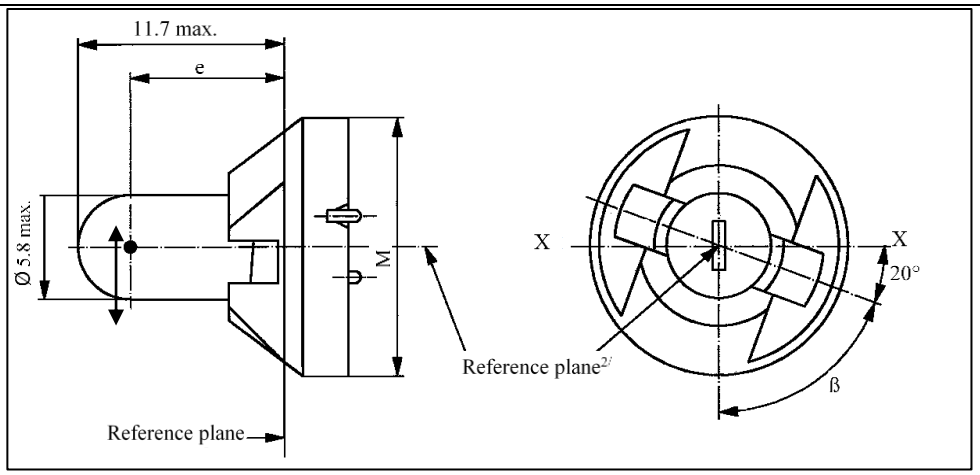
1/ The colour of the light emitted shall be white or selective-yellow.

2/ Distance related to the luminous centre.

3/ Lateral deviation of filament axis with respect to the reference axis. It is sufficient to check this deviation in two mutually perpendicular planes.

Category T1.4W	**Sheet T1.4W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



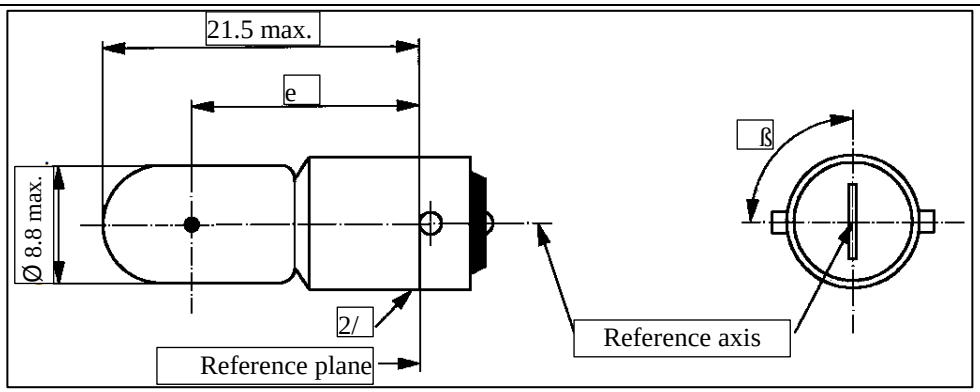
Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e		7.6	8.3	9.0	8.3 ± 0.35
Lateral deviation 1/				0.7	0.35 max
β		55°	70°	85°	70° ± 5°
Cap P11.5d in accordance with IEC Publication 60061 (sheet 7004-79-1)					
Electrical and photometric characteristics					
Rated values	Volts	12			12
	Watts	1.4			1.4
Test voltage	Volts	13.5			13.5
Objective values	Watts	1.54 max.			1.54 max.
	Luminous flux	8 ± 15 %			
Reference luminous flux: 8 lm at approximately 13.5 V					

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

2/ The reference axis is perpendicular to the reference plane and passes through the centre of the circle of diameter "M".

Category T4W	**Sheet T4W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



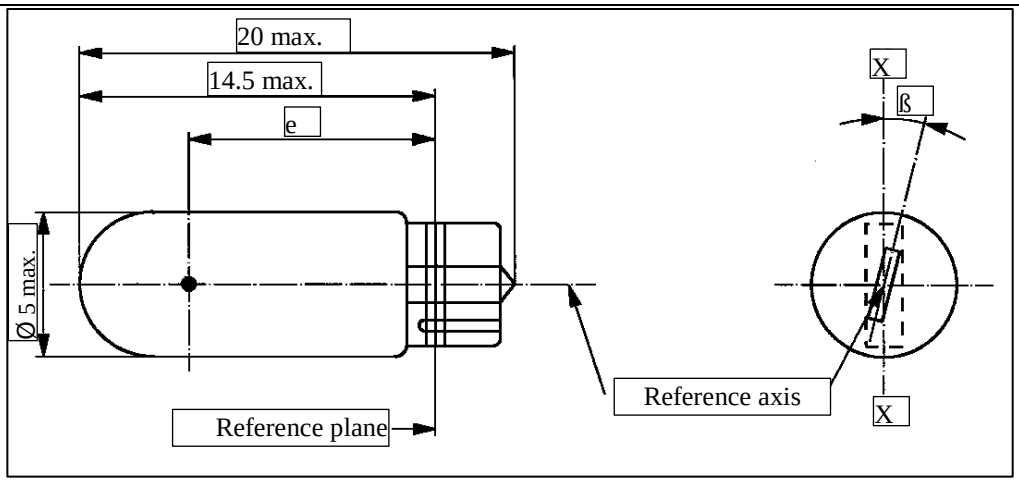
Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e		13.5	15.0	16.5	15.0 ± 0.3
Lateral deviation 1/				1.5	0.5 max
β			90°		90° ± 5°
Cap BA9s in accordance with IEC Publication 60061 (sheet 7004-14-9)					
Electrical and photometric characteristics					
Rated values	Volts	6	12	24	12
	Watts	4			4
Test voltage	Volts	6.75	13.5	28.0	13.5
Objective values	Watts	4.4 max.		5.5 max.	4.4 max.
	Luminous flux	35 ± 20 %			
Reference luminous flux: 35 lm at approximately 13.5 V					

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of pins.

2/ Over the entire length of the cap there shall be no projections or soldering extending beyond the permissible maximum diameter of the cap.

Category W2.3W	**Sheet W2.3W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

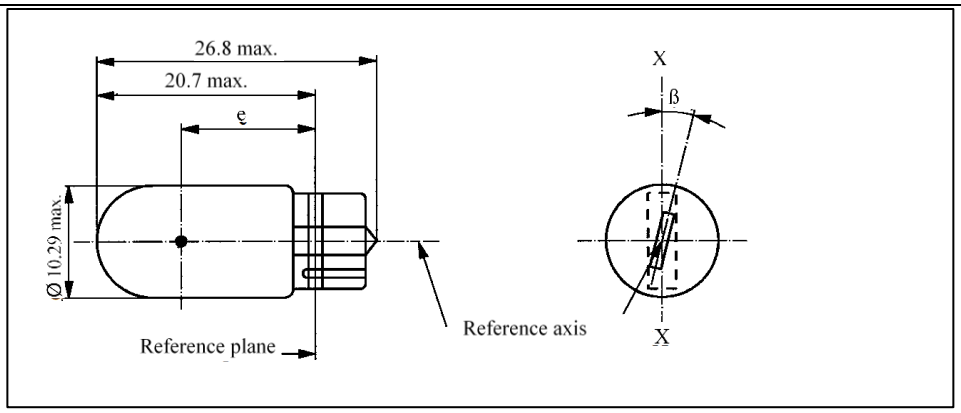


Dimensions in mm	Filament light sources of normal production			Standard filament light source
	Min.	Nom.	Max.	
e	10.3	10.8	11.3	10.8 ± 0.3
Lateral deviation 1/			1.0	0.5 max
β	-15°	0°	+15°	0° ± 5°
Cap W2x4.6d in accordance with IEC Publication 60061 (sheet 7004-94-2)				
Electrical and photometric characteristics				
Rated values	Volts	12		12
	Watts	2.3		2.3
Test voltage	Volts	13.5		13.5
Objective values	Watts	2.5 max.		2.5 max.
	Luminous flux	18.6 ± 20 %		
Reference luminous flux: 18.6 lm at approximately 13.5 V				

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

Category W3W	**Sheet W3W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

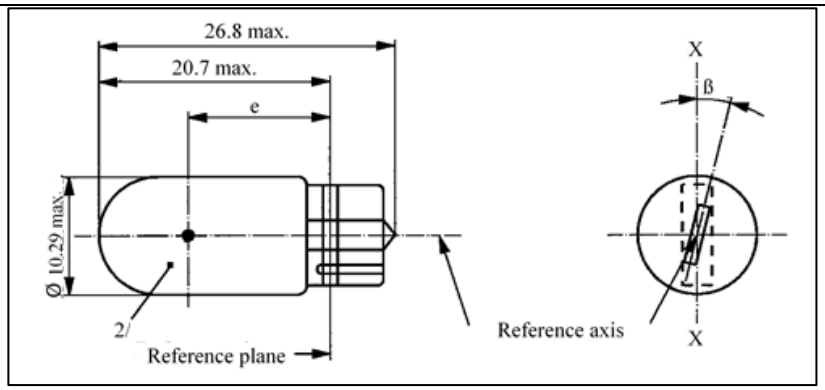


Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e		11.2	12.7.0	14.2	12.7 ± 0.3
Lateral deviation 1/				1.5	0.5 max
β		-15°	0°	+15°	0° ± 5°
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)					
Electrical and photometric characteristics					
Rated values	Volts	6	12	24	12
	Watts	3			3
Test voltage	Volts	6.75	13.5	28.0	13.5
Objective values	Watts	3.45 max.		4.6 max.	3.45 max.
	Luminous flux	22 ± 30 %			
Reference luminous flux: 22 lm at approximately 13.5 V					

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

Category W5W, WY5W and WR5W	**Sheet W5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light source 3/
			Min.	Nom.	Max.	
e			11.2	12.7	14.2	12.7 ± 0.3
Lateral deviation 1/					1.5	0.5 max.
β			-15°	0°	+15°	0° ± 5°
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)						
Electrical and photometric characteristics						
Rated values		Volts	6 4/	12	24	12
		Watts	5			5
Test voltage		Volts	6.75	13.5	28.0	13.5
Objective values		Watts	5.5 max.		7.7 max.	5.5 max.
	Luminous flux	W5W	50 ± 20 %			
		WY5W	30 ± 20 %			
		WR5W	4/	12 ± 25 %		
Reference luminous flux at approximately 13.5 V:						White:50 lm Amber:30 lm Red: 12 lm

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

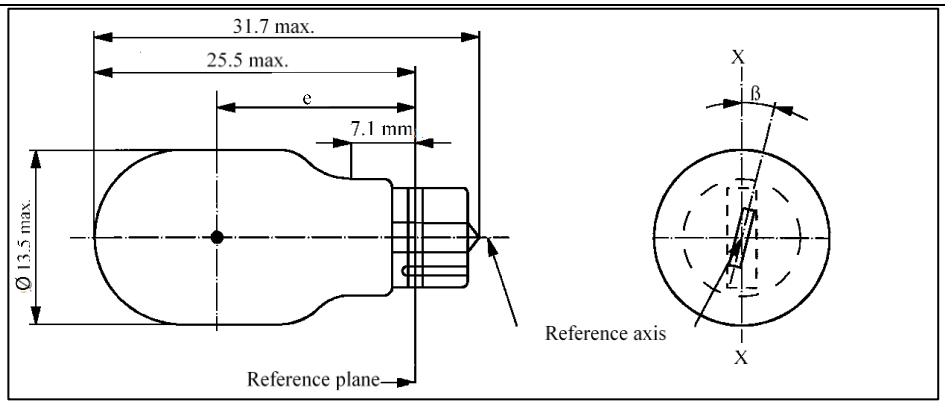
2/ The light emitted from filament light sources of normal production shall be white for category W5W, amber for category WY5W and red for category WR5W (see also footnote 3/)

3/ The light emitted from standard filament light sources shall be white for category W5W; white or amber for category WY5W; white or red for category WR5W.

4/ Within WR5W no 6 V rated voltage type specified.

Categories W10W and WY10W	**Sheet W10W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light source
			Min.	Nom.	Max.	
e			15.5	17.0	18.5	17.0 ± 0.3
Lateral deviation 1/					1.0	0.5 max.
β			-15°	0°	+15°	0° ± 5°
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)						
Electrical and photometric characteristics						
Rated values	Volts		6	12		12
	Watts		10			10
Test voltage	Volts		6.75	13.5		13.5
Objective values	Watts		11 max.			11 max.
	Luminous flux	White	125 ± 20 %			
		Amber	75 ± 20 %			
Reference luminous flux at approximately 13.5 V:						White: 125 lm Amber: 75 lm

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

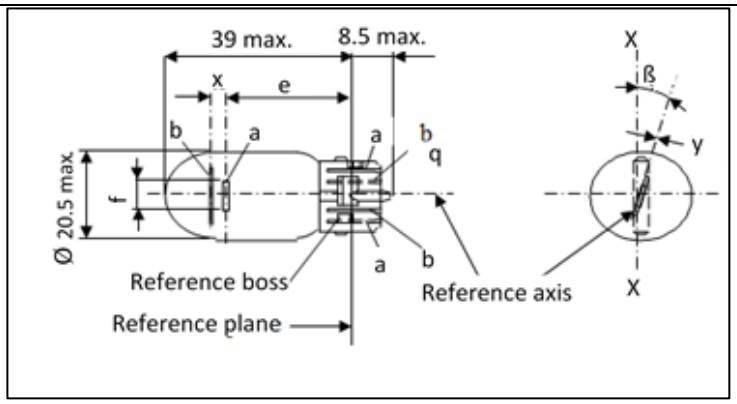
Category W15/5W	**Sheet W15/5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

Filament light source for motorcycles

a = major (high wattage) filament

b = minor (low wattage) filament



Dimensions in mm		Filament light sources of normal production			Standard filament light source	
		Min.	Nom.	Max.		
e			25.0 1/		25.0 ± 0.3	
f				7.5	7.5 + 0 / -2	
Lateral deviation 2/				1/	0.3 max.	
x 3/			2.8 1/		2.8 ± 0.3	
y 3/			0.0 1/		0.0 ± 0.3	
β		-15° 1/	0°	+15° 1/	0° ± 5°	
Cap WZ3x16q in accordance with IEC Publication 60061 (sheet 7004-151-2)						
Electrical and photometric characteristics						
Rated values	Volts	12			12	
	Watts	15	5		15	5
Test	Volts	13.5			13.5	
Objective values	Watts	19.1 max.	6.6 max.		19.1	6.6
	Luminous flux	280 ± 15 %	35 ± 20 %			
Reference luminous flux: 280 lm and 35 lm at approximately 13.5 V						

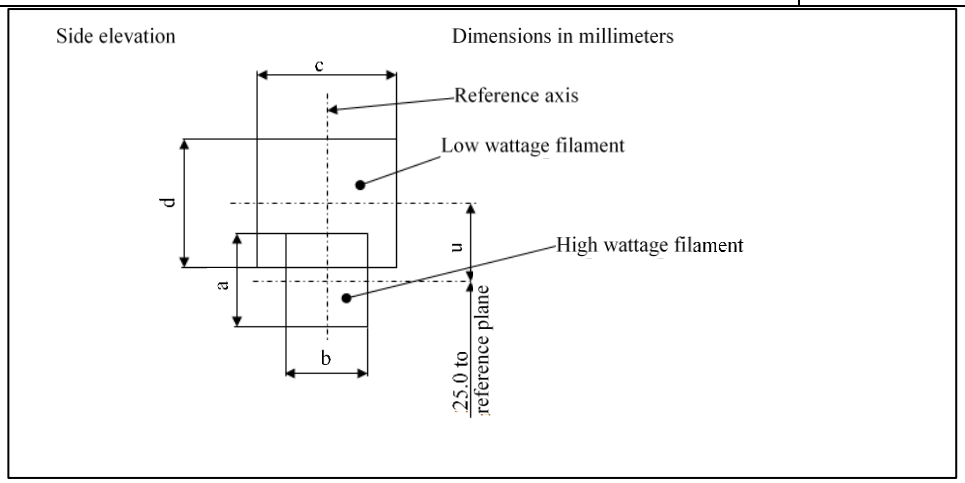
1/ To be checked by means of a "Box system"; sheets W15/5W/2 and 3.

2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

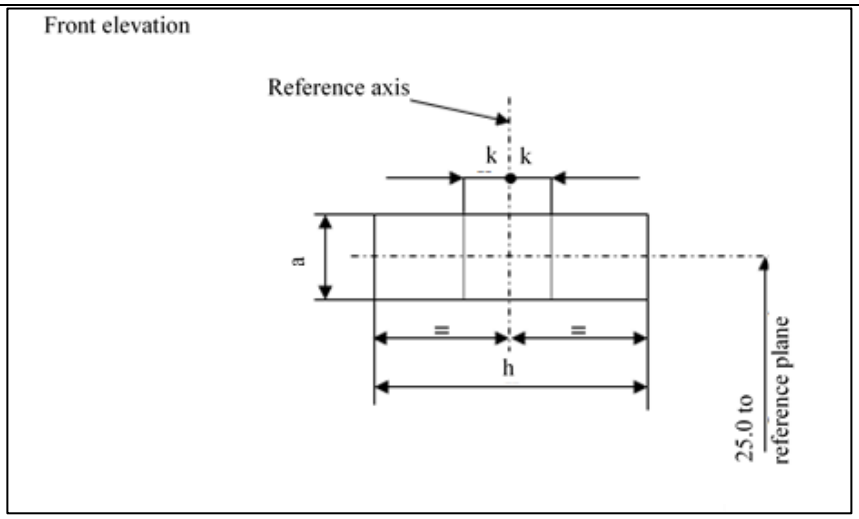
3/ "x" and "y" denote the offset of the axis of the minor filament with respect to the axis of the major filament.

Category W15/5W	Sheet W15/5W/2
Screen projection requirements	
This test is used to determine, by checking whether:	
(a) The major filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the axis X-X and the reference axis; and whether:	
(b) The minor filament is correctly positioned relative to the major filament, whether a filament light source complies with the requirements.	
Test procedure and requirements.	
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits. (±15°).	
2. Side elevation	
The filament light source placed with the cap down, the reference axis vertical and the major filament seen end-on:	
2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;	
2.2. The projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having its centre at a distance "u" above the theoretical position of the centre of the major filament.	
3. Front elevation	
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:	
3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;	
3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis.	
3.3. The centre of the minor filament axis shall not be offset from the reference axis by more than ±2 mm (±0.4 mm for standard filament light sources).	

Category W15/5W	Sheet W15/5W/3



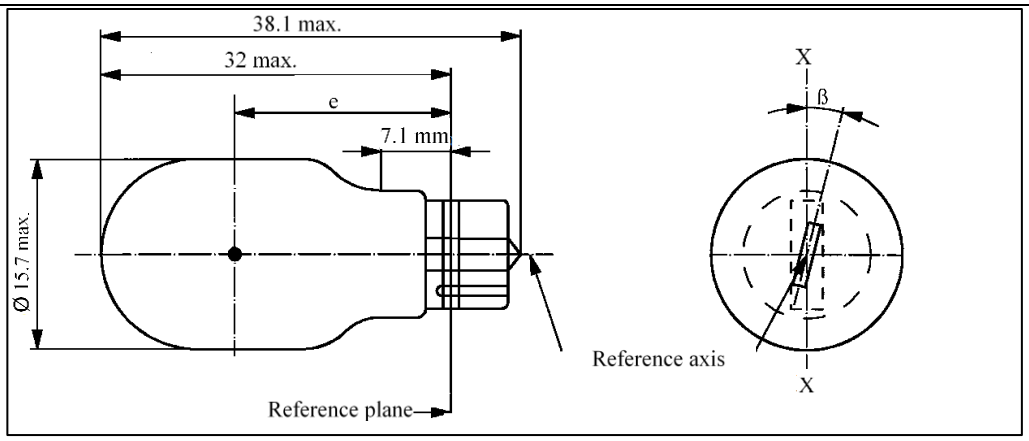
Reference	a	b	c	d	u
Dimensions	3.3	2.8	4.8		2.8



Reference	a	h	k
Dimensions	3.3	9.5	1.0

Categories W16W AND WY16W	**Sheet W16W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

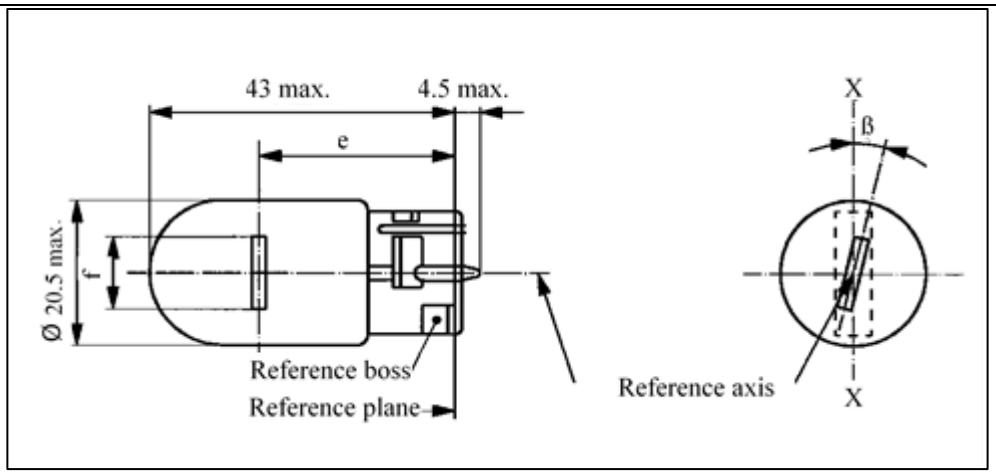


Dimensions in mm			Filament light sources of normal production			Standard filament light source
			Min.	Nom.	Max.	
e			18.3	20.6	22.9	20.6 ± 0.3
Lateral deviation 1/					1.0	0.5 max.
β			-15°	0°	+15°	0° ± 5°
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)						
Electrical and photometric characteristics						
Rated values	Volts		12			12
	Watts		16			16
Test voltage	Volts		13.5			13.5
Objective values	Watts		21.35 max.			21.35 max.
	Luminous flux	White	310 ± 20 %			
		Amber	190 ± 20 %			
Reference luminous flux at approximately 13.5 V:						White: 310 lm Amber: 190 lm

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

Category W21W	**Sheet W21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm	Filament light sources of normal production			Standard filament light source
	Min.	Nom.	Max.	
e		29.0 2/		29.0 ± 0.3
f			7.5	7.5 + 0 / -2
Lateral deviation 1/			2/	0.5 max.
β	-15° 2/	0°	+15° 2/	0° ± 5°
Cap W3x16d in accordance with IEC Publication 60061 (sheet 7004-105-3)				
Electrical and photometric characteristics				
Rated values	Volts	12		12
	Watts	21		21
Test voltage	Volts	13.5		13.5
Objective values	Watts	26.5 max.		26.5 max.
	Luminous flux	460 ± 15 %		
Reference luminous flux: 460 lm at approximately 13.5 V				

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

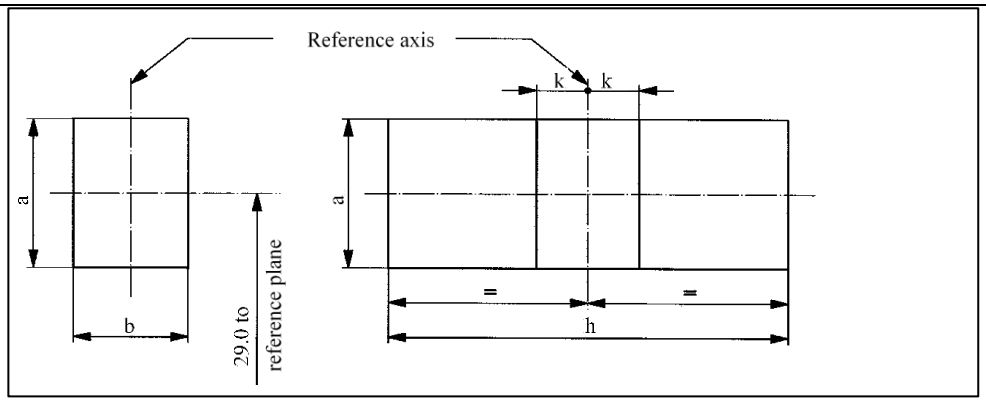
2/ To be checked by means of a "Box system"; see sheet W21W/2.

Category W21W	Sheet W21W/2

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the axis X-X and the reference axis, whether a filament light source complies with the requirements.

Side elevation Front elevation



Reference	a	b	h	k
Dimension	3.5	3.0	9.5	1.0

Test procedures and requirements

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits, i.e. ±15°. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits (±15°).

2. Side elevation

The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament;

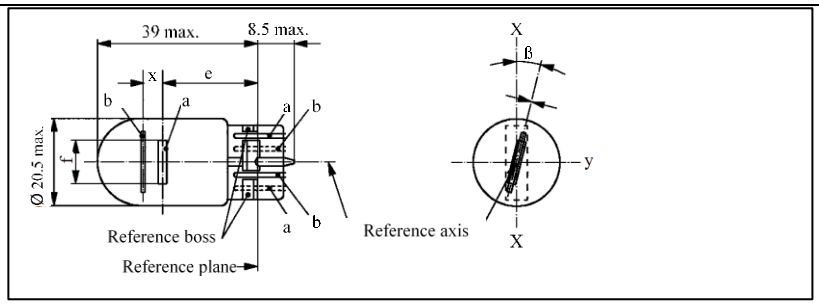
3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

Category W21/5W	**Sheet W21/5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

a = major (high wattage) filament

b = minor (low wattage) filament



Dimensions in mm		Filament light sources of normal production			Standard filament light source	
		Min.	Nom.	Max.		
e			25.0 1/		25.0 ± 0.3	
f				7.5	7.5 + 0 / -2	
Lateral deviation 2/				1/	0.3 max.	
x 3/			2.8 1/		2.8 ± 0.3	
y 3/			0.0 1/		0.0 ± 0.3	
β		-15° 1/	0°	+15° 1/	0° ± 5°	
Cap W3x16q in accordance with IEC Publication 60061 (sheet 7004-106-4)						
Electrical and photometric characteristics						
Rated values	Volts	12			12	
	Watts	21	5		21	5
Test voltage	Volts	13.5			13.5	
Objective values	Watts	26.5 max.	6.6 max.		26.5 max.	6.6 max.
	Luminous flux	440 ± 15 %	35 ± 20 %			
Reference luminous flux: 440 and 35 lm at approximately 13.5 V						

1/ To be checked by means of a "Box system"; sheets W21/5W/2 and 3.

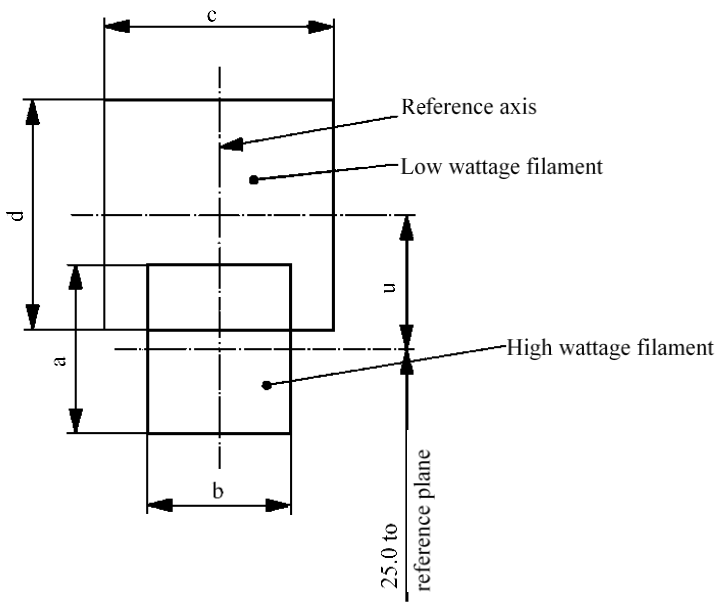
2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

3/ "x" and "y" denote the offset of the axis of the minor filament with respect to the axis of the major filament.

Category W21/5W	**Sheet W21/5W/2**
Screen projection requirements	
This test is used to determine, by checking whether:	
(a) The major filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the axis X-X and the reference axis; and whether:	
(b) The minor filament is correctly positioned relative to the major filament, whether a filament light source complies with the requirements.	
Test procedure and requirements.	
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits (±15°).	
2. Side elevation	
The filament light source placed with the cap down, the reference axis vertical and the major filament seen end-on:	
2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;	
2.2. The projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having its centre at a distance "u" above the theoretical position of the centre of the major filament.	
3. Front elevation	
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:	
3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;	
3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis;	
3.3. The centre of the minor filament axis shall not be offset from the reference axis by more than ±2 mm (±0.4 mm for standard filament light sources).	

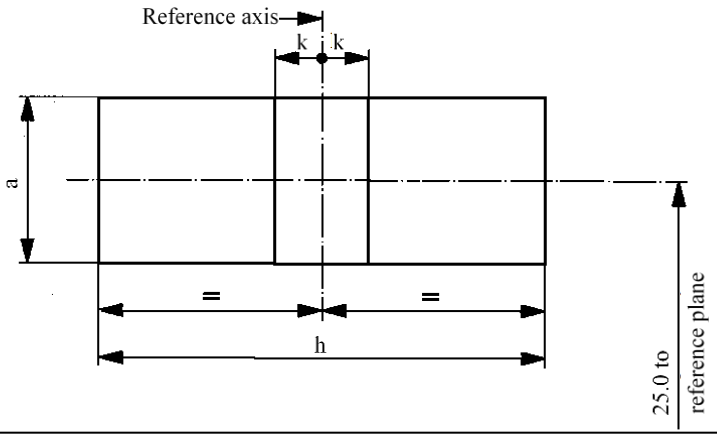
Category W21/5W	Sheet W21/5W/3

Side elevation



Reference	a	b	c	d	u
Dimension	3.5	3.0	4.8		2.8

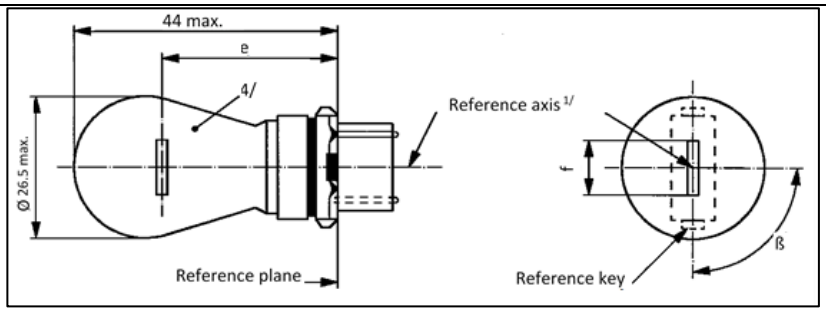
Front elevation



Reference	a	h	K
Dimension	3.5	9.5	1.0

Categories WP21W and WPY21W	**Sheet WP21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm			Filament light sources of normal production			Standard filament light source
			Min.	Nom.	Max.	
e				27.9 3/		27.9 ± 0.3
f			5.5	6.0	7.0	6.0 ± 0.5
Lateral deviation 2/					3/	0.0 ± 0.4
β			75° 3/	90°	105° 3/	90° ± 5°
Cap:	WP21W: WY2.5x16d WPY21W: WZ2.5x16d		in accordance with IEC Publication 60061			(sheet 7004-104B-1) (sheet 7004-104C-1)
Electrical and photometric characteristics						
Rated values		Volts		12		12
		Watts		21		21
Test voltage		Volts		13.5		13.5
Objective values		Watts		26.5 max.		26.5 max.
	Luminous flux	WP21W		460 ± 15 %		
		WPY21W		280 ± 20 %		
Reference luminous flux at approximately 13.5 V						White: 460 lm Amber: 280 lm

1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.

2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.

3/ To be checked by means of a "Box system"; sheet WP21W/2.

4/ The light emitted from filament light sources of normal production shall be white for category WP21W and amber for category WPY21W (see also footnote 5/).

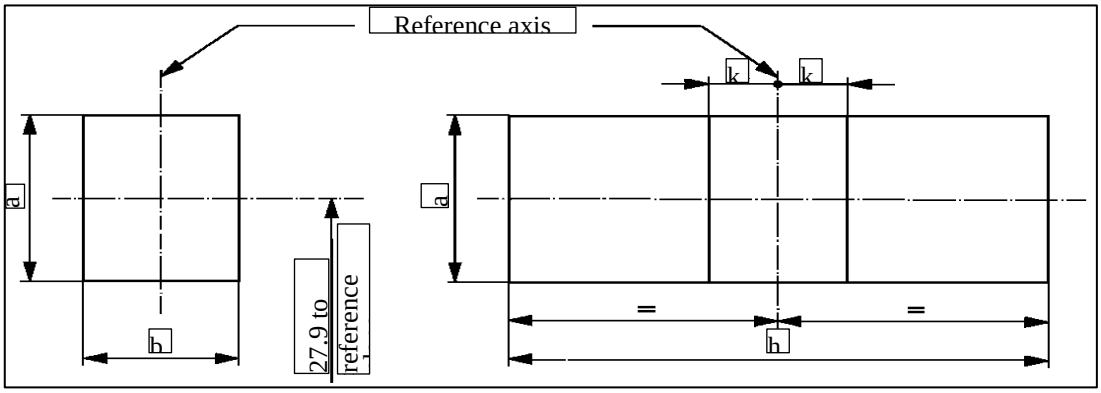
5/ The light emitted from standard filament light sources shall be white for category WP21W and white or amber for category WPY21W.

Categories WP21W and WPY21W	**Sheet WP21W/2**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centre line of the keys and the reference axis, whether a filament light source complies with the requirements.

Side elevation Front elevation



Reference	a	b	h	k
Dimension	3.5	3.0	9.0	1.0

Test procedures and requirements

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits.

2. Side elevation

   The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

   The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.

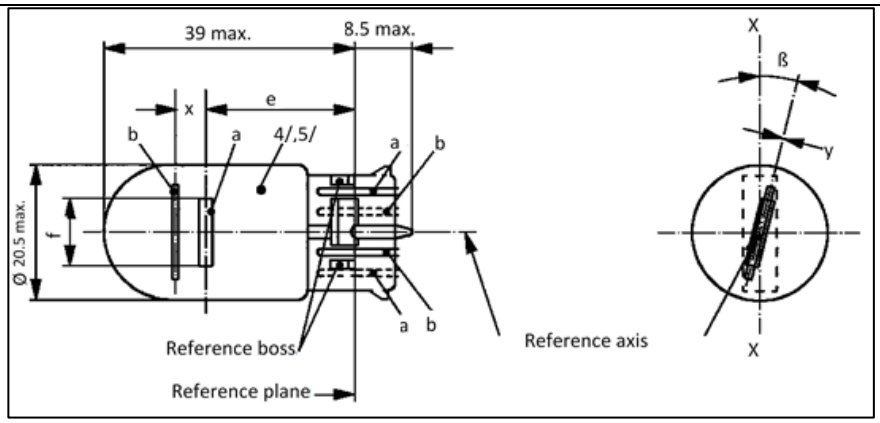
3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

Category WR21/5W	**Sheet WR21/5W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.

a = major (high wattage) filament

b = minor (low wattage) filament



Dimensions in mm		Filament light sources of normal production			Standard filament light source	
		Min.	Nom.	Max.		
e			25.0 1/		25.0 ± 0.3	
f				7.5	7.5 + 0 / -2	
Lateral deviation 2/				1/	0.3 max.	
x 3/			2.8 1/		2.8 ± 0.3	
y 3/			0.0 1/		0.0 ± 0.3	
β		-15° 1/	0°	15° 1/	0° ± 5°	
Cap WY3x16q in accordance with IEC Publication 60061 (sheet 7004-106-4)						
Electrical and photometric characteristics						
Rated values	Volts	12			12	
	Watts	21		5	21	5
Test	Volts	13.5			13.5	
Objective values	Watts	26.5 max.		6.6 max.	26.5	6.6
	Luminous	105 ± 20 %		8 ± 25 %		
Reference luminous flux at approximately 13.5 V:		White: 440 lm and 35 lm Red: 105 lm and 8 lm				

1/ To be checked by means of a "Box system"; sheets W21/5W/2 and 3.

2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

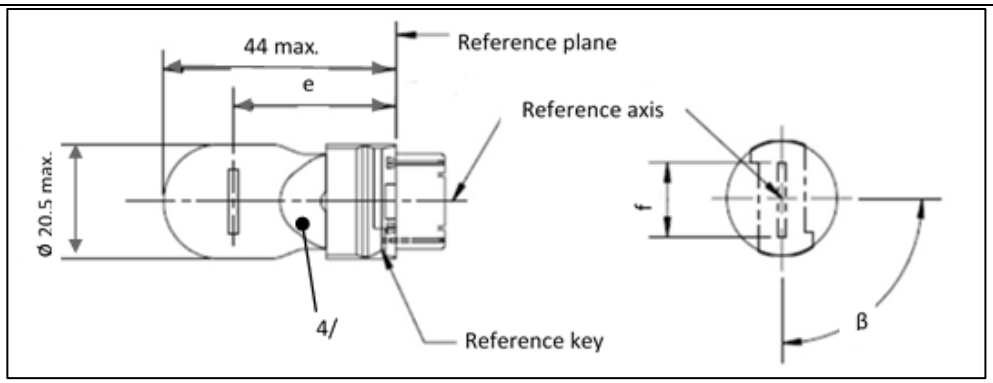
3/ "x" and "y" denote the offset of the axis of the minor filament with respect to the axis of the major filament.

4/ The light emitted from normal production lamps shall be red (see also footnote 5/).

5/ The light emitted from standard filament light sources shall be white or red.

CategoriesWT21W and WTY21W	**Sheet WT21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source 5/
		Min.	Nom.	Max.	
e	12 V		27.9 3/		27.9 ± 0.3
	24 V	26.9	27.9	28.9	
f				7.5	7.5 + 0 / - 2
Lateral deviation 2/	12 V			3/	0.0 ± 0.4
	24 V			1.5	
β		75° 3/	90°	105°	90° ± 5°
Cap: WT21W: WUX2.5x16d WTY21W: WUY2.5x16d		in accordance with IEC Publication 60061			(sheet 7004-176-1) (sheet 7004-177-1)

Electrical and photometric characteristics					
Rated values	Volts		12	24	12
	Watts		21		21
Test	Volts		13.5	28.0	13.5
Objective values	Watts		26.5 max.	29.7 max.	26.5 max.
	Luminous flux	WT21W	460 ± 15 %		
		WTY21W	280 ± 20 %		
Reference luminous flux at approximately 13.5 V:					White: 460 lm Amber: 280 lm

1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.

2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.

3/ To be checked by means of a "Box system", sheets WT21W/2.

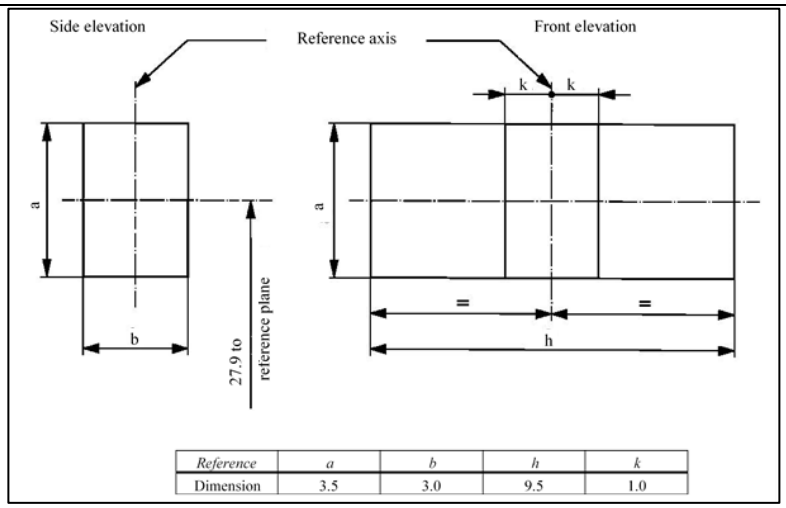
4/ The light emitted from filament light sources of normal production shall be white for category WT21W and amber for category WTY21W (see also note 5/).

5/ The light emitted from standard filament light sources shall be white for category WT21W and white or amber for category WTY21W.

CategoriesWT21W and WTY21W	**Sheet WT21W/2**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centres of the keys and the reference axis, whether a filament light source complies with the requirements.



Reference	*a*	*b*	*h*	*k*
Dimension	3.5	3.0	9.5	1.0

Test procedures and requirements

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits.

2. Side elevation

The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

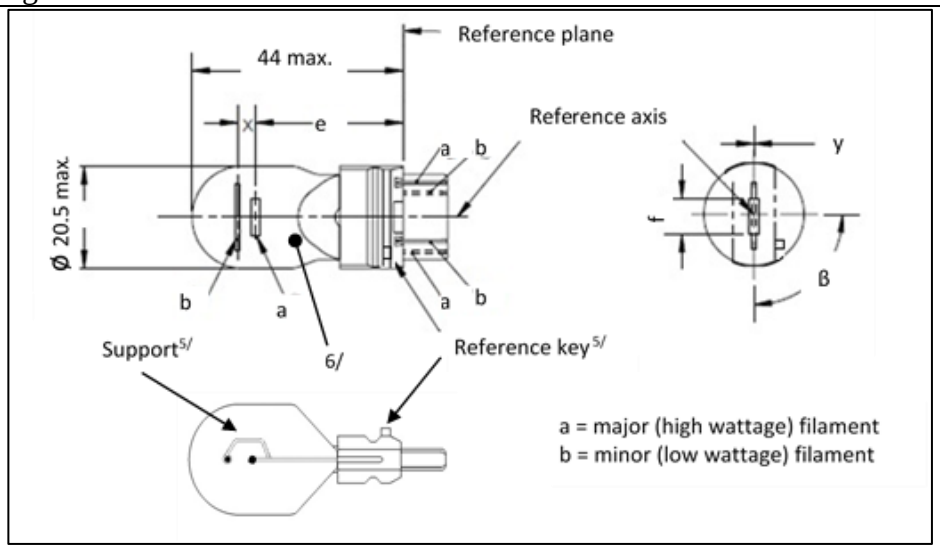
The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.

3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

Categories WT21/7W and WTY21/7W	**Sheet WT21/7W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm	Filament light sources of normal production 6/			Standard filament light source 7/
	Min.	Nom.	Max.	
e		27.9 3/		27.9 ± 0.3
f			7.5	7.5 + 0 / - 2
Lateral deviation			3/	0.0 ± 0.4
x 4/		5.1 3/		5.1 ± 0.5
y 4/		0.0 3/		0.0 ± 0.5
β	75° 3/	90°	105° 3/	90° ± 5°

Cap:	WT21/7W: WZX2.5x16q WTY21/7W: WZY2.5x16q	in accordance with IEC Publication 60061	(sheet 7004-180-1) (sheet 7004-181-1)

Electrical and photometric characteristics

Rated values	Volts	12		12	
	Watts	21	7	21	7
Test voltage	Volts	13.5		13.5	
Objective values	Watts	26.5 max.	8.5 max.	26.5	8.5
	Luminous flux	440 ± 15 %	35 ± 20		
		280 ± 20 %	22 ± 20		
Reference luminous flux at approximately 13.5 V:			White: 440 and 35 lm Amber: 280 and 22 lm		

For the notes see sheet WT21/7W/2.

Categories WT21/7W and WTY21/7W	Sheet WT21/7W/2
1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.	
2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.	
3/ To be checked by means of a "Box system", sheets WT21/7W/2 and 3.	
4/ "x" and 'y" denote the offset of the axis of the minor (low wattage) filament with respect to the axis of the major (high wattage) filament.	
5/ If the minor filament is positioned using an asymmetric support similar to the one shown then the reference key and support structure shall be located on the same side of the filament light source.	
6/ The light emitted from filament light sources of normal production shall be white for category WT21/7W and amber for category WTY21/7W (see also note 7/).	
7/ The light emitted from standard filament light sources shall be white for category WT21/7W and white or amber for category WTY21/7W.	
Screen projection requirements	
This test is used to determine, by checking whether:	
(a) The major (high wattage) filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the centres of the keys and the reference axis; and whether:	
(b) The minor (low wattage) filament is correctly positioned relative to the major (high wattage) filament, whether a filament light source complies with the requirements.	
Test procedure and requirements.	
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits.	
2. Side elevation	
The filament light source placed with the cap down, the reference axis vertical, the reference key to the right and the major filament seen end-on:	

Category WT21/7W AND WTY21/7W	**Sheet WT21/7W/3**

2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;

2.2. The projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having its centre at a distance "u" above the theoretical position of the centre of the major filament.

3. Front elevation

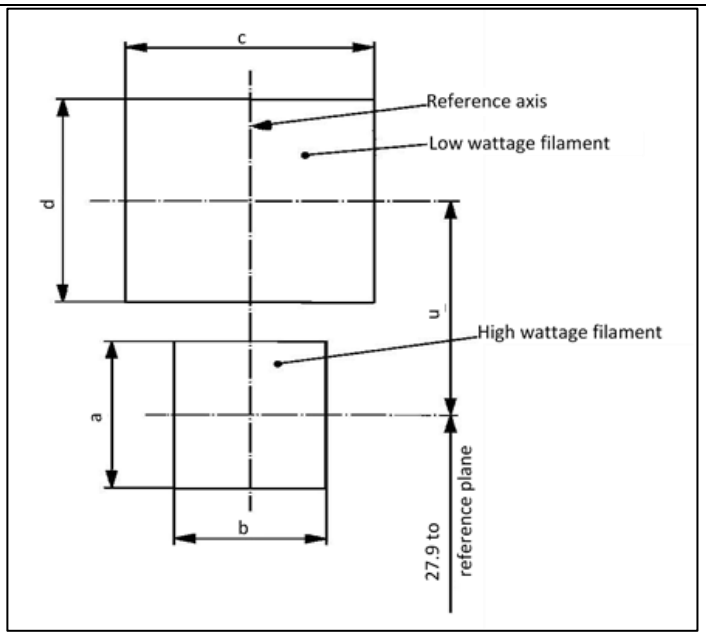
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:

3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;

3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis;

3.3. The centre of the minor filament axis shall not be offset from the reference axis by more than ±2 mm (±0.4 mm for standard filament light sources).

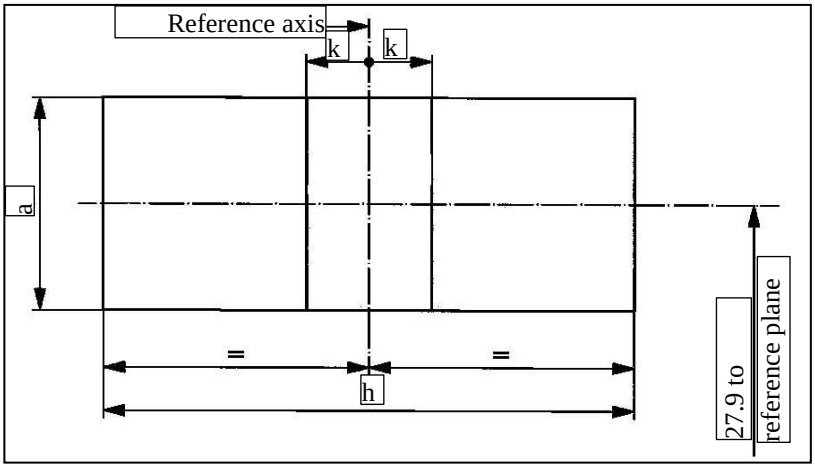
Side elevation



Reference	a	b	c	d	u
Dimensions	3.5	3.0	4.8		5.1

Category WT21/7W AND WTY21/7W	**Sheet WT21/7W/4**

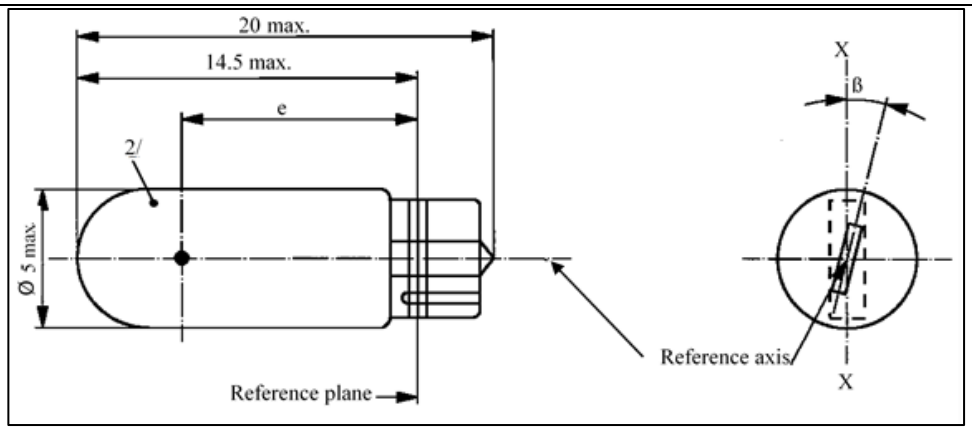
Front elevation



Reference	a	h	k
Dimensions	3.5	9.5	1.0

Category WY2.3W	**Sheet WY2.3W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm	Filament light sources of normal production			Standard filament light source
	Min.	Nom.	Max.	
e	10.3	10.8	11.3	10.8 ± 0.3
Lateral deviation 1/			1.0	0.5 max.
β	-15°	0°	+15°	0° ± 5°
Cap W2x4.6d in accordance with IEC Publication 60061 (sheet 7004-94-2)				
Electrical and photometric characteristics				
Rated values	Volts	12		12
	Watts	2.3		2.3
Test voltage	Volts	13.5		13.5
Objective values	Watts	2.5 max.		2.5 max.
	Luminous flux	11.2 ± 20 %		
Reference luminous flux at approximately 13.5 V				White: 18.6 lm Amber: 11.2 lm

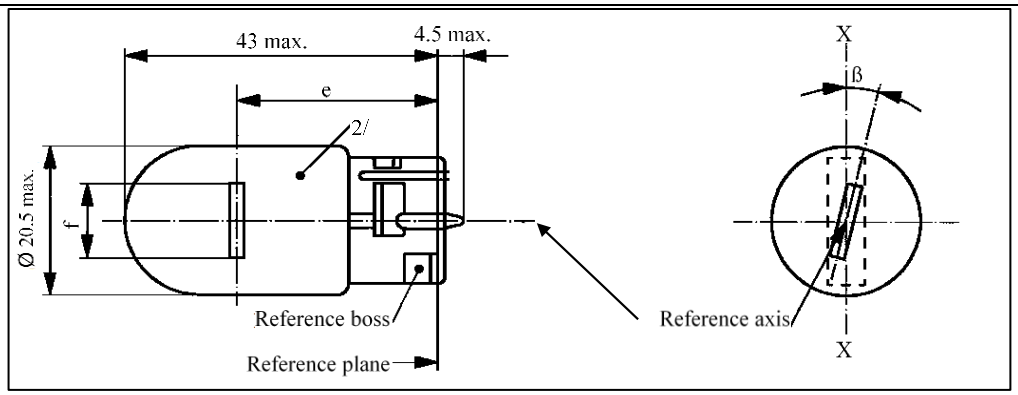
1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

2/ The light emitted from production lamps shall be amber (see also footnote 3/).

3/ The light emitted from standard filament light sources shall be amber or white.

Category WY21W	**Sheet WY21W/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source.



Dimensions in mm		Filament light sources of normal production			Standard filament light source
		Min.	Nom.	Max.	
e			29.0 2/		29.0 ± 0.3
f				7.5	7.5 + 0 / -2
Lateral deviation 1/				2/	0.5 max.
β		-15°	0°	+15°	0° ± 5°
Cap WX3x16d in accordance with IEC Publication 60061 (sheet 7004-105-3)					
Electrical and photometric characteristics					
Rated values	Volts	12			12
	Watts	21			21
Test voltage	Volts	13.5			13.5
Objective values	Watts	26.5 max.			26.5 max.
	Luminous flux	280 ± 20 %			
Reference luminous flux at approximately 13.5 V:					White: 460 lm Amber: 280 lm

1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.

2/ The light emitted from filament light sources of normal production shall be amber (see also footnote 4/).

3/ To be checked by means of a "Box system"; sheet WY21W/2.

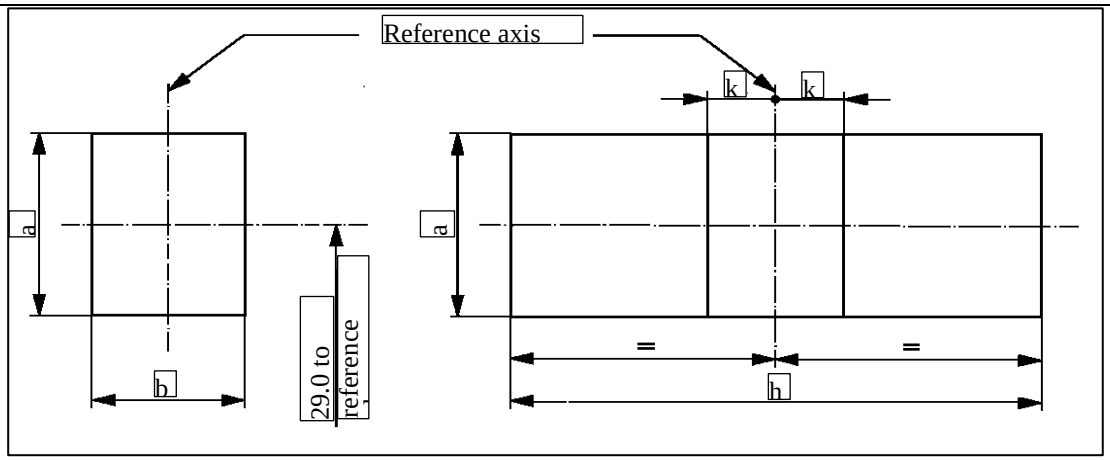
4/ The light emitted from standard filament light sources shall be amber or white.

Category WY21W	**Sheet WY21W/2**

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within ±15°, to the plane through the axis X-X and the reference axis, whether a filament light source complies with the requirements.

Side elevation Front elevation



Reference	a	b	h	k
Dimension	3.5	3.0	9.5	1.0

Test procedures and requirements

1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits, i.e. ±15°. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits (±15°).

2. Side elevation

The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

3. Front elevation

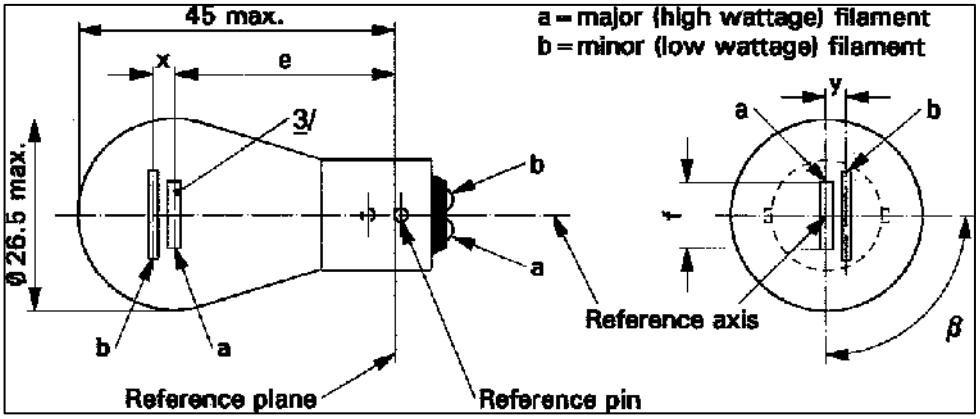
The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.

3.2. The centre of the filament shall not be offset by more than distance "k" from the reference axis.

CATEGORY R10/5W	Sheet R10/5W/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source



Electrical and photometric requirements:

Parameter		**Production Light Sources**				**Standard Light Sources**	
Rated values	Volts	6		12		12	
	Watts	10	5	10	5	10	5
Test voltage	Volts	6.75		13.5			
Objective values	Watts	11	6.6	11	6.6	11	6.6
	Luminous flux ± %	125 ± 20%	26 ± 20%	125 ± 20%	26 ± 20%		
Reference luminous flux at approximately 13.5 V		125 lm and 26 lm					

CATEGORY R10/5W				**Sheet R10/5W/2**
Dimensional requirements:				
Dimensions in mm	**Filament light sources of normal production** 4/			**Standard filament light source**
	Min.	Nom.	Max.	5/
e		31.8 1/		31.8 ± 0.3
f			7.0	7.0 + 0/- 2
Lateral deviation 2/	1/			0.3 max.
x, y	1/			2.8 ± 0.3
β	75° 1/	90°	105°	90° ± 5°
Cap	BAY15d in accordance with IEC Publication 60061 (sheet 7004-11B-7)			

Notes:

1/ These dimensions shall be checked by means of a "Box-System" 3/ based on the dimensions and tolerances shown above. "x" and "y" refer to the major (high-wattage) filament, not to the reference axis.

2/ Maximum lateral deviation of the main (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis of pins.

3/ The "Box-System" is the same as for filament light source P21/5W.

CATEGORY C5W	Sheet C5W_LEDr/1

The drawings are intended only to illustrate the essential dimensions (in mm) of the LED light source.

Figure 1
Main drawing

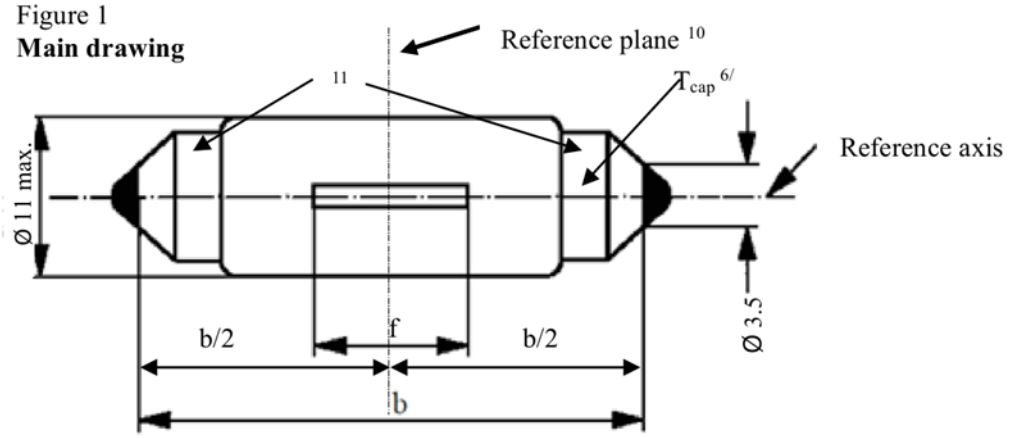


Table 1

Essential electrical and photometrical characteristics of the LED light source

Dimensions in mm			**LED light sources of normal production**
b 1/			35.0±1.0
f 2/			9.0 nom.
Elevated ambient air temperature 4/			50°C
Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4)			
Electrical and photometric characteristics 5/			
Rated values		Volts	12
		Watts	3 9/
Test voltage (DC)		Volts	13.5
	Power 7/	Watts	2.5 min. 8/ 5.5 max. 9/
	Electrical current 7/ at 12-14 V DC	mA	150 min. 8/
	Luminous flux 3/	lm	45±20 %
	Luminous flux 3/ at 9V DC	lm	9 min.
	Cap temperature T_{cap}	°C	75 max. 8/

CATEGORY C5W	Sheet C5W_LEDr/1

[1/] This dimension corresponds to a distance between two apertures of 3.5 mm diameter each bearing against one of the caps.

[2/] To be checked by a "box system", see Figure 2.

[3/] The light emitted shall be white, without a correlated colour temperature restriction.

[4/] The luminous flux measured at the elevated ambient air temperature shall be at least 70% of the objective luminous flux (both measured at test voltage).

[5/] In case of a failure of any of the light emitting elements (open circuit failure), the LED light source shall either still comply to the requirements concerning luminous flux and luminous intensity distribution or stop emitting light whereby in the latter case the electrical current draw, when operated between 12 V and 14 V, shall be less than 10 mA.

[6/] Measurement point for cap temperature T_{cap}

[7/] Including AE device, if any

[8/] Not applicable for high-efficiency type (if no AE device is specified)

[9/] For high-efficiency type 1W rated value and 2W max. objective value applies

[10/] The reference plane is perpendicular to the reference axis and passing through the centre of the light source as defined by the dimension b/2

[11/] Position of polarity marking, in case of particular electrical polarity

CATEGORY C5W	Sheet C5W_LEDr/2

Screen projection requirements

The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by means of a box system defined by the projections when viewing along the direction γ= 0° (top view), γ= 90° (front view), γ=180° (bottom view), γ= 270° (rear view) in the plane C0 (C, γas defined in Figure 3).

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in figure 2:

• A, B and C together shall be 70 per cent or more;

• B shall be 20 per cent or more;

• A and C shall each be 15 per cent or more.

These values shall be calculated as percentage of the total luminous flux emitted into the viewing direction from the maximum light source outline, i.e. a rectangle of length b = 36.0 mm and a height of 11 mm, aligned symmetrically to the reference axis and reference plane (see Figure 1).

Figure 2

Box definition of the light emitting area

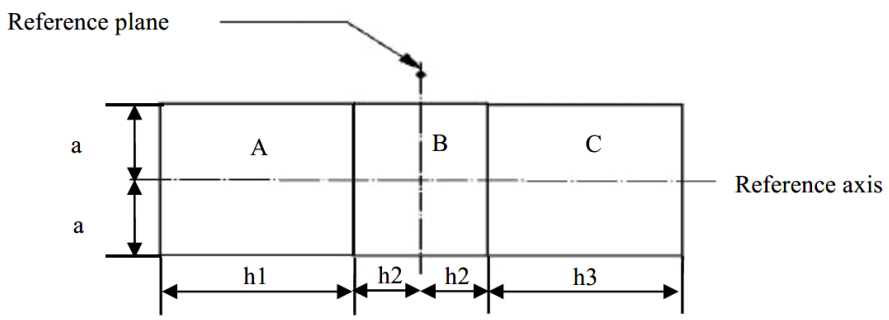


Table 2

Dimensions of the box system in Figure 2

Dimension (mm)	a	h1, h3	h2
All views (as specified above)	2.5	6	2

CATEGORY C5W	**Sheet C5W_LEDr/3**

Normalized luminous intensity distribution

The following test is intended to determine the normalized luminous intensity distribution of the light source in the C-planes as described in figure 3. The intersection of the reference axis and the reference plane is used as the coordinate system origin.

The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in figure 3.

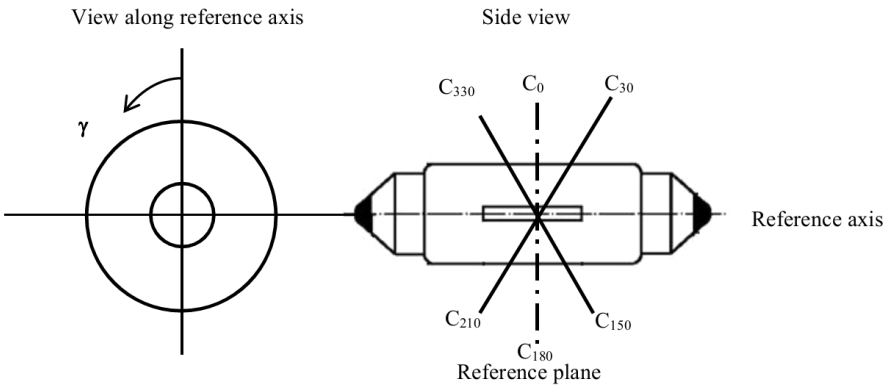
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately in order to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes, where C0 (C180) shall be the reference plane of the light source. The C-planes to be measured shall be those specified in Table 3. The test points for each plane and multiple polar angles γare specified in Table 3.

The measured luminous intensity values, normalised to the measured luminous flux of the individual light source under test, shall be converted to normalised luminous intensity values of a 1000 lm light source. These data shall comply with the tolerance band as defined in Table 3.

Figure 3 Setup to measure the luminous intensity distribution

(Definition of C-Planes and angle γ)



C-planes: See CIE publication 70-1987, "The measurement of absolute intensity distributions".

CATEGORY C5W	**Sheet C5W_LEDr/4**

Table 3

Test point values of normalized intensity in the planes C0, C30, C150, C180, C210, C330

	LED light source of normal production	
γ	Minimum intensity in cd /1000 lm	Maximum intensity in cd /1000 lm
0°	60	140
30°	60	140
60°	60	140
90°	60	140
120°	60	140
150°	60	140

The luminous intensity distribution as described in Table 3 shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3.

CATEGORY H11	**Sheet H11_LEDr/1**

The drawings are intended only to illustrate the essential dimensions (in mm) of the LED light source.

Figure 1

Main drawings

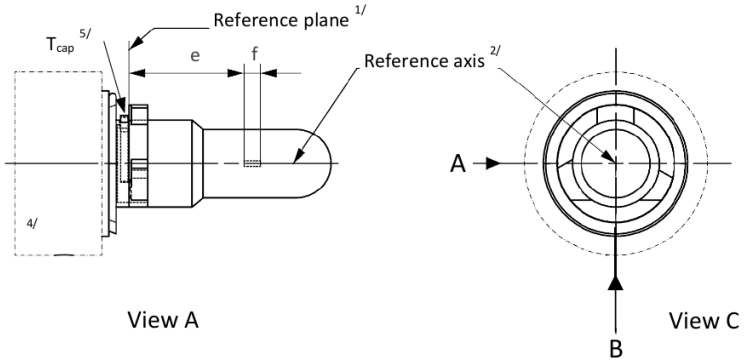
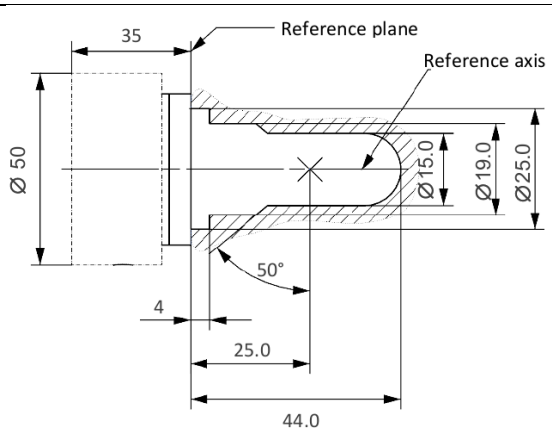


Figure 2

Maximum LED light source outline 3/



1/ The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.

2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.

3/ The LED light source shall not exceed the envelope as indicated in Figure 2.

4/ The light source shall function in either voltage polarity.

5/ Measurement point for cap temperature T_{cap}

CATEGORY H11				**Sheet H11_LEDr/2**
Table 1 Essential electrical and photometrical characteristics of the LED light source				
Dimensions in mm	LED light sources of normal production			
e[2/]			25.0 nom.	
f[2/]			4.5 nom.	
Contrast [6/]			100 min.	
Elevated ambient air temperature [3/]			60°C	
Cap H11 PGJ19-2 9/in accordance with IEC Publication 60061 (sheet 7004-110-3)				
Electrical and photometric characteristics			[4/]	[5/]
Rated values		Volts	12	24
		Watts	27 [11/]	27 [11/]
Test voltage (DC)		Volts (DC)	13.2	28.0
Objective values	Power[8/]	Watts	27 min. [10/] 62 mx. [11/]	27 min. [10/] 62 mx. [11/]
	Cap temperature T_{cap}	°C	120 max. [10/]	120 max. [10/]
	Electrical current [8/]	mA	2000 min. [10/] (at 12-14 V DC)	1000 min. [10/] (at 24-28 V DC)
	Luminous flux[1/ 3/]	lm	1,350 ± 10%	
	Luminous flux deviation[7/] (voltage range limits)	lm	±10% (at 12V) ±10% (at 14V)	±10% (at 24V) ±10% (at 28V)

CATEGORY H11	**Sheet H11_LEDr/2**
1/ The light emitted shall be white without a correlated colour temperature restriction.	
2/ To be checked by means of a "box system", sheet H11 LEDr/3	
3/ The luminous flux measured at the elevated ambient air temperature shall be at least 75% of the objective luminous flux (both measured at test voltage)	
4/ In case of a failure of any of the light emitting elements (open circuit failure), the LED light source shall either still comply to the requirements concerning luminous flux and luminous intensity distribution or stop emitting light whereby, in the latter case, the electrical current draw, when operated between 12 V and 14 V, shall be less than 100 mA	
5/ In case of a failure of any of the light emitting elements (open circuit failure), the LED light source shall either still comply to the requirements concerning luminous flux and luminous intensity distribution or stop emitting light whereby, in the latter case, the electrical current draw, when operated between 24 V and 28 V, shall be less than 50 mA	
6/ The contrast is the proportion of luminous flux originating from two different areas, see details in sheet H11 LEDr/3	
7/ The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. The luminous flux behaviour shall be substantially uniform within the specified voltage range.	
8/ Including AE device, if any	
9/ The maximum specifications of parameters G and K are excluded, but the maximum outline dimensions in Figure 2 apply	
10/ Not applicable for high-efficiency type (if no AE device is specified)	
11/ For high-efficiency type 18W rated value and 21W max. objective value applies	

CATEGORY H11	Sheet H11_LEDr/3

Screen projection requirements

The following test is intended to define the requirements for the apparent light emitting area of the LED light source and to determine whether the light emitting area is correctly positioned relative to the reference axis and reference plane in order to check compliance with the requirements.

The position of the light emitting area is checked by a box system defined in Figure 4 when operated at test voltage, which shows the projections when viewing from B (see sheet H11 LEDr/1, Figure 1) and from A and –A (see sheet H11 LEDr/1, Figure 1), i.e. along the C-planes C0, C90 and C270 (as defined in Figure 6).

The proportion of the total luminous flux emitted into these viewing directions from the area(s) as defined in Figure 4:

• Total box area: (A+B+C) / E shall be not less than 90%

• Area A: A / (A+B+C) shall be not more than 10%

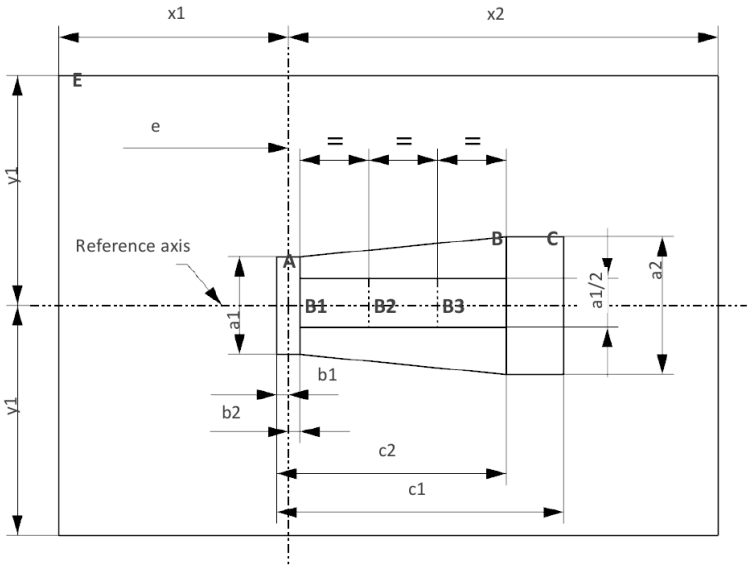
• Areas B1, B2 and B3: B1/B, B2/B, B3/B shall each be not less than 15%

• Area B: B / (A+B+C) shall be not less than 72 %

• Area C: C / (A+B+C) shall be not more than 22%

Figure 4

Box definition of the light emitting area (dimensions given in Table 2)



The contrast is checked by a box system defined in Figure 5 when operated at test voltage, which shows the projections when viewing from A and –A (see sheet H11 LEDr/1, Figure 1), i.e. along the C-planes C_{90} and C_{270} (as defined in Figure 6).

The contrast is the proportion of the total luminous flux values emitted into these viewing directions from the corresponding areas (A+B+C) and D. The value of the contrast (A+B+C) / D shall be within the limits given in Table 1 (see Figure 5 for the definition of the area D).

CATEGORY H11	Sheet H11_LEDr/4

Figure 5

Box definition of the area D (dimensions given in Table 2)

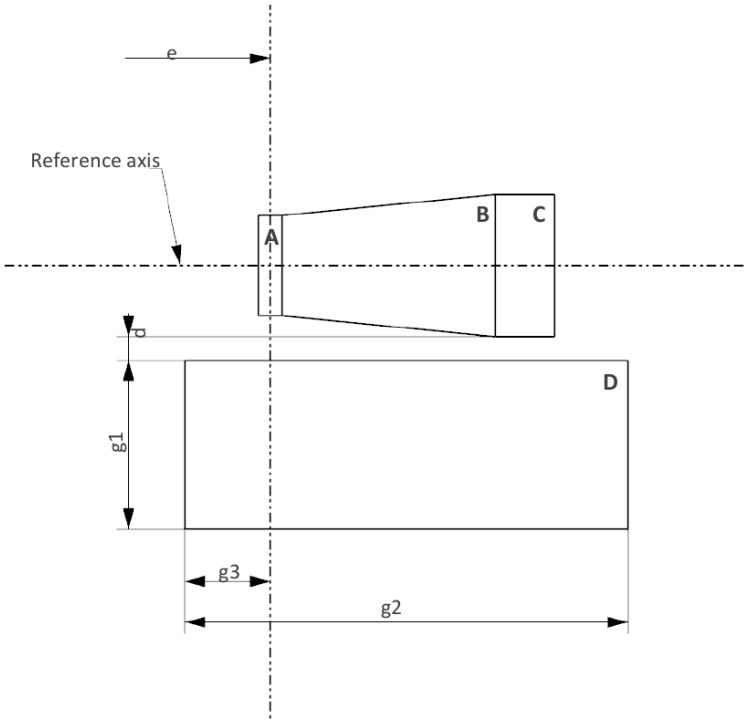


Table 2

Dimensions of the box definitions in Figure 4 and Figure 5

All views (as specified above)	Dimensions in mm	All views (as specified above)	Dimensions in mm
a1	1.7	x1	25
a2	1.9	x2	19
b1	0.2	y1	12.5
b2	0.2	g1	2.85
c1	5.0	g2	7.5
c2	4.0	g3	1.45
d	0.4		

CATEGORY H11	Sheet H11_LEDr/5

Normalized luminous intensity distribution

The following test is intended to determine the normalized luminous intensity distribution of the light source in the C-planes as described in Figure 6 when operated at test voltage. The intersection of the reference axis and the plane parallel to the reference plane at distance e = 25.0 mm is used as the coordinate system origin.

The light source is mounted on a flat plate with the corresponding holder features. The plate is fixed to the goniometer table by a bracket, so that the reference axis of the light source lines up with one of the rotating axis of the goniometer. The corresponding measurement set-up is described in Figure 6.

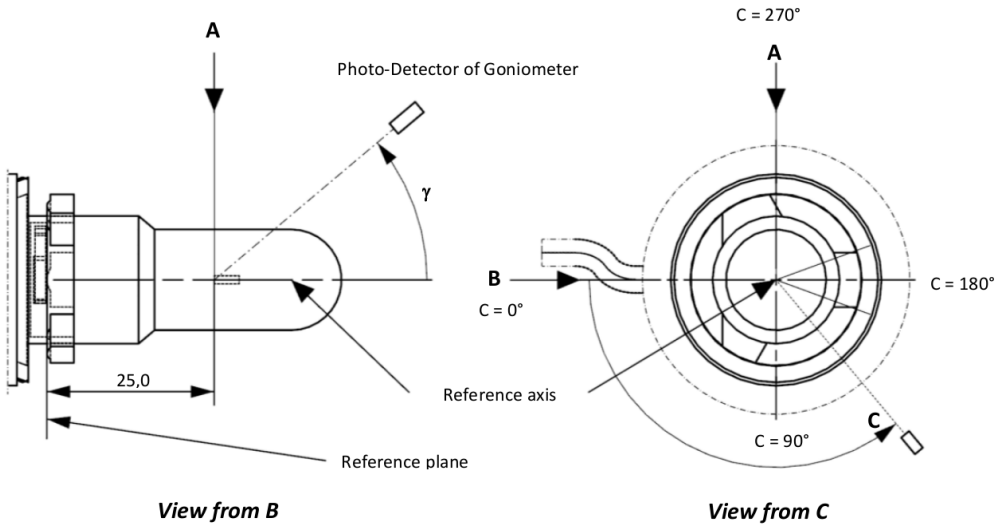
Luminous intensity data is recorded with a standard photo-goniometer. The measurement distance should be chosen appropriately in order to make sure that the detector is located in the far field of the light distribution.

The measurements shall be performed in C-planes for which the line of intersection coincides with the reference axis of the light source. The test points for each plane and polar angles γ are specified in Table 3.

The measured luminous intensity values, normalised to the measured luminous flux of the individual light source under test, shall be converted to normalised luminous intensity values of a 1000 lm light source. These data shall comply with the limits as defined in Table 3.

Figure 6

Setup to measure the luminous intensity distribution and the definition of C-Planes and angle γ



C-planes: see CIE publication 70-1987, "The measurement of absolute intensity distributions".

CATEGORY H11	Sheet H11_LEDr/6

Table 3 – Part 1

Test point values of normalized intensity (Black top area)

LED light source of normal production

	Minimum intensity (cd/klm)	Maximum intensity (cd/klm)
γ	C_0, C_{90}, C_{180}, C_{270}	C_0, C_{90}, C_{180}, C_{270}
0°	n/a	10
10°	n/a	10
20°	n/a	10
30°	n/a	10

The light pattern as described in Table 3 – part 1 shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3 – part 1.

Note: The angular range in Table 3 – Part 1 is equivalent to the black top of its counterpart H11 filament light source specified by γ3 in sheet H11/3.

Table 3 – Part 2

Test point values of normalized intensity (Distortion free area)

LED light source of normal production

	Minimum intensity (cd/klm)	Maximum intensity (cd/klm)
	C_0, C_{90}, C_{270}	C_0, C_{90}, C_{270}
50°	80	130
60°	80	130
70°	80	130
80°	80	130
90°	80	130
100°	80	130
110°	80	130
120°	80	130
130°	80	130
140°	80	130

The light pattern as described in Table 3 – part 2 (excluding the section between C90 and C270) shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3 – part 2.

CATEGORY H11	Sheet H11_LEDr/7

Note: The angular range in Table 3 – Part 2 is equivalent to the distortion free area of its counterpart H11 filament light source specified by γ2 and γ1 in sheet H11/3.

Table 3 – Part 3

Test point values of normalized intensity (Shading area of the lead-in wire of the counterpart filament light source)

LED light source of normal production		
	Minimum intensity (cd/klm)	**Maximum intensity (cd/klm)**
C-plane	γ=90°	γ=90°
C_0	80	130
C_{30}	80	130
C_{60}	80	130
C_{90}	80	130
C_{120}	80	130
C_{150}	80	130
C_{180}	n/a	n/a
C_{210}	80	130
C_{240}	80	130
C_{270}	80	130
C_{300}	80	130
C_{330}	80	130
C_{360} ($=C_0$)	80	130

The light pattern as described in Table 3 – part 3 (excluding the section between C150 and C210) shall be substantially uniform, i.e. in between two adjacent grid points the relative luminous intensity requirement is calculated by linear interpolation using the two adjacent grid points. In case of doubt this may be checked in addition to verification of the grid points given in Table 3 – part 3.

Note: Due to the shading area created by the lead-in wire of its counterpart H11 filament light source (opposite to the metal-free zone; see Figure 4 on sheet H11/2) there is no requirement in the C180-plane.

ANNEX B (See 2.2.1)
INFORMATION TO BE SUBMITTED AT THE TIME OF APPLICATION FOR TYPE APPROVAL
1 Trade name or mark (see Note 1 below) of the filament light source:
2 Manufacturer's name for the type of filament light source:
3 Manufacturer's name and address:
4 If applicable, name and address of manufacturer's representative:
5 Drawings in triplicate, sufficiently detailed to permit identification of the type and a brief technical description including
5.1 Category of filament light source:
5.2 Rated voltage:
5.3 Rated wattage:
5.4 Colour of the light emitted: White/selective-yellow/amber/red (see Note 2 below)
5.5 Halogen filament light source: yes/no
5.6 Position of the approval mark:
6. Reason(s) for extension (if applicable):
Note 1 See 2.2.3 for cases where there is a change in the trade mark.
Note 2 Strike out what does not apply.

ANNEX C (Reserved)

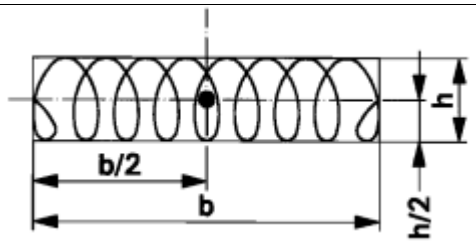
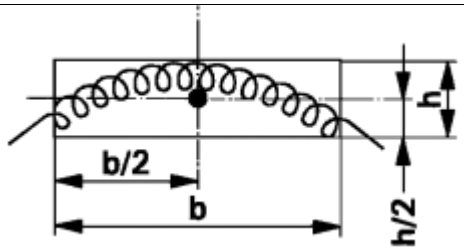
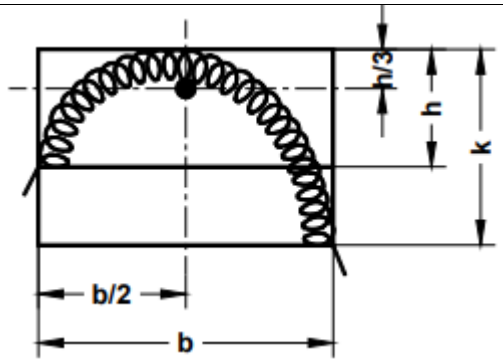
ANNEX D
(See 3.5.3)

LUMINOUS CENTRE AND SHAPES OF FILAMENTS

D-1 Unless otherwise stated on the filament light source data sheets, this standard is applicable to the determination of the luminous centre of different filament shapes.

Figure D-1(See D-1)

The position of the luminous centre depends upon the filament shape.

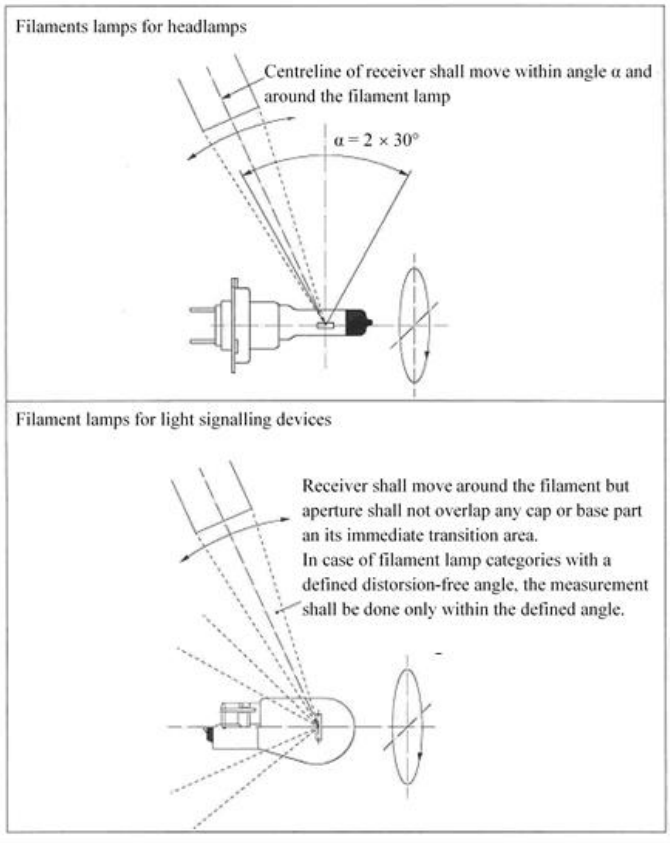
No.	Filament shapes	Observations
1		With b > 1.5 h, the deviation of the filament axis with respect to a plane normal to the reference axis shall not exceed 15°
2		Only applicable to filaments which can be inscribed in a rectangle of b > 3h.
3		Applicable to filaments which can be inscribed in a rectangle of b ≤ 3h, whereby, however, k < 2h.

The side lines of the circumscribed rectangles in Nos. 2 and 3 are parallel and perpendicular, respectively, to the reference axis.

The luminous centre is the intersection of the dash-dot lines.

The drawings are intended only to demonstrate the essential dimensions.

ANNEX E	
(See 3.6.3)	
CHECKING THE COLOUR OF FILAMENT LIGHT SOURCES	
E-1.0	General
E-1.1	Measurements shall be made on finished light sources. Filament light sources with secondary (outer) bulb acting as colour filter shall be handled as filament light source with primary bulb.
E-1.2	Tests shall be made at an ambient temperature of 23 °C ± 5 °C.
E-1.3	Tests shall be made at test voltage(s) as specified in the relevant light source data sheet.
E-1.4	Filament light sources shall be measured preferably in the normal operating position. In case of filament light sources the high wattage (major or driving beam) filament shall be operated only.
E-1.5	Before starting a test, the stabilisation of the temperature of the filament light source shall be obtained by operating at test voltage for 10 minutes. In the case of filament light sources, for which more than one test voltage is specified, the relevant test voltage value shall be used for achieving stabilization
E-2.0	Colour
E-2.1	Colour tests shall be made with a measuring system that determines CIE chromaticity co-ordinates of the received light with an accuracy of ± 0.002.
E-2.2	The trichromatic coordinates shall be measured with a colourimetric receiver integrating over a right circular cone subtending an angle of minimum 5° and maximum 15°, at the centre of the filament.
E-2.3	Measuring directions (see the figure below).
E-2.3.1	Initially, the receiver shall be positioned perpendicular to the filament light source axis and to the filament axis (or plane in case of a curved filament). After measurement the receiver shall be moved around the filament light source in bi-directional steps of about 30° until the area specified in paragraphs E-2.3.2. or E-2.3.3. is covered. In each position a measurement shall be made. However, no measurement shall be made when:
	(a) The centreline of the receiver coincides with the filament axis; or
	(b) The line of sight between the receiver and the filament is blocked by opaque (non-transmitting) parts of the light source, such as lead wires or a second filament, if any.
E-2.3.2	For filament light sources used in head light source, measurements shall be made in directions around the filament light source with the centreline of the receiver aperture located within an angle ± 30°, from the plane perpendicular

	to the light source axis with the origin in the centre of the filament. In case of filament light sources with two filaments, the centre of the driving-beam filament shall be taken.
E-2.3.3	For filament light sources used in light signalling devices, measurements shall be made in directions around the filament light source with exception of:
	(a) The area claimed or covered by the cap of the filament light source; and
	(b) The immediate transition area along the cap.
	In case of filament light sources with two filaments, the centre of the major filament shall be taken.
	In case of filament light source categories with a defined distortion-free angle, the measurement shall be done only within the defined angle.
Figure illustrating the positions of colorimetric receiver	
	

ANNEX F	
(See 4.2)	
MINIMUM REQUIREMENTS FOR QUALITY CONTROL PROCEDURES BY THE MANUFACTURER	
F-1.	General
	The conformity requirements shall be considered satisfied from a photometric, geometrical, visual and electrical standpoint if the specified tolerances for production filament light sources in the relevant data sheet of Annex A and the relevant data sheet for the caps are met.
F-2.	Minimum requirements for verification of conformity by the manufacturer
	For each type of filament light sources the manufacturer or the holder of the approval mark shall carry out tests, in accordance with the provisions of this standard, at appropriate intervals.
F-2.1.	Nature of tests
	Tests of conformity of these specifications shall cover their photometric, geometrical and optical characteristics.
F-2.2.	Methods used in tests
F-2.2.1.	Tests shall generally be carried out in accordance with the methods set out in this standard.
F-2.2.2.	The application of 2.2.1. requires regular calibration of test apparatus and its correlation with measurements made by testing agency.
F-2.3.	Nature of sampling
	Samples of filament light sources shall be selected at random from the production of a uniform batch. A uniform batch means a set of filament light sources of the same type, defined according to the production methods of the manufacturer.
F-2.4.	Inspected and recorded characteristics
	The filament light sources shall be inspected and test results recorded following the grouping of characteristics as listed in Annex G, Table G-1.
F-2.5.	Criteria governing acceptability
	The manufacturer or the holder of approval is responsible for carrying out a statistical study of the test results in order to meet the specifications laid down for verification of conformity of production in 4.1. of this standard.
	Compliance shall be assured if the level of acceptable non-compliance per grouping of characteristics given in Table G-1 of Annex G is not exceeded. This means that the number of filament light sources not complying with the requirement for any grouping of characteristics of any filament light source type does not exceed the qualifying limits in the relevant Tables G-2, G-3 or G-4 of Annex G.

	Note: Each individual filament light source requirement shall be considered as a characteristic.

ANNEX G

(See F-2.5)

SAMPLING AND COMPLIANCE LEVELS FOR MANUFACTURER TEST RECORDS

Table G-1 - Characteristics

Grouping of characteristics	Grouping */ of test records between light source types of the same category and of the same light producing technology	Minimum 12 monthly sample per grouping */	Acceptable level of non-compliance per grouping of characteristics (%)
Marking, legibility and durability	All types with the same external dimensions	315	1
External light source dimensions (excluding cap/base)	All types of the same category	200	1
Dimensions of caps and bases	All types of the same category	200	6.5
Dimensions related to internal elements **/	All light sources of one type	200	6.5
Initial readings, watts and lumens and for LED replacement light sources also colour **/	All light sources of one type	200	1
Additional characteristics of filament light sources			
Bulb quality	All types with the same bulb	315	1
Colour of the bulb	All types (emitting red and amber light) of the same category and colour	20	1
Colour endurance test	All filament light sources (emitting red, amber and white light)	20***/	1

	of one colour coating technology		
Additional characteristics of LED replacement light sources			
Normalised luminous intensity or cumulative luminous flux distribution	All LED replacement light sources of one type	20	6.5
Electrical current****	All LED replacement light sources of one type	20	1

*/ The assessment shall in general cover series production ~~filament~~ light sources from individual factories. A manufacturer may group together records concerning the same type from several factories, provided these operate under the same quality system and quality management.

**/ In case a filament light source has more than one inner element (filament, shield) the grouping of characteristics (dimensions, watts, lumens) applies to each element separately. In case a LED replacement light source has more than one light output function the grouping of characteristics (dimensions, power, colour and luminous flux) applies to each element and light emitting surface separately.

***/ Representative distribution over categories of filament light sources using the same colour coating technology and finishing, and that comprises light sources of the smallest and the largest diameter of the outer bulb, each at the highest rated wattage.

****/ LED replacement light sources only.

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table G-2 as maximum number of non-compliance. The limits are based on an acceptable level of 1 per cent of non-compliance, assuming an acceptance probability of at least 0.95.

Table G-2

Number of test results of each characteristics	Qualifying limits for acceptance
20	0
21 - 50	1
51 - 80	2
81 - 125	3
126 - 200	5
201 - 260	6
261 - 315	7
316 - 370	8
371 - 435	9
436 - 500	10
501 - 570	11
571 - 645	12
646 - 720	13
721 - 800	14
801 - 860	15
861 - 920	16
921 - 990	17
991 - 1,060	18
1,061 - 1,125	19
1,126 - 1,190	20
1,191 - 1,249	21

*In accordance with ISO 2859-1:1999 “Sampling procedures for inspection by attributes - Part1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection" including Technical Corrigendum 1:2001

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table G-3 given as maximum number of non-compliance. The limits are based on an acceptable level of 6.5 per cent of non-compliance for filament light sources and 5 per cent for LED replacement light sources, assuming an acceptance probability of at least 0.95.

Table G-3

Number of light sources in records	Qualifying limit	Number of light sources in records	Qualifying limit	Number of light sources in records	Qualifying limit
– 20	3				
21 – 32	5				
33 – 50	7				
51 – 80	10	500 - 512	44		
81 – 125	14	513 - 526	45	881 – 893	72
126 - 200	21	527 – 540	46	894 - 907	73
201 - 213	22	541 - 553	47	908 - 920	74
214 - 227	23	554 - 567	48	921 - 934	75
228 - 240	24	568 - 580	49	935 - 948	76
241 - 254	25	581 - 594	50	949 - 961	77
255 - 268	26	595 - 608	51	962 - 975	78
269 - 281	27	609 - 621	52	976 - 988	79
282 - 295	28	622 - 635	53	989 - 1,002	80
296 - 308	29	636 - 648	54	1,003 -,1016	81
309 - 322	30	649 - 662	55	1,017 - 1,029	82
323 - 336	31	663 - 676	56	1,030 - 1,043	83
337 - 349	32	677 - 689	57	1,044 - 1,056	84
350 - 363	33	690 - 703	58	1,057 - 1,070	85
364 - 376	34	704 - 716	59	1,071 - 1,084	86
377 - 390	35	717 - 730	60	1,085 - 1,097	87
391 - 404	36	731 - 744	61	1,098 - 1,111	88
405 - 417	37	745 - 757	62	1,112 - 1,124	89
418 - 431	38	758 - 771	63	1,125 - 1,138	90
432 - 444	39	772 - 784	64	1,139 - 1,152	91
445 - 458	40	785 - 798	65	1,153 - 1,165	92
459 - 472	41	799 - 812	66	1,166 - 1,179	93
473 – 485	42	813 - 825	67	1,180 - 1,192	94
486 - 499	43	826 - 839	68	1,193 - 1,206	95
		840 - 852	69	1,207 - 1,220	96
		853 - 866	70	1,221 - 1,233	97
		867 - 880	71	1,234 - 1,249	98

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table G-4 given as a percentage of the results, assuming an acceptance probability of at least 0.95.

Table G-4

Number of test results of each characteristic	Qualifying limits shown as a percentage of results. Acceptable level of 1 % of non-compliance	Qualifying limits shown as a percentage of results. Acceptable level of 6.5 % of non-compliance
1,250	1.68	7.91
2,000	1.52	7.61
4,000	1.37	7.29
6,000	1.30	7.15
8,000	1.26	7.06
10,000	1.23	7.00
20,000	1.16	6.85
40,000	1.12	6.75
80,000	1.09	6.68
100,000	1.08	6.65
1,000,000	1.02	6.55

ANNEX H	
(See 4.3)	
MINIMUM REQUIREMENTS FOR SPOT CHECKS BY THE TESTING AGENCY	
H-1.	General
	The conformity requirements shall be considered satisfied from a photometric, geometrical, visual and electrical standpoint if the specified tolerances for production filament light sources in the relevant data sheet of Annex A and the relevant data sheet for the caps are met.
H-2.	The conformity of mass-produced filament light sources shall not be contested if the results are in agreement with Annex J to this standard.
H-3.	Conformity shall be contested and the manufacturer requested to make the production meet the requirements if the results are not in agreement with Annex J to this standard.
H-4.	If paragraph clause 3 of this annex is applied, a further sample of 250 filament light sources, selected at random from a recent production run, shall be taken within two months.

ANNEX J

(See H-2 and H-3)

COMPLIANCE APPROVED BY SPOT CHECK

Compliance approved or disapproved shall be decided according to the values in Table J-1. For each grouping of characteristics filament light sources shall be either accepted or rejected according to the values in Table 1 */.

Table J-1

	1 %**		6.5 %**	
	Accept	Reject	Accept	Reject
First sample size: 125	2	5	11	16
If the number of non-conforming units is greater than 2 (11) and less than 5 (16) take a second sample size of 125 and assess the 250	6	7	26	27

*/ The proposed scheme is designed to assess the compliance of filament light sources to an acceptance level of non-compliance of 1 per cent and 6.5 per cent respectively and is based on the Double Sampling Plan for Normal Inspection in IEC Publication 60410: Sampling Plans and Procedures for Inspection by Attributes.

**/ The filament light sources shall be inspected and test results recorded following the grouping of characteristics as listed in Annex G, Table G-1

Annex K

Method of measurement of electrical, photometrical and thermal characteristics of LED replacement light sources

LED replacement light sources shall be measured in still air at ambient temperature of (23 ± 2) °C, and at an additional ambient temperature if indicated in the relevant data sheet of Annex A.

1.0.	Luminous flux
1.1.	A luminous flux measurement using an integrating method shall be made after 1 minute and after 30 minutes of operation.
1.2.	The luminous flux values, as measured after 30 minutes shall comply with the minimum and maximum requirements.
	Additionally, unless otherwise specified on the data sheet
	(a) Either the luminous flux value measured after 30 minutes shall be in between 100 per cent and 80 per cent of the luminous flux value measured after 1 minute; or
	(b) The luminous flux value measured after 1 minute shall comply with the minimum and maximum requirements, and in addition the luminous flux value measured after 30 minutes shall not deviate by more than ± 20 per cent from the luminous flux value measured after 1 minute.
1.3.	Measurements have to be carried out at relevant test voltage and at the minimum and maximum values of the relevant voltage range. Unless specified more tightly on the data sheet the following deviation of the luminous flux at the tolerance interval limits shall not be exceeded.

Rated Voltage	Min. Voltage	Max Voltage
6	6.0	7.0
12	12.0	14.0
24	24.0	28.0
Corresponding luminous flux tolerance*	±30%	±15%

	*The maximum luminous flux deviation at the tolerance limits is calculated by using the measured flux at test voltage as reference. The luminous flux behaviour shall be substantially uniform within the voltage range specified in the table.
2.0	Normalized luminous intensity/ cumulative luminous flux
2.1.	The luminous intensity measurements shall be started after 30 minutes of operations.

2.2.	Measurements have to be carried out at relevant test voltage.
2.3.	Normalized luminous intensity of a test sample is calculated by dividing the luminous intensity distribution as measured under clause 2.1. and 2.2. of this annex by the luminous flux as determined under clause 1.2. of this annex
3.0	Colour The colour of the light emitted as measured under the conditions as described in clause 1.1. of this annex shall be within the required colour boundaries.
4.0	Power consumption
4.1.	A power consumption measurement shall be made under the same conditions as described in clause 1.1. of this annex using the requirements of clause 3.4.1.3. of this Standard.
4.2.	Power consumption measurements shall be carried out at relevant test voltage and test voltage range, if specified in the relevant data sheet of Annex A.
4.3.	Values obtained shall comply with the minimum and maximum requirements of the relevant data sheet.
5.0	Electrical current
5.1.	An electrical current measurement shall be made under the same conditions as described in clause 1.1. of this annex using the requirements of clause 3.4.1.3. of this Standard.
5.2.	Electrical current measurements shall be carried out at relevant test voltage and test voltage range, if specified in the relevant data sheet of Annex A.
5.3.	Values obtained shall comply with the minimum and maximum requirements of the relevant data sheet.
6.0	Cap temperature
6.1.	A cap temperature measurement shall be made under the same conditions as described in clause 1.1. of this annex.
6.2.	Measurements shall be carried out at relevant test voltage.
6.3.	The cap temperature shall be determined at the location indicated in the light source category data sheet.

ANNEX L

(See Introduction)

COMPOSITION OF AISC PANEL ON PROVISIONS CONCERNING THE APPROVAL OF FILAMENT LIGHT SOURCES FOR USE IN APPROVED LAMP OF POWER-DRIVEN VEHICLES AND THEIR TRAILERS*

Convener	
Mr. Feroz Ali Khan	SIAM (Hero MotoCorp Ltd.)
Members	Representing
Mr. B.V. Shamsundara	ARAI
Mrs. Jyoti Kirve	ARAI
Mr. Kamalesh Patil	ARAI
Dr. Madhusudan Joshi	ICAT
Representative From	CFMTTI
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Mr. Uday Harite	ACMA
Mr. P N Bhagwan	ACMA (Patodia Glass Ltd.)
Mr. Maydeo S	ACMA

* At the time of approval of this Automotive Industry Standard (AIS)

ANNEX M
(See Introduction)

COMMITTEE COMPOSITION *
Automotive Industry Standards Committee

Chairperson	
Dr. Reji Mathai	Director, The Automotive Research Association of India
Members	**Representing**
Representative from	Ministry of Road Transport and Highways
Representative from	Ministry of Heavy Industries
Representative from	Office of the Development Commissioner, MSME, Ministry of Micro, Small and Medium Enterprises
Shri Shrikant R. Marathe	Former Chairman, AISC
Head-TED	Bureau of Indian Standards
Director	Central Institute of Road Transport
Director	Global Automotive Research Centre
Director	International Centre for Automotive Technology
Director	Indian Institute of Petroleum
Director	National Automotive Test Tracks
Director	Vehicles Research and Development Establishment
Director	Indian Rubber Manufacturers Research Association
Representatives from	Society of Indian Automobile Manufacturers
Representatives from	Tractor and Mechanization Association
Representatives from	Automotive Components Manufacturers Association of India
Representative from	Indian Construction Equipment Manufactures' Association
Member Secretary	
Shri Vikram Tandon	The Automotive Research Association of India