

AUTOMOTIVE INDUSTRY STANDARD

DRAFT-D2

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

(Revision 2)

HMSI comments marked in **Green highlighted text**

BAL comments marked in **Blue highlighted text**

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INTRODUCTION

- 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 lamps 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 lamps 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 9** : Supplement 46 to the 03 series of amendments – Date of entry into force: 16 October 2018.
- 0.4 While preparing this standard attempts 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
AIS-010 (Part 5) Rev2:2021	Requirements of Chromaticity Co-ordinates of Colour of Light emitted from Lighting and Light-Signaling Devices
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 Analogue Electrical Measuring Instruments and their Accessories.
IEC Publication 15.2 Colorimetry, 1986.	CIE Recommendation on Colorimetry, 2 nd edition.

- 0.6 The AISC responsible for formulation of this standard is given in Annex ##
- 0.7 The Automotive Industry Standards Committee (AISC) responsible for approval of this standard in Annex ##

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

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**CHECKLIST FOR PREPARING AUTOMOTIVE INDUSTRY STANDARD
Draft AIS-34(Part1) (Rev.2)**

**Provisions concerning the Approval of Retro-Reflecting Devices for
Power Driven Vehicles and their Trailers**

SR. NO.	PARTICULARS	REMARKS
1.	Indicate details of the base reference standard. (eg. ECE / EEC Directive/GTR etc.)	ECE Regulation No.37 - Revision 8.7 Amend 9: Supplement 46 to the 03 series of amendments – Date of entry into force: 16 th October 2018
2.	Add an explanatory note indicating differences between the above standard and the draft, if any.	
3.	Specify details of technical specifications to be submitted at the time of type approval relevant to the requirements of this standard covered.	
4.	Are the details of Worst Case Criteria covered?	
5.	Are the performance requirements covered?	
6.	Is there a need to specify dimensional requirements?	
7.	If yes, are they covered?	
8.	Is there a need to specify COP requirements? If yes, are they covered?	
9.	Is there a need to specify type approval, and routine test separately, as in the case of some of the Indian Standards? If yes, are they covered?	
10.	If the standard is for a part/component or sub-system; i) AIS-037 or ISI marking scheme be implemented for this part? ii) Are there any requirements to be covered for this part when fitted on the vehicle? If yes, has a separate standard been prepared?	

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11.	If the standard is intended for replacing or revising an already notified standard, are transitory provisions for re-certification of already certified parts/vehicles by comparing the previous test result, certain additional test, etc. required? If yes, are they included?	
12.	Include details of any other international or foreign national standards which could be considered as alternate standard.	
13.	Are the details of accuracy and least counts of test equipment/meters required to be specified? If yes, have they been included?	
14.	What are the test equipment for establishing compliance?	
15.	If possible, identify such facilities available in India.	
16.	Are there any points on which special comments or information is to be invited from members? If yes, are they identified?	
17.	Does the scope of standard clearly identify vehicle categories?	
18.	Has the clarity of definitions been examined?	

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

1. SCOPE

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

2. 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 standardised filament-light sources. Each category has a specific designation, as for example: "H4", "P21W", "T4W", "PY21W" or "RR10W".

2.1.2. Definition of "type"

Filament light sources of different "types" are filament light sources within the same category which differ in such essential respects as:

2.1.2.1. 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.

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

2.1.2.3. Bulb colour

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;

2.1.2.4. Rated voltage;

2.1.2.5. Halogen.

2.2. Application for approval

2.2.1. Information to be submitted at the time of applying for type approval of the filament light source shall be as given in Annex B.

2.2.2. Reserved

2.2.2.1. Reserved

- 2.2.2.2. Reserved
- 2.2.2.3. Five samples of each colour which has been applied for;
- 2.2.3. In the case of a type of filament light source differing only by the trade name or mark from a type 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) with 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. Reserved
- 2.3. **Inscriptions**
 - 2.3.1. Filament light source submitted for approval shall bear on the cap or bulb:

Note: In the latter case, the luminous characteristics shall not be adversely affected.

 - 2.3.1.1. The trade name or mark of the filament light source manufacturer;
 - 2.3.1.2. The rated voltage. However, for filament light source for which only a 12 V type is standardised and the maximum allowed bulb diameter of which does not exceed 7.5 mm, the rated voltage need not be marked;
 - 2.3.1.3. The designation of the relevant category. The wattage character "W" of this designation need not be marked when the maximum allowed bulb diameter of the filament light source type does not exceed 7.5 mm;
 - 2.3.1.4. The rated wattage (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. A space of sufficient size to accommodate the approval mark.
 - 2.3.2. The space mentioned in 2.3.1.5. 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. Inscriptions other than those covered by 2.3.1. and 2.4.3. may be affixed, on the condition that they do not adversely affect the luminous characteristics.

Note : On the prototype for type approval, the markings may be provided by suitable temporary methods and need not necessary be obtained from the tools used for series production.

2.4. Approval

- 2.4.1. If all samples of a type of filament light source which are submitted in pursuance of 2.2.2.3. or 2.2.3.2. above meet the requirements of this standard, approval shall be granted.
- 2.4.2. If the applicant so desires, the same approval code may be assigned to the filament light source emitting white light and to the filament light source emitting selective-yellow light (see para. 2.1.2.3).
- 2.4.3. To every filament light source conforming to a type approved under this standard, there shall be affixed in the space referred to in 2.3.1.5., 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. and 2.4.3. shall be clearly legible and be indelible
- 2.4.6. Reserved

3. 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;**
- 3.1.3. **Test voltage:** **The voltage, at the input terminals of filament light source terminals 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 supplied with current at its test voltages is energized at specified test voltage(s);**
- 3.1.5. **Standard (étalon) filament light source:** **a filament light source emitting white or amber or red light with reduced dimensional tolerances, used for the photometric testing of lighting and light-signalling devices. Standard filament light sources are specified in only one voltage rating for each category; 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:** **specified luminous flux of a standard filament light source to which the optical characteristics of a lighting device shall be referred 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 (filament lamp):** a light source where the **only** element for visible radiation is one or more **heated** 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;

3.2. **General specifications**

- 3.2.1. Each sample submitted shall conform to the relevant specifications of this standard.
- 3.2.2. Filament 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 lamp 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.

3.3. **Manufacture**

- 3.3.1. Filament light sources bulbs shall exhibit no scores or spots which might impair their efficiency and their optical performance.
- 3.3.2. Filament light sources shall be equipped with standard caps complying with the cap data sheets of IEC Publication 60061, third edition, as specified on the individual data sheets of Annex A.
- 3.3.3. The cap shall be strong and firmly secured to the bulb.
- 3.3.4. To ascertain whether filament light sources conform to the requirements of 3.3.1.to 3.3.3. above, a visual inspection, a dimension check and, where necessary, a trial fitting shall be carried out.

3.4. **Tests**

- 3.4.1. Filament light sources shall first be aged at their test voltage for approximately one hour. For dual-filament lamps, each filament shall be aged separately. In the case of filament lamps, 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 lamp 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., 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-010 (Part 5)(Rev.2). 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. (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 4.4.2 of IEC publication 60809, Edition 3.

3.7. UV radiation

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

$$k1 = \frac{\int_{\lambda=315 \text{ nm}}^{400 \text{ nm}} E_e(\lambda) \cdot d\lambda}{k_m \cdot \int_{\lambda=380 \text{ nm}}^{780 \text{ nm}} E_e(\lambda) \cdot V(\lambda) \cdot d\lambda} \leq 2 \cdot 10^{-4} \text{ W/lm}$$

$$\int_{\lambda=250 \text{ nm}}^{315 \text{ nm}} E_e(\lambda) \cdot d\lambda$$

$$k_2 = \frac{\int_{\lambda=380 \text{ nm}}^{780 \text{ nm}} E_e(\lambda) \cdot V(\lambda) \cdot d\lambda}{k_m} \leq 2 \cdot 10^{-6} \text{ W/lm}$$

where:

- $E_e(\lambda)$ (W/nm) is the spectral distribution of the radiant flux;
- $V(\lambda)$ (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.

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).

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.

4. CONFORMITY OF PRODUCTION

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

- 4.1. Filament 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 3, Annex A and Annex D to this standard.
- 4.2. The minimum requirements for quality procedures set fourth in Annex F to this standard shall be complied with.
- 4.3. The minimum requirements for spot checks by testing agency are set forth in Annex H to this standard shall be complied with.
- 4.4. The normal frequency of these verifications shall be once every two years.

5. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 5.1. Penalties of non-conformity of production shall be as specified in AIS-037.
- 5.2. Reserved.
- 6. Reserved.
- 7. Reserved.

8. TRANSITIONAL PROVISIONS

8.1 At the request of the applicant, type approvals for compliance to AIS-034 (Part 1) (Rev.2):2021, shall be granted by testing agencies from DATE MONTH YEAR (date of adoption in CMVR-TSC). Such type approvals shall be deemed to be compliance to AIS-034: (Rev 1):2010.

8.2 At the request of applicant, type approval to the compliance to AIS-034:(Rev1):2010 shall be granted up to the notified date of implementation of AIS-034 (Part 1) (Rev.2):2021.

8.3 Subject to the provisions of 8.6, type approvals issued for compliance to AIS-034(part) (rev1):2010 shall be extended to approval of AIS-034 (Part 1) (Rev2):2021subject to satisfactory compliance of the following:

8.3.1 ~~Filament lamps light sources for use in lighting and light signalling devices as specified in Annex K. Verification as per clause 3.6~~

Note : Additional verification for the above need not be carried out, if compliance to the above requirements has already been established during the type approval as per AIS-034:~~2004 (Rev 1):2010.~~

8.3.2 In case of “E/e” approved devices, requirements specified in 10.

~~**Note :** Additional verification for the above need not be carried out, if compliance to the above requirements has already been established during the type approval as per AIS-034:2004 (Rev 1):2010.~~

8.4 Extension of Approvals for engineering and administrative changes:

8.4.1 In the case of 8.1, extensions shall be granted subject to the conditions of AIS-034 (Part 1) (Rev.2):2021. Such extensions shall be deemed to be compliance to AIS-034: (Rev 1):2010.

8.4.2 In the case of 8.2, extensions shall be granted subject to conditions of AIS-034: (Rev 1):2010 till the notified date of implementation of AIS-034 (Part 1) (Rev.2):2021.

8.5 Type approvals for compliance to AIS-037, already been granted, shall continue to be valid for AIS-034 (Part 1) (Rev.2):2021.

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.

8.6 Filament light sources of category R10/5W shall not be permitted for use in vehicles manufactured on and after 18 months from the notified date of implementation of AIS-034 (Part 1) (Rev.2):2021.

9. EXTENSION OF TYPE APPROVAL

- 9.1 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,

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

- 9.1.2 Any further verification is required to establish compliance.

- 9.2 For considering whether testing is required or not, guidelines given in 9.5 (Criteria for Extension of Approval) shall be used.

- 9.3 In case of 9.1.2, tests for only those parameters which are affected by the modifications need be carried out

- 9.4 In case of fulfillment of criterion of 9.1.1 or after results of further verification as per 9.1.2 are satisfactory, the approval of compliance shall be extended for the changes carried out.

9.5 **Criteria for extension of approval**

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

10 ESTABLISHING COMPLIANCE OF “E”/”e” APPROVED FILAMENT LIGHT SOURCES TO THIS STANDARDS

- 10.1 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.

11 AMENDMENTS TO ECE REGULATIONS AFTER THE LEVEL DESCRIBED IN 0.3 OF FOREWORD

11.1 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 amendment /revision.

11.2 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.

- 11.3 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. [Justification: As agreed in panel, to take care of approval as per new UN Regulations for devices and light sources]

ANNEX A

(See 1.)

SHEETS */ FOR FILAMENT LIGHT SOURCES

List of categories of filament light sources, grouped and their sheet numbers:

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

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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
HS2^{*6/}	HS2/1 to 3
HS5 ^{*4/}	HS5/1 to 4
HS5A^{*4/}	HS5A/1 to 3
PSX24W ^{*2}	P24W/1 to 3
PSX26W ^{*2}	PSX26W/1 to 3
PX24W^{*2}	P24W/1 to 3
S2 ^{*6/}	S1/S2/1 to 2

Group 2

Only for use in signalling **lamps light sources**, cornering **lamps light sources**, reversing **lamps light sources** and rear registration plate **lamps light sources**:

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
P24W	P24W/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
R10/5W*9	R10/5W/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

For replacement purposes only (see transitional provisions in 8.6)

Category	Sheet number(s)
C5W *7, *8	C5W/1
C21W *8	C21W/1 to 2
H1 *7	H1/1 to 3
H3 *7	H3/1 to 4
H12	H12/1 to 3
H13A	H13/1 to 4
H14	H14/1 to 4
HB3A	HB3/1 to 4
HB4A	HB4/1 to 4
HIR1 *3	HIR1/1 to 3
HS1 *7	HS1/1 to 5
HS2 *7	HS2/1 to 3
HS5A *5	HS5A/1 to 3
HS6 *4	HS6/1 to 4
P19W *8	P19W/1 to 3
P21W *7, *8	P21W/1 to 2
P24W *8	P24W/1 to 3
P21/5W *7, *8	P21/5W/1 to 3
PC16W *8	PC16W/1 to 3
PCR16W *8	PC16W/1 to 3
PCY16W *8	PC16W/1 to 3
PR19W *8	P19W/1 to 3
PR21/4W *8	PR21/4W/1; (P21/5W/2 to 3)
PR24W *8	P24W/1 to 3
PR27/7W *8/	PR27/7W/1; (P27/7W/2 to 3)
PSR19W *8/	P19W/1 to 3
PSR24W *8/	P24W/1 to 3
PX24W *2	P24W/1 to 3
PY19W *8/	P19W/1 to 3
R2	R2/1 to 3
R5W *7, *8	R5W/1
R10W *7, *8	R10W/1
RY10W *7, *8	R10W/1
S1	S1/S2/1 to 2
S2 *7	S1/S2/1 to 2
S3	S3/1

T1.4W ^{*8}	T1.4w/1
T4W ^{*7, *8}	T4W/1
W3W ^{*7, *8}	W3W/1
W5W ^{*7, *8}	W5W/1
W10W ^{*7, *8}	W10W/1
WP21W ^{*8}	WP21W/1 to 2
<hr/>	
WPY21W ^{*8}	WP21W/1 to 2
WY2.3W ^{*8}	WY2.3W/1
WY5W ^{*7, *8}	W5W/1
WY10W ^{*7, *8}	W10W/1

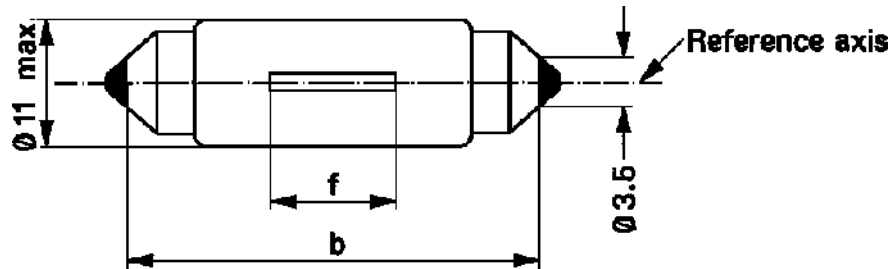
- * Tables, Electrical and Photometric characteristics:
Voltage is expressed in V;
Wattage is expressed in W;
Luminous flux is expressed in lm.
In a case that for a category of filament light source more than one value of reference luminous flux is specified, the value at approximately 12 V for approval 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. 2)]
- *4 Not for use in [AIS-010 (Part 1) (Rev. 2)] headlamps.
- *5 Not for use in headlamps other than [AIS-010(Part 2) Rev2] Class C 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 see transitional provisions in 8.6 for R10/5W

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

Sheet number(s)	Page Nos.
C5W/1	[TBF In DF version]
C21W/1 to 2	
H1/1 to 3	
H3/1 to 4	
H4/1 to 5	
H7/1 to 4	
H8/1 to 4	
H9/1 to 4	
H10/1 to 3	
H11/1 to 4	
H12/1 to 3	
H13/1 to 4	
H14/1 to 4	
H15/1 to 5	
H16/1 to 4	
H17/1 to 6	
H18/1 to 4	
H19/1 to 5	
H20/1 to 4	
H6W/1	
H10W/1 to 2	
H21W/1 to 2	
H27W/1 to 3	
HB3/1 to 4	
HB4/1 to 4	
HIR1/1 to 3	
HIR2/1 to 3	
HS1/1 to 5	
HS2/1 to 3	
HS5/1 to 4	
HS5A/1 to 3	
HS6/1 to 4	
P13W/1 to 3	
P19W/1 to 3	
P21W/1 to 2	
P21/4W/1	
P21/5W/1 to 3	
P24W/1 to 3	
P27W/1 to 2	
P27/7W/1 to 3	
PC16W/1 to 3	
PR21W/1	
PR21/4W/1	
PR21/5W/1	
PR27/7W/1	
PSX26W/1 to 3	
PY21W/1	
PY21/5W/1 to 3	
PY27/7W/1	
R2/1 to 3	

R5W/1
R10W/1
S1/S2/1 to 2

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

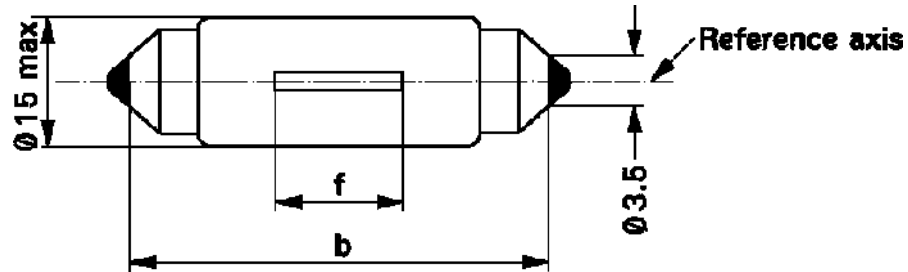


Dimensions in mm		Filament light sources of normal production			Standard filament light source	
		min.	nom.	max.		
b ^{1/}		34.0	35.0	36.0	35.0 ± 0.5	
f ^{2/ 3/}		7.5 ^{4/}		15 ^{5/}	9	±
Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4)						
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS						
Rated values		Vol	6	12	24	12
		Wat	5			5
Test voltage		Vol	6.75	13.5	28.0	13.
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.

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

Filament light source for reversing lamp only

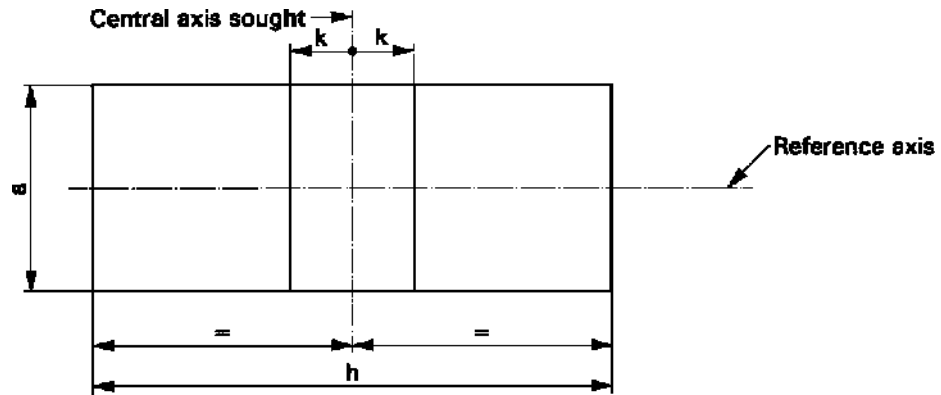


Dimensions in mm	Filament light sources of normal production			Standard filament light source	
	min.	nom.	max.		
b ^{1/}	40.0	41.0	42.0	41.0 ± 0.5	
f ^{2/}	7.5		10.5	8	±
Cap SV8.5 in accordance with IEC Publication 60061 (sheet 7004-81-4)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Vol	12			12
	Wat	21			21
Test voltage	Vol	13.5			13.
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.

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.



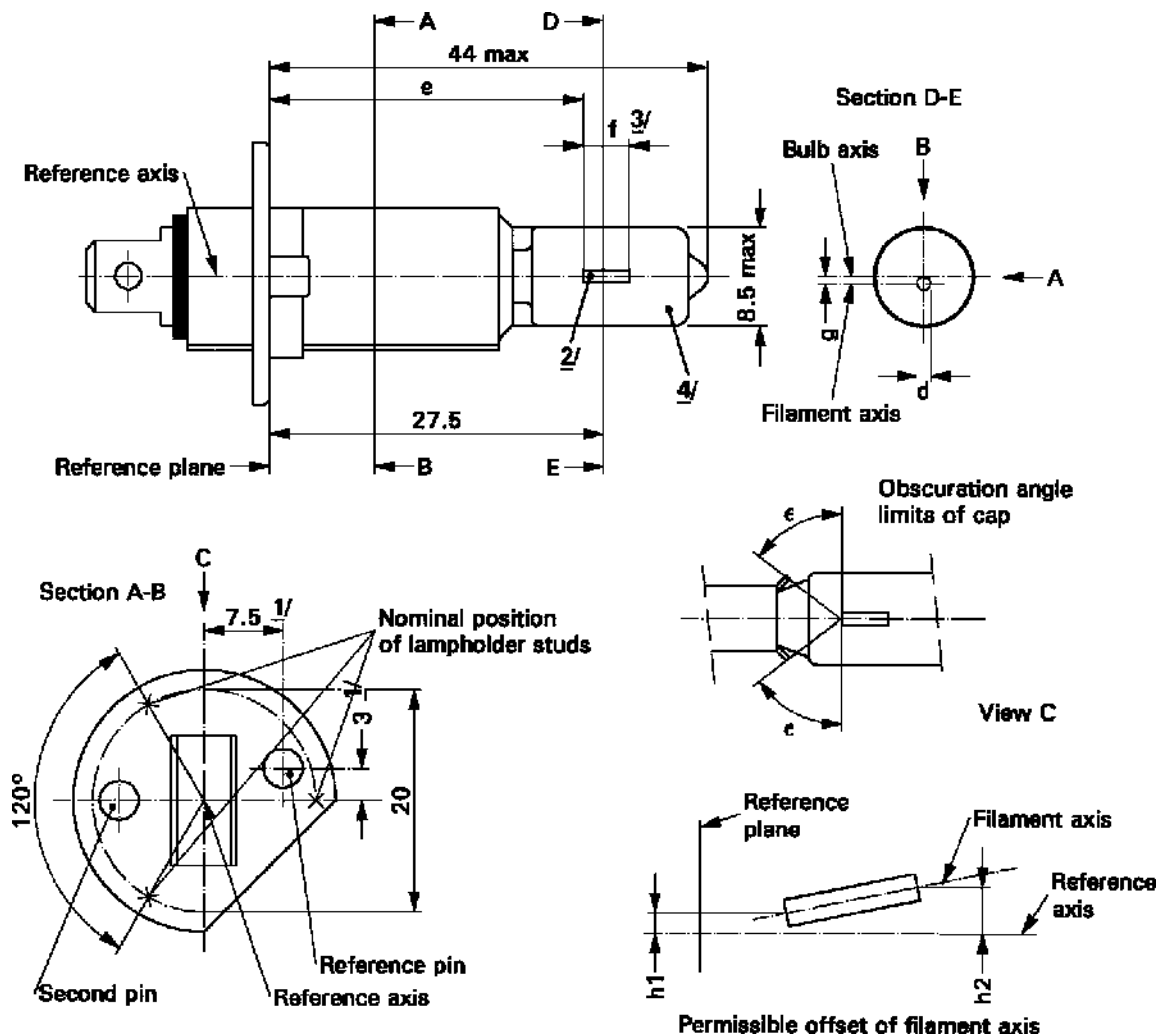
12 V	a	h	k
filament light sources of normal production	4.0 + d	14.5	2.0
standard filament light source	2.0 + d	14.5	0.5

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 lamp 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.

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

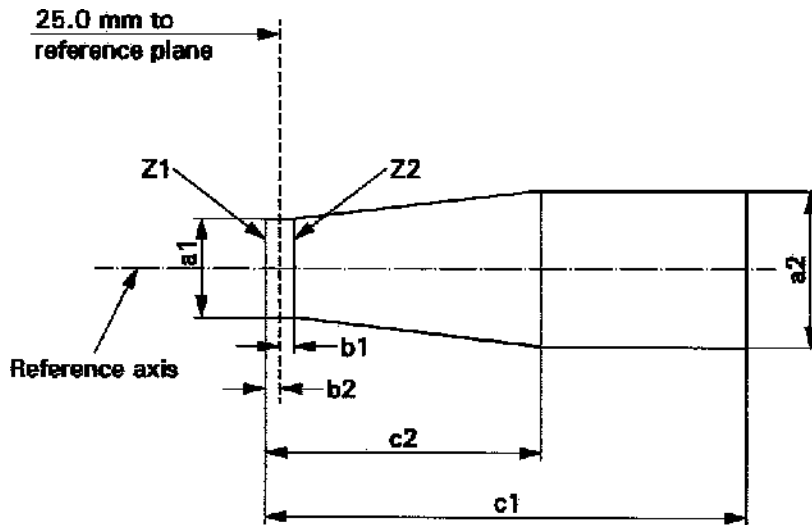
Sheet H1/2

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).

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

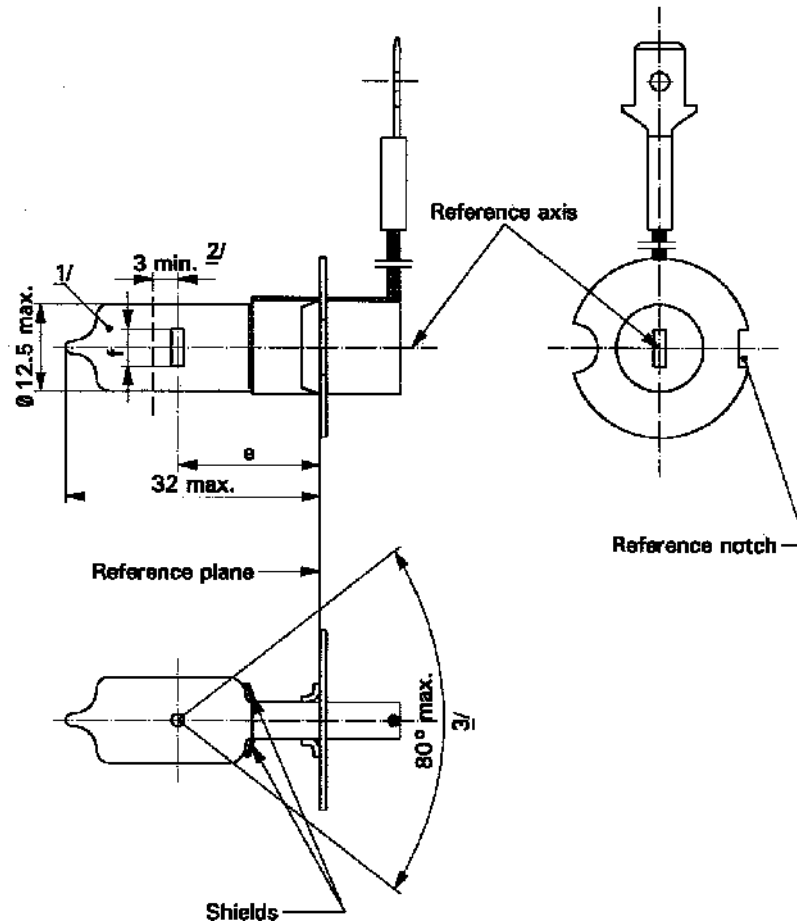
d = diameter of filament.

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

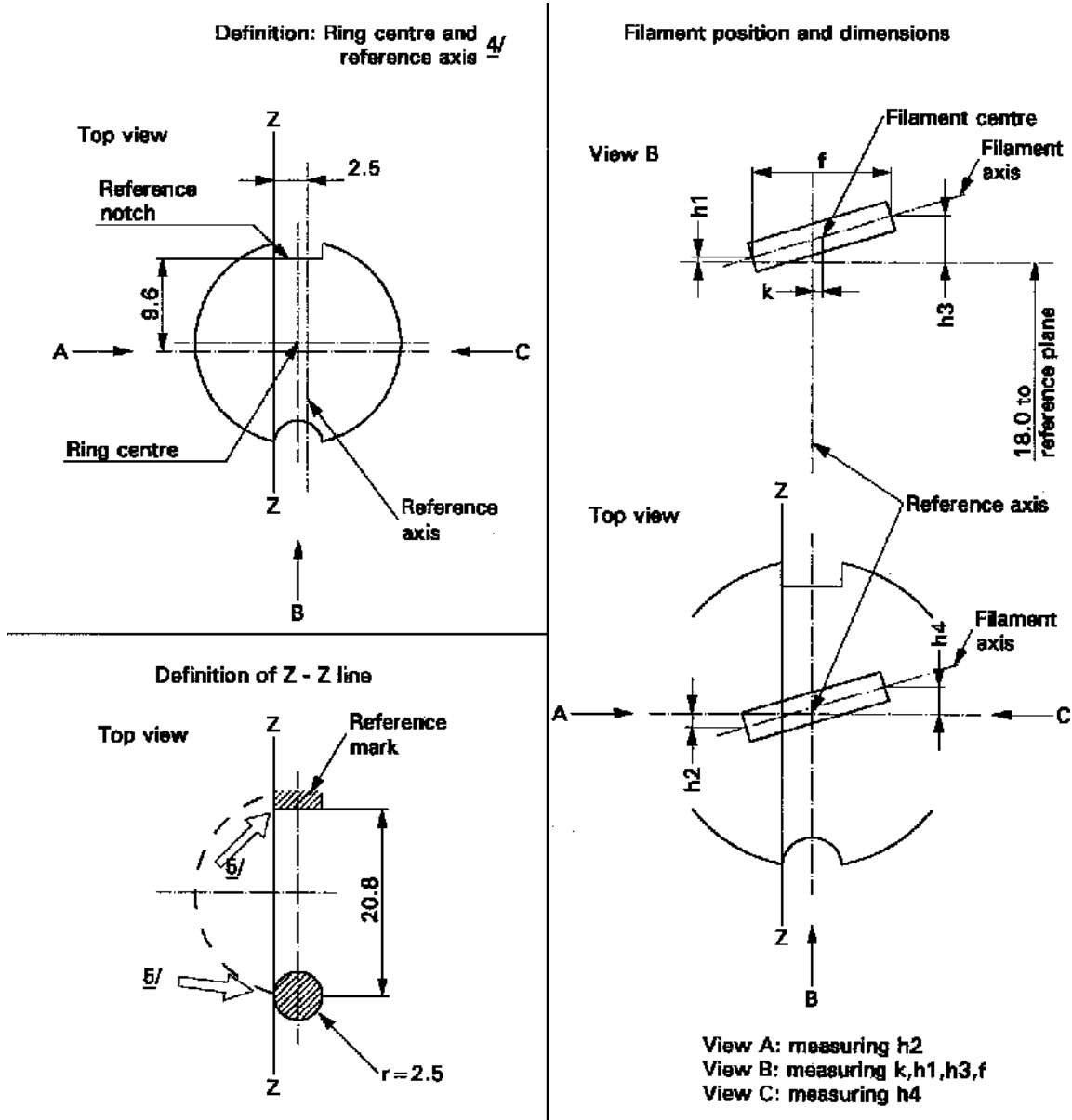
The filament shall lie entirely within the limits shown.

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

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° .



- 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

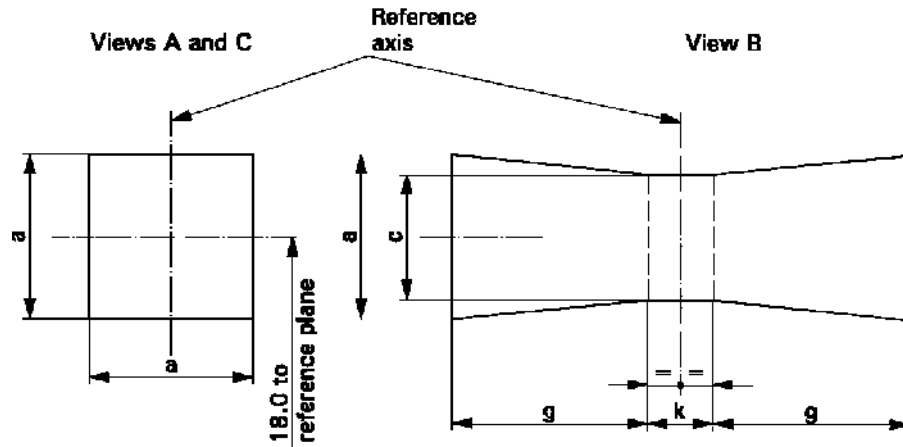
Sheet H3/3

Dimensions in mm	Filaments light sources of normal production			Standard filament light source	
	6 V	12 V		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).

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.

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

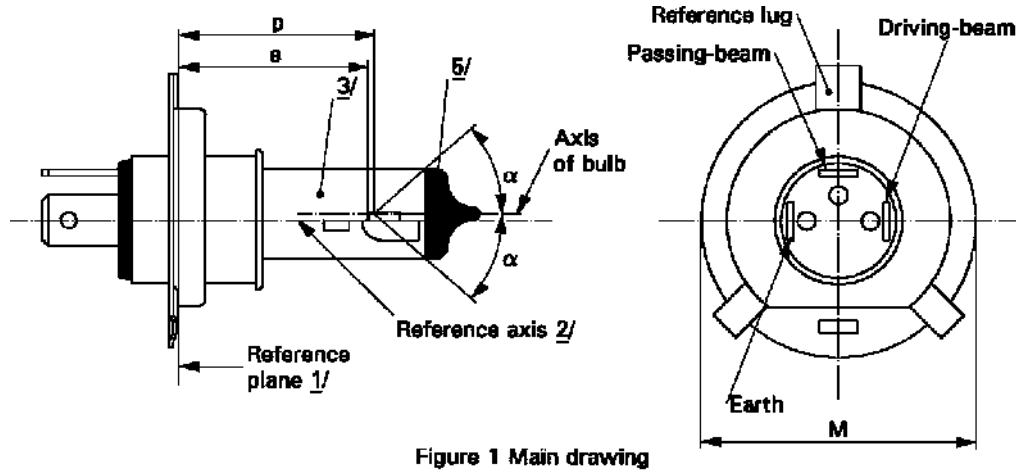


Figure 1 Main drawing

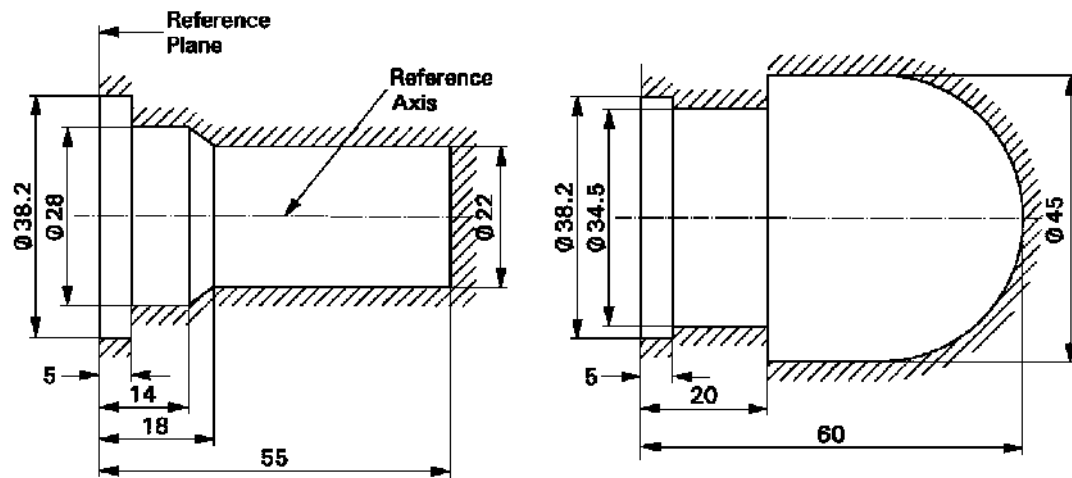


Figure 2

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.

CATEGORY H4

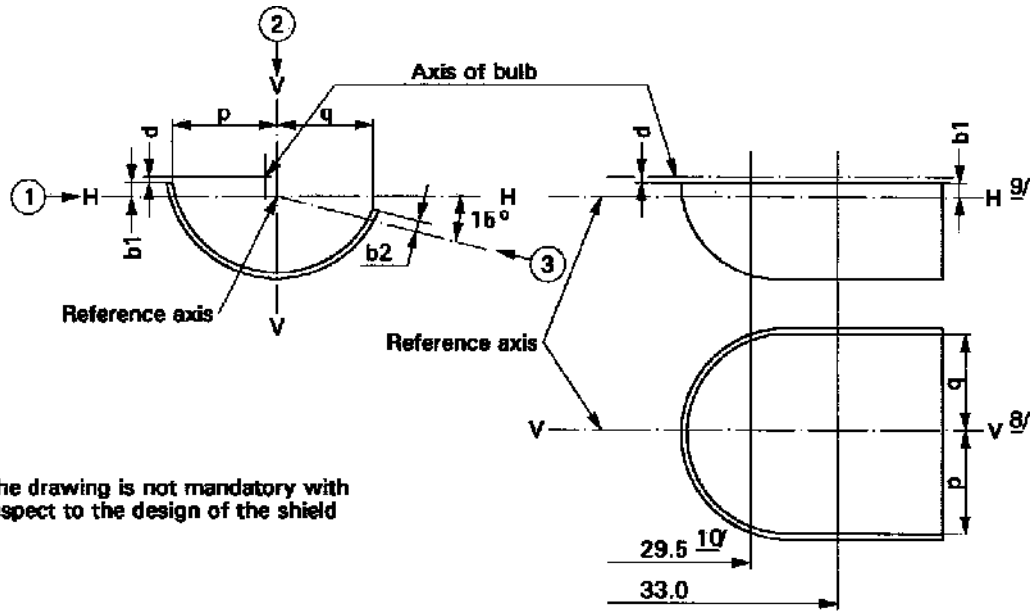
Sheet H4/2

Dimensions in mm	Filament light sources of normal production						Standard filament light source	
		12 V		24 V		12 V		
e	28.5 +0.35/-0.25		29.0 ± 0.35		28.5 + 0.20/-0.00			
p	28.95		29.25		28.95			
α	max. 40°						max. 40°	
Cap P43t in accordance with IEC Publication 60061 (sheet 7004-39-6)								
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS								
Rated values	Vol	12 ^{6/}		24 ^{6/}		12 ^{6/}		
	Wat	60	55	75	70	60	55	
Test voltage	Vol	13.2		28.0		13.2		
Objective values	Watts	75 max.	68 max.	85 max.	80 max.	75	68 max.	
	Luminous flux ± %	1,650	1,000	1,900	1,200			
15								
Measuring flux ^{7/} lm		-	750	-	800			
Reference luminous flux at approximately				12 V	1,250	750		
				13.2 V	1,650	1,000		

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.

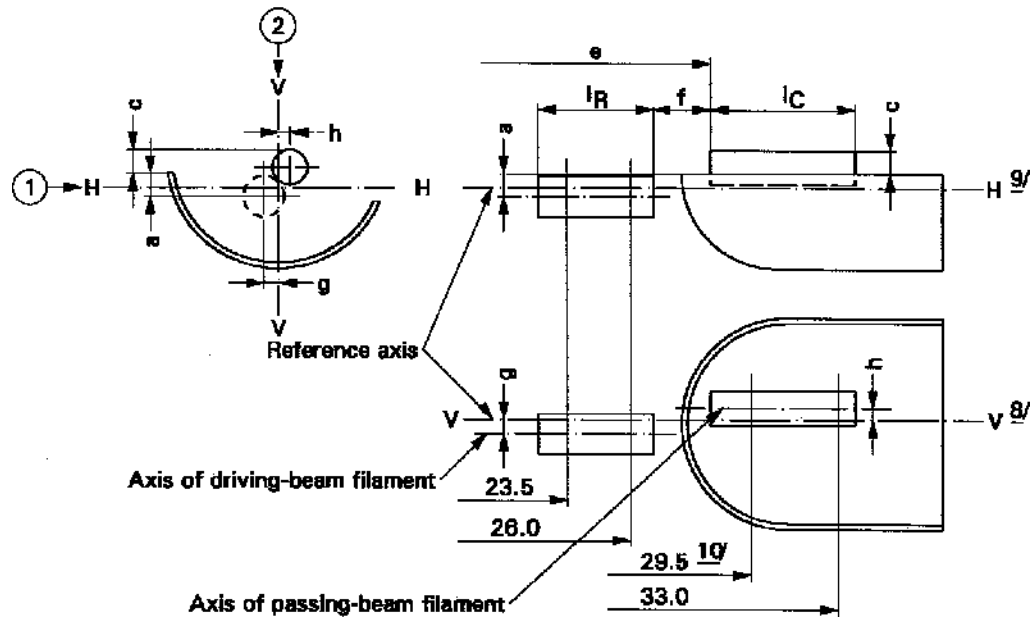
7/ Measuring luminous flux for measuring according to 3.9. of this standard to the provisions for filament light sources with an internal shield to produce the cut-off.

Position of shield



The drawing is not mandatory with respect to the design of the shield

Position of filaments



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 sources
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 mv	b1/30.0 mv	± 0.30	± 0.35	± 0.15
b2/29.5	30.0	0		± 0.30	± 0.35	± 0.20
b2/33		b2/29.5 mv	b2/30.0 mv	± 0.30	± 0.35	± 0.15
c/29.5	30.0	0.6	0.75	± 0.35		± 0.20
c/33		c/29.5 mv	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 mv	h/30.0 mv	± 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.

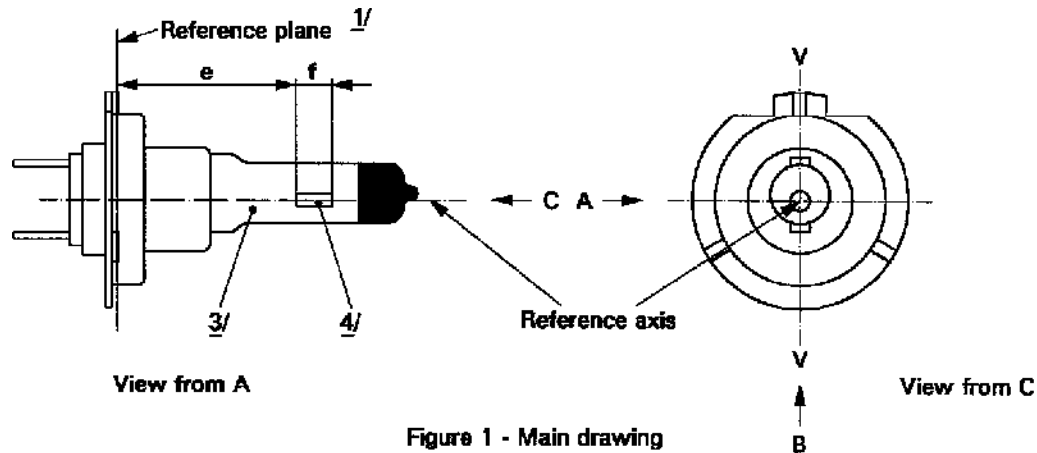


Figure 1 - Main drawing

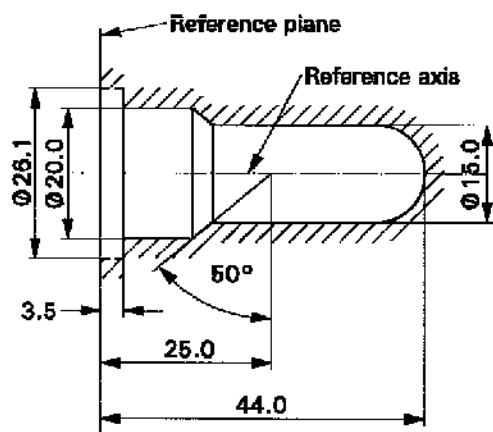


Figure 2 - Maximum lamp outline 5/

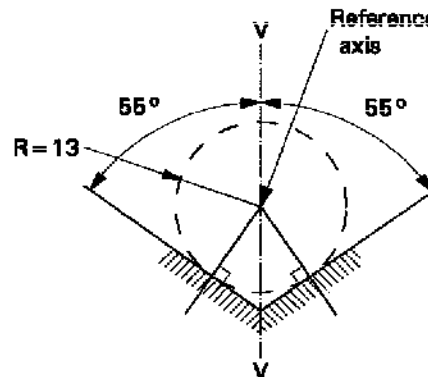
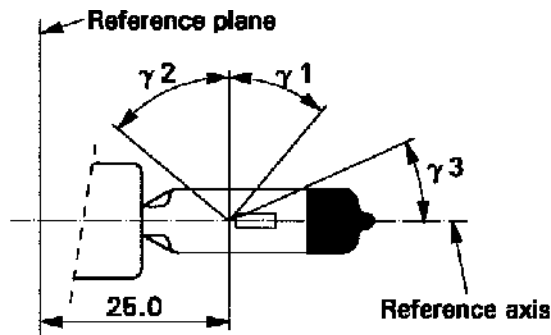


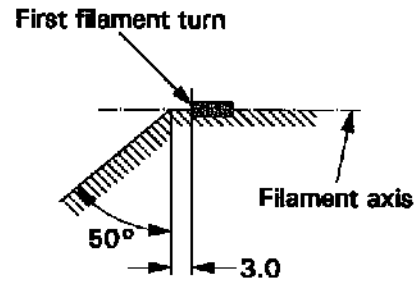
Figure 3 - Definition of reference axis 2/

- 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.



View from B

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



View from A

Figure 5
Metal free zone 8/

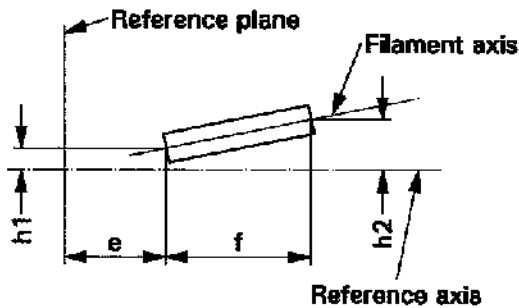


Figure 6
Permissible offset of filament axis
(for standard filament lamps only)

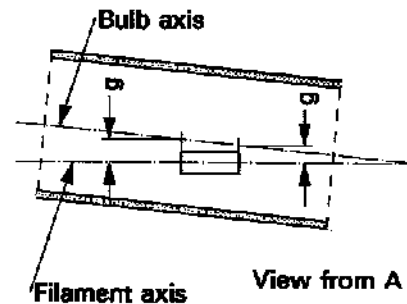


Figure 7
Bulb eccentricity

- 6/ Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 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 γ_3 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.	
γ2	50° min.		50° min.	
γ3	30° min.		30° min.	
Cap PX26d in accordance with IEC Publication 60061 (sheet 7004-5-7)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Vol	12	24	12
	Wat	55	70	55
Test voltage	Vol	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.

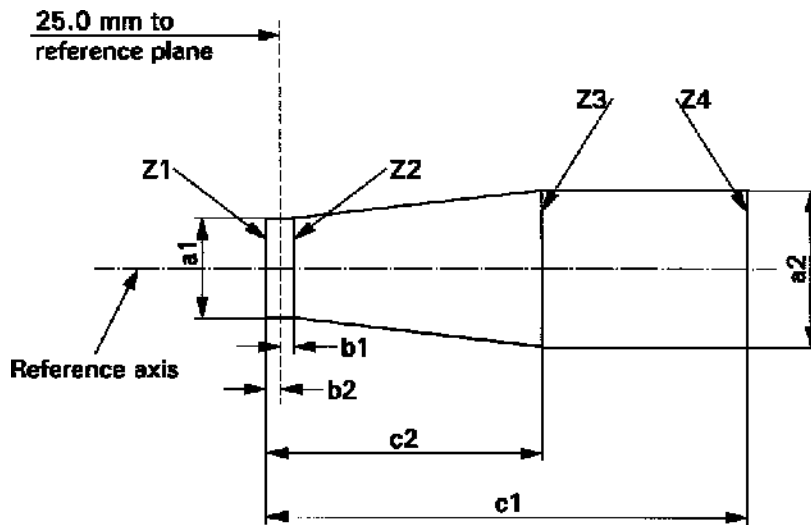
11/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in Figure 1 in sheet H7/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament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

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

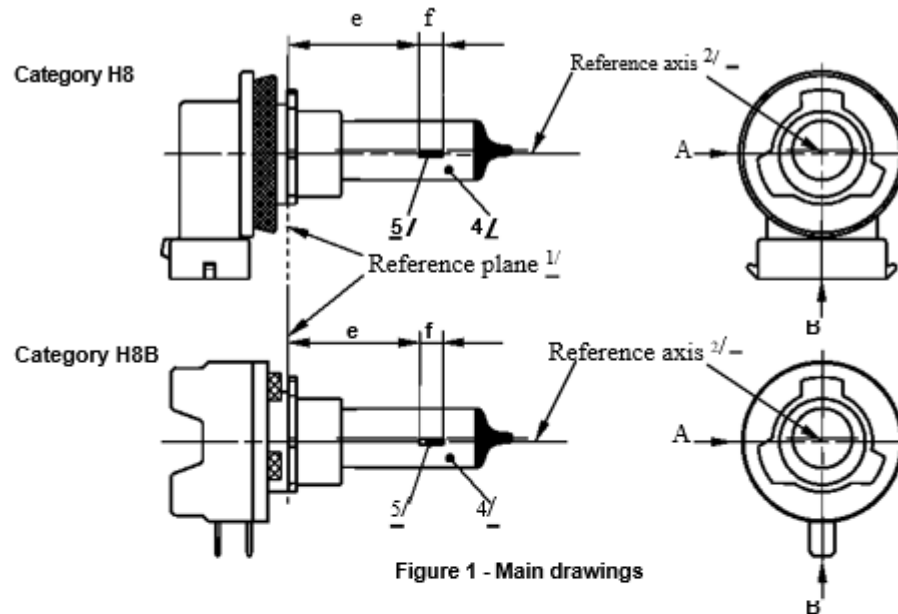
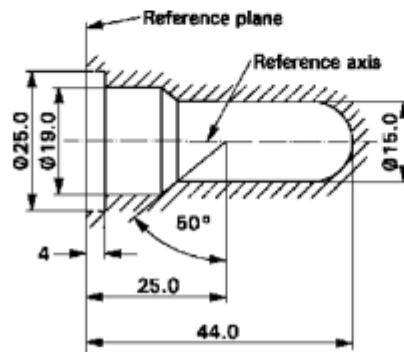
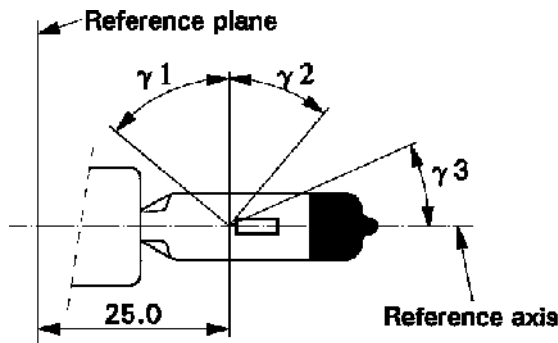


Figure 1 - Main drawings

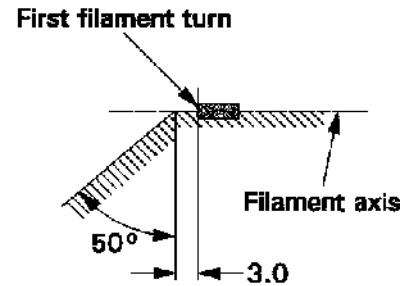
Figure 2 Maximum light source outline ^{3/}

- 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.



View B

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



View A

Figure 4
Metal free zone 8/

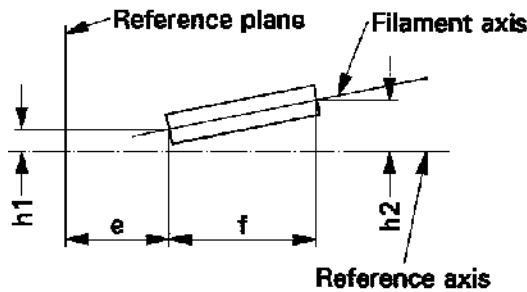
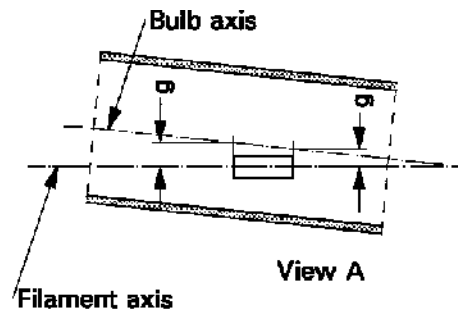


Figure 5
Permissible offset of filament axis 9/
(for standard filament lamps only)



View A

Figure 6
Bulb eccentricity 10/

- 6/ Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 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 γ_3 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

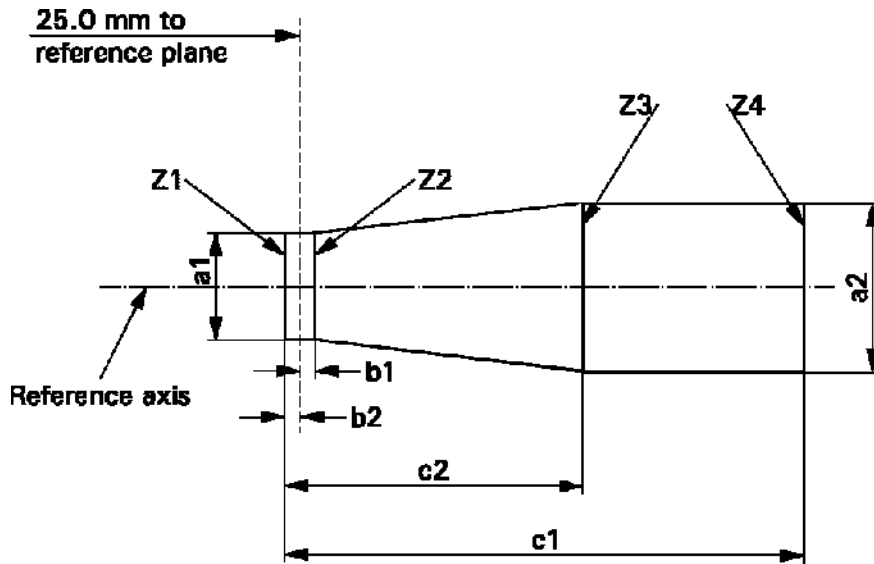
Dimensions in mm	Filaments light sources of normal production	Standard filament light sources	
	12 V	12 V	
e ^{11/}	25.0 ^{12/}	25.0 ± 0.1	
f ^{11/}	3.7 ^{12/}	3.7 ± 0.1	
g	0.5 min.	u.c.	
h1	0 ^{12/}	0 ± 0.1	
h2	0 ^{12/}	0 ± 0.15	
γ1	50° min.	50° min.	
γ2	40° min.	40° min.	
γ3	30° min.	30° min.	
Cap: H8: PGJ19-1 in accordance with IEC Publication 60061 (sheet 7004-110-2) H8B: PGJY19-1 in accordance with IEC Publication 60061 (sheet 7004-146-1)			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Volt	12	12
	Wat	35	35
Test voltage	Volt	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.

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

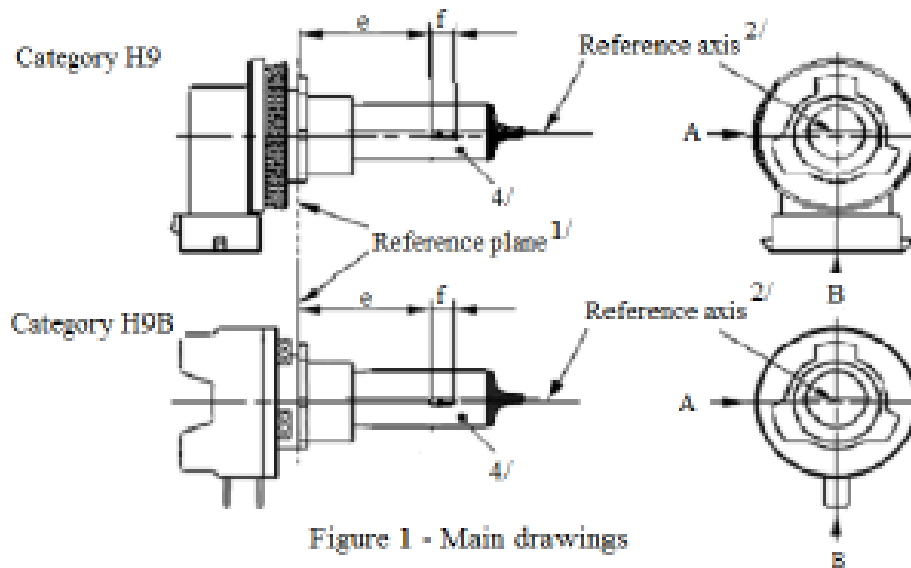


Figure 1 - Main drawings

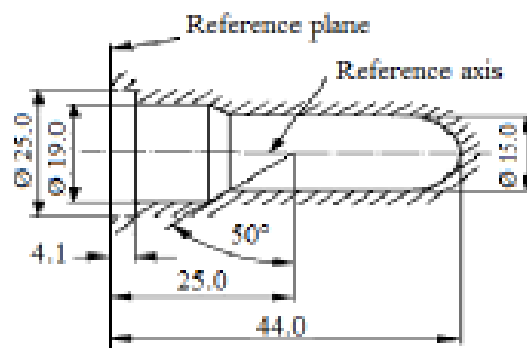


Figure 2 - Maximum lamp outline ^{3/}

- 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.

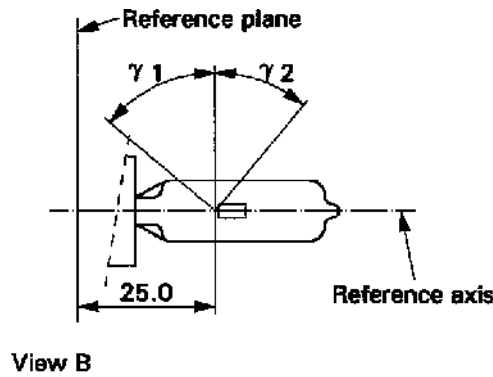


Figure 3
Distortion free area 5/

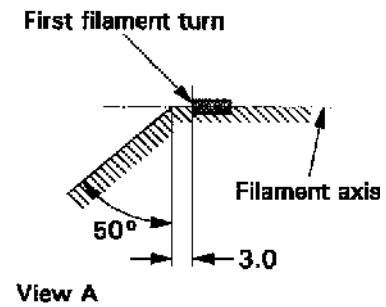


Figure 4
Metal free zone 6/

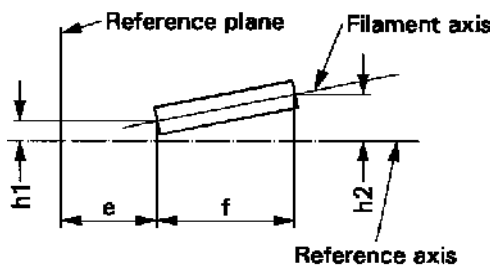


Figure 5
Permissible offset of filament axis 7/
(for standard filament lamps only)

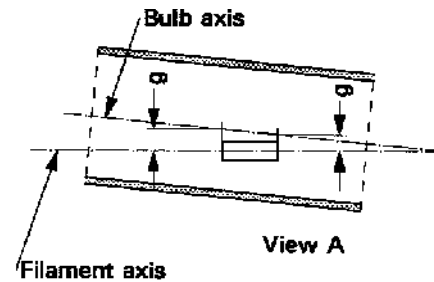


Figure 6
Bulb eccentricity 8/

- 5/ Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 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.

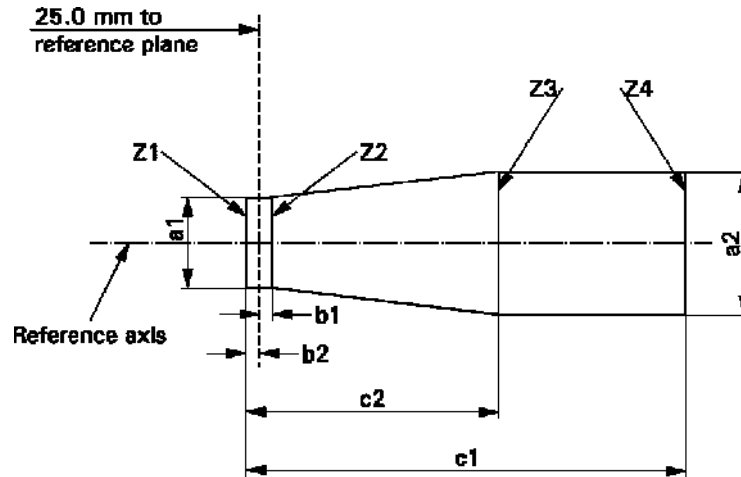
10/ The ends of the filament are defined as the points where, when the viewing direction is as defined in note 9/ above, the projection of the outside of the end turns crosses the filament axis.

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.

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.

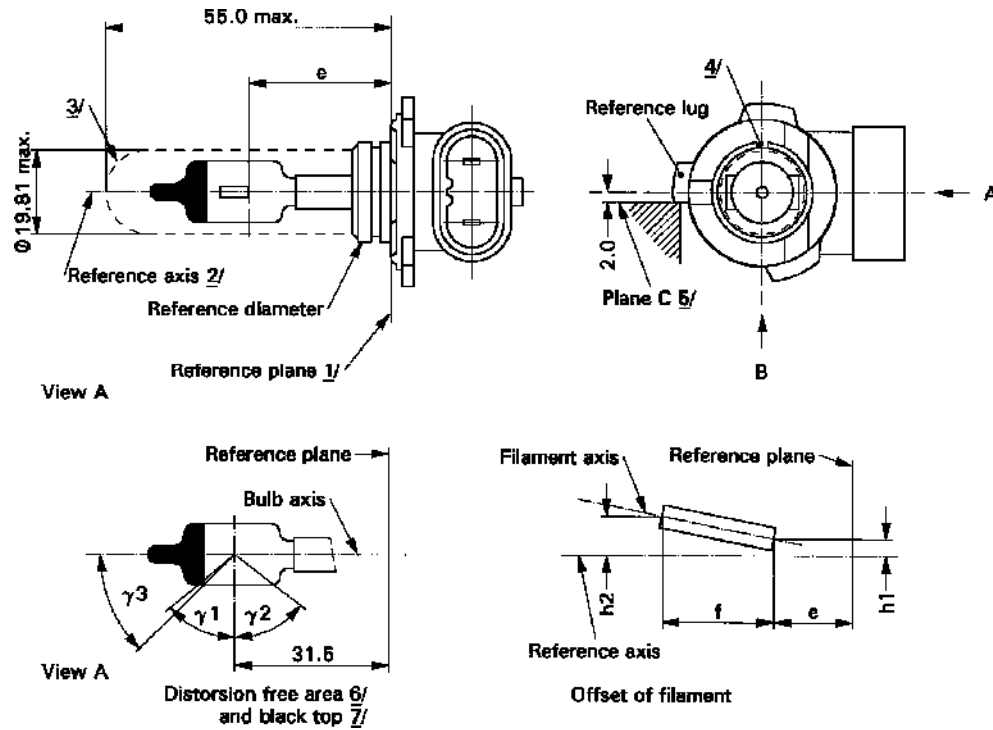
The filament shall lie entirely within the limits shown.

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.

CATEGORY H10

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 ' γ_1 ' and ' γ_2 '. This requirement applies to the whole bulb circumference within the angles ' γ_1 ' and ' γ_2 ' and does not need to be verified in the area covered by the obscuration.
- 7/ The obscuration shall extend to at least angle ' γ_3 ' and shall be at least as far as the undistorted part of the bulb defined by angle ' γ_1 '.

CATEGORY H10

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.	-	-
γ2	52° min.	-	-
γ3	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.

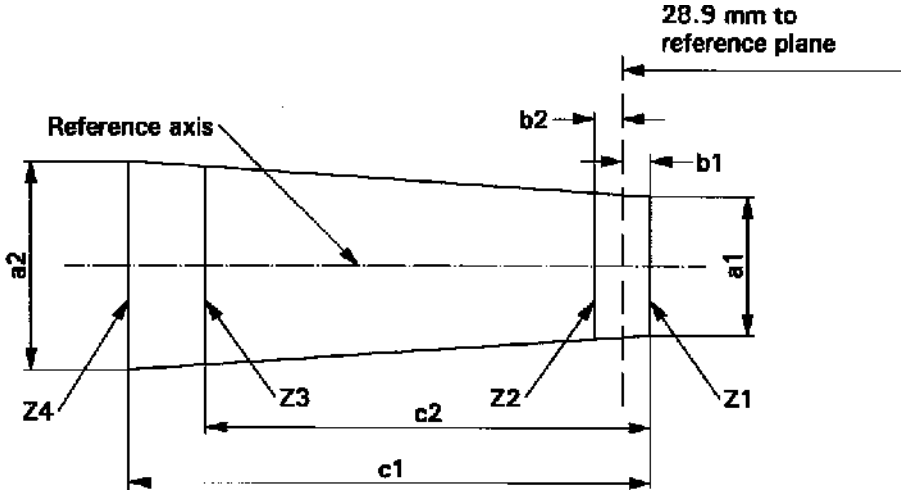
*/ Manufacturers may choose another set of perpendicular viewing directions. The viewing directions specified by the manufacturer are to be used by the testing laboratory when checking filament dimensions and position.

CATEGORY 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

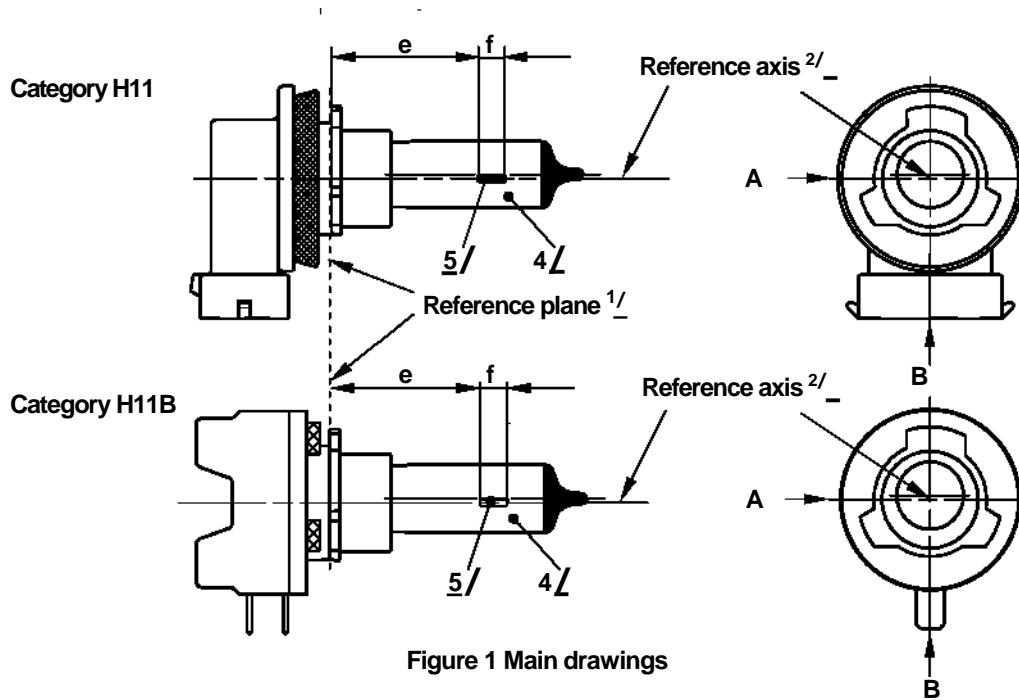


Figure 1 Main drawings

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

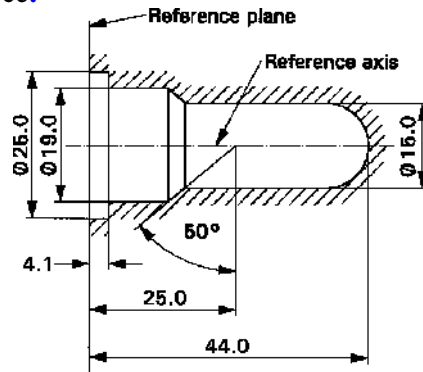
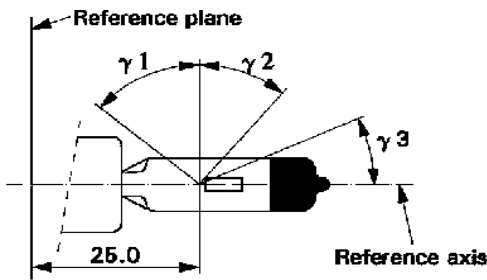


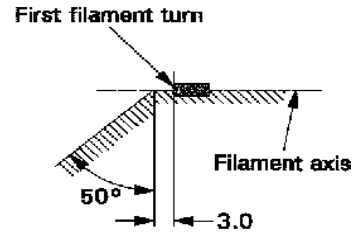
Figure 2 - Maximum lamp outline 3/

- 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/ 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



View B

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



View A

Figure 4
Metal free zone 8/

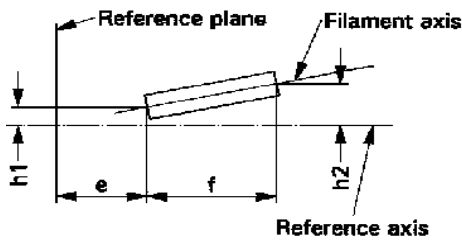
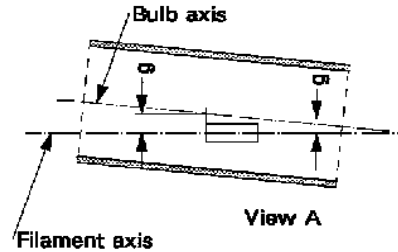


Figure 5

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



View A

Figure 6
Bulb eccentricity 10/

- 6/ Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 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 γ_3 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

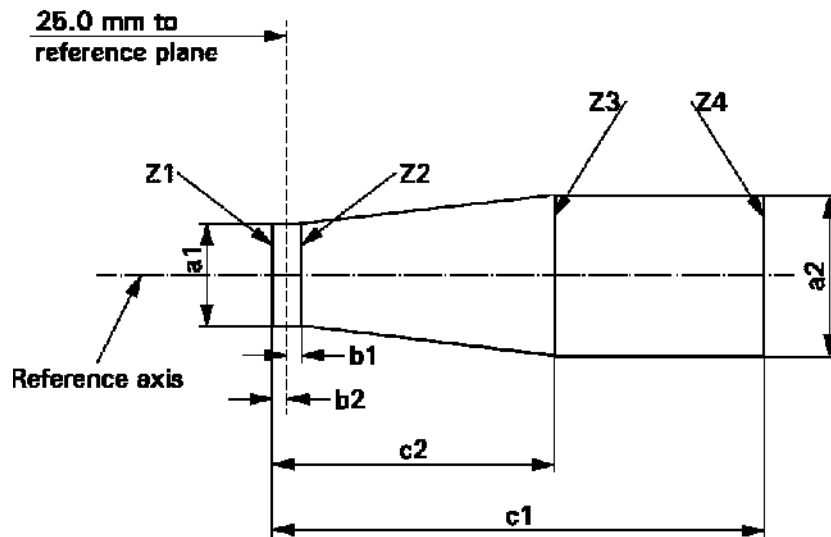
Dimensions in mm	Filaments light sources of normal production		Standard filament light source	
	12 V	24 V	12 V	
e ^{11/}	25.0 ^{12/}		25.0 ± 0.1	
f ^{11/}	4.5	5.3 ^{12/}	4.5 ± 0.1	
g	0.5 min.		u.c.	
h1	0 ^{12/}		0 ± 0.1	
h2	0 ^{12/}		0 ± 0.15	
γ1	50° min.		50° min.	
γ2	40° min.		40° min.	
γ3	30° min.		30° min.	
Cap: H11: PGJ19-2 in accordance with IEC Publication 60061 (sheet 7004-110-2) H11B: PGJY19-2 in accordance with IEC Publication 60061 (sheet 7004-146-1)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Vol	12	24	12
	Wat	55	70	55
Test voltage	Vol	13.2	28.0	13.2
Objective values	Watts	62 max.	80 max.	62 max.
	Luminous	1350 ± 10 %	1600 ± 10 %	
Reference luminous flux at approximately			12 V	1,000
			13.2 V	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.

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

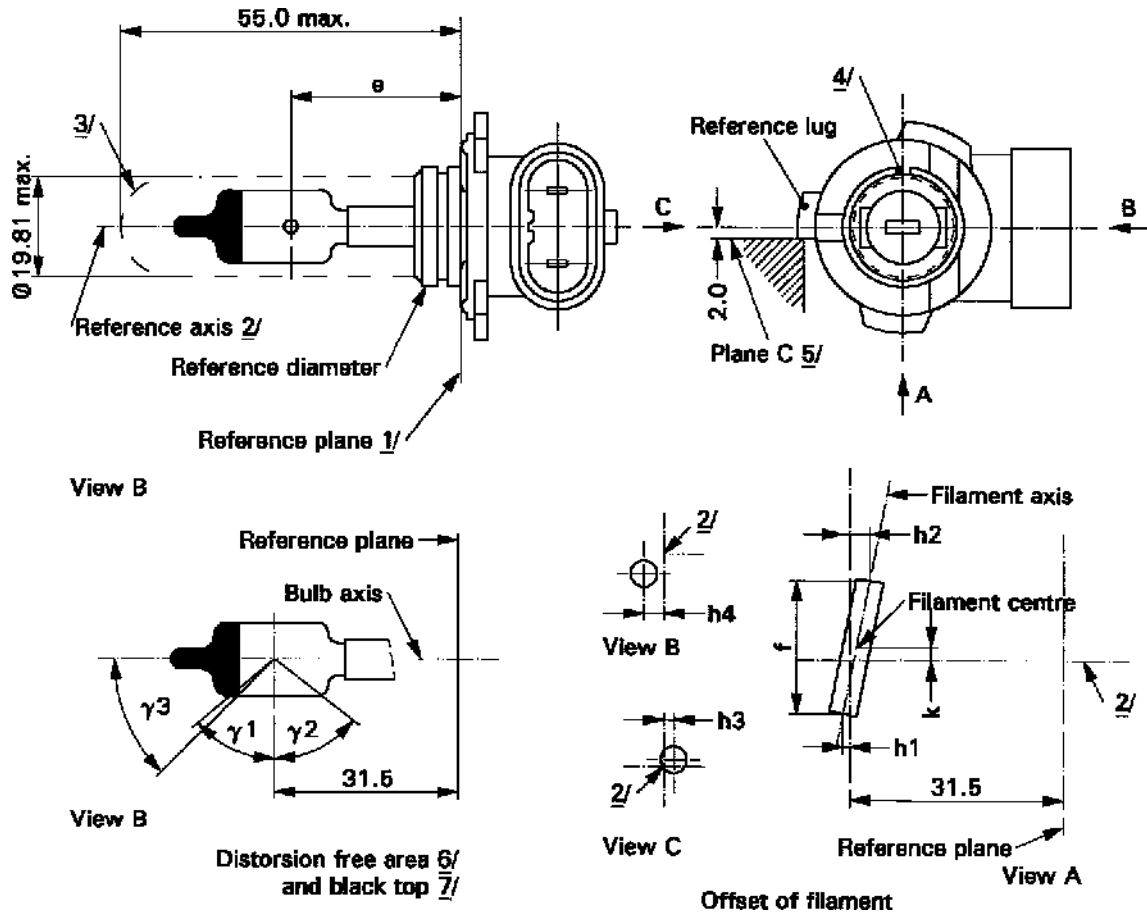
d = diameter of filament

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.

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 γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 and does not need to be verified in the area covered by the obscuration.
- 7/ The obscuration shall extend to at least angle γ_3 and shall be at least as far as the undistorted part of the bulb defined by angle γ_1 .

CATEGORY H12

Sheet H12/2

Dimensions in mm ^{8/}		Tolerance	
		Filament light sources of normal production	Standard filament light source
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.

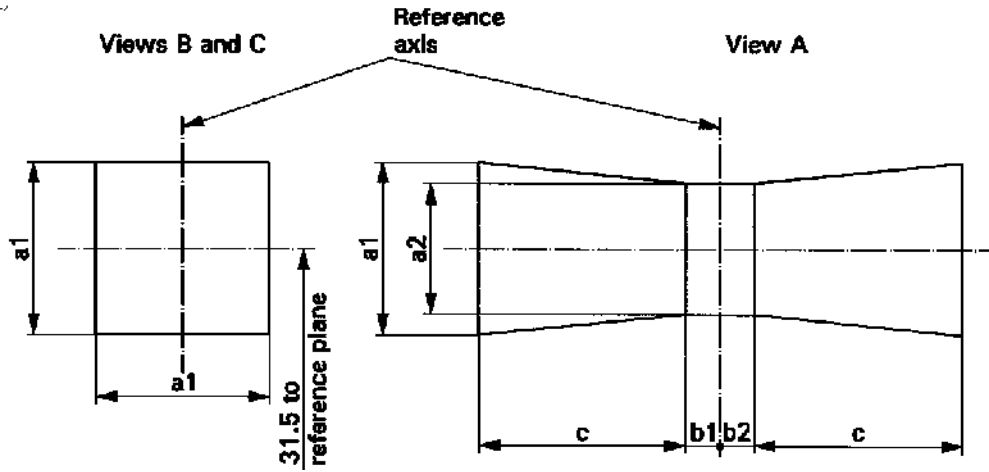
11/ To be checked by means of a "Box-System"; sheet H12/3.

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.

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 b_1 and b_2 .

CATEGORIES H13 AND H13A Sheet H13/1

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

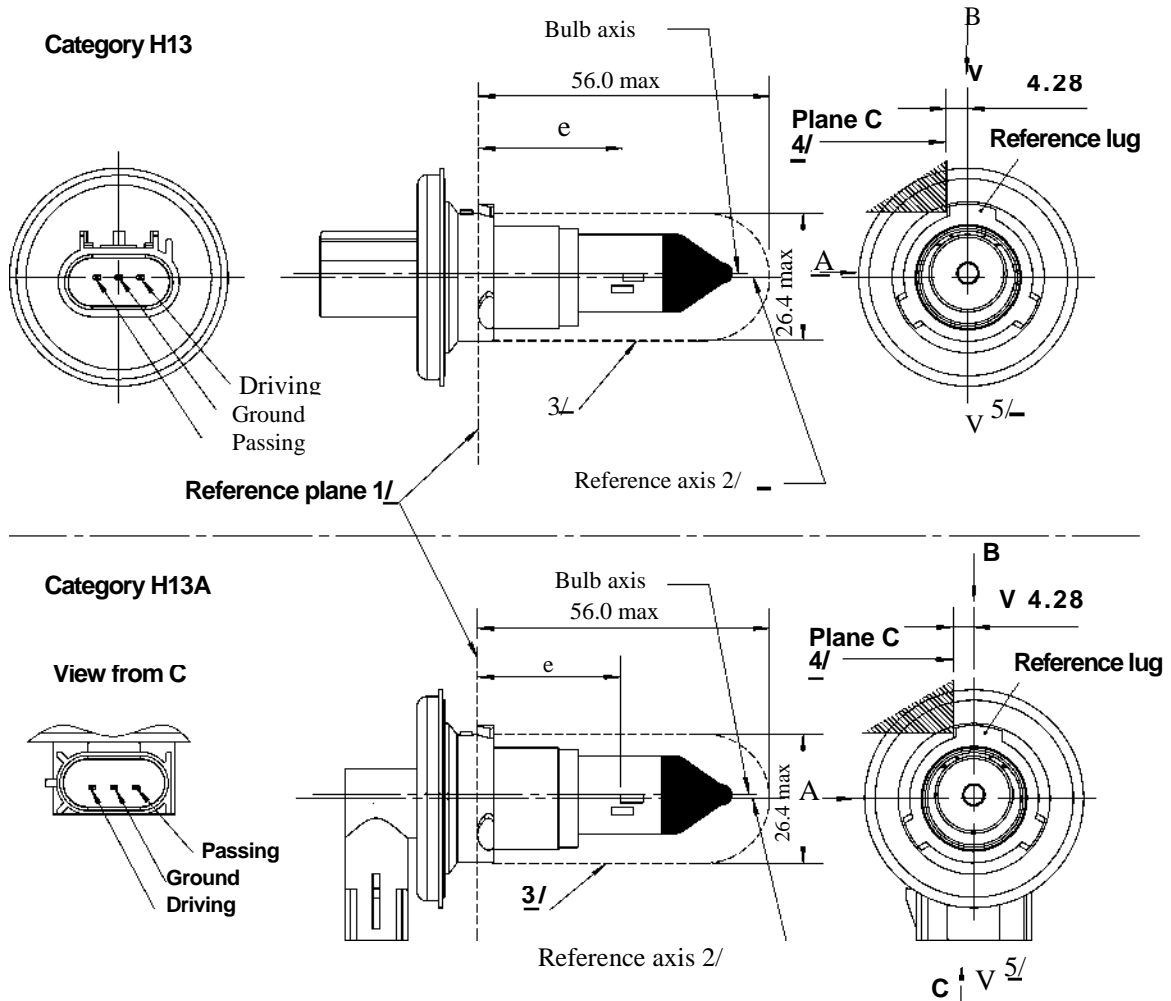


Figure 1 Main drawing

- 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.

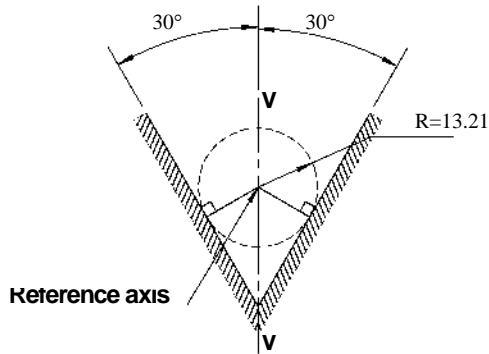


Figure 2-Definition of reference axis ^{2/}

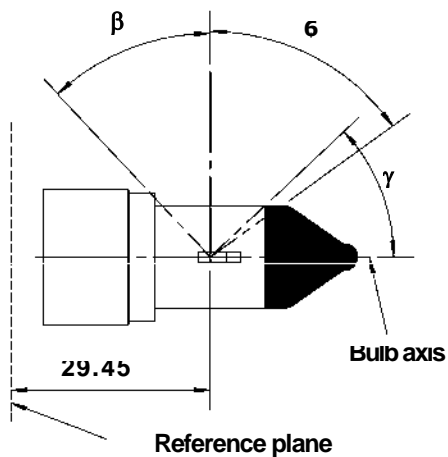
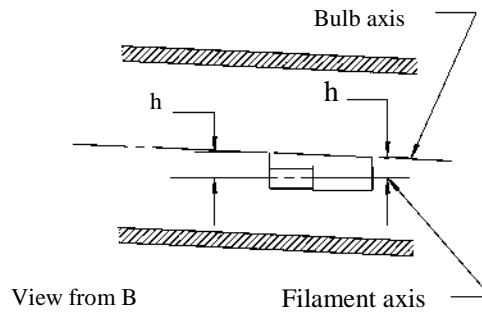
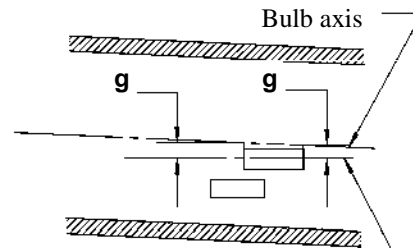


Figure 3- Undistorted area ^{6/} and opaque coating ^{7/}



View from B

Filament axis



View from A

Filament axis

Figure 4- Bulb offset ^{8/}

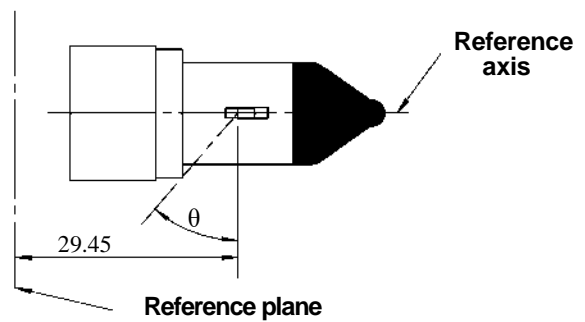


Figure 5- Light blocking toward cap ^{9/}

- 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.

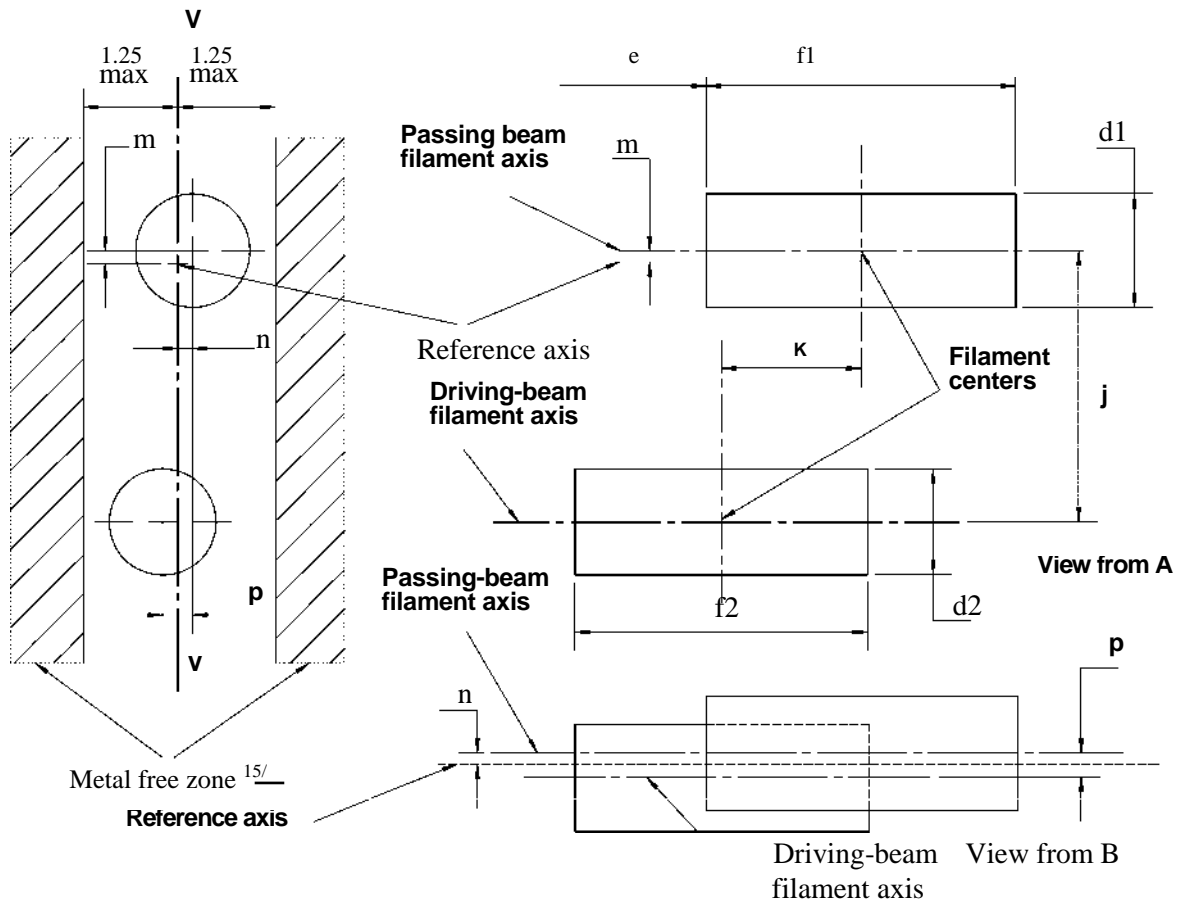


Figure 6- Position and dimensions of filaments ^{10/ 11/ 12/ 13/ 14/}

- 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.
(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 H13A

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	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.

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

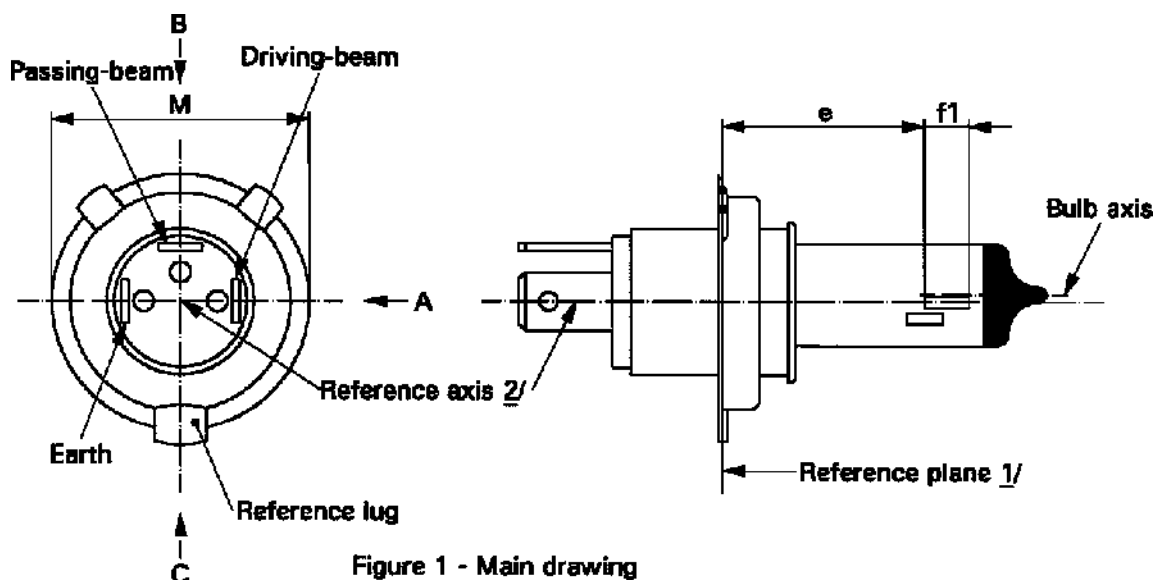


Figure 1 - Main drawing

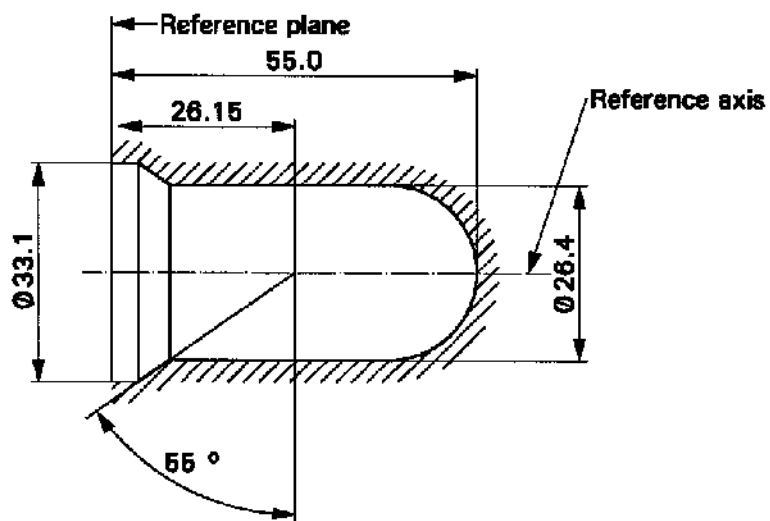
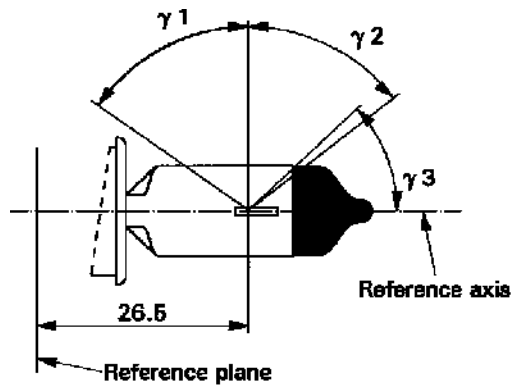
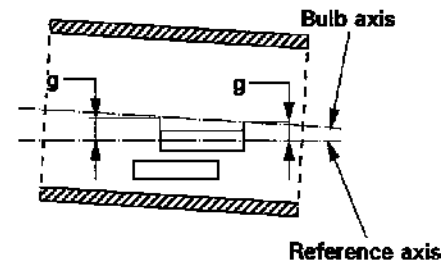


Figure 2 - Maximum lamp outline 3/

- 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.



View B
Figure 3 - Distortion free area 4/
and black top 5/



View A

Figure 4 - Bulb eccentricity 6/

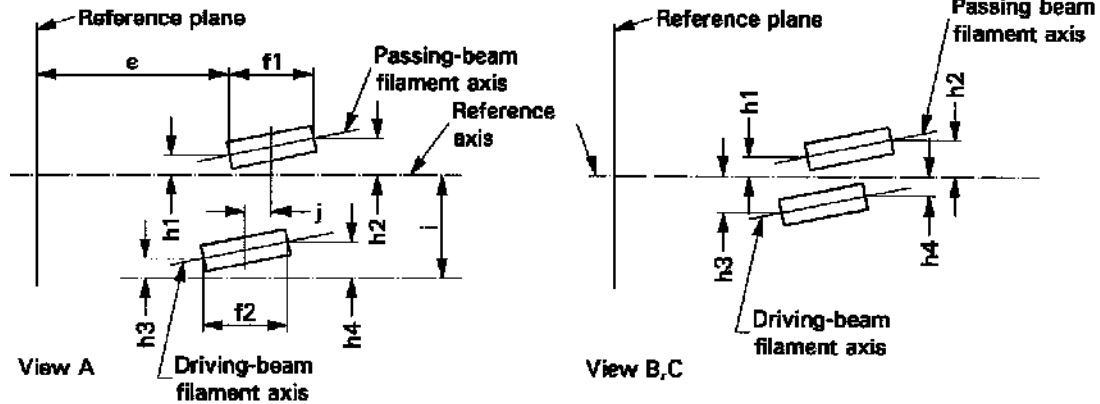


Figure 5- Offset of filament axis 7/
(for standard filament lamps only)

- 4/ Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 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 γ_3 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

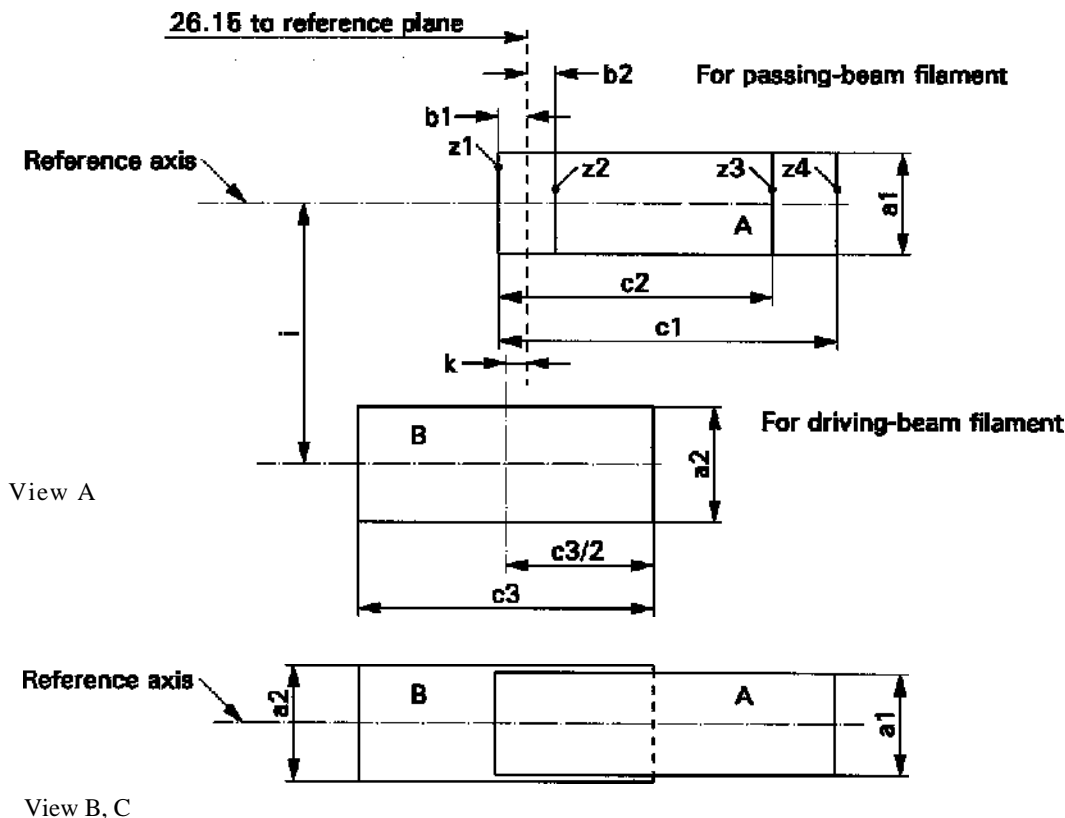
Sheet H14/3

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 CHARACTERISTICS					
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
	Luminous	1,150 ± 15%	1,750 ±		
Reference luminous flux at approximately			1	860	1,300
			1	1,150	

- 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 the 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

d_1 is diameter of the passing beam filament and d_2 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 d_1 max. = 1.6 mm and d_2 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 Z_1 and Z_2 and between lines Z_3 and Z_4 .

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

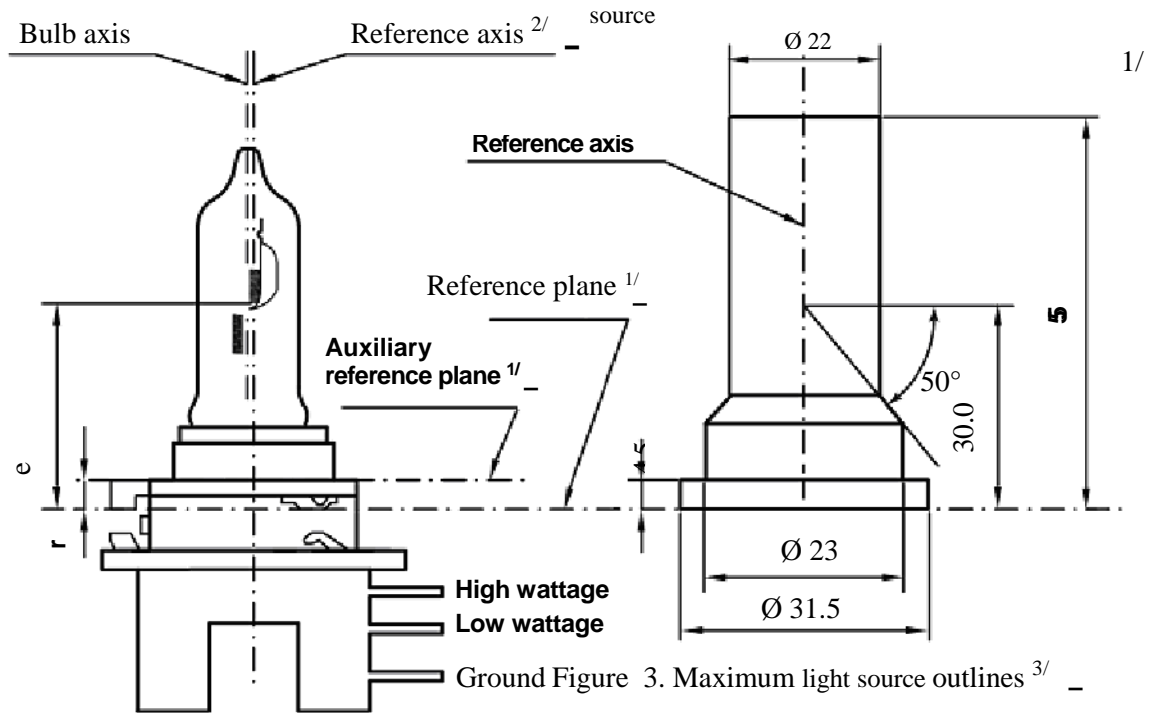


Figure 1. Main drawing

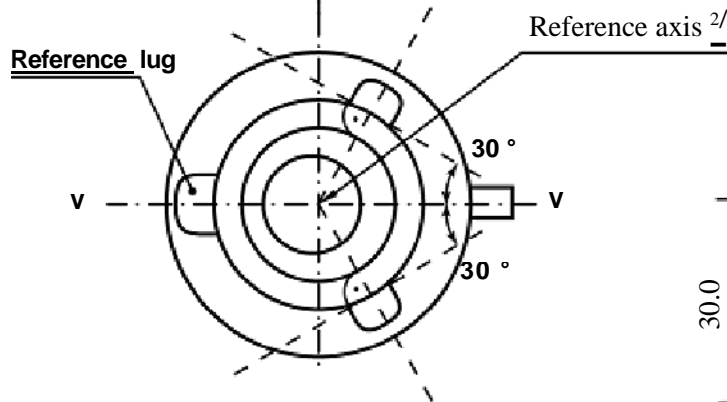


Figure 2. Definition of reference axis 2/

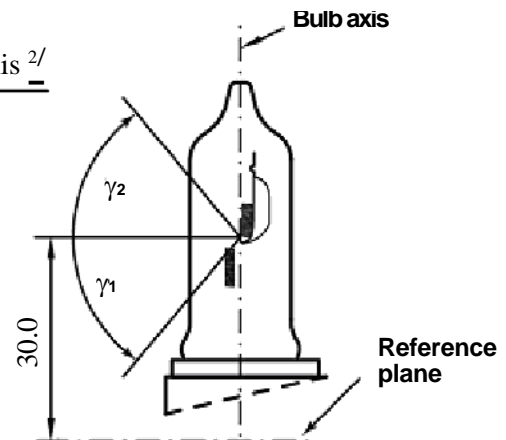


Figure 4. Distortion free area 4/

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 γ_1 and γ_2 as indicated in figure 4. This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .

CATEGORY H15

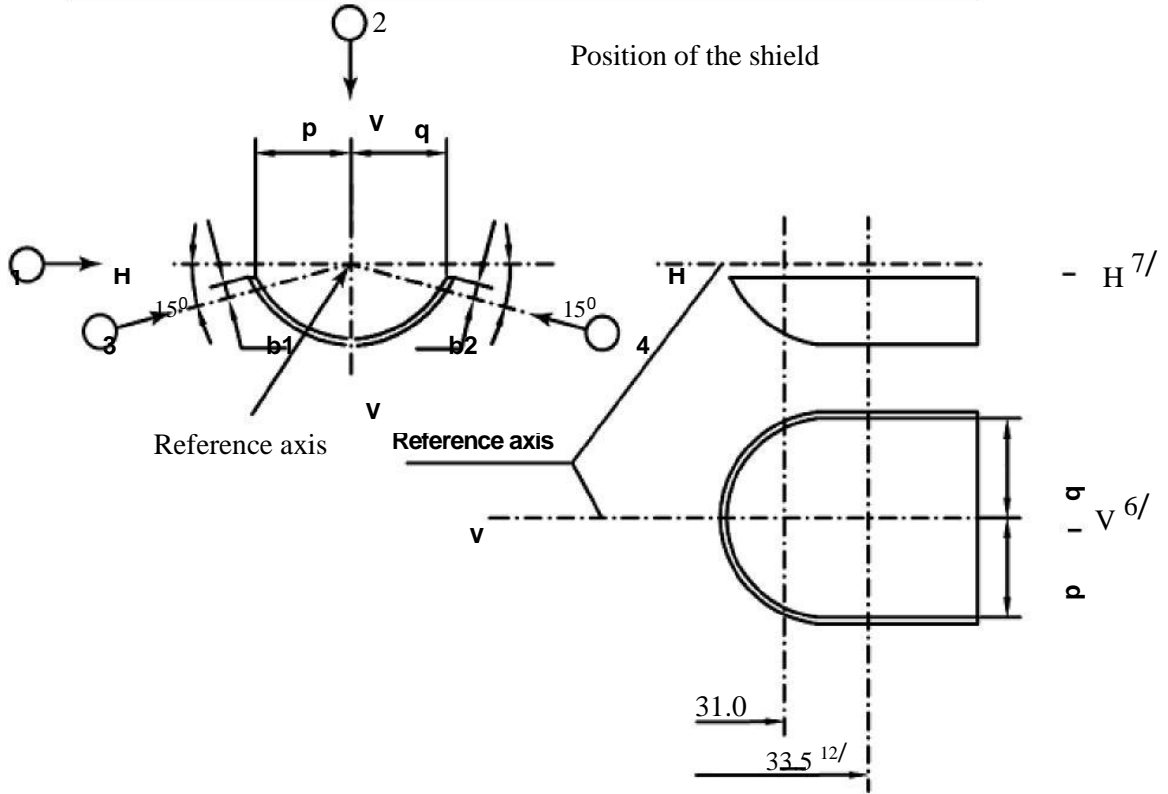
Sheet H15/2

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	
γ_1		50°min		50°min		50°min	
γ_2		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	

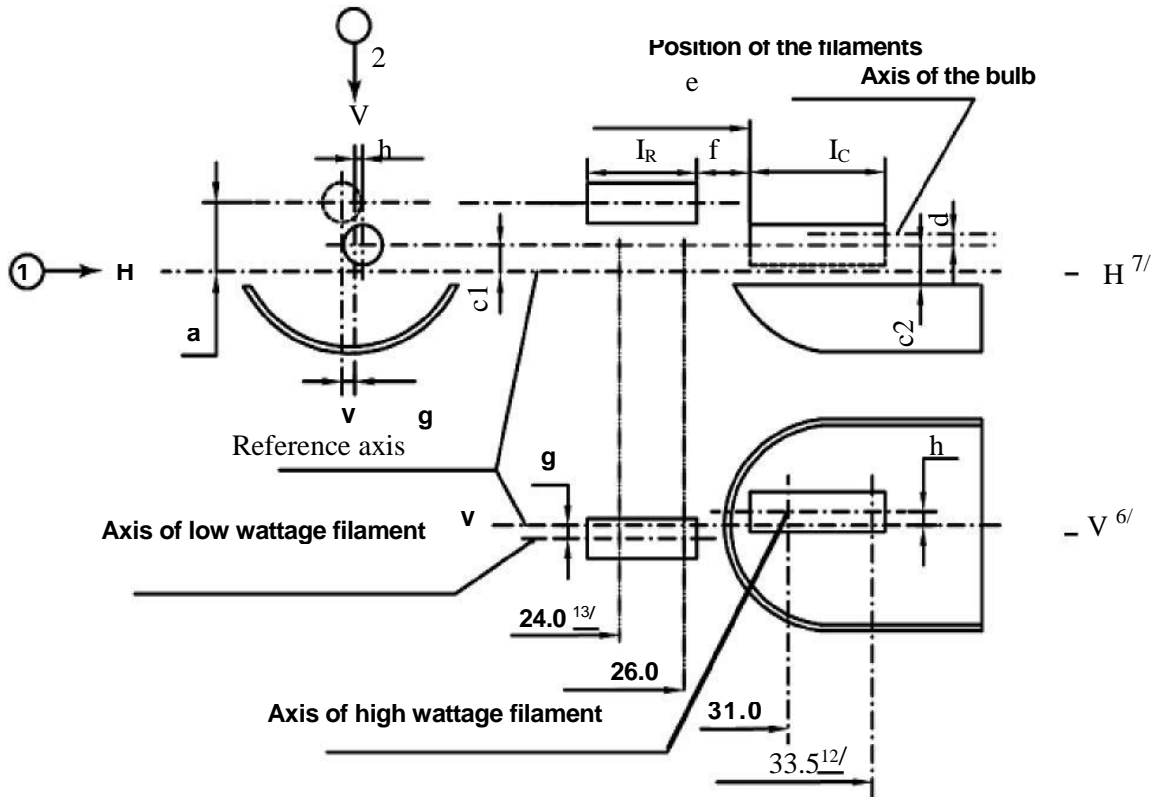
^{5/} The values indicated in the left-hand columns relate to the low wattage filament. Those indicated in the right-hand columns relate to the high wattage filament.

CATEGORY H15

Sheet H15/3



The drawing is not mandatory with respect to the design of the shield



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	
b1/33.5	b1/34.0	b1/31.0 mv		± 0.30		± 0.15	
b2/31.0		0		± 0.30		± 0.15	
b2/33.5	b2/34.0	b2/31.0 mv		± 0.30		± 0.15	
c1/31.0		0		± 0.30	± 0.50	± 0.15	± 0.25
c1/33.5	c1/34.0	c1/31.0 mv		± 0.30	± 0.50	± 0.15	± 0.25
c2/33.5	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
l _R ^{8/11/}		4.2	4.6	± 0.40	± 0.60	± 0.20	± 0.30
l _C ^{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:

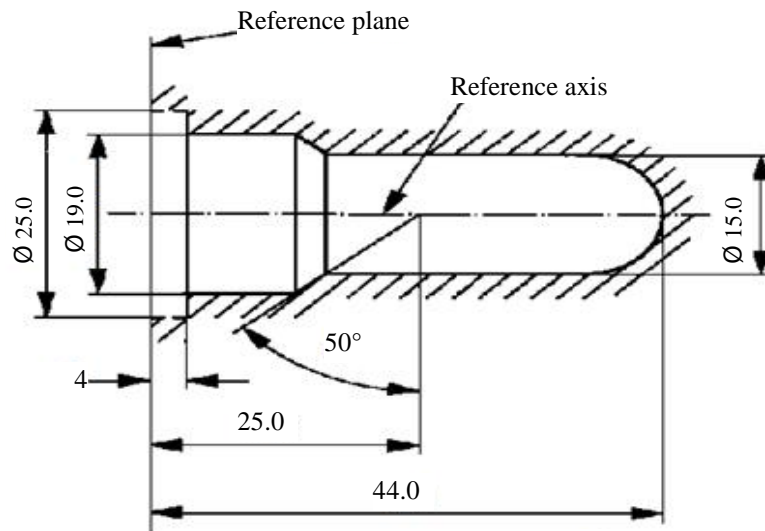
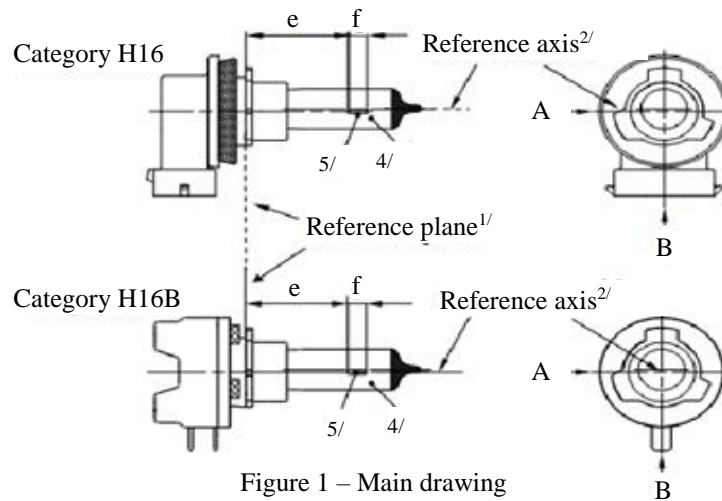
- 1) for dimensions a, c1, c2, d, e, f, l_R and l_C;
- 2) for dimensions g, h, p and q;
- 3) for dimension b1;
- 4) for dimension b2.

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).

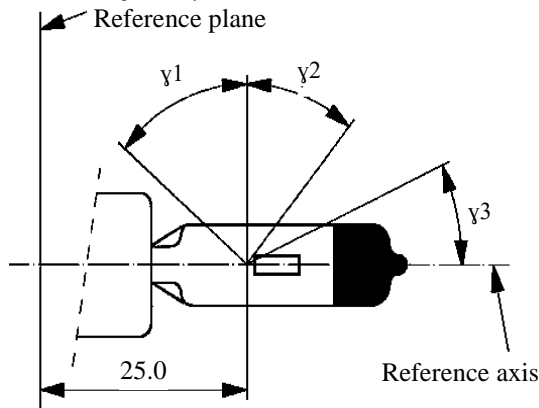
Dimensions a and g are measured in planes parallel to the reference plane at distances of 24.0 mm (24.5 mm for 24 V types) and 26.0

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



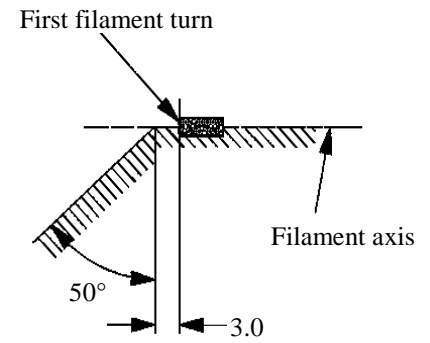
- ^{1/} The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.
- ^{2/} The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.
- ^{3/} Glass bulb and supports shall not exceed the envelope as indicated 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.



View B

Figure 3 - Distorsion free area^{6/} and black top^{7/}



View A

Figure 4 – Metal free zone^{8/}

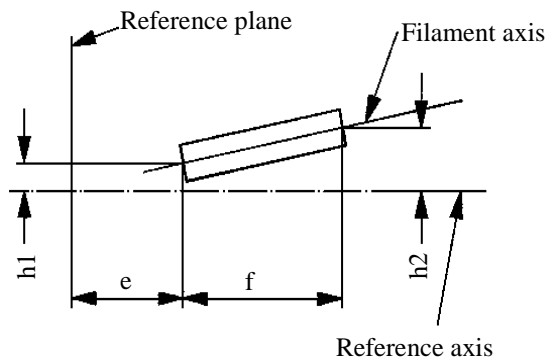


Figure 5 – Permissible offset of filament axis^{9/}
(for standard filament light sources only)

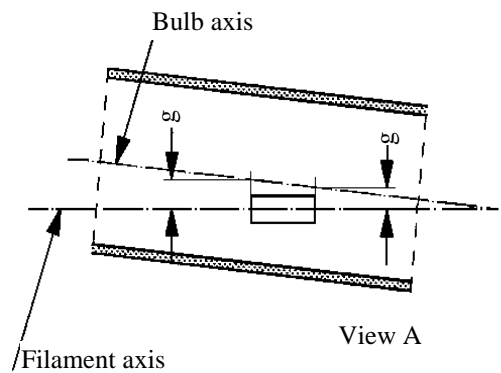


Figure 6 – Bulb eccentricity^{10/}

- ^{6/} Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- ^{7/} The obscuration shall extend at least to angle γ_3 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

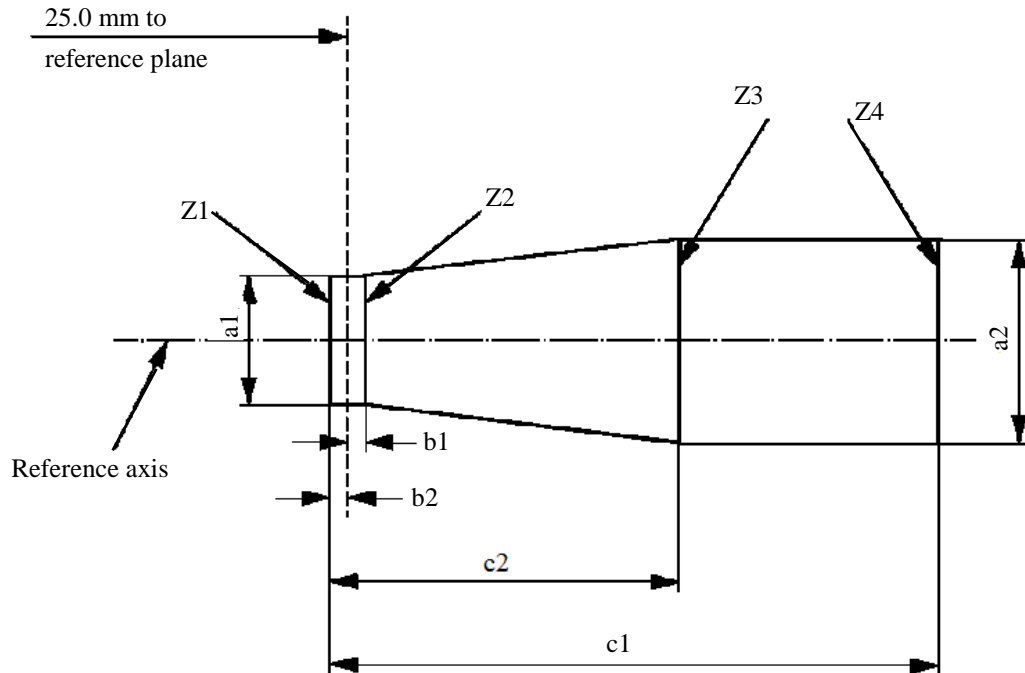
<i>Dimensions in mm</i>	Filament light sources of normal production		Standard filament light source
	12 V		12 V
e ^{11/}	25.0 ^{12/}		25.0 ± 0.1
f ^{11/}	3.2 ^{12/}		3.2 ± 0.1
g	0.5 min.		u.c.
h1	0 ^{12/}		0 ± 0.1
h2	0 ^{12/}		0 ± 0.15
γ1	50° min.		50° min.
γ2	40° min.		40° min.
γ3	30° min.		30° min.
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.

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.



<i>a1</i>	<i>a2</i>	<i>b1</i>	<i>b2</i>	<i>c1</i>	<i>c2</i>
$d + 0.50$	$d + 0.70$	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.

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

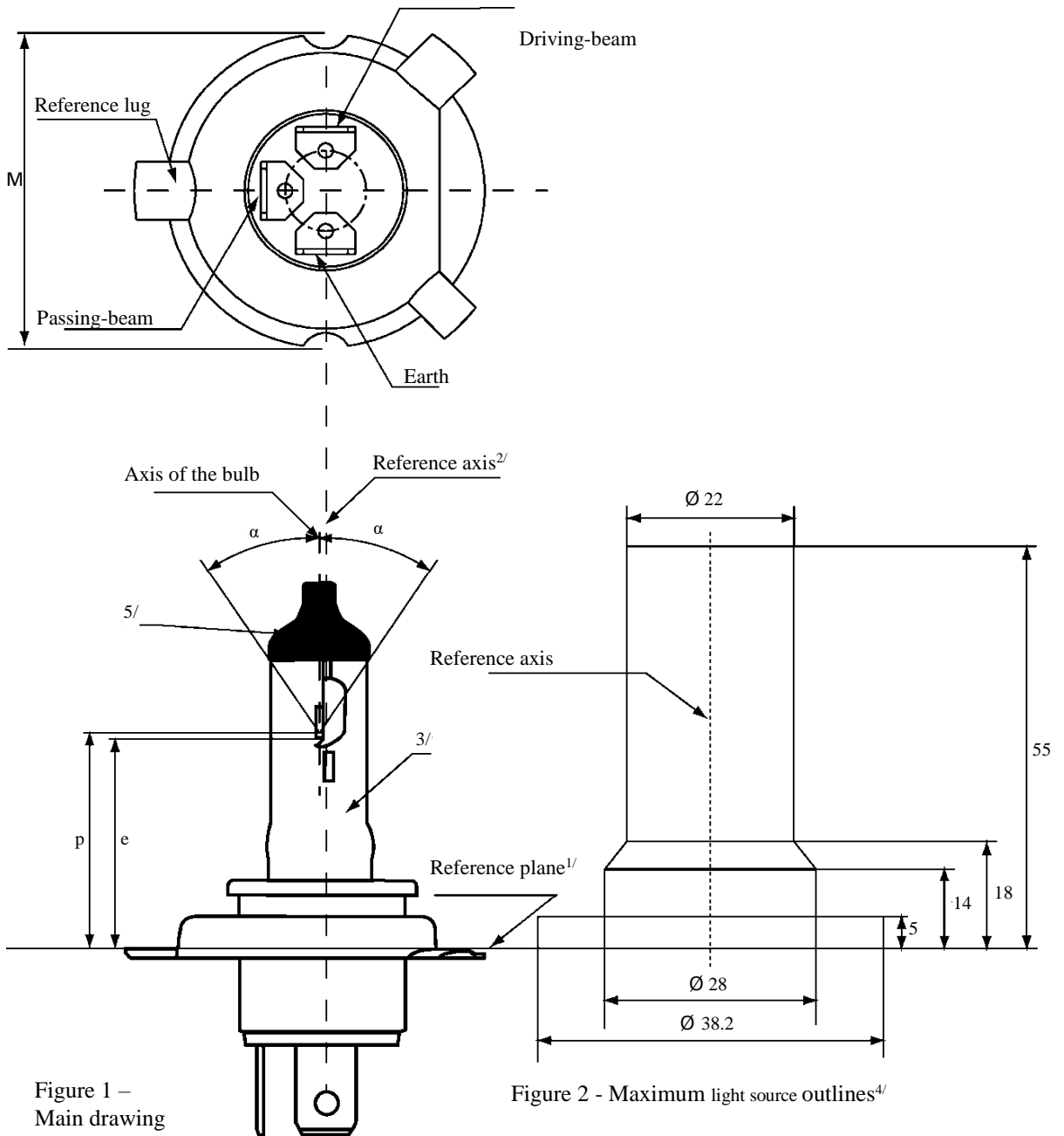


Figure 1 – Main drawing

Figure 2 - Maximum light source outlines^{4/}

For the notes see sheet H17/6

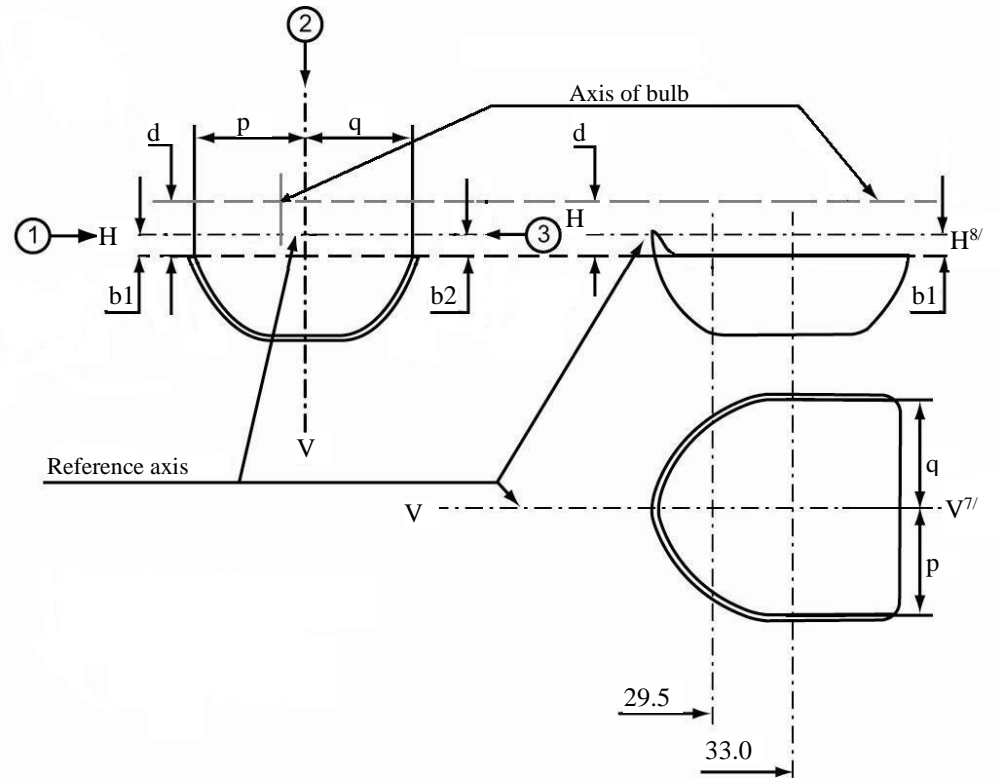
Category H17

Sheet H17/2

		Filament light sources of normal production		Standard filament light source	
<i>Dimensions in mm</i>		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

Position of the shield



Position of filaments

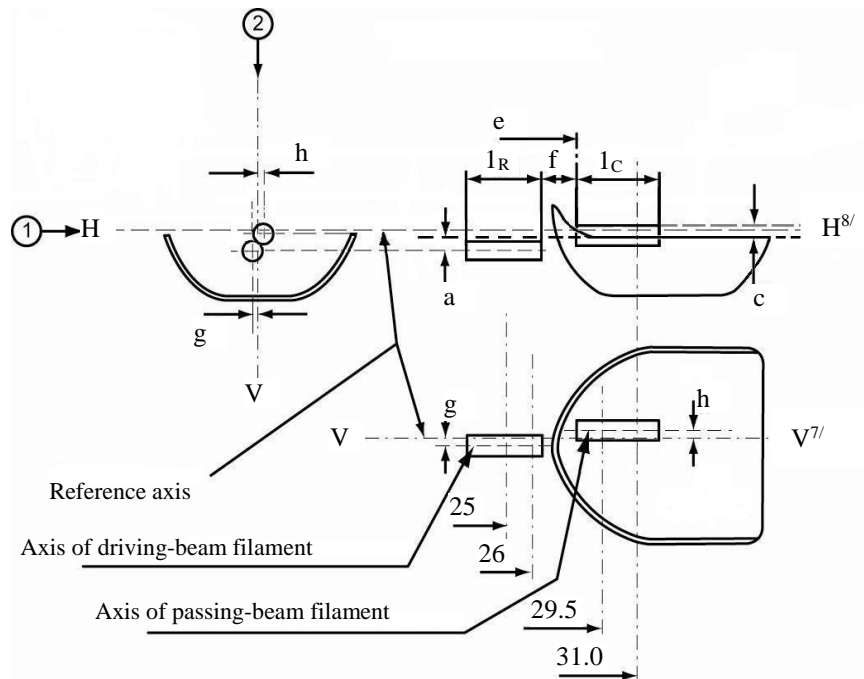


Table of the dimensions (in mm) referred to in the drawings on sheets H17/3 and H17/4

<i>Reference*</i>	<i>Dimension**</i>	<i>Tolerance</i>	
		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

$l_C^{9/, 10/}$	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

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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, 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 33.0 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.

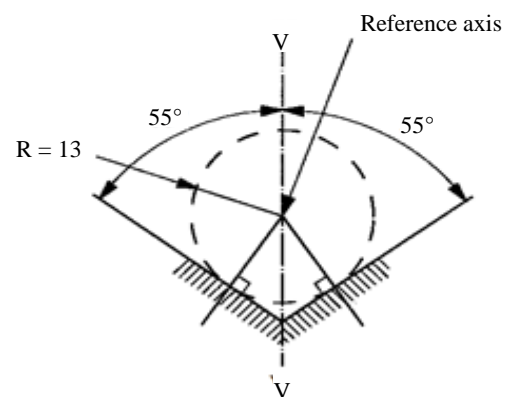
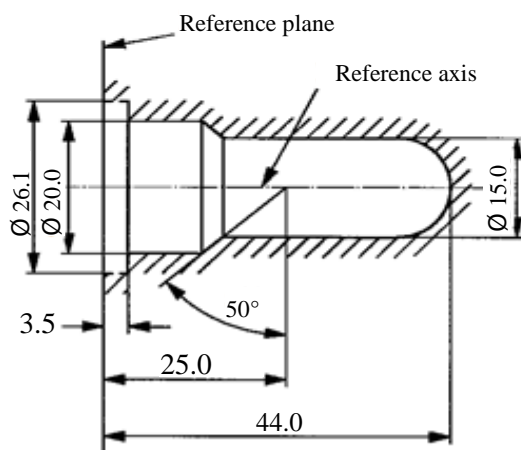
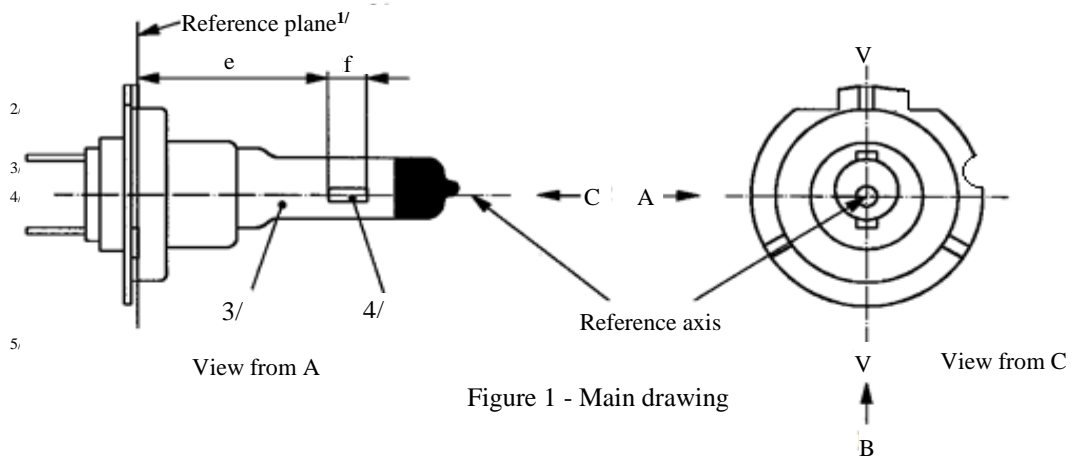
Note: For the method of measurement, see Appendix E to IEC Publication 60809.

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Category H18

Sheet H18/1

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

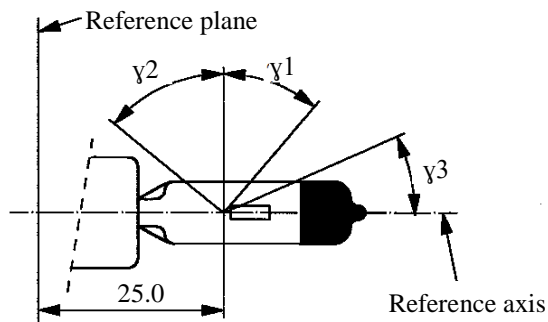


- 1/ The reference plane is defined by the points on the surfaces of the holder on which the three supporting bosses of the cap ring will rest.
- 2/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two perpendiculars as indicated in Figure 3.
- 3/ The colour 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.

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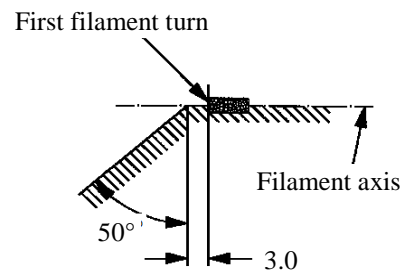
Category H18

Sheet H18/2



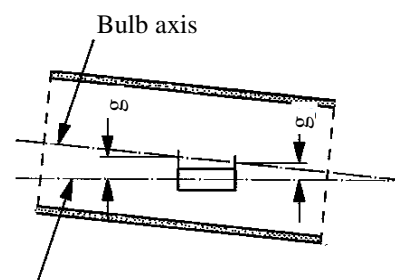
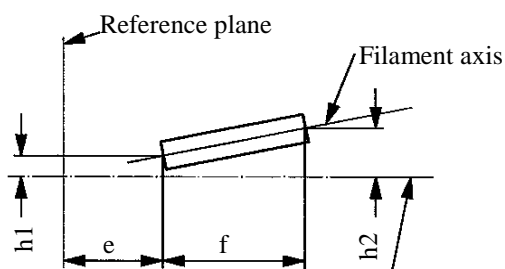
View from B

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



View from A

Figure 5 - Metal free zone^{8/}



- 6/ Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 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 γ_3 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.

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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	
γ_1	40° min.		40° min.	
γ_2	50° min.		50° min.	
γ_3	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.

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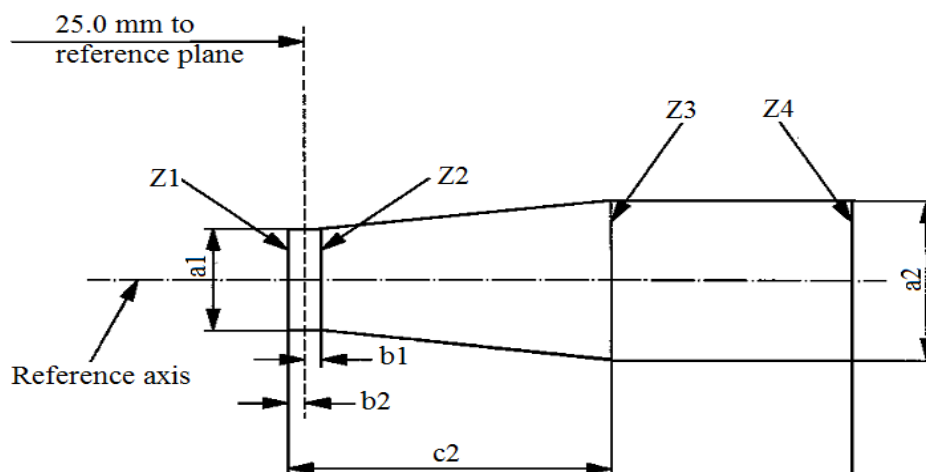
Category H18

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



	<i>a1</i>	<i>a2</i>	<i>b1</i>	<i>b2</i>	<i>c1</i>	<i>c2</i>
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.

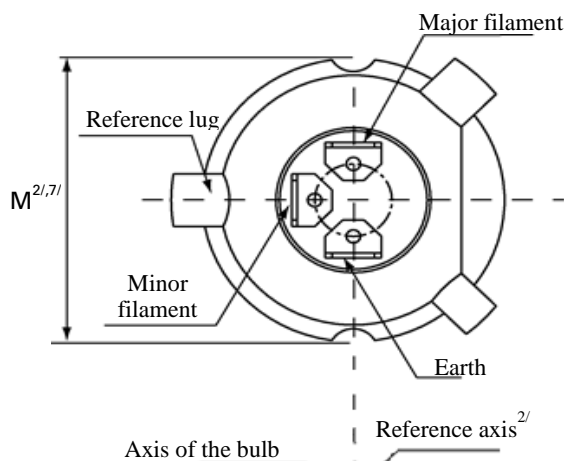
The ends of the filament as defined on sheet H18/3, note 9, shall lie between lines Z1 and Z2 and between Z3 and Z4.

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Category H19

Sheet H19/1

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



For the notes see sheet H19/5

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Category H19

Sheet H19/2

<i>Dimensions in mm</i>	Filament light sources of normal production	Standard filament light source
	<i>12 V</i>	<i>12 V</i>
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

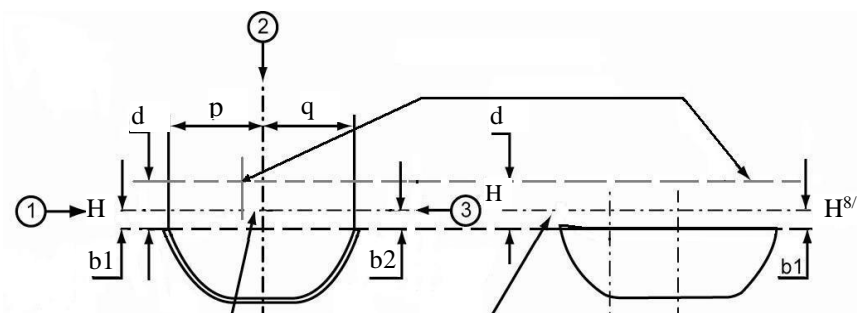
For note 6 see sheet H19/5.

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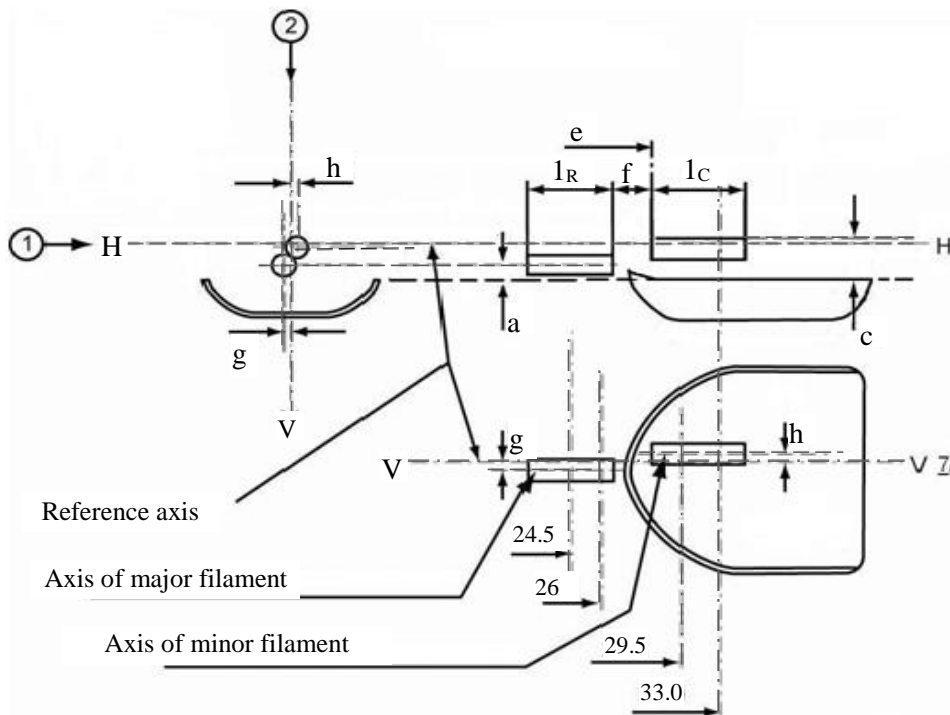
Category H19

Sheet H19/3

Position of Shield



Position of Filament



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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
IR ^{9/, 12/}	4.0	±0.60	±0.30
IC ^{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.

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- 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, IR and IC.
- 2 For dimensions g, h, p and q.
- 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.

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

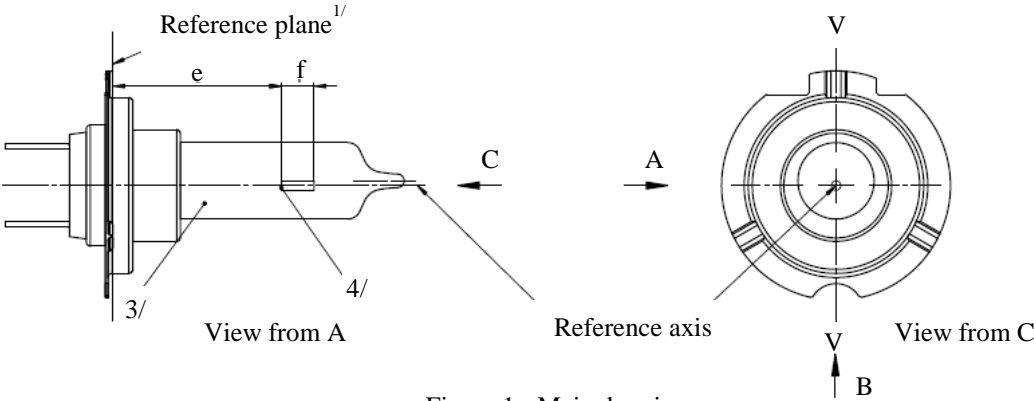


Figure 1 - Main drawing

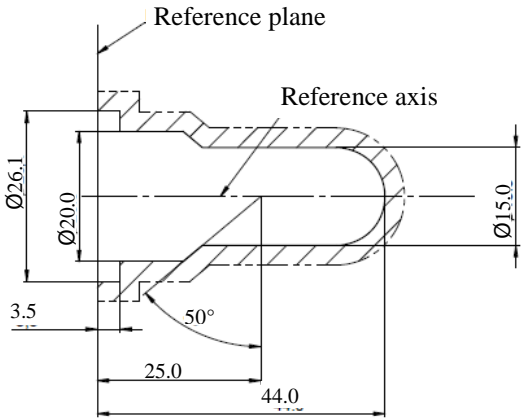


Figure 2 - Maximum light source outline^{5/}

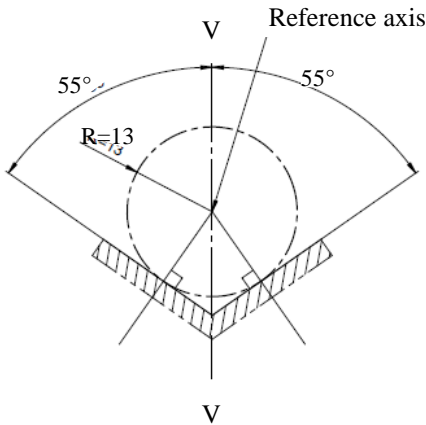


Figure 3 - Definition of reference axis^{2/}

- ^{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 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 $d_{max.} = 1.4 \text{ mm}$.
 - (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.

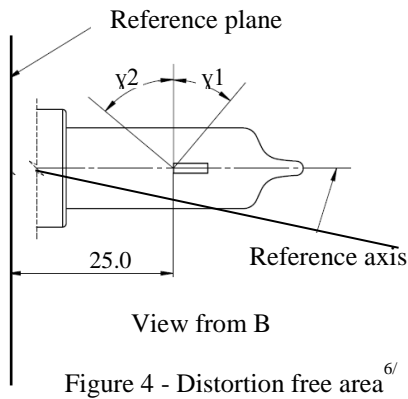


Figure 4 - Distortion free area^{6/}

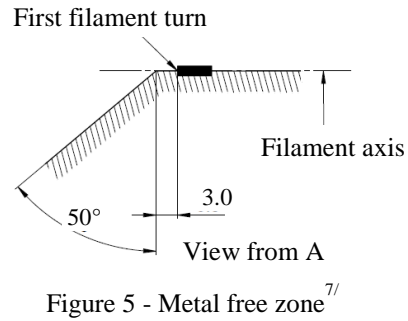


Figure 5 - Metal free zone^{7/}

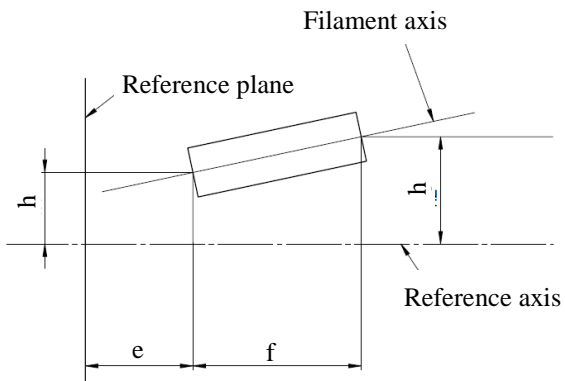


Figure 6 - Permissible offset of filament axis
(for standard filament light sources only)

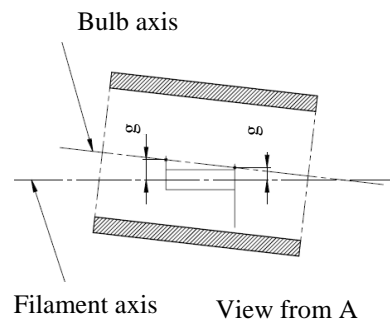


Figure 7 - Bulb eccentricity

^{6/} Glass bulb shall be optically distortion free within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .

^{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.

<i>Dimensions in mm</i>		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.

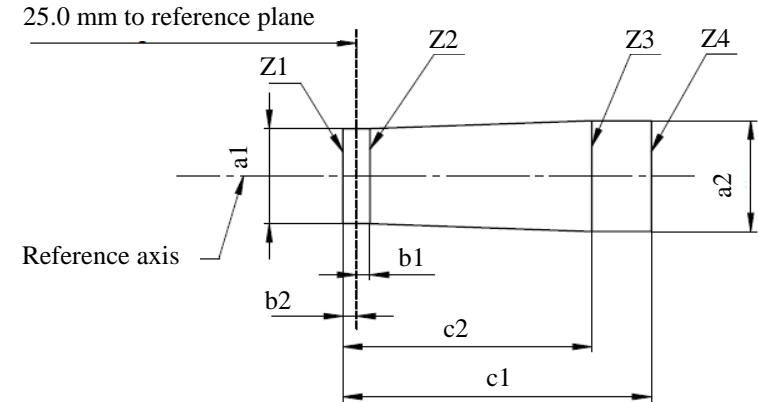
^{11/} Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

^{12/} See Annex 5.

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



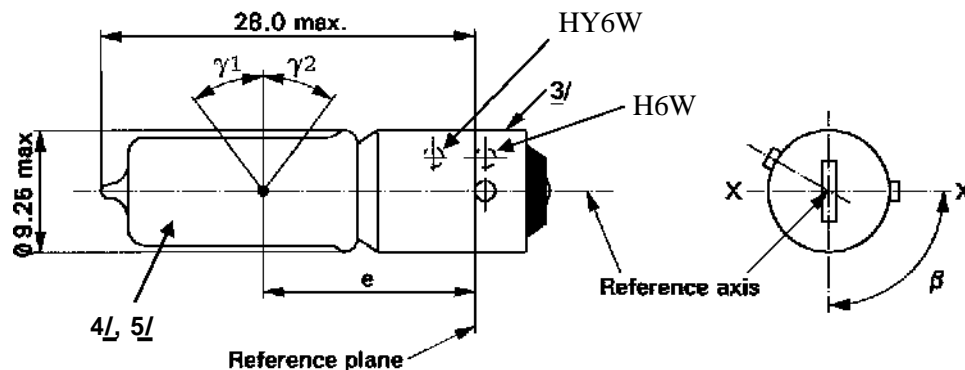
<i>a1</i>	<i>a2</i>	<i>b1</i>	<i>b2</i>	<i>c1</i>	<i>c2</i>
$d + 0.40$	$d + 0.70$	0.25		5.7	4.6

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.



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CATEGORIES H6W AND HY6W

Sheet H6W/1

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

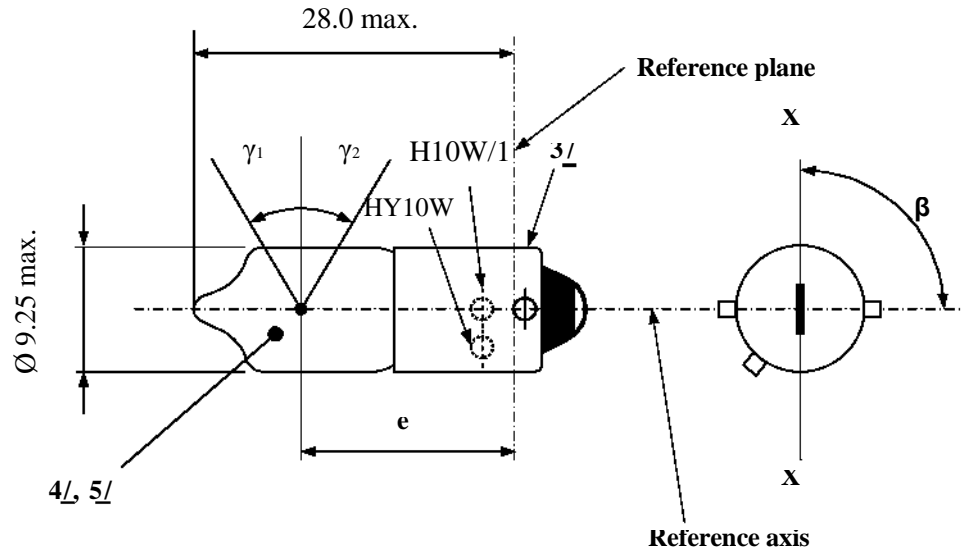
Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e	14.25	15.0	15.75	15.0 ± 0.25
Lateral deviation ^{1/}			0.75	0.4 max
β	82.5°	90°	97.5°	90° ± 5°
γ1, γ2 ^{2/}	30°			30° min.
Cap: H6W: BAX9s in accordance with IEC Publication 60061 (sheet 7004-8-1) 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
	Watts	7.35 max.		7.35 max.
		H6W	125 ± 12 %	

Objective	Luminou α	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 γ_1 and γ_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.
- 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/1 AND HY10W Sheet H10W/1

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



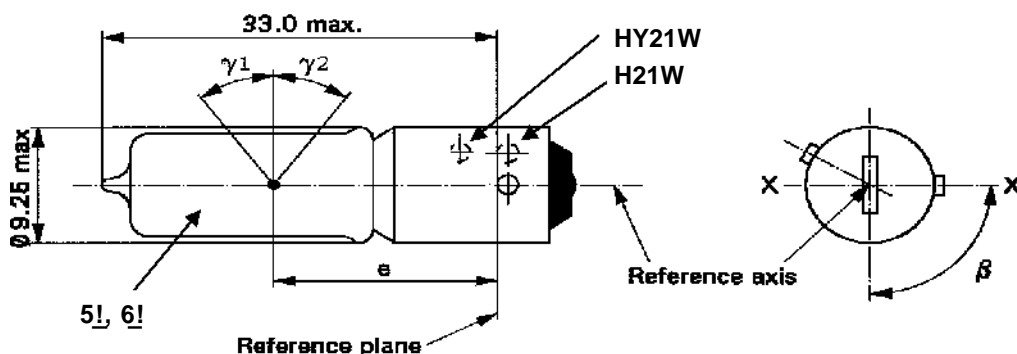
Dimensions in mm	Filament light sources of normal production			Standard filament light sources
	min.	nom.	max.	
e	14.25	15.0	15.75	15.0 ± 0.25
Lateral deviation ^{1/}			0.75	0.4 max
β	82.5°	90°	97.5°	90° ± 5°
γ ₁ , γ ₂ ^{2/}	30°			30° min.
Cap: H10W/1 BAU9s in accordance with IEC Publication 60061 (sheet 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/1 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 γ_1 and γ_2 , 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.

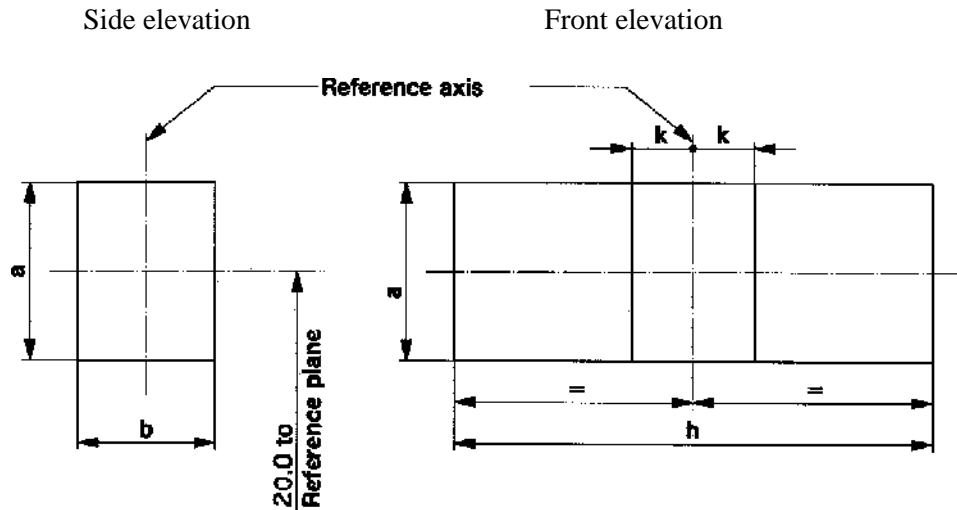
Dimensions in mm		Filament light sources of normal production			Standard filament light source
		min.	nom.	max.	
e			20.0 ^{1/}		20.0 ± 0.25
f	12			3.8	3.8 + 0/ - 1
	24			4.5	
Lateral deviation ^{2/}				1/	0.0 ± 0.15 ^{3/}
β		82.5°	90°	97.5°	90° ± 5°
γ1, γ2 ^{4/}		45°			45° min.
Cap: H21W: BAY9s in accordance with IEC Publication 60061 (sheet 7004-9-1) 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	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 %	
		HY21	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.

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 $\pm 7.5^\circ$, 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

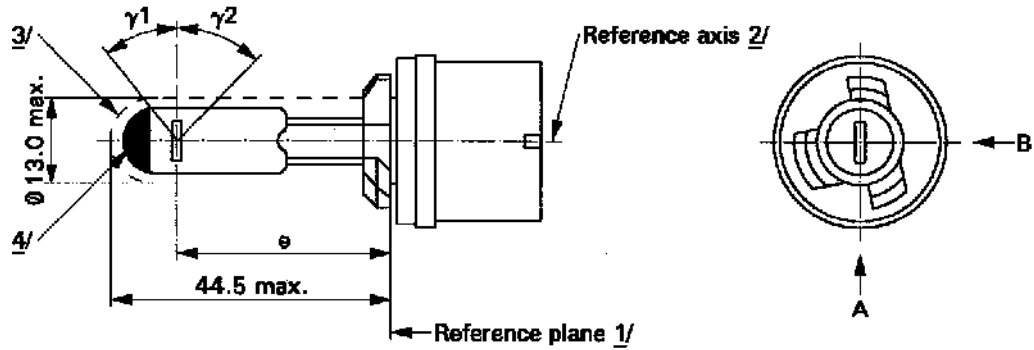
f = actual filament length

Test procedures and requirements.

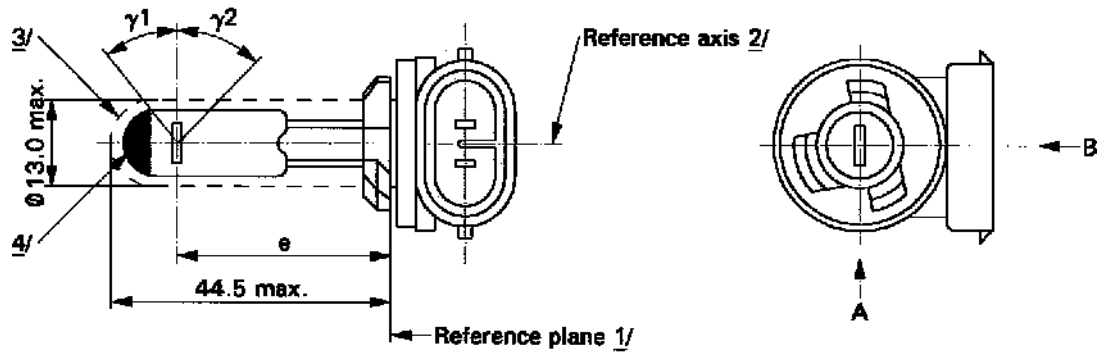
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the 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 H27W/2 Sheet H27W/1

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



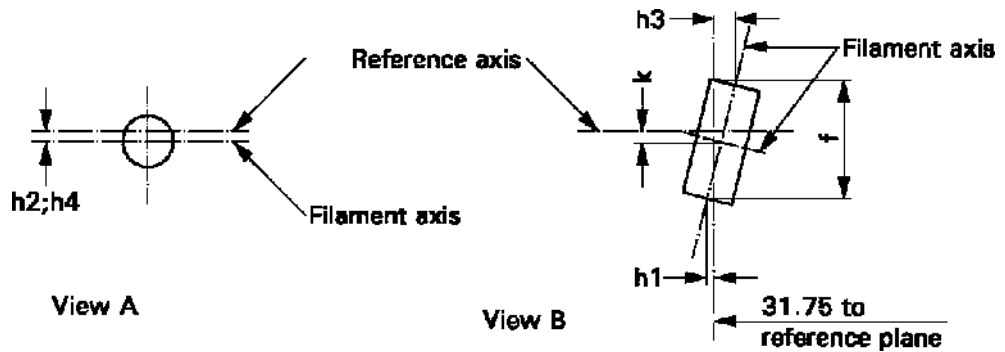
Category H27W/1



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 γ_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)

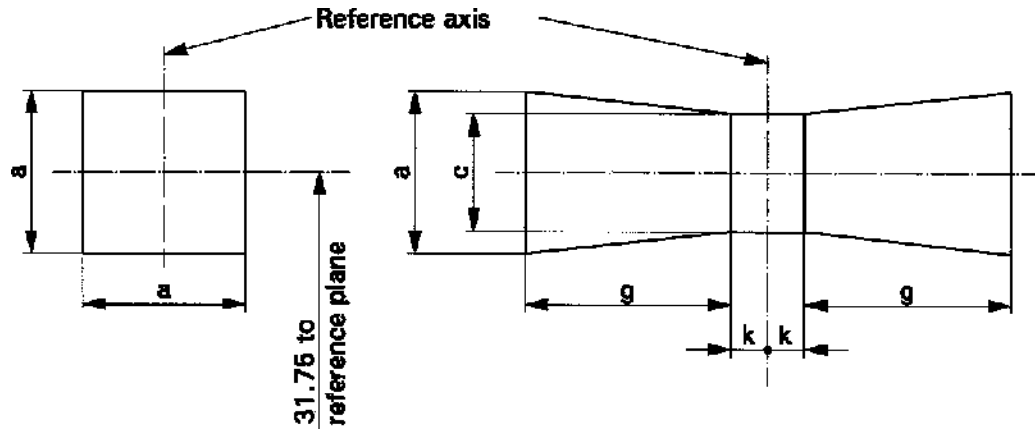
Dimensions in mm		Filament light source of normal production	Standard filament light sources
e		31.75 ^{6/}	31.75 ± 0.25
f ^{8/}		4.8 max.	4.2 ± 0.20
k		0 ^{6/}	0.0 ± 0.25
h1, h2, h3, h4 ^{7/}		0 ^{6/}	0.0 ± 0.25
γ1 ^{5/}		38° nom.	38° nom.
γ2 ^{5/}		44° nom.	44° nom.
Cap H27W/1: PG13 in accordance with IEC Publication 60061 (sheet 7004-107-4) H27W/2: PGJ13			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Vol	12	12
	Wat	27	27
Test voltage	Vol	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.

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

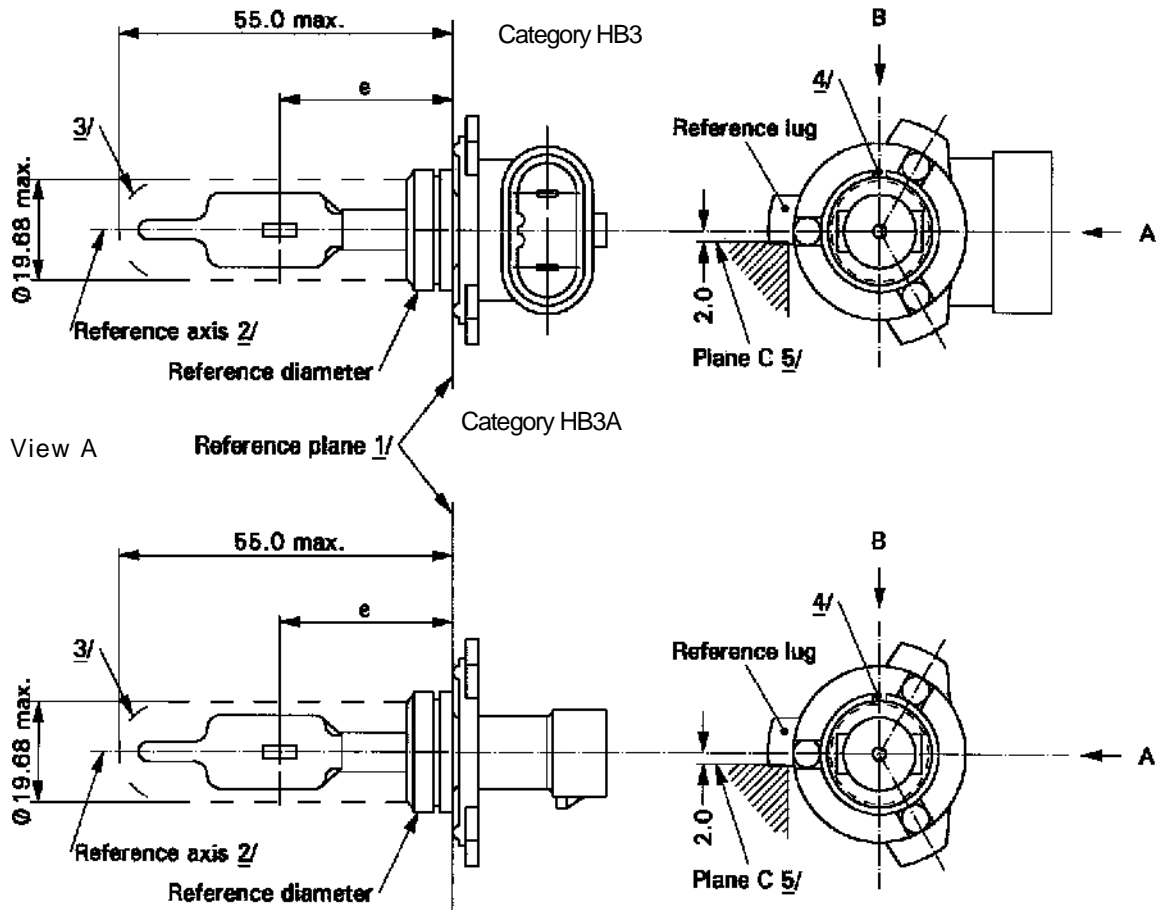
The filament shall lie entirely within the limits shown.

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

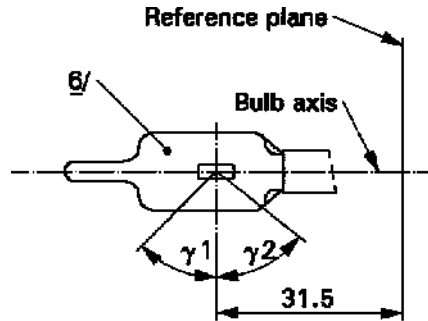
CATEGORIES HB3 AND HB3A

Sheet HB3/1

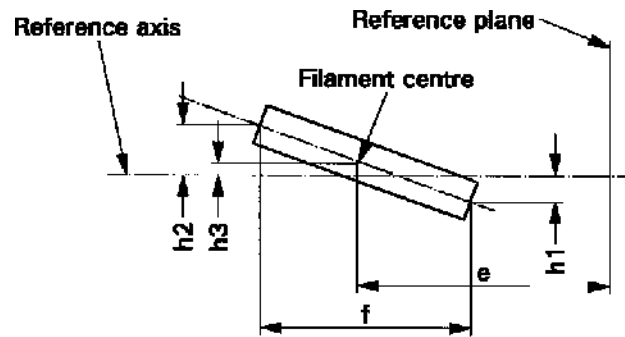
The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source



- 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 light source 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.



Distortion free area 7/



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 within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .

CATEGORIES HB3 AND HB3A

Sheet HB3/3

Dimensions in mm ^{12/}		Tolerances	
		Filament light sources of normal production	Standard filament light sources
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	1,860 ± 12 %	
Reference luminous flux at approximately		12 V	1,300
		13.2	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.

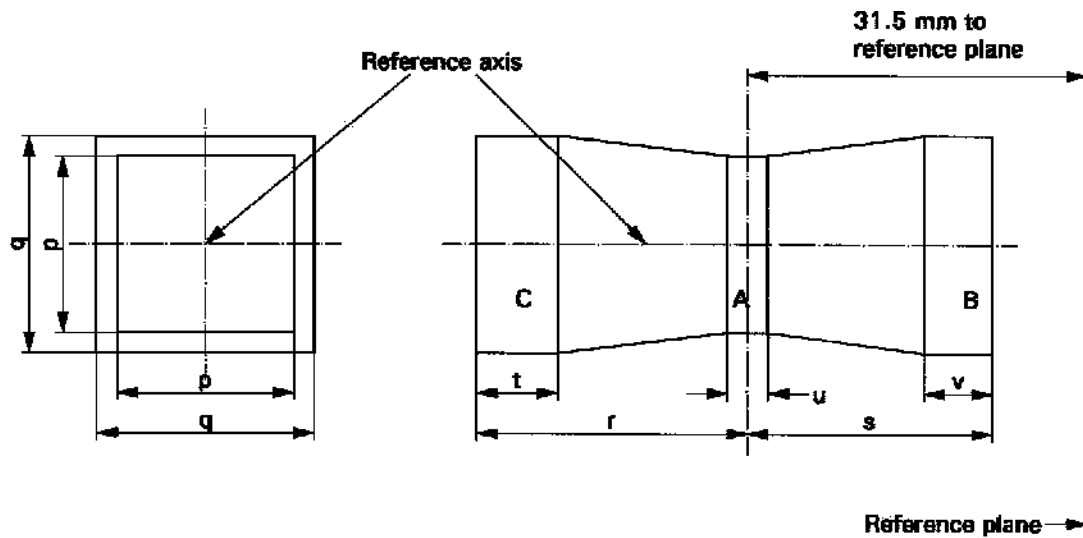
^{*/} Manufacturers may choose another set of perpendicular viewing directions. The viewing directions specified by the manufacturer are to be used by the testing laboratory when checking filament dimensions and position.

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

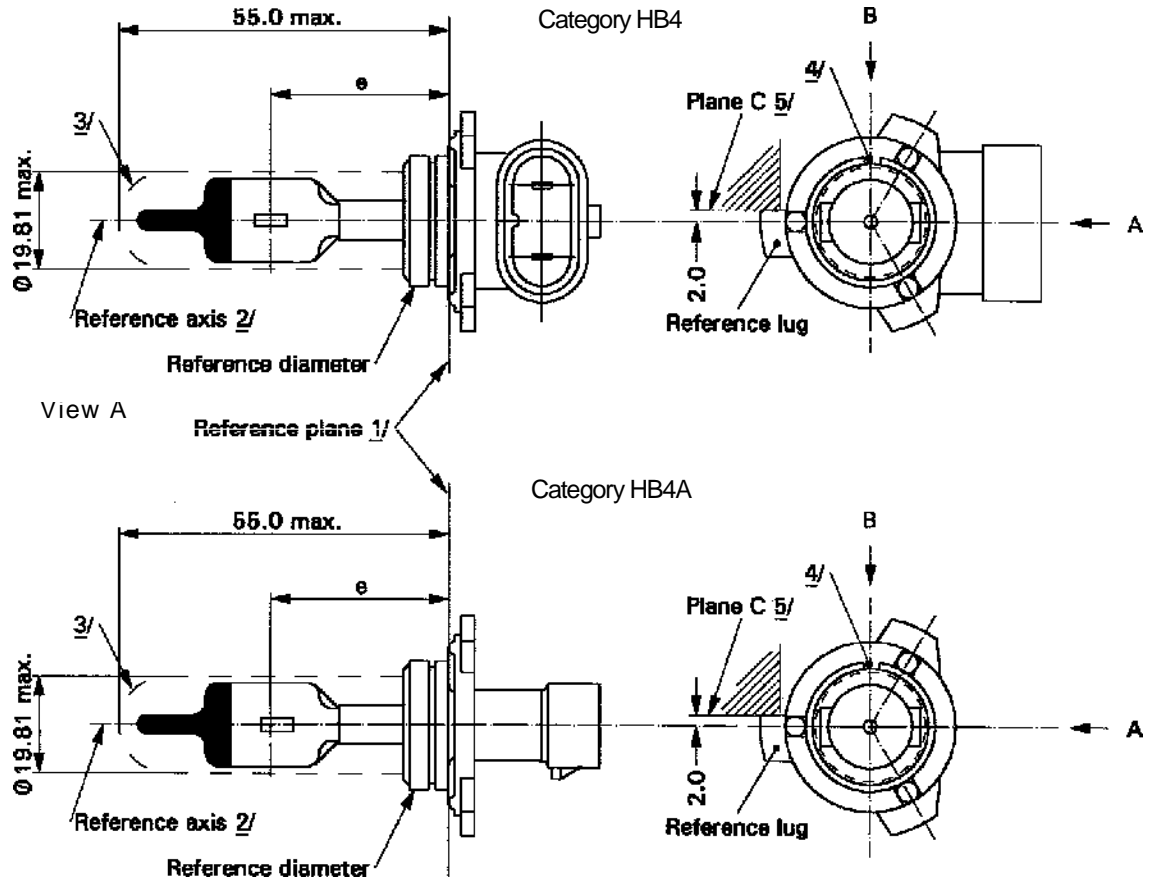
The filament position is checked solely in directions A and B as shown on sheet HB3/1.

The filament shall lie entirely within the limits shown.

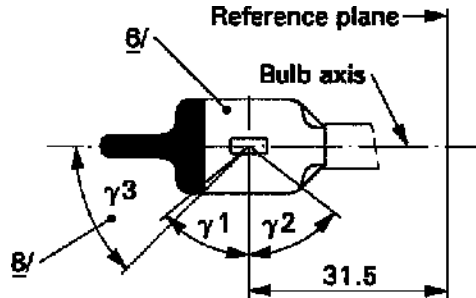
The beginning of the filament as defined on sheet HB3/3, footnote 11/, shall lie in volume "B" and the end of the filament in volume "C".

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

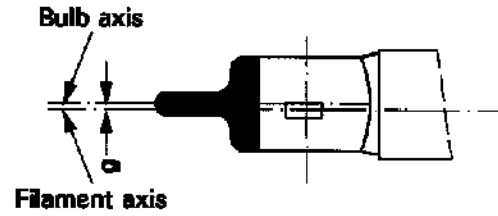
The drawings are intended only to illustrate the essential dimensions (in mm) of the filament light source



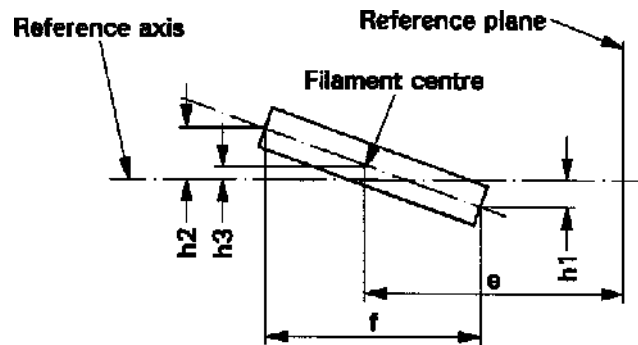
- 1/ The reference plane is the plane defined by the meeting points of cap-holder fit.
- 2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.
- 3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the light source key. The envelope is concentric to the reference axis.
- 4/ The keyway is mandatory 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.



Distortion 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 γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 and does not need to be verified in the area covered by the obscuration.
- 8/ The obscuration shall extend to at least angle γ_3 and shall be at least as far as the undistorted part of the bulb defined by angle γ_1 .

CATEGORIES HB4 AND HB4A

Sheet HB4/3

Dimensions in mm ^{13/}		Tolerances	
		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.
	Luminou	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.

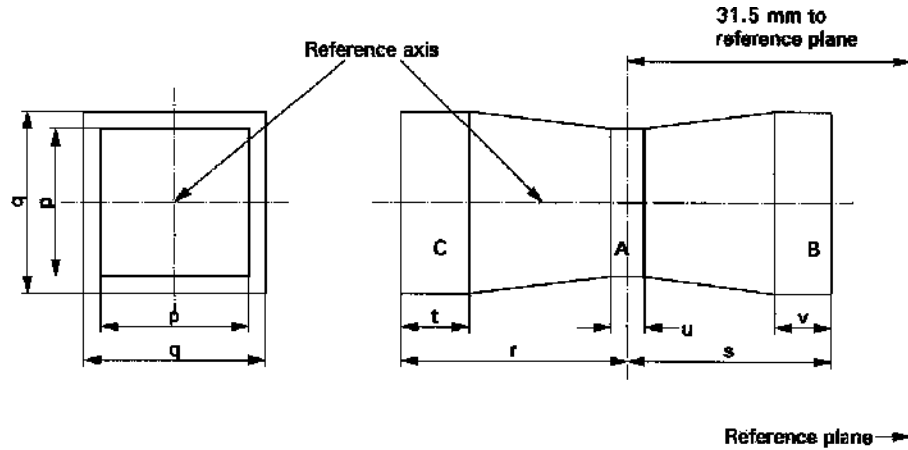
*/ Manufacturers may choose another set of perpendicular viewing directions. The viewing directions specified by the manufacturer are to be used by the testing laboratory when checking filament dimensions and position.

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

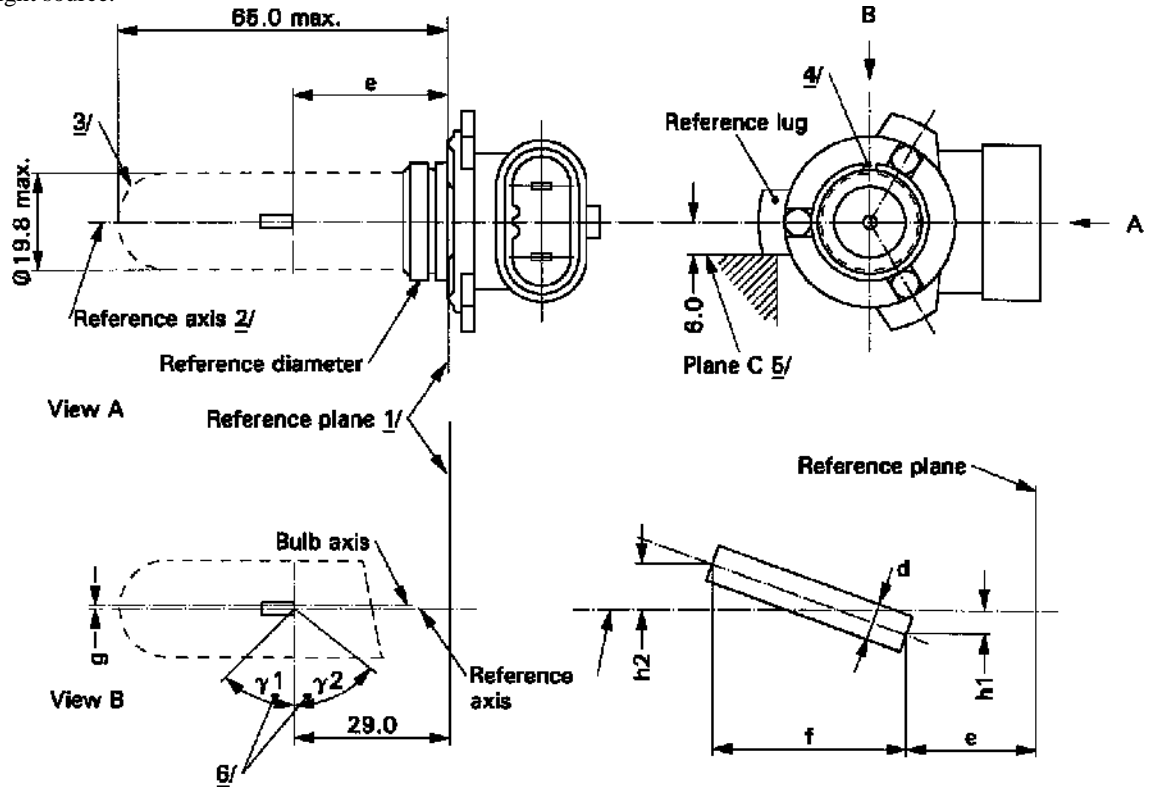
The filament position is checked solely in directions A and B as shown on sheet HB4/1.

The filament shall lie entirely within the limits shown.

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

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

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



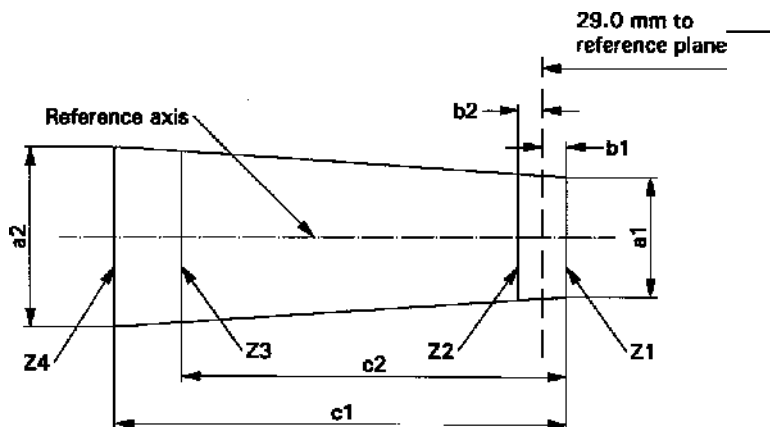
- 1/ The reference plane is the plane defined by the three supporting bosses on the cap flange.
- 2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.
- 3/ Glass bulb and supports shall not exceed the envelope. The envelope is concentric 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 within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .

Dimensions in mm ^{11/}			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	Volt		12	12
	Watt		65	65
Test	Volt		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 note 8/ above, the projection of the outside of the end turns crosses the filament axis.
- 11/ Dimensions shall be checked with O-ring mounted.

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.



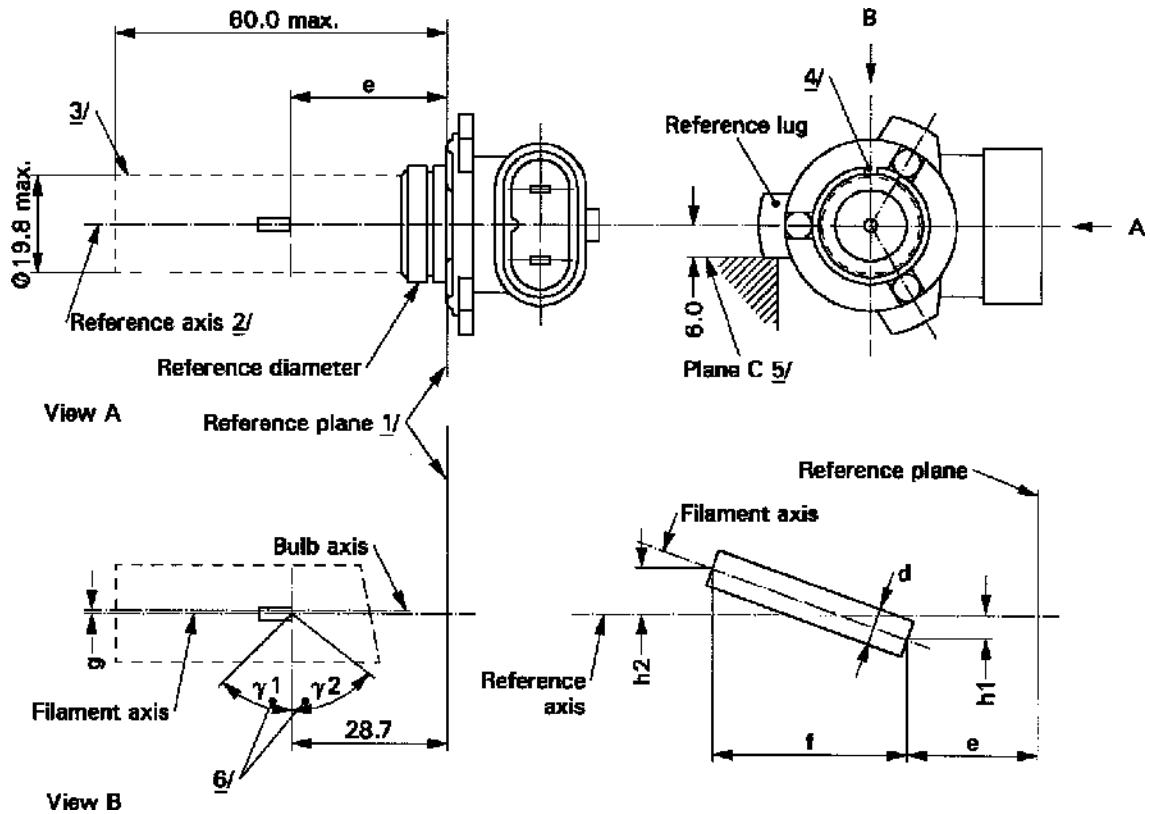
	a1	a2	b1	b1	b2	c1	c2
12 V	$d + 0.4$	$d + 0.8$	0.35			6.1	5.2

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 note 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

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



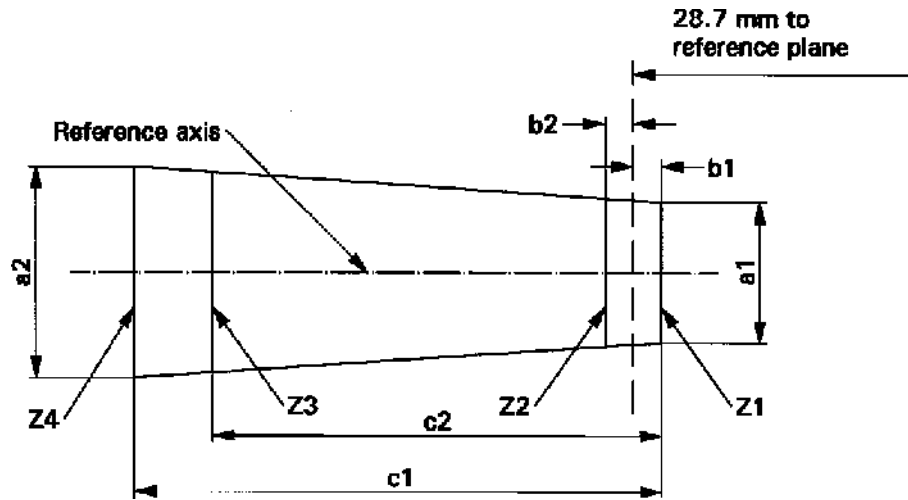
- 1/ The reference plane is the plane defined by the three meeting points of the cap holder fit.
- 2/ The reference axis is perpendicular to the reference plane and passes through the centre of the reference diameter of the cap.
- 3/ Glass bulb and supports shall not exceed the envelope. The envelope 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 within the angles γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_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	Volt	12	12
	Watt	55	55
Test voltage	Volt	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.

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 Z_1 and Z_2 and between lines Z_3 and Z_4 .

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

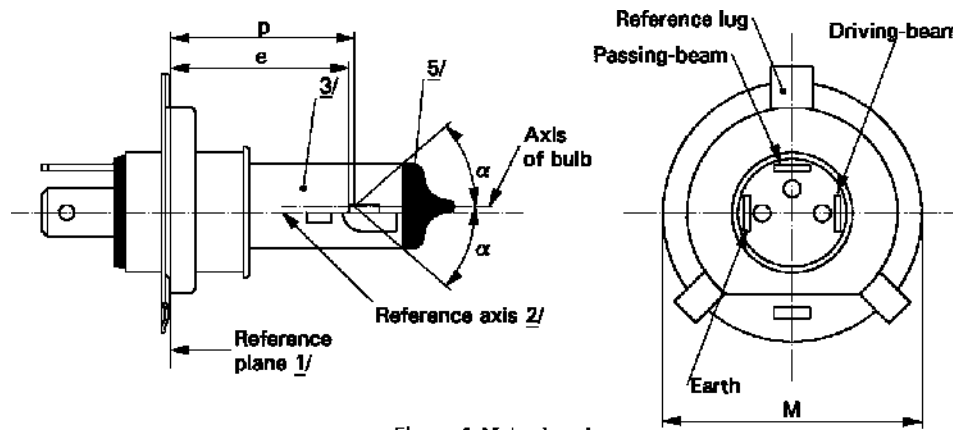


Figure 1 Main drawing

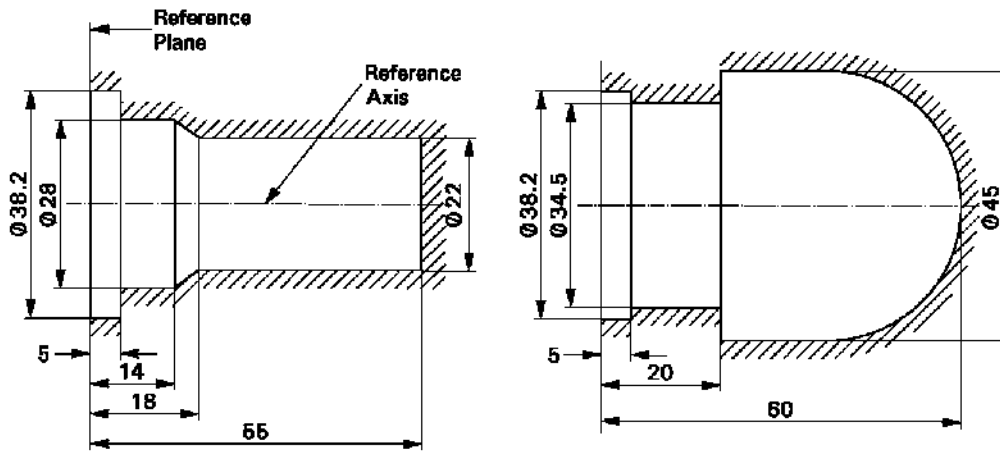


Figure 2

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.

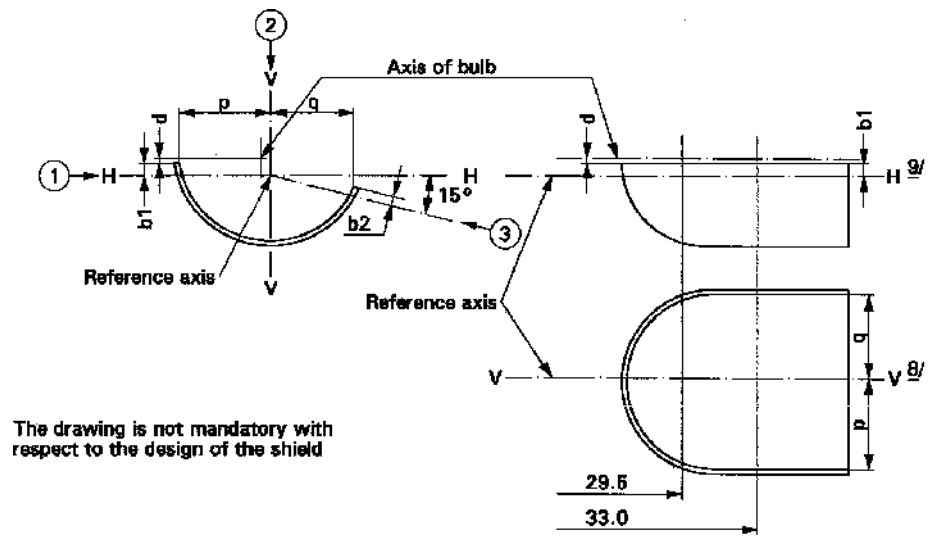
CATEGORY HS1

Sheet HS1/2

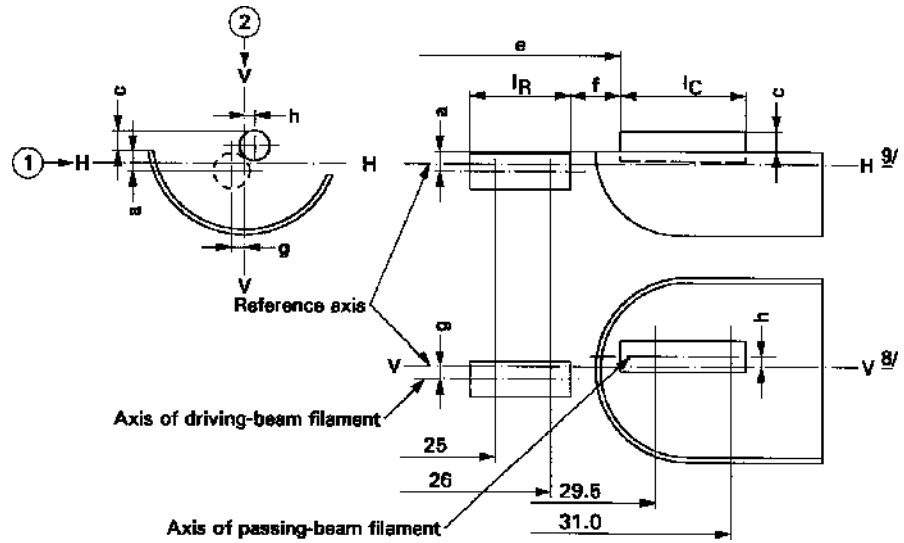
Dimensions in mm		Filament light sources of normal production				Standard filament light source	
		6 V		12 V		12 V	
e		28.5 + 0.45/ - 0.25				28.5 + 0.20/-0.00	
p		28.95				28.95	
α		max. 40°				max. 40°	
Cap PX43t in accordance with IEC Publication 60061 (sheet 7004-34-2)							
ELECTRICAL AND PHOTOMETRIC 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 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.

Position of shield



Position of filaments



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, 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.

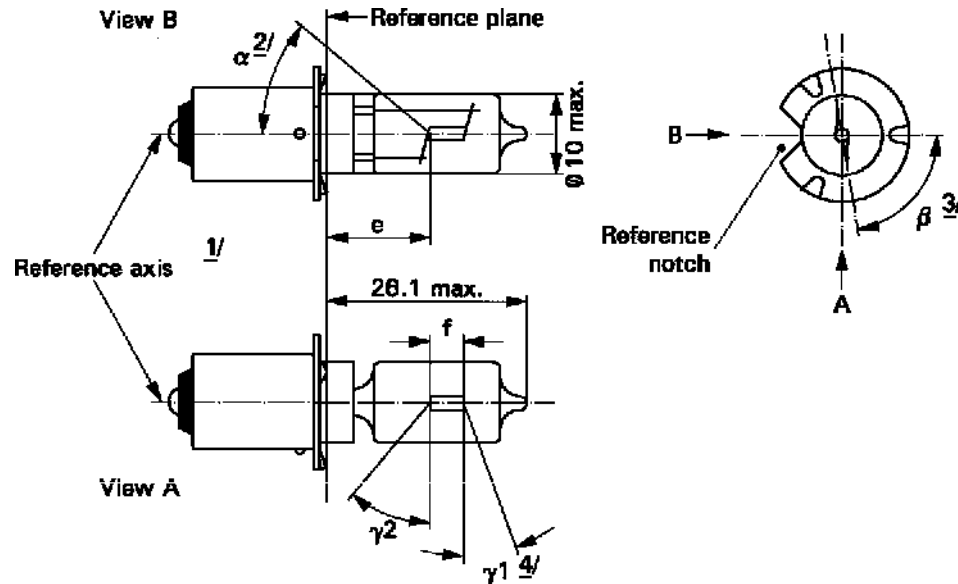
Dimensions b1 and b2 are measured in planes parallel to and 29.5 mm and 33 mm away from the reference plane.

Dimensions a and g are measured in planes parallel to and 25.0 mm and 26.0 mm away from the reference plane.

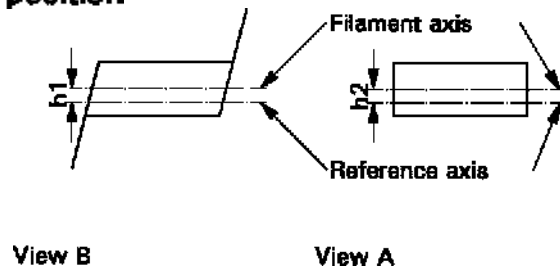
Dimensions c and h are measured in planes parallel to and 29.5 mm and 31 mm away from the reference plane.

Note : For the method of measurement, see Appendix E of IEC Publication 60809.

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



Filament position



- 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 γ_1 and γ_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 sources
		min.	nom.	max.	
e			11.0 ^{5/}		11.0 ± 0.15
f ^{6/}	6	1.5	2.5	3.0	2.5 ± 0.15
	12	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	Volts	6.75	13.5		6.75
Objective values	Watts	15 ± 6 %			15 ± 6 %
	Luminou	320 ± 15 %			
Reference luminous flux: 320 lm at approximately 6.75 V					

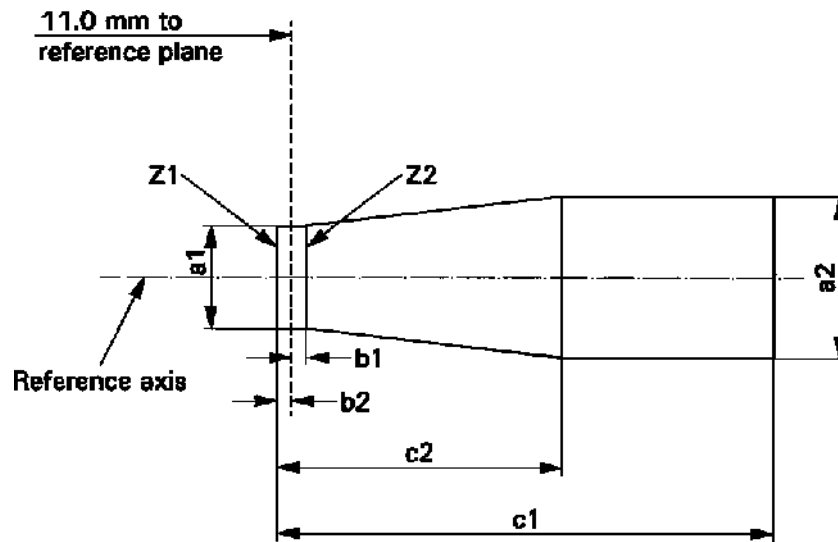
- 5/ To be checked by means of the "box system", sheet HS2/3.
- 6/ In order to avoid rapid filament failure, the supply voltage shall not exceed 8.5 V for 6 V filament light sources and 15 V for 12 V types.

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.

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

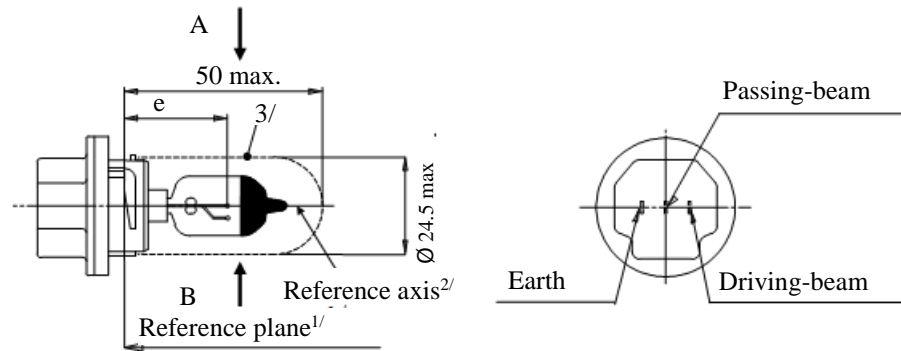


Figure 1 – Main drawing

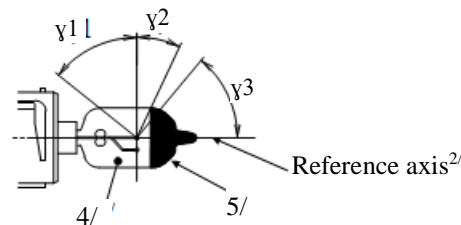
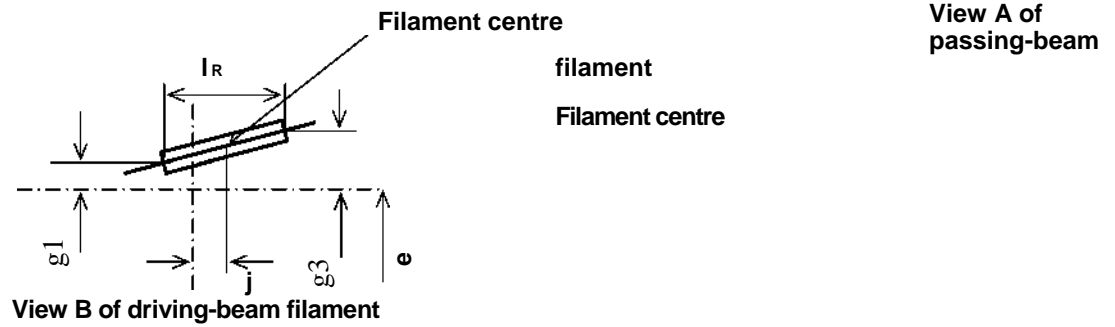


Figure 2 - Distorsion free area^{4/} and black top^{5/}

- 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 γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 5/ The obscuration shall extend at least to angle γ_3 and shall extend at least to the cylindrical part of the bulb on the whole top circumference.



Top view of driving-beam filament

Top view of passing beam filament

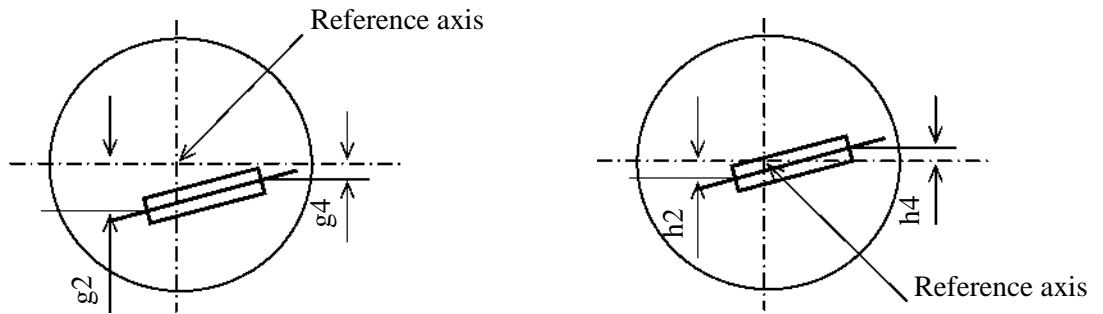


Figure 3-Filament position and dimensions

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 CHARACTERISTICS						
Rated values	Voltage	V	12		12	
	Wattage	W	35	30	35	30
Test voltage		V	13.2		13.2	
Objective Values	Wattage	W	40	37 max.	40 max.	37 max.
	Luminous flux	lm	620	515		
		±%	15	15		
Reference luminous at approximately				12 V	460	
				13.2	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.

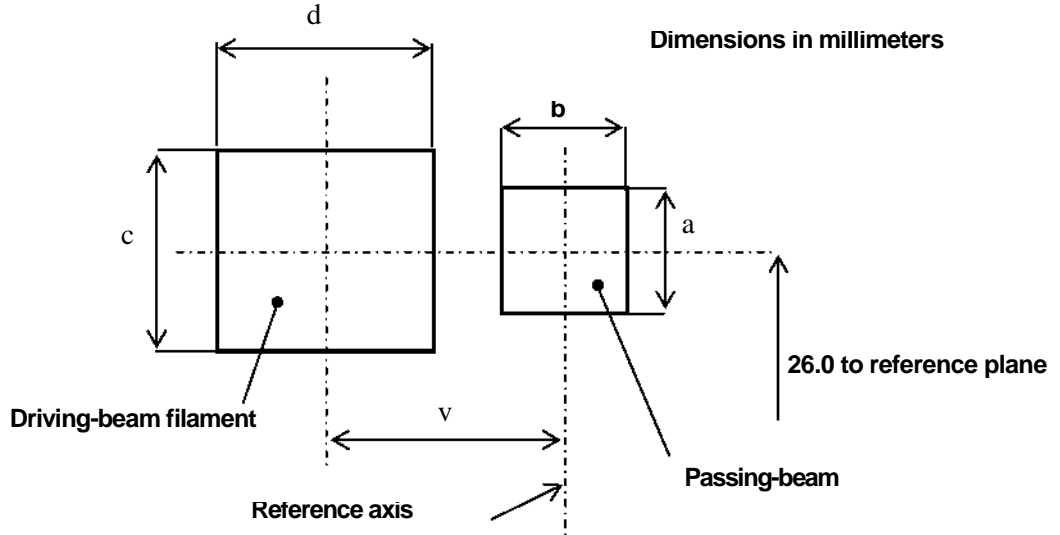
CATEGORY HS5

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.



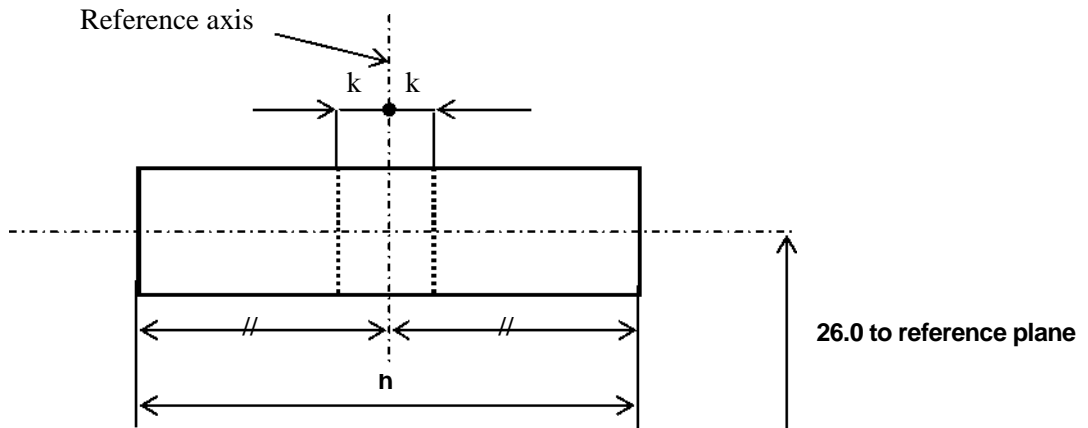
Side elevation

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

Front elevation



Reference	h	k
Dimensions	6.0	0.5

The filaments shall lie entirely within the limits shown.

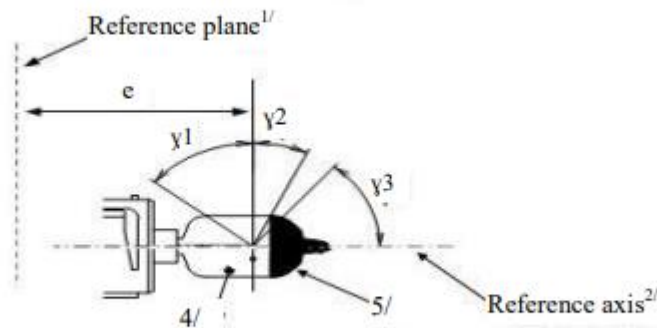
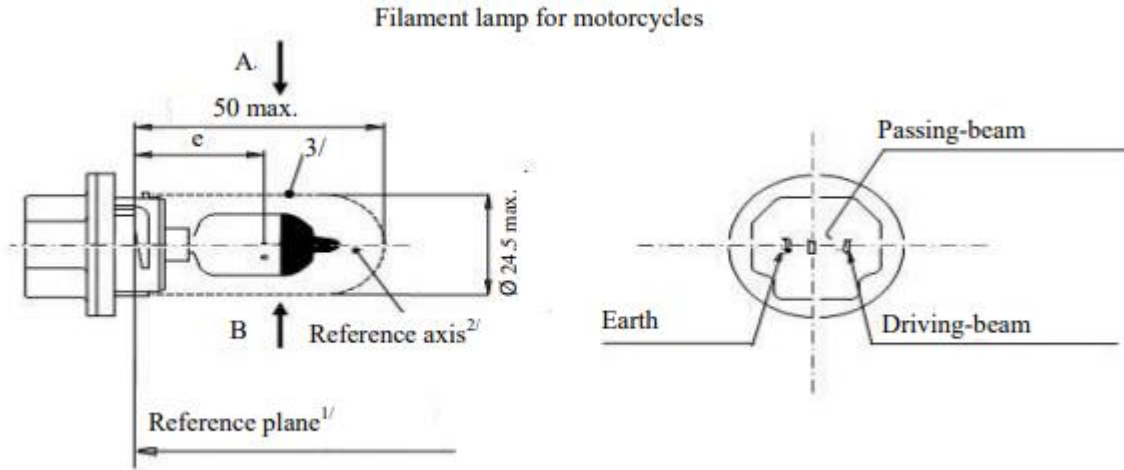
The centre of the filament shall lie within the limits of dimension k.

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CATEGORY HS5A

Sheet HS5A/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 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 γ_1 and γ_2 . This requirement applies to the whole bulb circumference within the angles γ_1 and γ_2 .
- 5/ The obscuration shall extend at least to angle γ_3 and shall extend at least to the cylindrical part of the bulb on the whole top circumference.

CATEGORY HS5A

Sheet HS5A/2

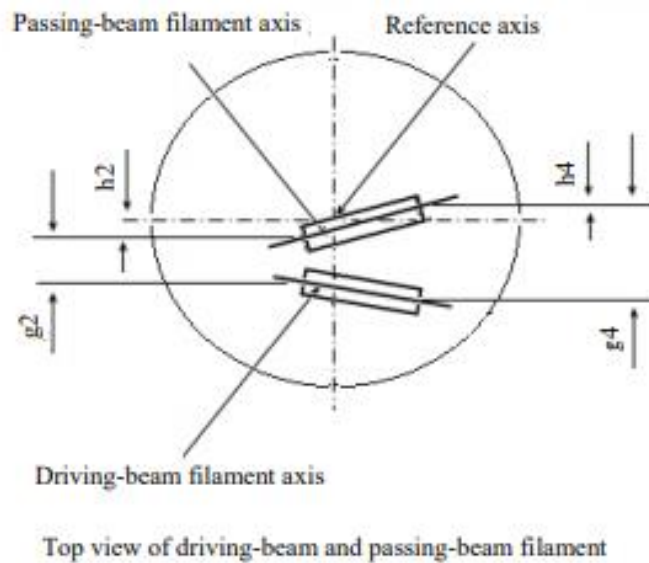
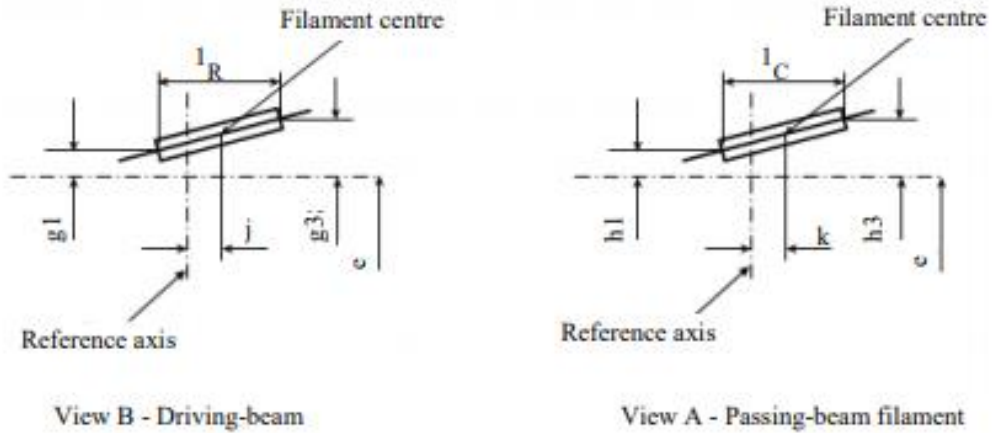
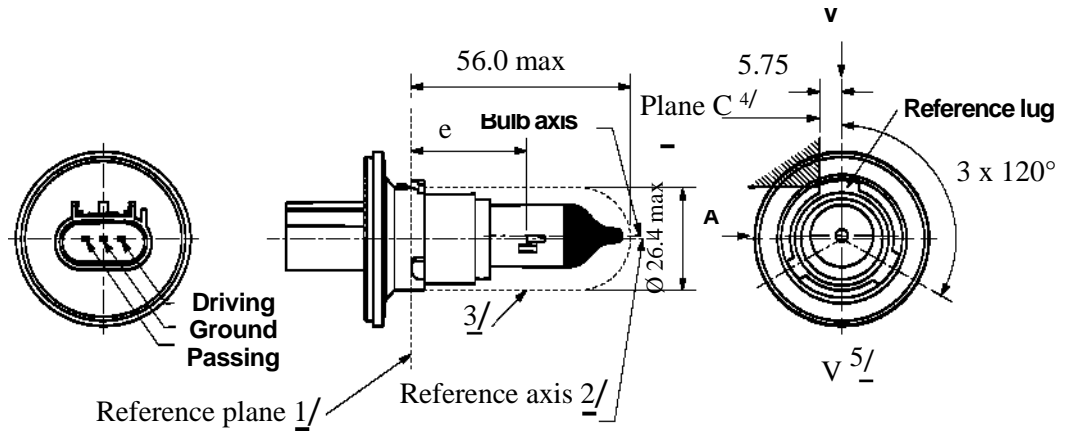


Figure 3 – Filament position and dimensions

CATEGORY HS5A

Sheet HS5A/3

<i>Dimensions in mm</i>		Filament light source of normal production		Standard filament light source		
		<i>12 V</i>		<i>12 V</i>		
e	26	-		-		
lc ^{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		
lr ^{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



<i>Dimensions in mm</i>	Filament light source of normal production		Standard filament light source	
	12 V		12 V	
	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.

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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.

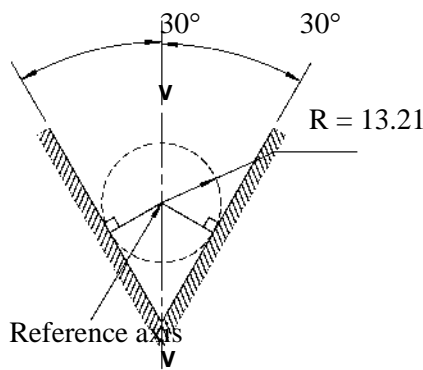


Figure 2-Definition of reference axis 2/

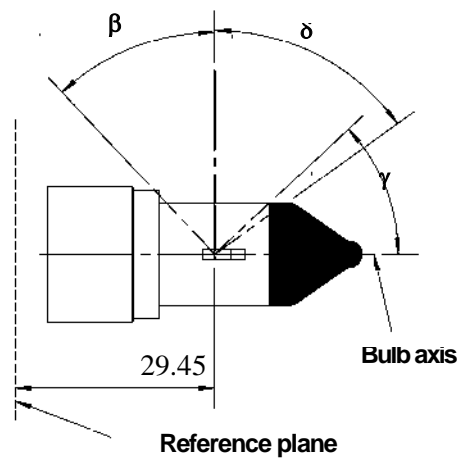


Figure 3 Undistorted area 6/ and opaque coating 7/

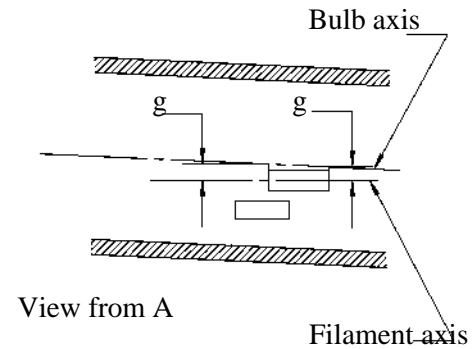
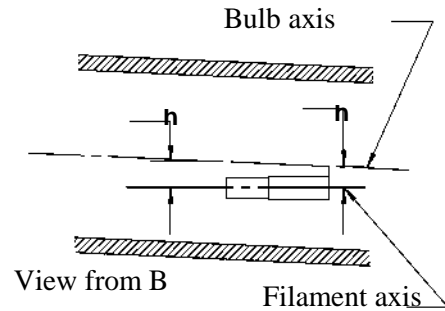


Figure 4 Bulb offset 8/

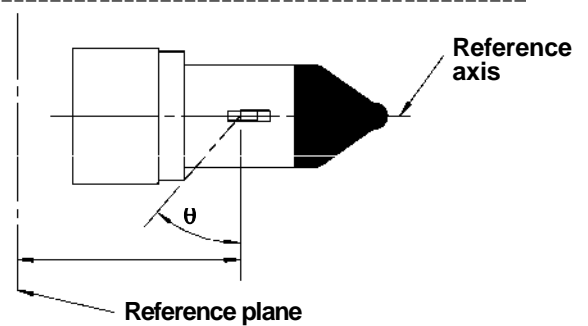


Figure 5 Light blocking toward cap 9/

- 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.

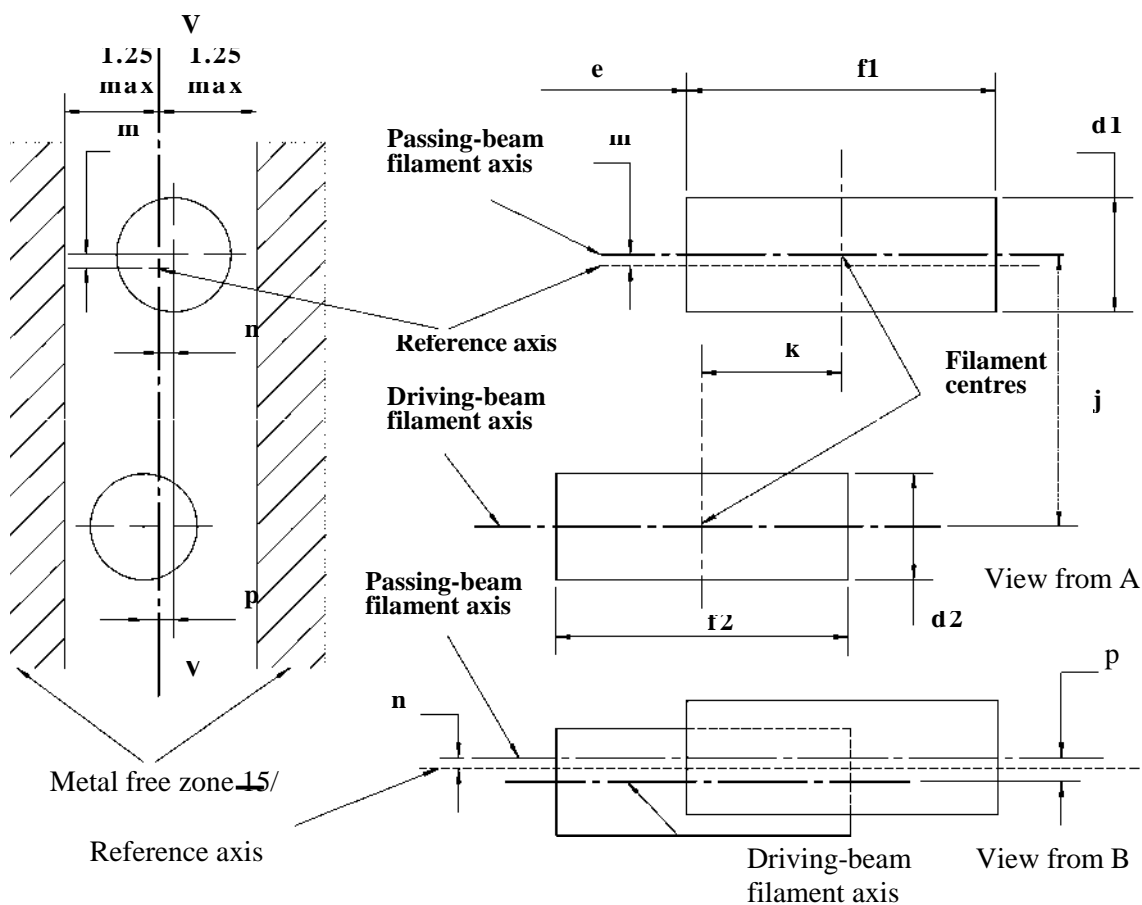


Figure 6-Position and dimensions of filaments ^{10/ 11/ 12/ 13/ 14/}

- ^{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 flux	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.

CATEGORY P13W AND PW13W

Sheet P13W/1

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

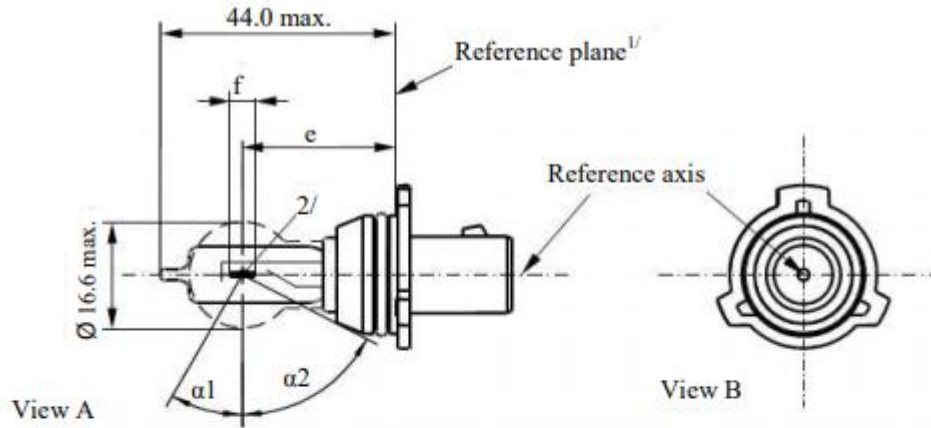


Figure 1 – Main drawing P13W

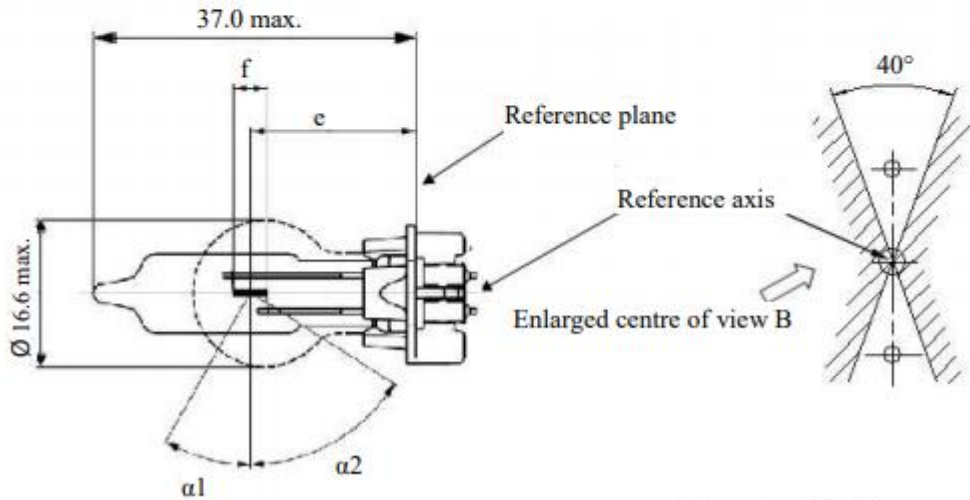


Figure 2 – Metal free zone^{3/}

Figure 3 – Main drawing PW13W

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 $\alpha 1 + \alpha 2$.

CATEGORY P13W AND PW13W

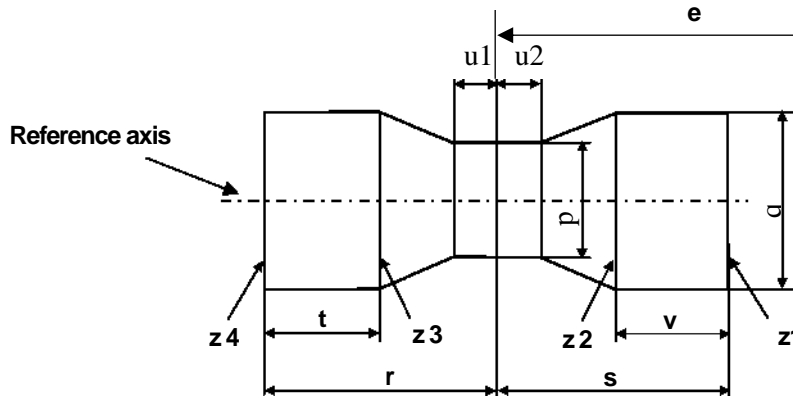
Sheet P13W/2

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 α₂ as shown in Figure 1 on sheet P13W/1. The bulb shall be optically distortion free within the angles α₁+ α₂.
These requirements apply to the whole bulb circumference

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.



View A

	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

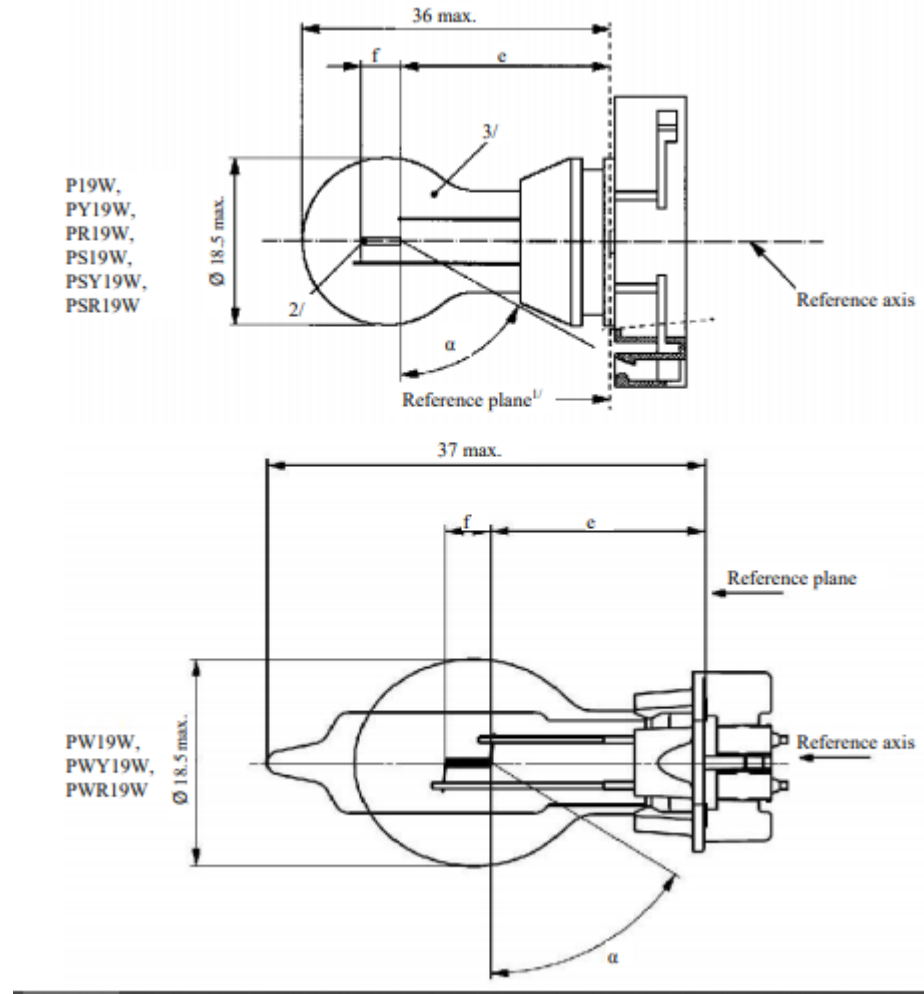
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

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

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 light sources shall be white for categories P19W and PS19W; amber for categories PY19W and PSY19W; red for categories PR 19W and PSR 19W (see also note 8/).

CATEGORIES P19W, PY19W, PR19W, PS19W, PSY19W PSR19W, PW19W, PWY19W AND PWR19W

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 Cap PGU20-1 PY19W Cap PGU20-2 PR19W Cap PGU20-5 in accordance with IEC Publication 60061 (sheet 7004-127 - 2) PS19W Cap PG20-1 PSY19W Cap PG20-2 PSR19W Cap PG20-5					
PW19W Cap WP3.3x14.5-1 PWY19W Cap WP3.3x14.5-2 in accordance with IEC Publication 60061 (sheet 7004-164-2) PWR19W Cap WP3.3x14.5-5					
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.
		P19W PS19W PW19W	350 ± 15 %		
	Luminous flux	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

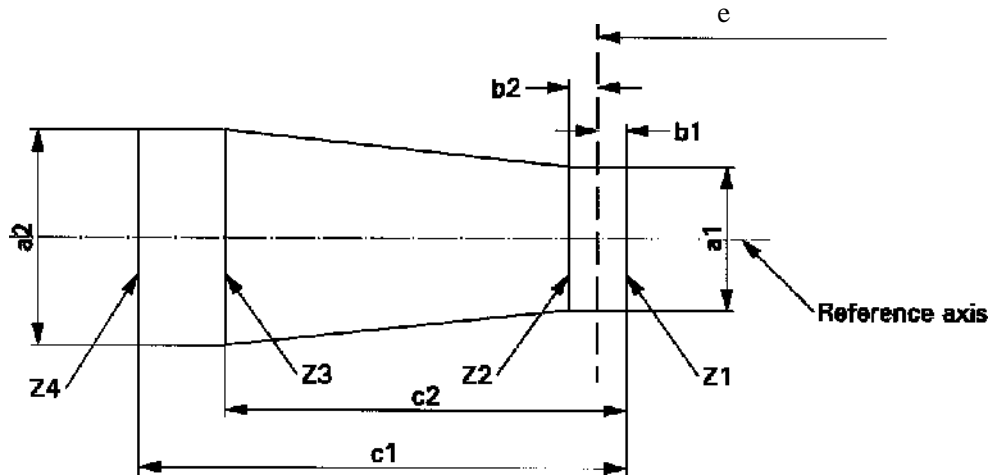
- 4/ For categories PS19W, PSY19W and PSR19W, dimensions shall be checked with O-ring removed to assure the correct mounting during testing
- 5/ The filament position is checked by means of a "Box-System"; sheet P19W/3.
- 6/ The ends of the filament are defined as the points where, when the viewing direction 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 $2\alpha + 180^\circ$.
- 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.

CATEGORIES P19W, PY19W, PR19W, PS19W, PSY19W, AND PSR19W, PW19W, PWY19W 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

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

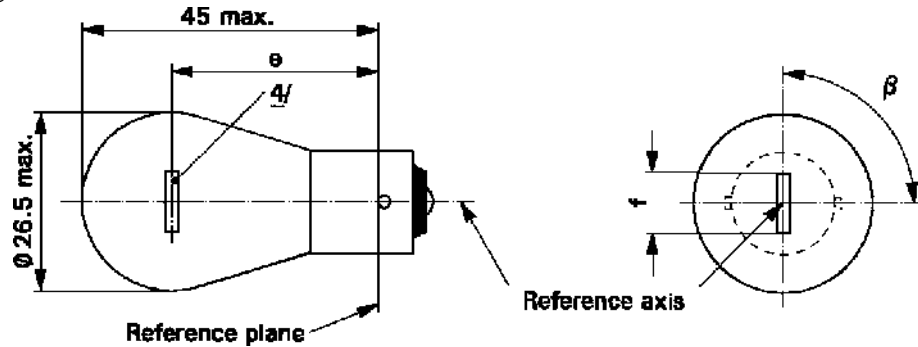
The filament position is checked in two mutually perpendicular planes, one of them being the plane through the lead-in wires.

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

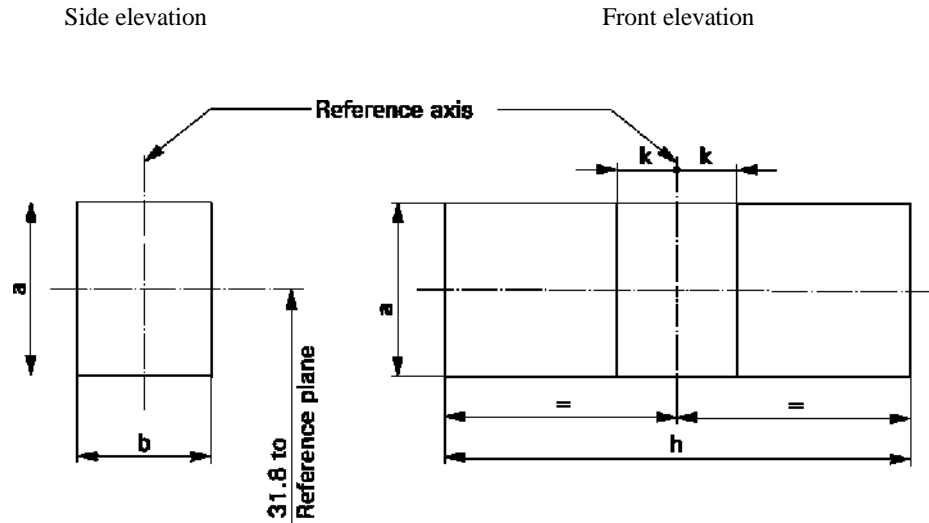


Dimensions in mm		Filament light sources of normal production			Standard filament light source
		min.	nom.	max.	
e	6, 12		31.8 ^{3/}		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V	5.5	6.0	7.0	6.0 ± 0.5
	6 V			7.0	
Lateral deviation ^{1/}	6, 12			^{3/}	0.3 max.
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap BA15s 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	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.

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 $\pm 15^\circ$, 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 sources complies with the requirements.



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.

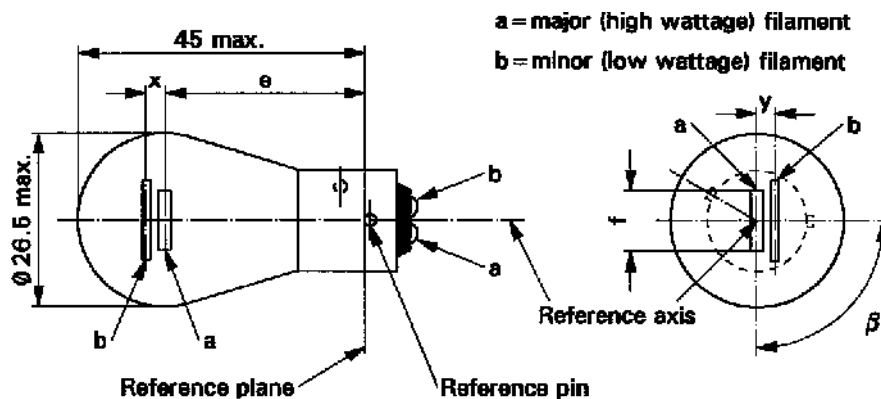
3. Front elevation

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.

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



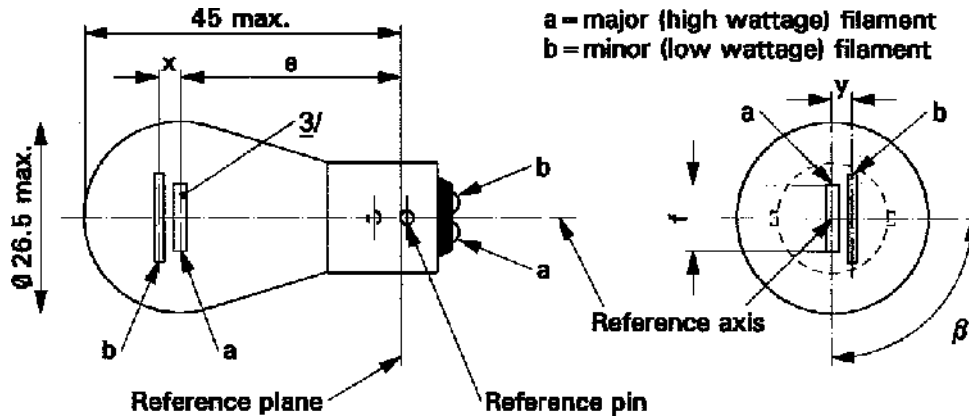
Dimensions in mm	Filament light sources of normal production			Standard filament light source		
	min.	nom.	max.			
E		31.8 ^{1/}		31.8 ± 0.3		
F			7.0	7.0 + 0/- 2		
Lateral deviation			^{1/}	0.3 max. ^{2/}		
x,y	^{1/}			2.8 ± 0.5		
β	75° ^{1/}	90° ^{1/}	105° ^{1/}	90° ± 5°		
Cap BAZ15d in accordance 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	26.5max	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 sources			
		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			
	24 V			1.5				
Lateral deviation 2/	6, 12 V			^{1/}	0.3 max.			
	24 V							
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 voltage	Volts	6.75		13.5		28.0		13.5
Objective values	Watts	27.6m		26.5m		29.7m	11.0	26.5 and 6.6 max.
	Luminous flux ± %	440	35	440	35	440	4	
		15	20	15	20	15	2	
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

Notes

- 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 $\pm 15^\circ$, 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.

3. Front elevation

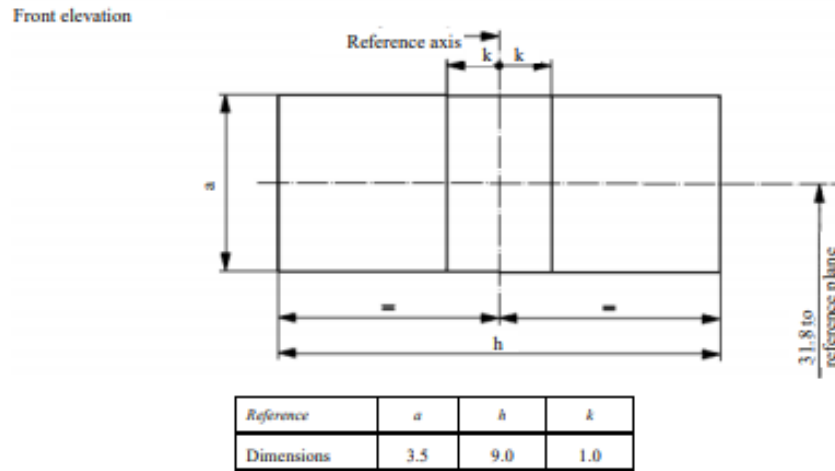
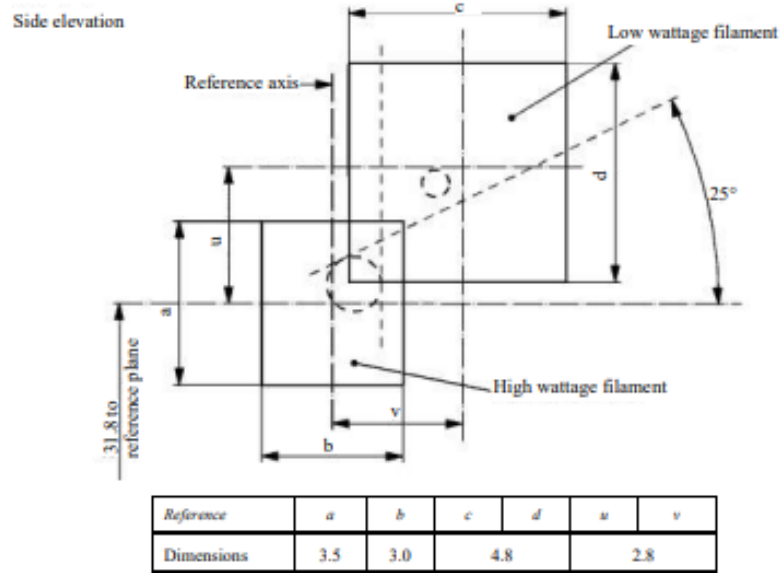
The filament light source being placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to axis of the major filament:

- 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 P21/5W

Sheet P21/5W/3

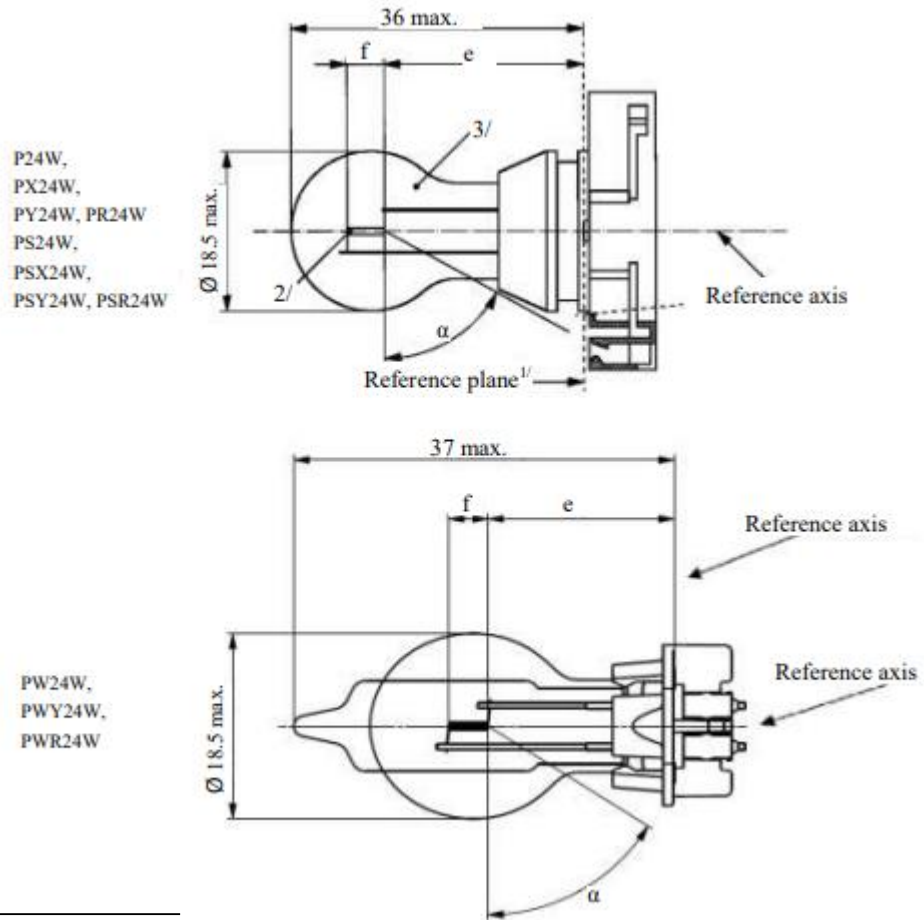
Dimensions in mm



Sheet P24W/1

**CATEGORIES P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W
PSR24W, PW24W, PWY24W and PWR24W**

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 light sources shall be white for categories P24W, PX24W, PS24W, PSX24W and PW24W; amber for categories PY24W, PSY24W and PWY24W; red for the categories PR24W, PSR24W and PWR24W. (See also footnote 8/)

Sheet P24W/2

CATEGORIES P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W, PSR24W, PW24W, PWY24W and PWR24W

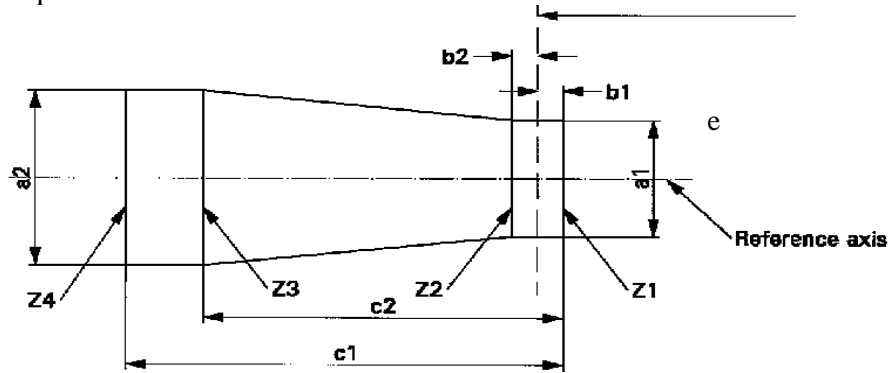
Dimensions in mm ^{4/}		Filament light sources of normal production			Standard filament light source
		min.	Nom	Max	^{8/}
e ^{5/ 6/}	P24W, PY24W, PR24W, PS24W,PSY24W, PSR24W, PX24W, PSX24W		24.0		24.0
	PW24W, PWY24W, PWR24W		18.1		18.1
f ^{5/,6/}	P24W, PY24W, PR24W, PS24W, PSY24W, PSR24W, PW24W, PWY24W, PWR24W		4.0		4.0
	PX24W, PSX24W		4.2		4.2
α ^{7/}		58.0°			58.0° min.
P24W	Cap PGU20-3	in accordance with IEC Publication 60061 (sheet 7004-127-2)			
PX24W	Cap PGU20-7				
PY24W	Cap PGU20-4				
PR24W	Cap PGU20-6				
PS24W	Cap PG20-3				
PSX24W	Cap PG20-7				
PSY24W	Cap PG20-4				
PSR24W	Cap PG20-6				
PW24W	Cap WP3.3x14.5-3	in accordance with IEC Publication 60061 (sheet 7004-164-1)			
PWY24W	Cap WP3.3x14.5-4				
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 %		
		PY24W, PSY24W PWY24W	300 +15/-25 %		
		PR24W ,PSR24W PWR24W	115 +15/-25 %		
Reference luminous flux at approximately		12 V	White: 345 lm		
		13.2 V	White: 465 lm		
		13.5 V	White: 500 lm Amber: 300 lm Red: 115 lm		

- 4/ For categories PS24W, PSX24W, PSY24W and PSR24W, dimensions shall be checked with O-ring removed.
- 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 shown 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 $2\alpha + 180^\circ$.
- 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.

CATEGORIES P24W, PX24W, PY24W, PR24W, PS24W, PSX24W, PSY24W, PSR24W, PW24W, PWY24W 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.



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.

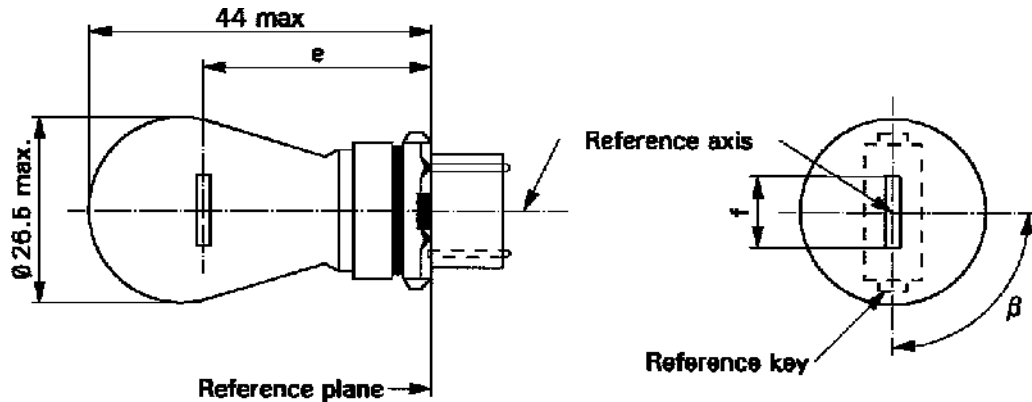
The ends of the filament as defined on sheet P24W/2, footnote 6/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

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

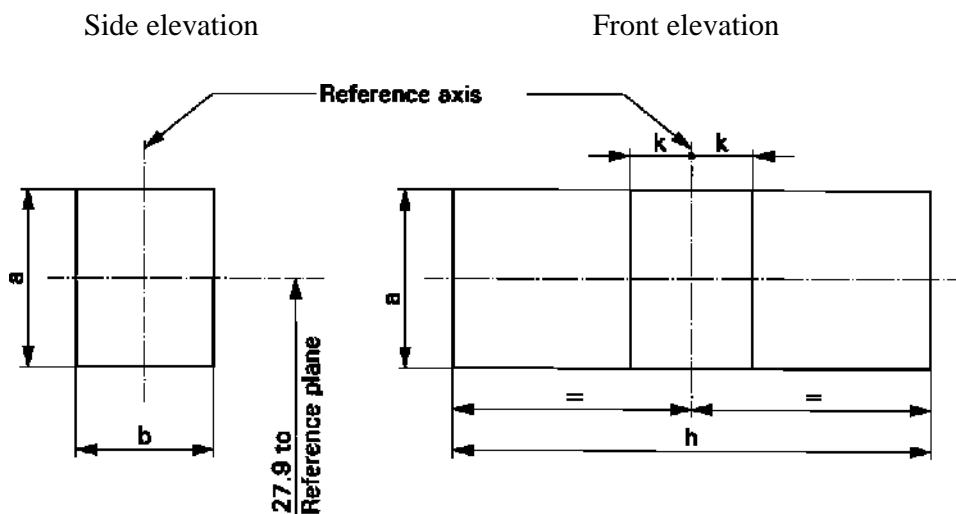


Dimensions in mm	Filament light sources of normal production				Standard filament light source
	min.	nom.	max.		
e		27.9			27.9 ± 0.3
f			9.9		9.9 + 0/ - 2
Lateral deviation ^{2/}			3/		0.0 ± 0.4
β	75° ^{3/}	90°	105°	^{3/}	90° ± 5°
Cap W2.5x16d in accordance with IEC Publication 60061 (sheet 7004-104-1)					
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.

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 $\pm 15^\circ$, 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:

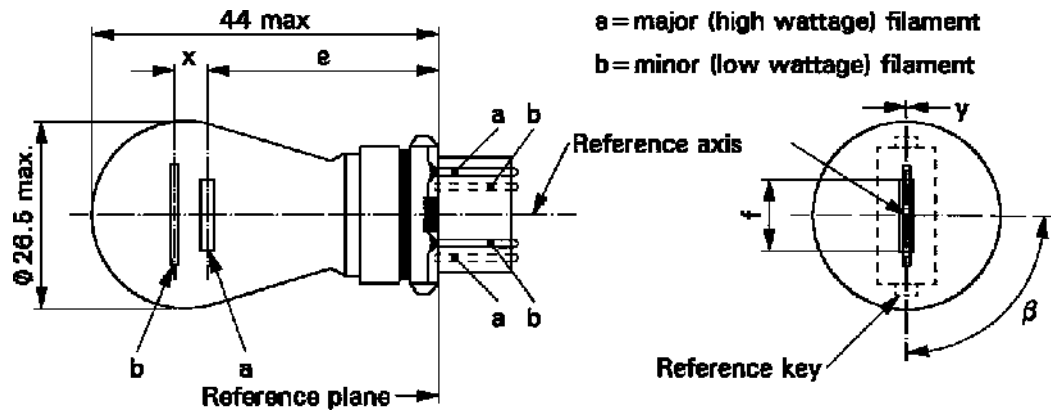
3.1. The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.

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	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.

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 $\pm 15^\circ$, 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

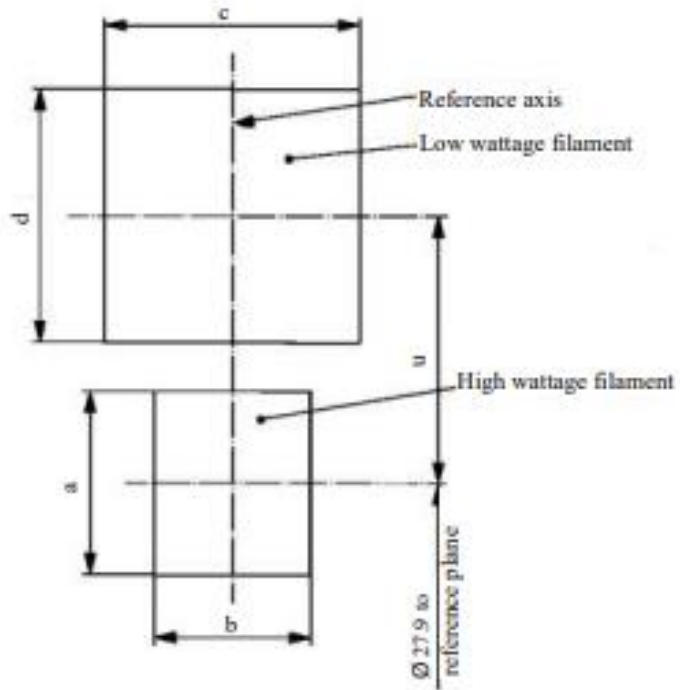
The filament light source placed with the cap down, the reference axis vertical, the reference key to the right and the major filament seen end-on:

 - 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:

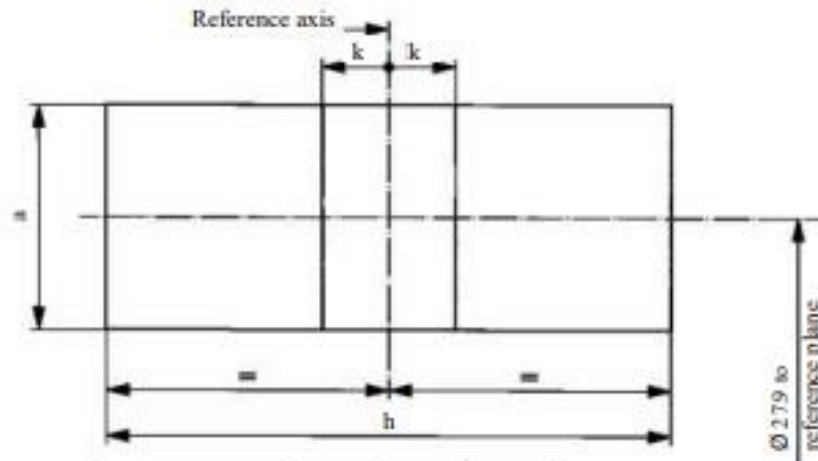
 - 3.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;
 - 3.2. The centre of the major filament shall not be offset by more than distance "k" from the reference axis;
 - 3.3. The 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).

Side elevation



Reference	a	b	c	d	u
Dimension	3.5	3.0	4.8	5.1	

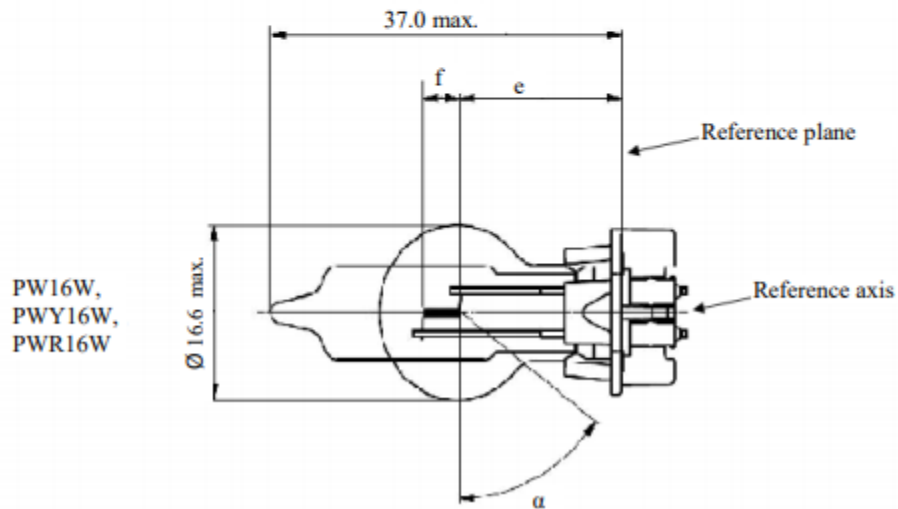
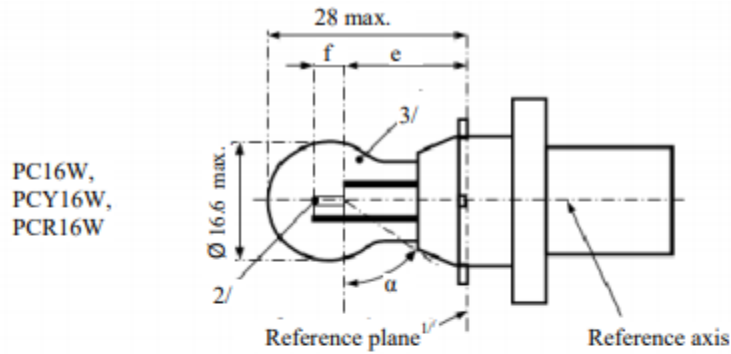
Front elevation



Reference	a	h	k
Dimension	3.5	11.9	1.0

CATEGORIES PC16W, PCY16W PCR16W, PW16W, PWY16W and PWR16W

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 light sources shall be white for category PC16W and PW16W; amber for category PCY16W and PCR16W; red for category PWR16W. (see also footnote 7/).

Sheet PC16W/2

CATEGORIES PC16W, PCY16W, PCR16W, PW16W, PWY16W and PWR16W

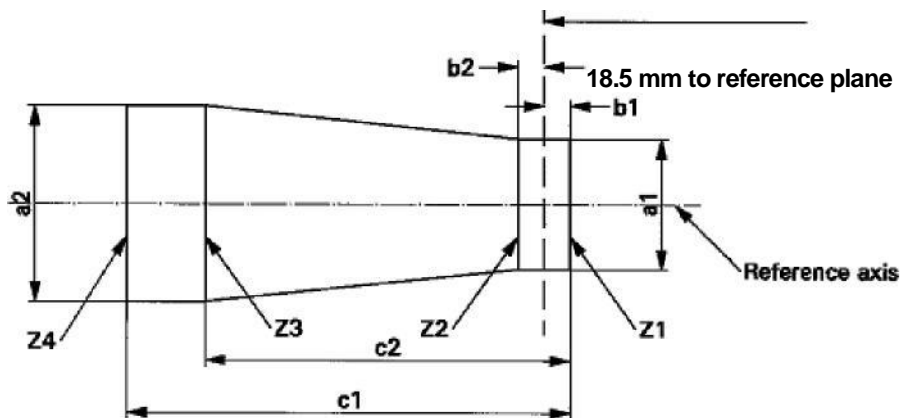
Dimensions in mm		Filament light sources of normal production			Standard filament light source ^{7/}	
		min.	nom.	max.		
e ^{4/ 5/}	PC16W PCY16W PCR16W		18.5		18.5	
	PW16W PWY16W PWR16W		17.1		17.1	
f ^{4/ 5/}			4.0		4.0 ± 0.2	
α ^{6/}		54°			54° min.	
PC16W	Cap PU20d-1	in accordance with IEC Publication 60061(sheet 7004-158-1)				
PCY16W	Cap PU20d-2					
PCR16W	Cap PU20d-7					
PW16W	Cap WP3.3x14.5-8	in accordance with IEC Publication 60061 (sheet 7004-164-1)				
PWY16W	Cap WP3.3x14.5-9					
PWR16W	Cap WP3.3x14.5-10					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS						
Rated values	Vol		12		12	
	Wat		16		16	
Test voltage	Vol		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: Amber: Red:	300 lm 180 lm 70 lm	

- 4/ The filament position is checked by means of a "Box-System"; 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 2α + 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.

CATEGORIES PC16W, PCY16W PCR16W, PW16W, PWY16W 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.

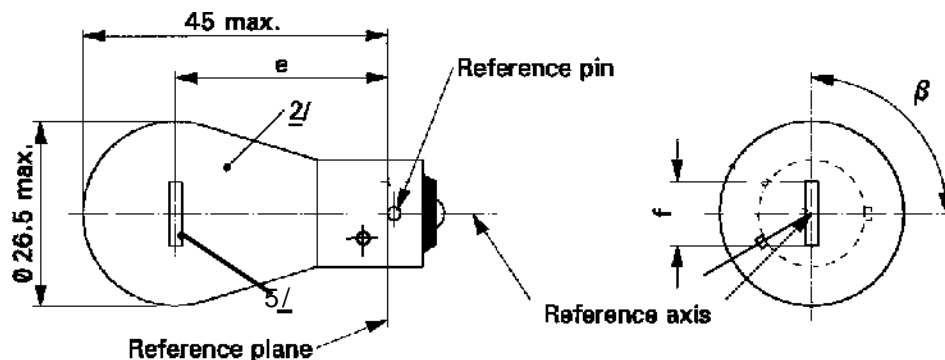
The ends of the filament as defined on sheet PC16W/2, footnote 5/, shall lie between Z_1 and Z_2 and between the lines Z_3 and Z_4 .

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.



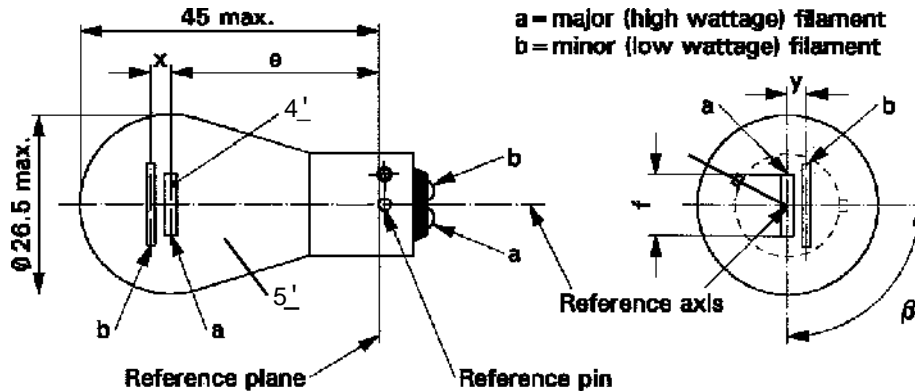
Dimensions in mm		Filament light sources of normal production			Standard filament light source ^{4/}
		min.	nom.	max.	
e	12 V		31.8 ^{3/}		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V	5.5	6.0	7.0	6.0 ± 0.5
Lateral deviation ^{1/}	12 V			^{3/}	0.3 max
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap BAW15s in accordance with IEC Publication 60061 (sheet 7004-11E-1)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	12	24	12	
	Watts	21			21
Test	Volts	13.5	28.0		
Objective values	Watts	26.5 max.	29.7 max.	26.5 max.	
	Luminous	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 light sources shall be red (see also note 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.



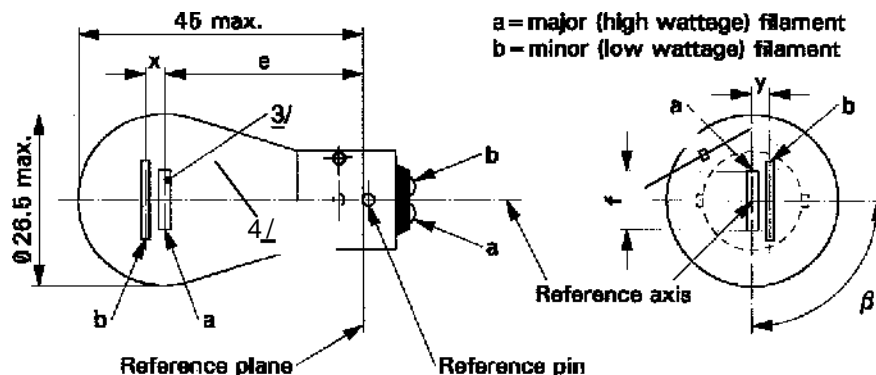
Dimensions in mm	Filament light sources of normal production 5/			Standard filament light source 6/		
	min.	nom.	max.			
e		31.8 ^{1/}		31.8 ± 0.3		
f			7.0	7.0 + 0/- 2		
Lateral deviation			1/	0.3 max. 2/		
x, y	1/			2.8 ± 0.5		
β	75° ^{1/}	90° ^{1/}	105° ^{1/}	90° ± 5°		
Cap BAU15d in accordance with 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	5.5 max.	29.7	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	

- 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.
- 4/ The 24-Volt filament light source is not recommended for future embodiments.
- 5/ The light emitted from normal production light sources 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 voltage	Volts	13.5		28.0		13.5
Objective values	Watts	26.5 max.	6.6 max.	29.7 max.	11.0 max.	26.5 and 6.6 max.
	Luminous flux	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.

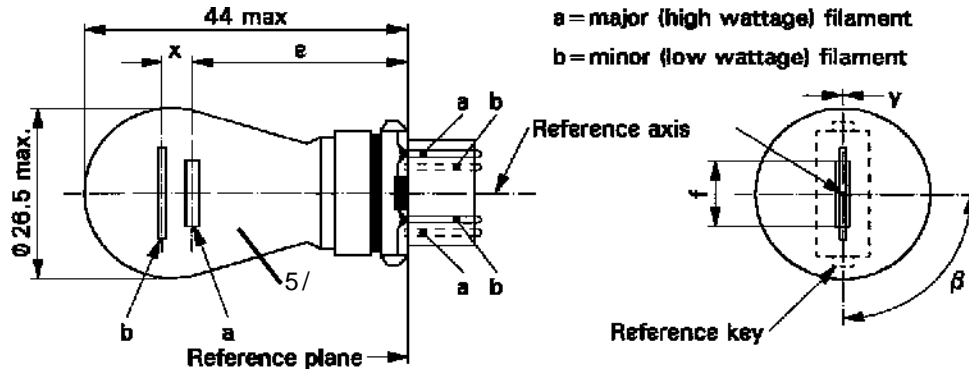
4/ The light emitted from normal production light sources shall be red (see also footnote 5/).

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 WU2.5x16 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.
- 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 light sources 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

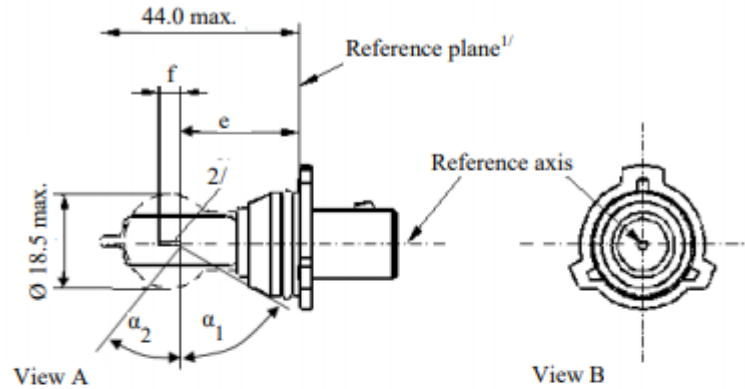
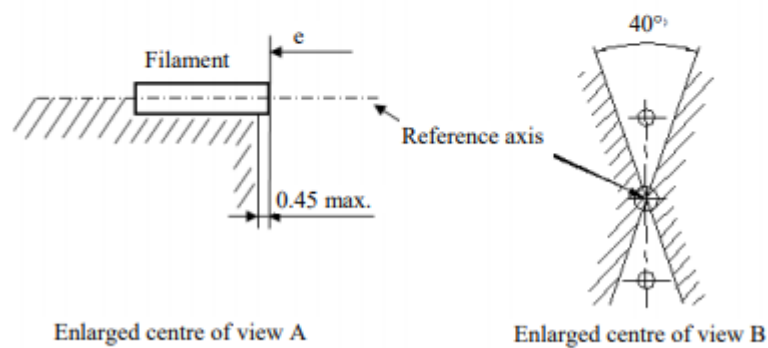


Figure 1 – Main drawing

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 $\alpha_1 + \alpha_2$.

<i>Dimensions in mm</i>		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

CATEGORY PSX26W

Sheet PSX26W/2

- 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 α_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.

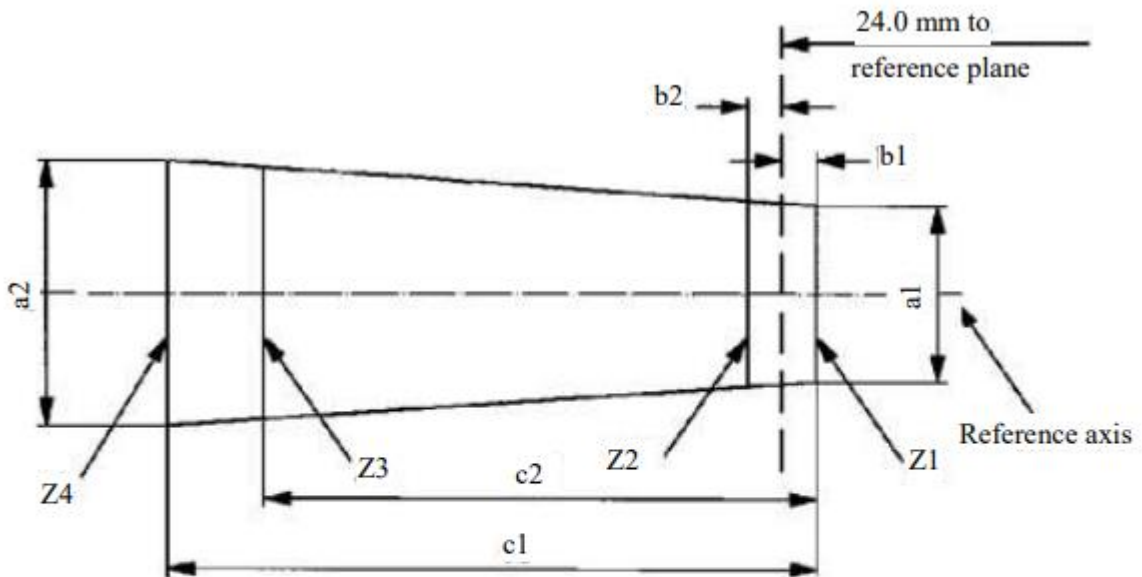
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CATEGORY PSX26W

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.



	<i>a1</i>	<i>a2</i>	<i>b1, b2</i>	<i>c1</i>	<i>c2</i>
Filament lamps of normal production	1.7	1.7	0.30	5.0	4.0
Standard filament lamps	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.

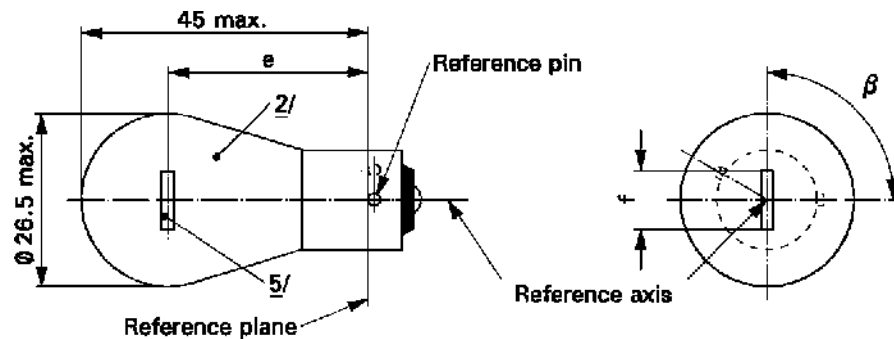
The filament shall lie entirely within the limits shown.

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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 source 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 voltage	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

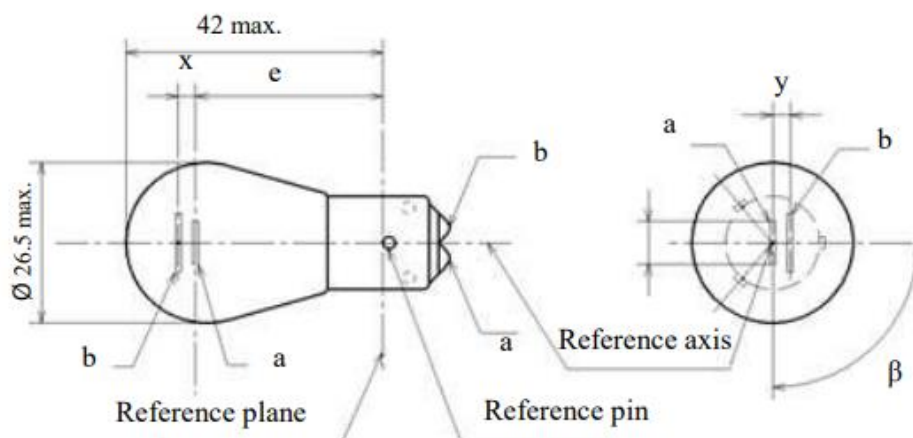
- 1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.
- 2/ The light emitted from production light sources shall be amber (see also footnote 4/).
- 3/ To be checked by means of a "Box-System"; sheet P21W/2.
- 4/ The light emitted from standard filament light source 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.

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CATEGORY PY21/5W

Sheet PY21/5W/1

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



<i>Dimensions in mm</i>		<i>Filament lamps of normal production^{1/}</i>			<i>Standard filament lamp^{4/}</i>
		<i>Min.</i>	<i>Nom.</i>	<i>Max.</i>	
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

- 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 filament light source shall be amber (see also note 4/).
- 4/ The light emitted from standard filament light source shall be white or amber.

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CATEGORY PY21/5W

Sheet PY21/5W/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 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

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", centered 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).

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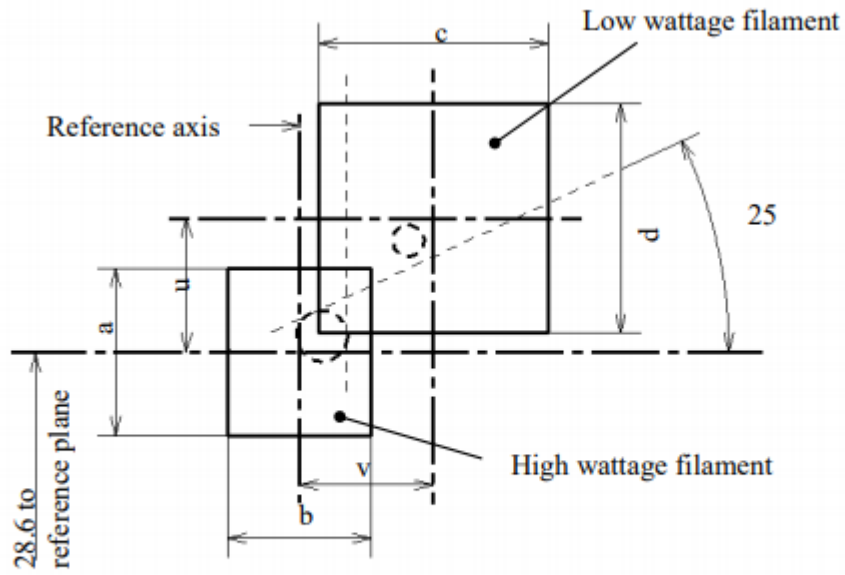
162/221

CATEGORY PY21/5W

Sheet PY21/5W/3

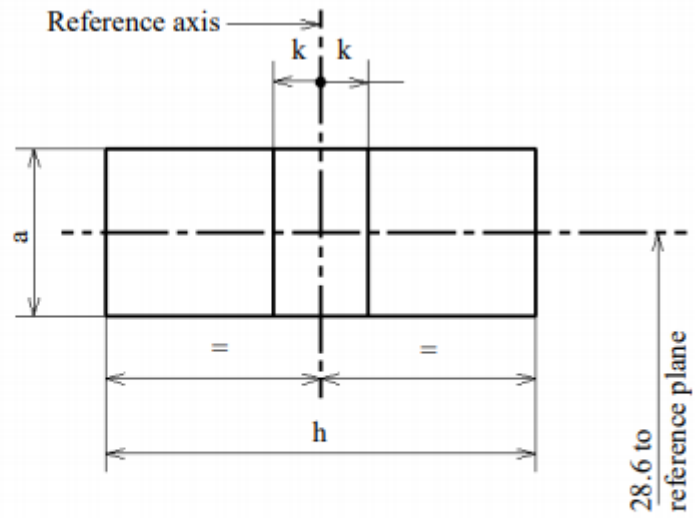
Dimensions in mm

Side elevation



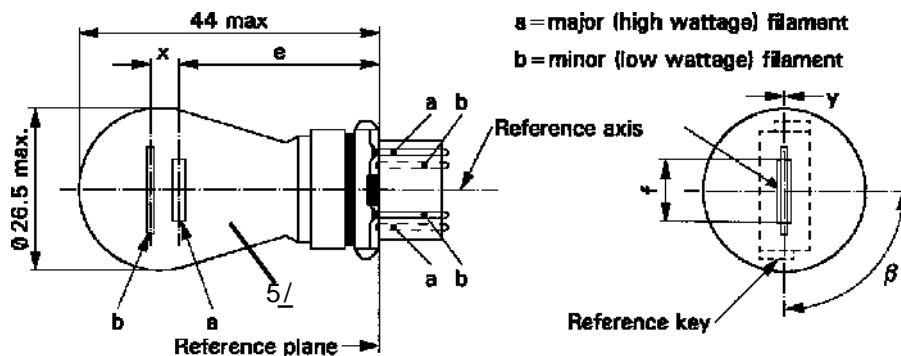
Reference	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>u</i>	<i>v</i>
Dimensions	3.5	3.0	4.8		2.8	

Front elevation



Reference	<i>a</i>	<i>h</i>	<i>k</i>
Dimensions	3.5	9.0	1.0

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



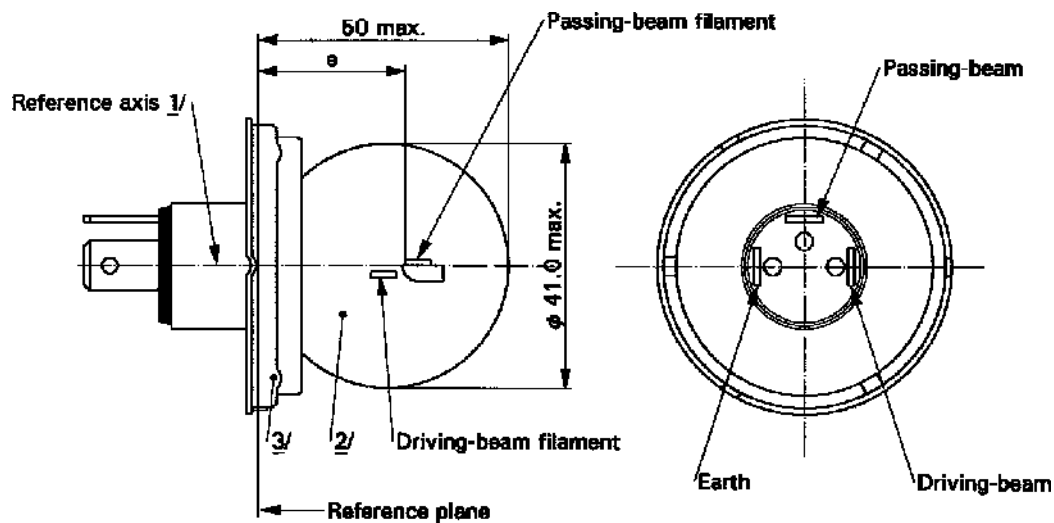
Dimensions in mm	Filament light source of normal production			Standard filament light source	
	min.	nom.	max.	6/	
e		27.9 ^{3/}		27.9 ± 0.3	
f			9.9	9.9 + 0/ - 2	
Lateral deviation ^{2/}			^{3/}	0.0 ± 0.4	
x ^{4/}		5.1 ^{3/}		5.1 ± 0.5	
y ^{4/}		0.0 ^{3/}		0.0 ± 0.5	
β	75° ^{3/}	90°	105° ^{3/}	90° ± 5°	
Cap 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 voltage	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	

- 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 source 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 source 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%	1000 min.	860 ±15		
Measuring flux ^{5/}		-	450	-	450	-	450		
Reference luminous flux at approximately 12V								700	450

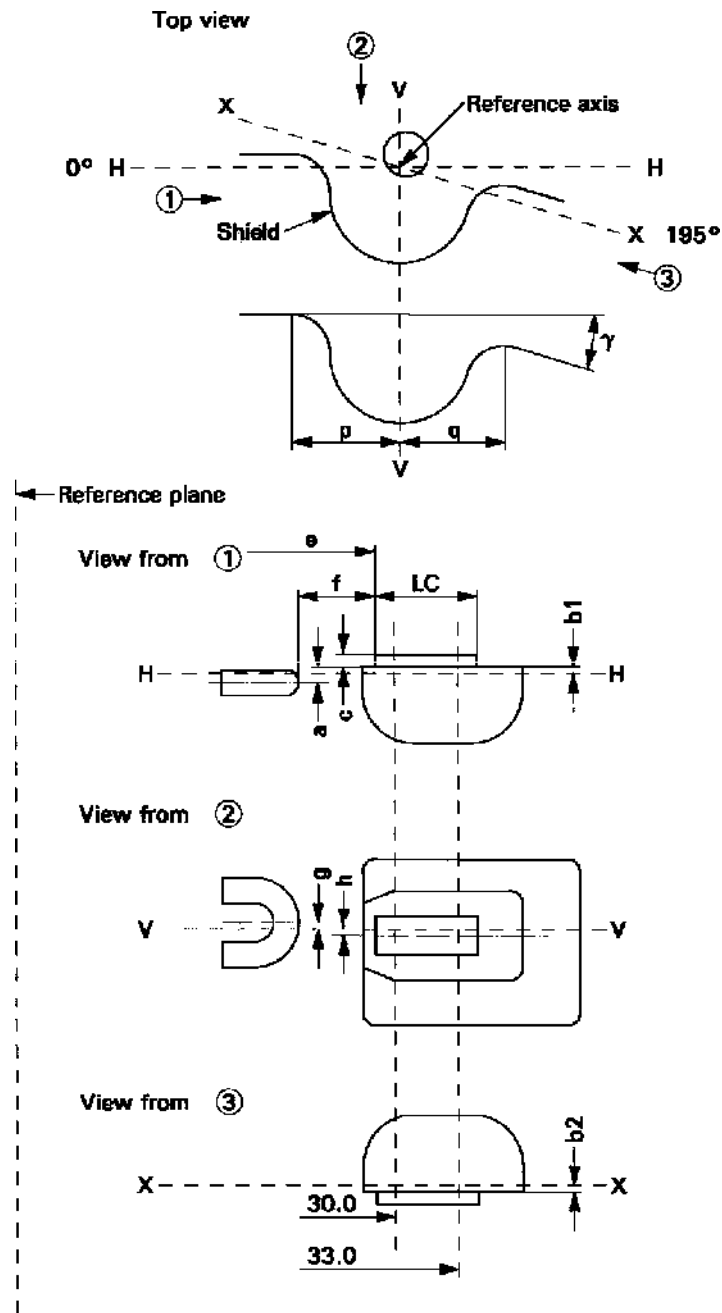
- 1/ The reference axis is perpendicular to the reference plane and passes through the centre of the 45 mm cap diameter.
- 2/ The colour of the light emitted shall be white or selective-yellow.
- 3/ No part of the cap shall, by reflection of light emitted by the passing-beam filament, throw any stray 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 3.9. of this standard with an internal shield to produce cut-off.

CATEGORY R2

Sheet R2/2

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

FILAMENTS AND SHIELD POSITION AND DIMENSIONS ^{1/}					
Dimensions in mm		Tolerance			
		Filament light sources of normal production		Standard filament light source	
		6V	12V	24V	12V
a		0.60		± 0.35	± 0.15
b1/30.0 ^{2/}		0.20		± 0.35	± 0.15
b1/33.0		b1/30.0 mv ^{3/}			
b2/30.0 ^{2/}		0.20		± 0.35	± 0.15
b2/33.0		b2/30.0 mv ^{3/}			
c/30.0 ^{2/}		0.50		± 0,30	± 0.15
c/33.0		c/30.0 mv ^{3/}			
E	6, 12 V 24V	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/}		0		± 0.50	± 0.30
h/33.0		h/30.0 mv ^{3/}			
1/2(p-q)		0		± 0.60	± 0.30
Lc		5.5		± 1.50	± 0.50
γ ^{4/}		15° nom.			
Cap P45t-41 in accordance with IEC Publication 60061 (sheet 7004-95-5)					

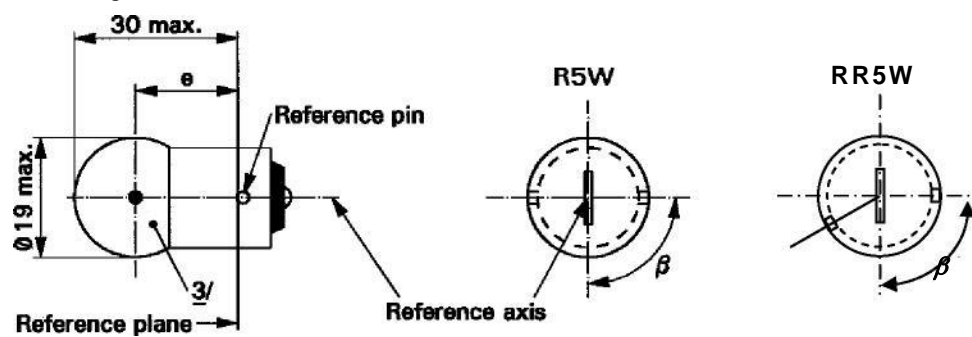
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- 1/ The position and dimensions of the shield and filaments shall be checked by means of the method of measurement as described in IEC Publication 60809.
 - 2/ To be measured at the distance from the reference plane indicated in millimetres behind 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

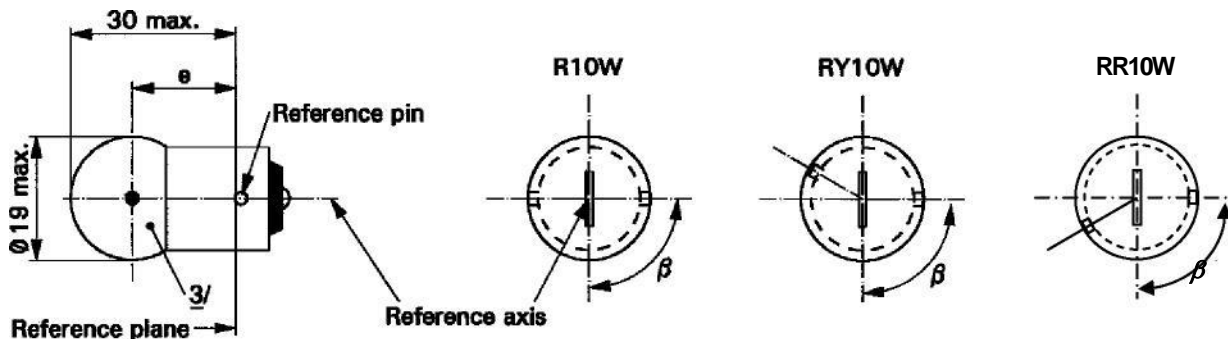


Dimensions in mm	Filament light sources of normal production			Standard filament light source ^{4/}	
	min.	nom.	max.		
e	17	19.0	20.5	19.0 ± 0.3	
Lateral deviation ^{2/}			1.5	0.3 max.	
β	60	90°	120°	90° ± 5°	
Cap: R5W: BA15s (sheet 7004-11A-9) ^{1/} RR5W: BAW15s in accordance with IEC Publication 60061 (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 note 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.

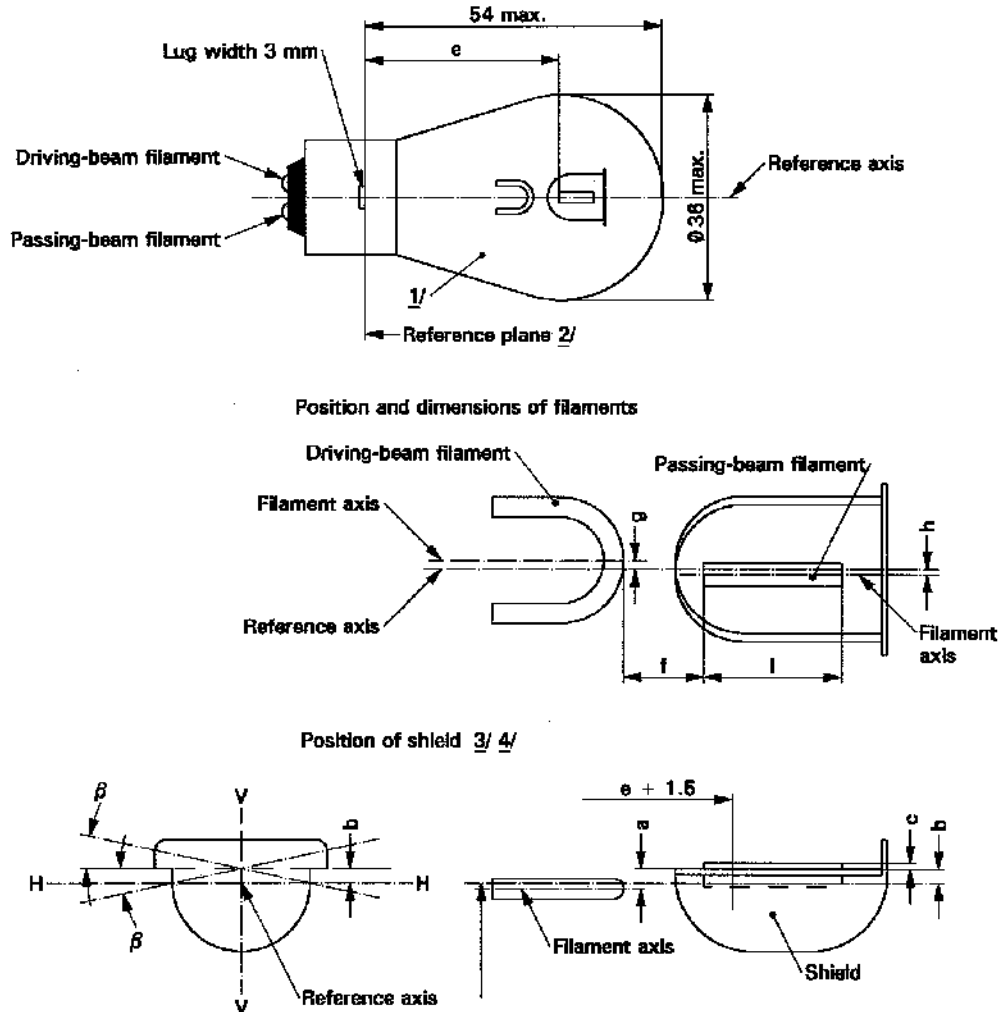


Dimensions in mm		Filament light sources of normal production			Standard filament light source ^{4/}	
		min.	nom.	max.		
e		17.5	19.0	20.5	19.0 ± 0.3	
Lateral deviation ^{2/}				1.5	0.3 max.	
β		60°	90°	120°	90° ± 5°	
Cap: R10W:BA15s RY10W:BAU15s RR10W:BAW15s		(sheet 7004-11A-9) ^{1/} (sheet 7004-19-2) (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	11 max.		14 max.	11 max.
		RY10				11 max.
		RR10W	^{5/}	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.

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

FILAMENT LAMPS 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/ 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

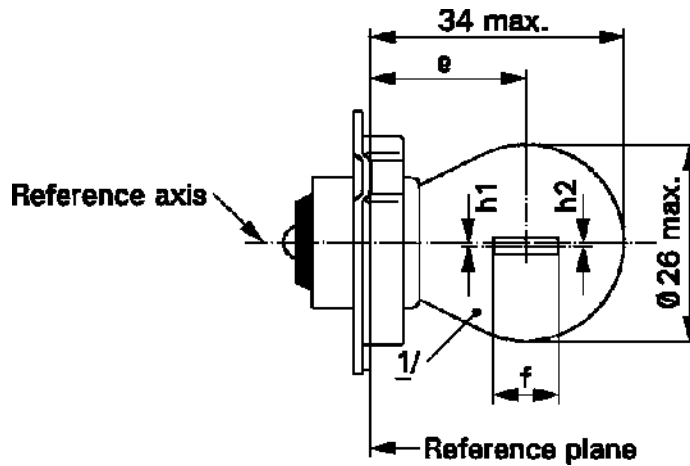
Dimensions in mm		Filament light sources of normal production			Standard filament light source			
		min.	nom.	max.				
e		32.35	32.70	33.05	32.7 ± 0.15			
f		1.4	1.8	2.2	1.8 ± 0.2			
l		4.0	5.5	7.0	5.5 ± 0.5			
c ^{5/}		0.2	0.5	0.8	0.5 ± 0.15			
b ^{5/}		- 0.15	0.2	0.55	0.2 ± 0.15			
a ^{5/}		0.25	0.6	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 ±	25 ± 5%	25 ± 5%
		S2	35 ± 5%	35 ± 5%	35 ± 5%	35 ±	35 ± 5%	35 ± 5%
	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	568	426
						13.2	634	457
						13.5	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



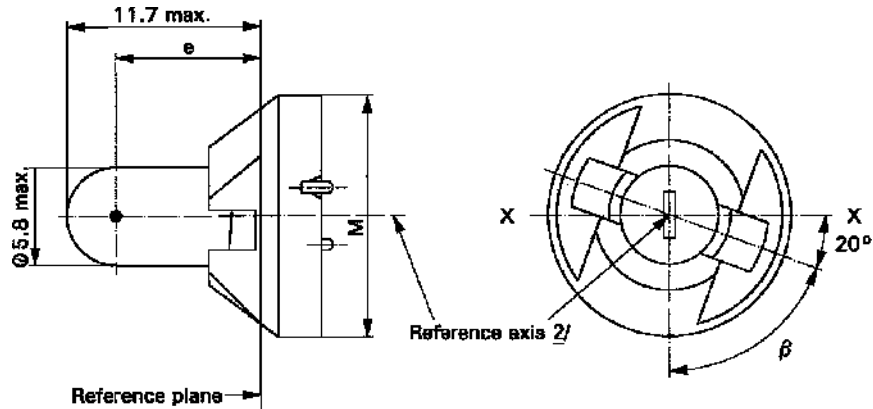
Dimensions in mm		Filament light sources of normal production			Standard filament light source
		min.	nom.	max.	
e ^{2/}		19.0	19.5	20.0	19.5 ± 0.25
f	6 V			3.0	2.5 ± 0.5
	12 V			4.0	
h1, h2 ^{3/}		- 0.5	0	0.5	0 ± 0.3
Cap P26s in accordance with IEC Publication 60061 (sheet 7004-36-1)					
ELECTRICAL 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.



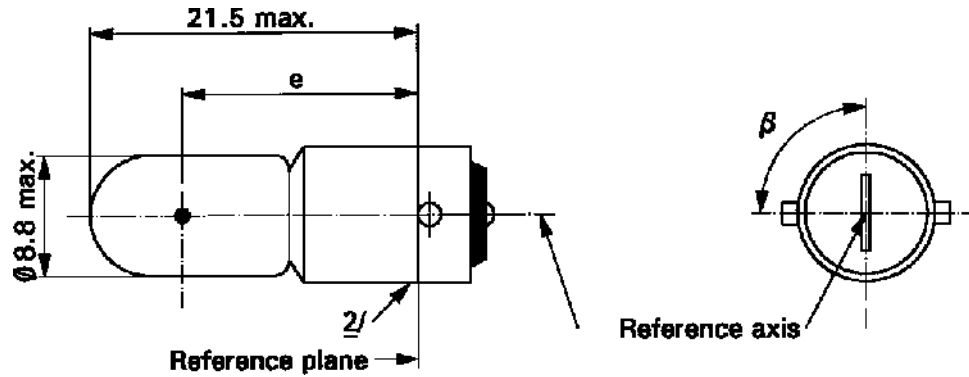
Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e	7.6	8.3	9.0	8.3 ± 0.35
Lateral deviation ^{1/}			0.7	0.35 max
β	55°	70°	85°	$70^\circ \pm 5^\circ$
Cap P11.5d in accordance with IEC Publication 60061 (sheet 7004-79-1)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	12		12
	Watts	1.4		1.4
Test	Volts	13.5		13.5
Objective values	Watts	1.54 max.		1.54 max.
	Luminous	$8 \pm 15 \%$		
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.



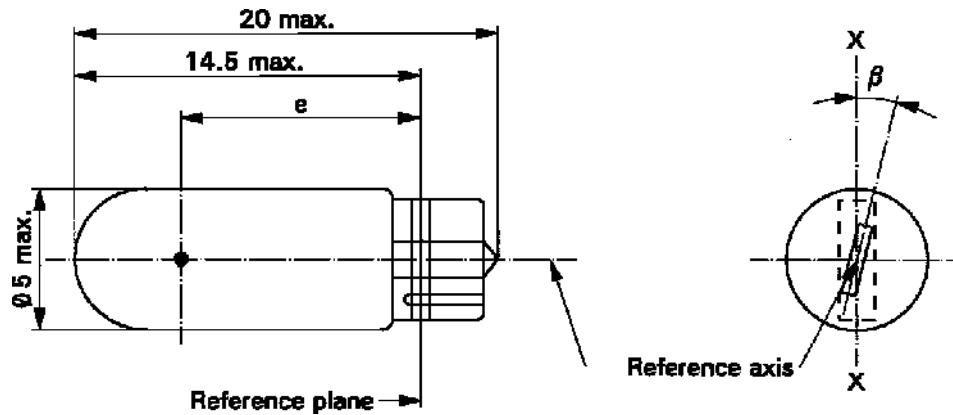
Dimensions in mm	Filament light sources of normal production			Standard filament light source	
	min.	nom.	max.		
e	13.5	15.0	16.5	15.0 ± 0.3	
Lateral deviation ^{1/}			1.5	0.5 max	
β		90°		$90^\circ \pm 5^\circ$	
Cap BA9s in accordance with IEC Publication 60061 (sheet 7004-14-9)					
ELECTRICAL AND 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 \pm 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



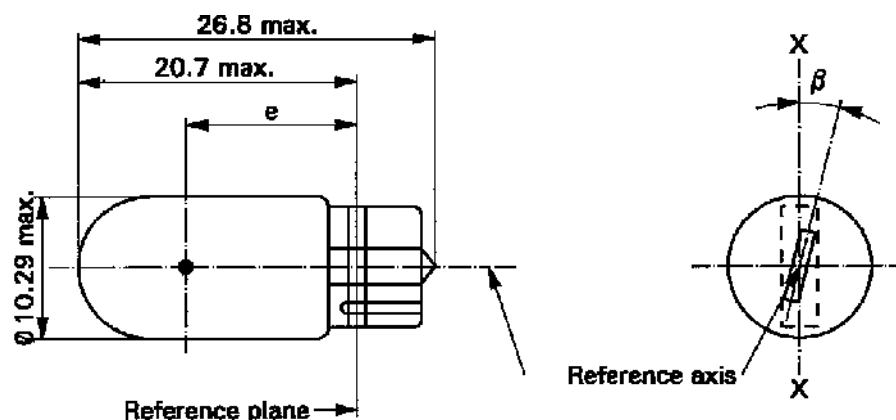
Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e	10.3	10.8	11.3	10.8 ± 0.3
Lateral deviation ^{1/}			1.0	0.5 max
β	- 15°	0°	+ 15°	$0^\circ \pm 5^\circ$
Cap W2x4.6d in accordance with IEC Publication 60061 (sheet 7004-94-2)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	12		12
	Watts	2.3		2.3
Test	Volts	13.5		13.5
Objective values	Watts	2.5 max.		2.5 max.
	Luminous flux	18.6 \pm 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

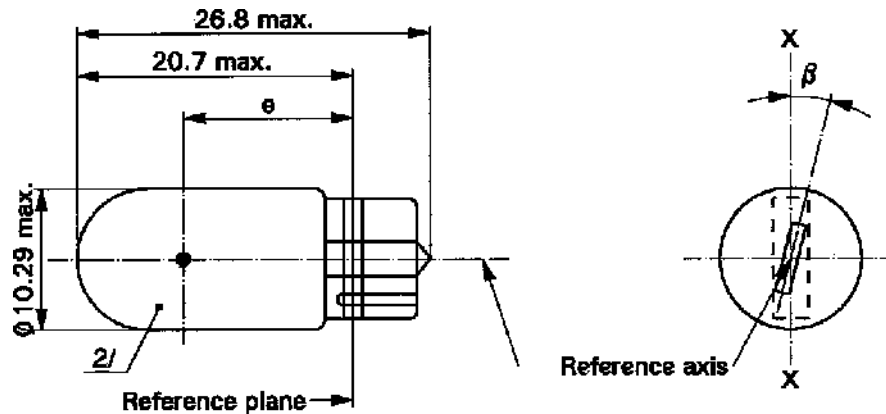


Dimensions in mm	Filament light sources of normal production			Standard filament light source	
	min.	nom.	max.		
e	11.2	12.7.0	14.2	12.7 ± 0.3	
Lateral deviation ^{1/}			1.5	0.5 max	
β	- 15°	0°	+ 15°	$0^\circ \pm 5^\circ$	
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	6	12	24	12
	Watts	3			3
Test	Volts	6.75	13.5	28.0	13.5
Objective values	Watts	3.45 max.		4.6 max.	3.45 max.
	Luminous	22 \pm 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

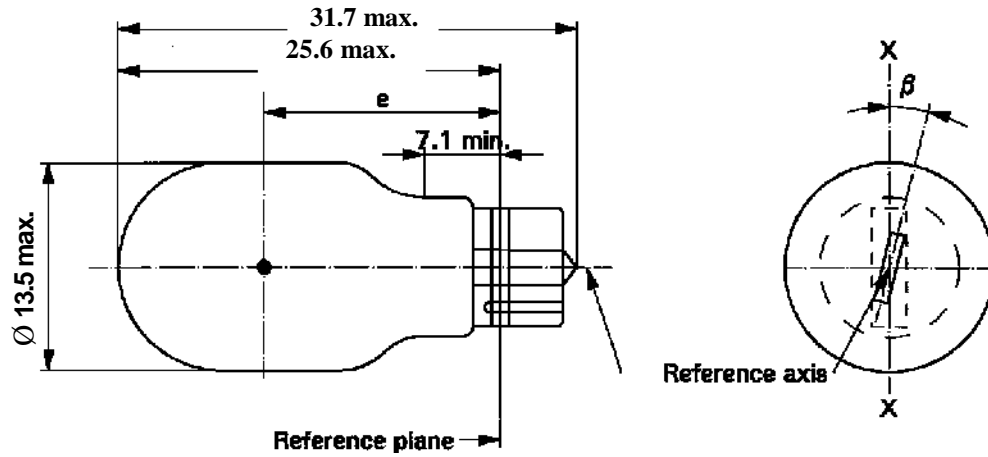


Dimensions in mm		Filament light sources of normal production			Standard filament light source ^{3/}	
		min.	nom.	max.		
e		11.2	12.7	14.2	12.7 ± 0.3	
Lateral deviation ^{1/}				1.5	0.5 max.	
β		- 15°	0°	+ 15°	$0^\circ \pm 5^\circ$	
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)						
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	$50 \pm 20 \%$			
		WY5W	$30 \pm 20 \%$			
	WR5W	^{4/}	$12 \pm 25 \%$			
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



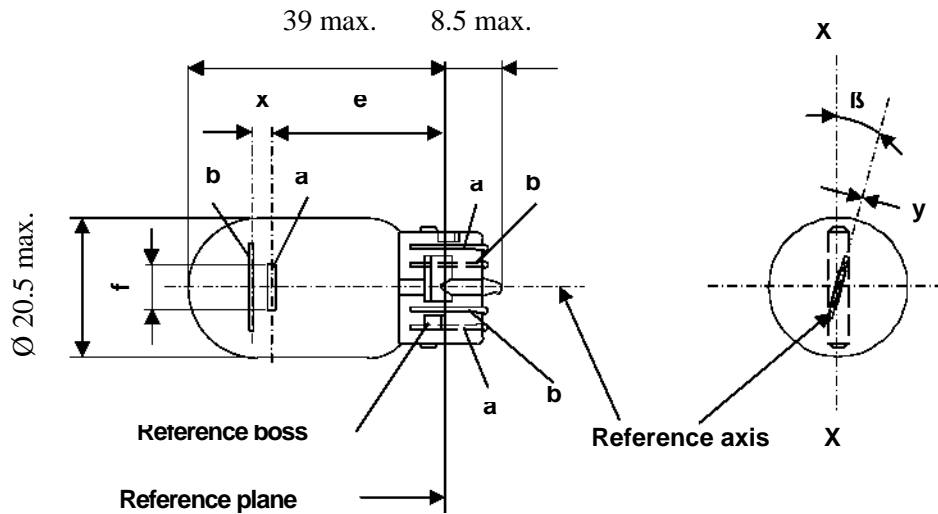
Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e	15.5	17.0	18.5	17.0 ± 0.3
Lateral deviation ^{1/}			1.0	0.5 max.
β	-15°	0°	+ 15°	0° ± 5°
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	6	12	12
	Watts	10		10
Test voltage	Volts	6.75	13.5	13.5
Objective values	Watts	11 max.		
	Luminous flux	White	125 ± 20 %	
		Amber	75 ± 20 %	
Reference luminous flux at approximately 13.5 V:				White: 125 Amber: 75

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

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 voltage	Volts	13.5			13.5	
Objective values	Watts	19.1 max.		6.6 max.	19.1 max.	6.6 max.
	Luminous	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.

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 $\pm 15^\circ$, 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. ($\pm 15^\circ$).

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.

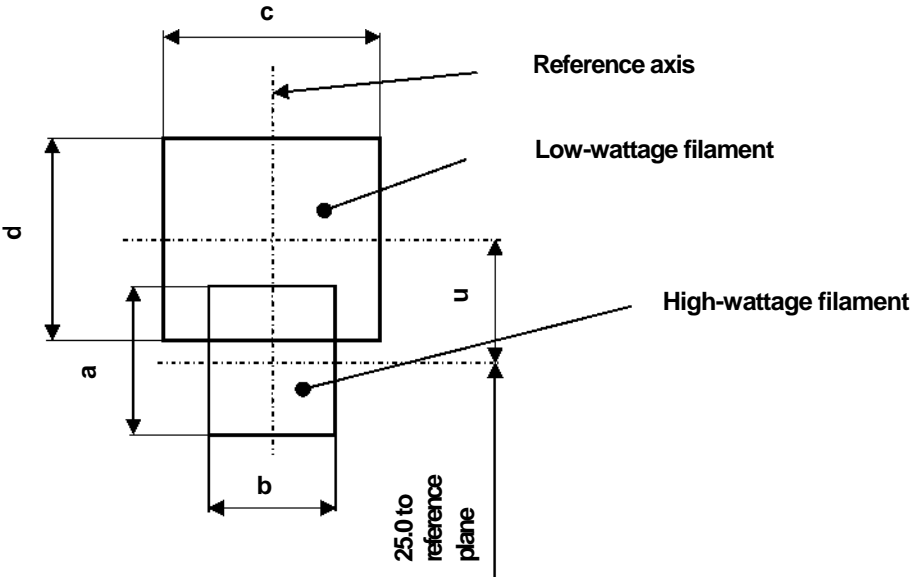
3. Front elevation

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).

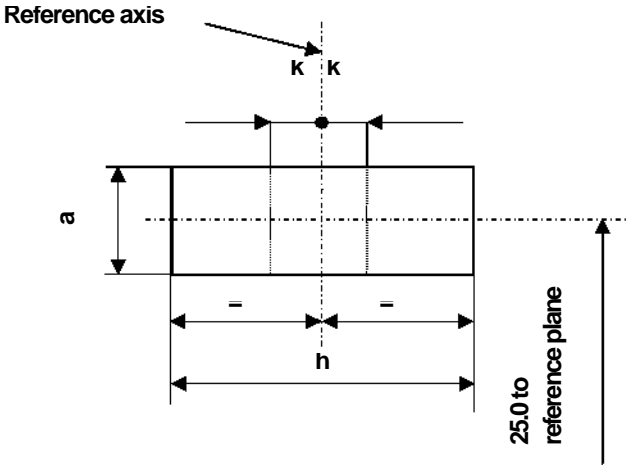
Side elevation

Dimensions in millimetres



Reference	a	b	c	d	u
Dimensions	3.3	2.8	4.8		2.8

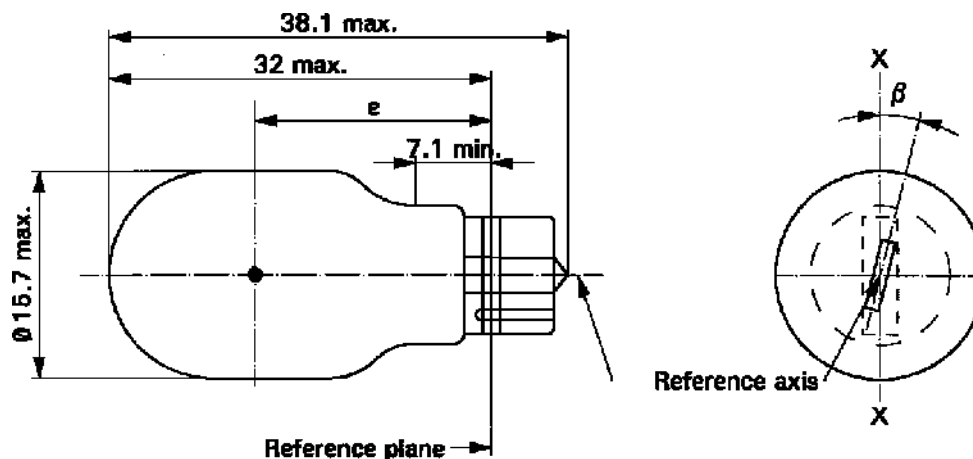
Front elevation



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



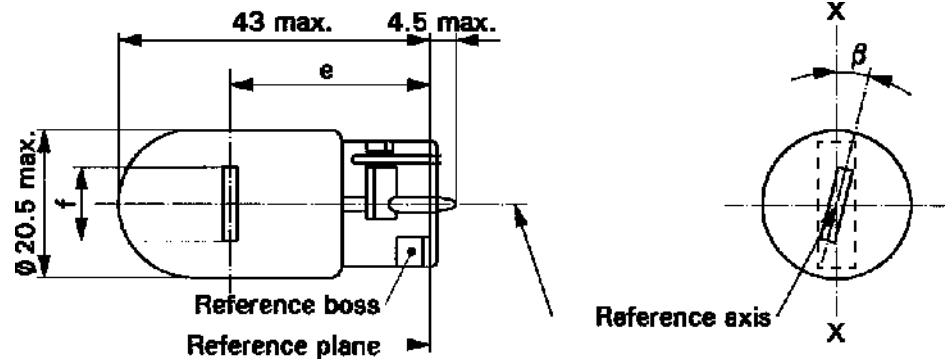
Dimensions in mm			Filament light sources of normal production			Standard filament light source
			min.	nom.	max.	
e			18.3	20.6	22.9	20.6 ± 0.3
Lateral deviation ^{1/}					1.0	0.5 max.
β			-15°	0°	+ 15°	$0^\circ \pm 5^\circ$
Cap W2.1x9.5d in accordance with IEC Publication 60061 (sheet 7004-91-3)						
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	Whit	$310 \pm 20 \%$			
		Amb	$190 \pm 20 \%$			
Reference luminous flux at approximately 13.5 V:					White:	310
					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

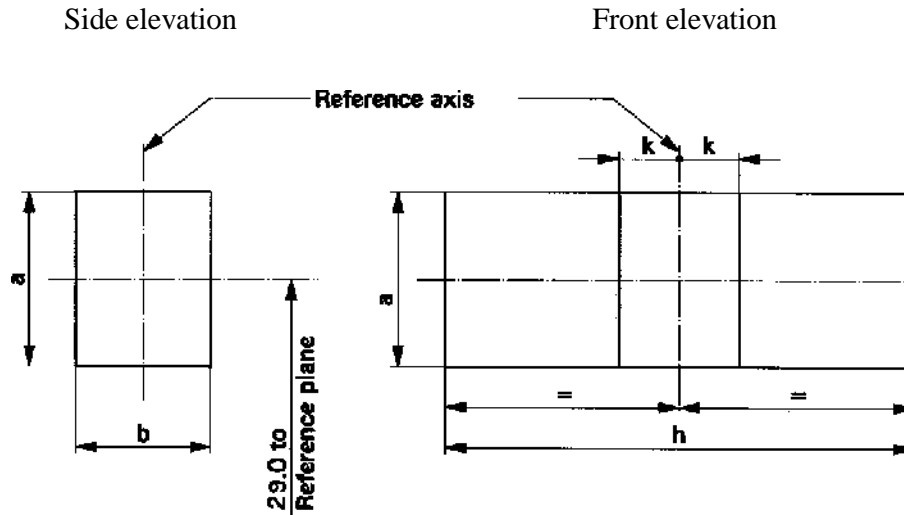


Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e		29.0 ^{2/}		29.0 ± 0.3
f			7.5	7.5 + 0/- 2
Lateral deviation ^{1/}			^{2/}	0.5 max.
β	-15° ^{2/}	0°	+15° ^{2/}	0° ± 5°
Cap W3x16d in accordance with IEC Publication 60061 (sheet 7004-105- 2 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.

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 $\pm 15^\circ$, to the plane through the axis X-X 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, i.e. $\pm 15^\circ$. 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 ($\pm 15^\circ$).
2. Side elevation

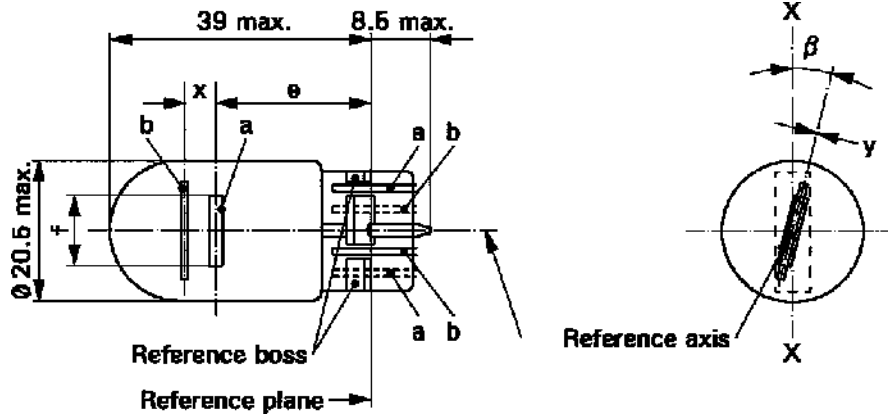
The filament light source placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.
3. Front elevation

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.

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 7004-106-3 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.

Screen projection requirements

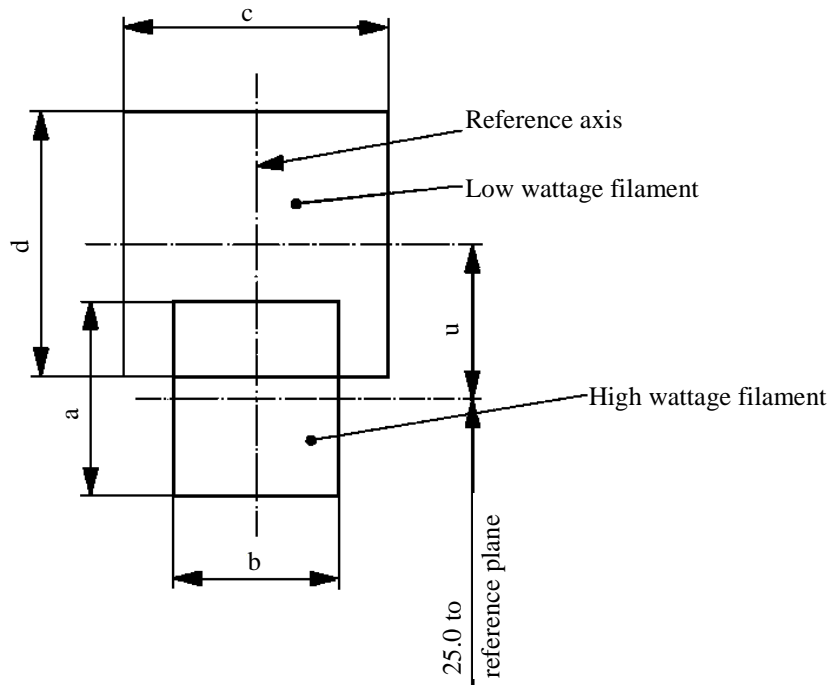
This test is used to determine, by checking whether:

- (a) the major filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within $\pm 15^\circ$, 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.

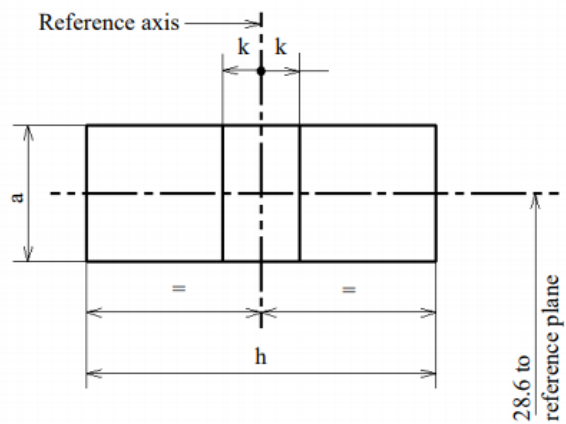
1. The filament light source is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the major filament is seen on the screen on which the image of the filament is projected. The end view of that filament shall be obtained within the angular displacement tolerance limits ($\pm 15^\circ$).
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).

Side elevation



Reference	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>u</i>
Dimension	3.5	3.0	4.8		2.8

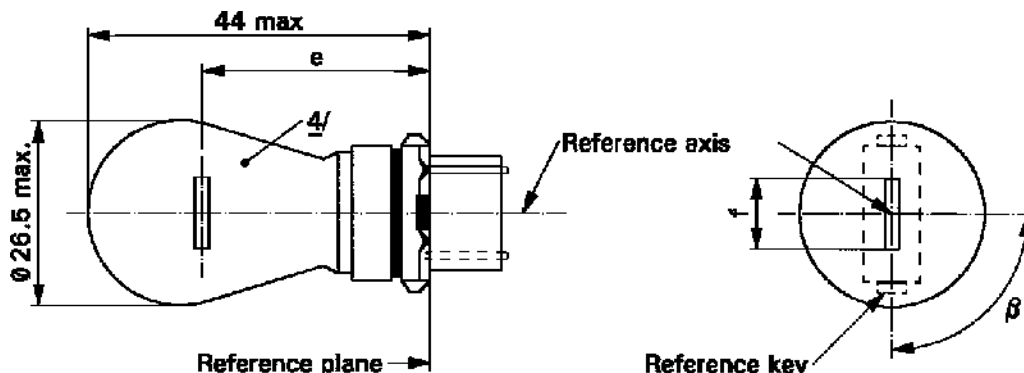
Front elevation



Reference	<i>a</i>	<i>h</i>	<i>k</i>
Dimensions	3.5	9.0	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



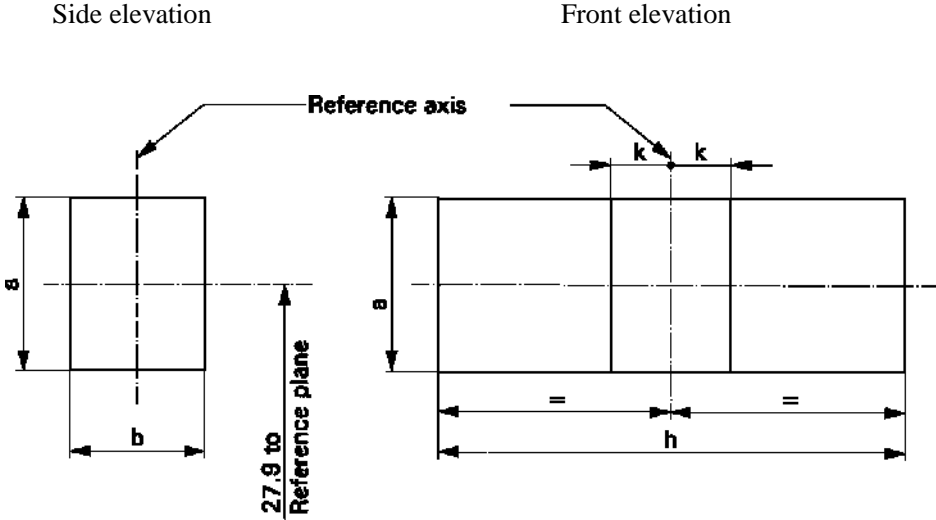
Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e		27.9 ^{3/}		27.9 ± 0.3
f	5.5	6.0	7.0	6.0 ± 0.5
Lateral deviation ^{2/}			^{3/}	0.0 ± 0.4
β	75° ^{3/}	90°	105° ^{3/}	90° ± 5°
Cap: WP21W: WY2.5x16d in accordance with IEC Publication 60061(sheet 7004-104B-1) WPY21W: WY2.5x16d (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 $\pm 15^\circ$, to the plane through the centre line 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	9.0	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

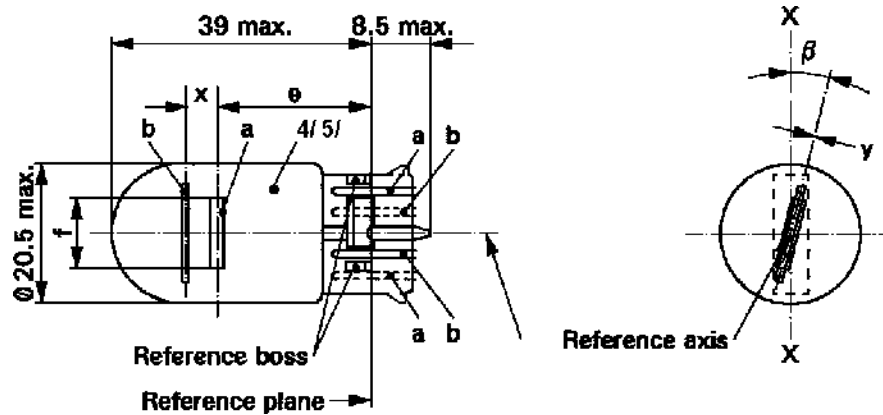
The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

 - 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



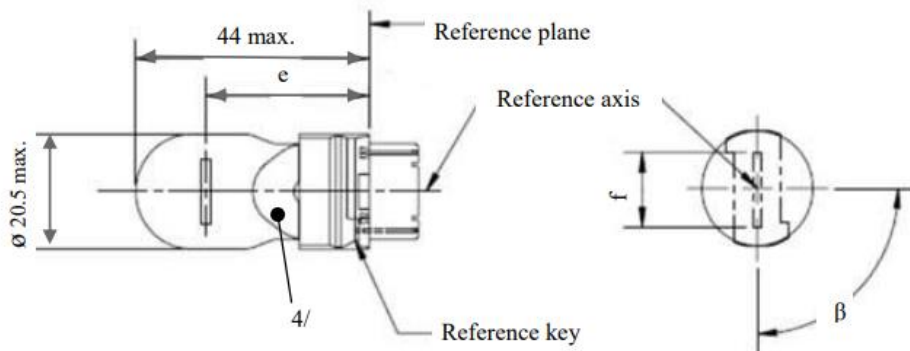
Dimensions in mm	Filament light source of normal production			Standard filament light source	
	min.	nom.	max.		
E		25.0 ^{1/}		25.0 ± 0.3	
F			7.5	7.5 + 0/ - 2	
Lateral deviation ^{2/}			1/	0.3 max.	
x ^{3/}		2.8 ^{1/}		2.8 ± 0.3	
y ^{3/}		0.0 ^{1/}		0.0 ± 0.3	
β	-15° ^{1/}	0°	+15° ^{1/}	0° ± 5°	
Cap 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 voltage	Volts	13.5		13.5	
Objective values	Watts	26.5 max.	6.6 max.	26.5 max.	6.6 max.
	Luminous flux	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 light sources shall be red (see also footnote 5/).
- 5/ The light emitted from standard filament light sources shall be white or red.

CATEGORIES WT21W 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° ^{3/}	90° ± 5°
Cap: WT21W: WUX2.5x16d in accordance with IEC Publication (sheet 7004-176-1)					
WTY21W: WUY2.5x16d60061 (sheet 7004-177-1)					
Electrical and photometric characteristics					
Rated values	Volts		12	24	12
	Watts		21		21
Test voltage	Volts		13.5	28.0	13.5
	Watts		26.5 max.	29.7 max.	26.5 max.
Objective values	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 lamps of normal production shall be white for category WT21W and amber for category WTY21W (see also footnote 5/).

5/ The light emitted from standard filament light sources shall be white for category WT21W and white or amber for category WTY21W.

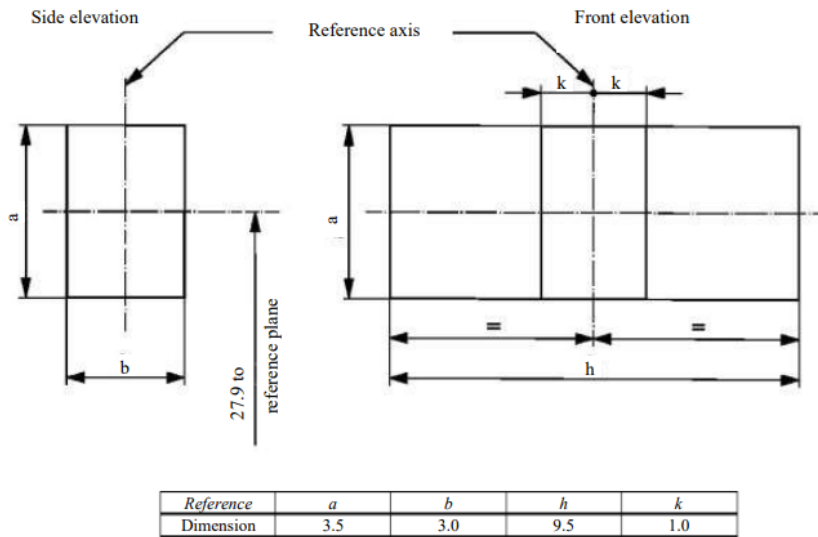
AIS-034 (Part 1) (Rev2): 2021/D2

CATEGORIES WT21W 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 $\pm 15^\circ$, to the plane through the centres of the keys and the reference axis, whether a filament light source complies with the requirements.



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.

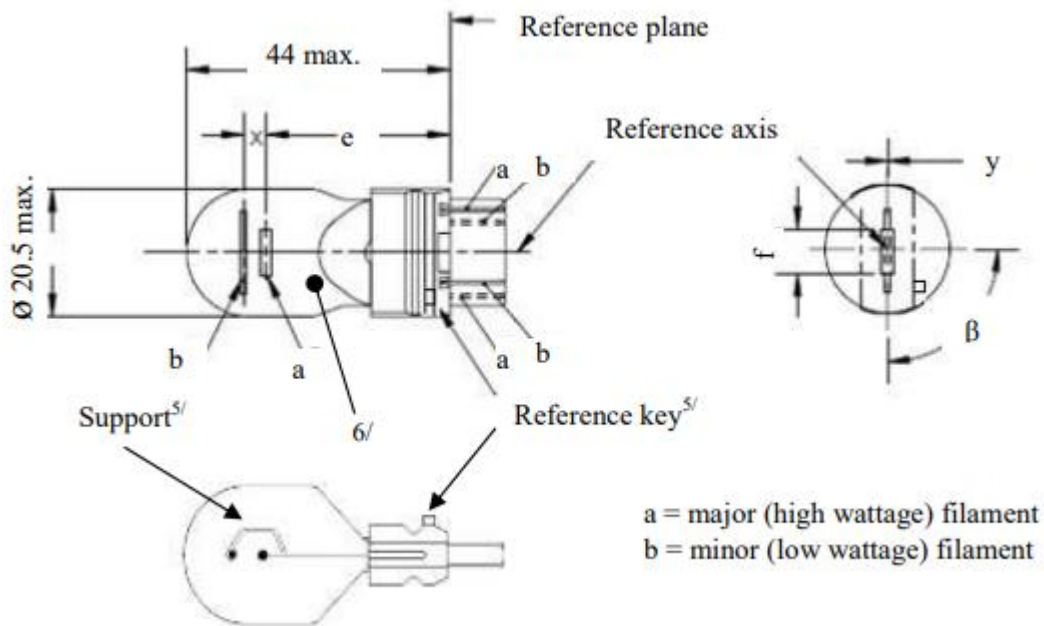
3. Front elevation The filament light source placed with the cap down and the reference axis vertical, the filament light source being viewed in a direction at right angles to the filament axis:

- 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.

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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 source 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 ^{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:	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				
	Volts	12		12

		Filament light source of normal production ^{6/}			Standard filament light source ^{7/}	
		Min.	Nom.	Max.		
<i>Dimensions in mm</i>						
Rated values	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 max.	
	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.

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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 $\pm 15^\circ$, 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:

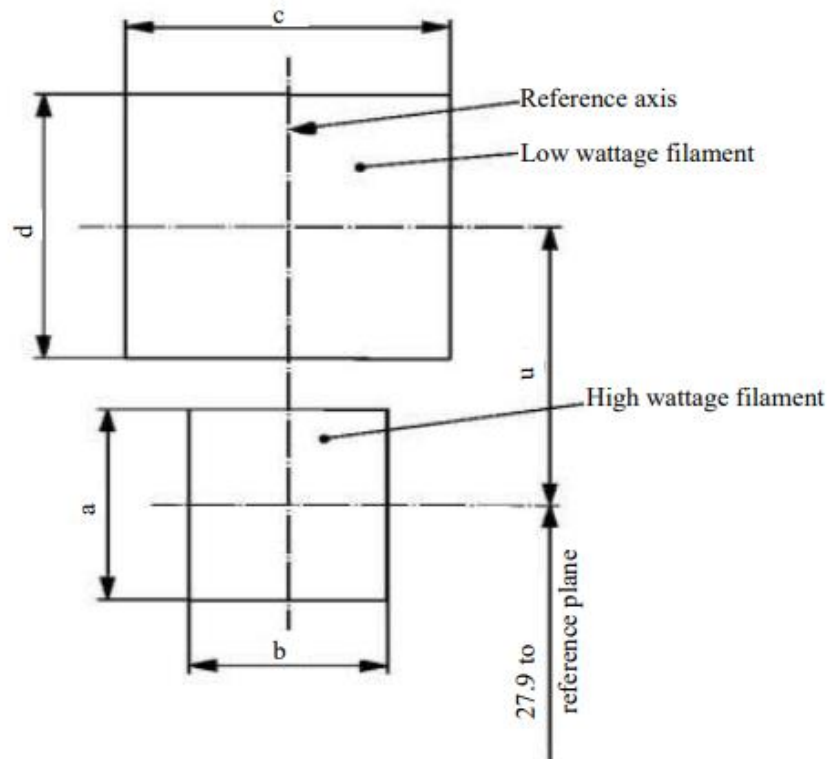
- 2.1. The projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;
- 2.2. The projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having 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 "b", 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).

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CATEGORIES WT21/7W and WTY21/7W

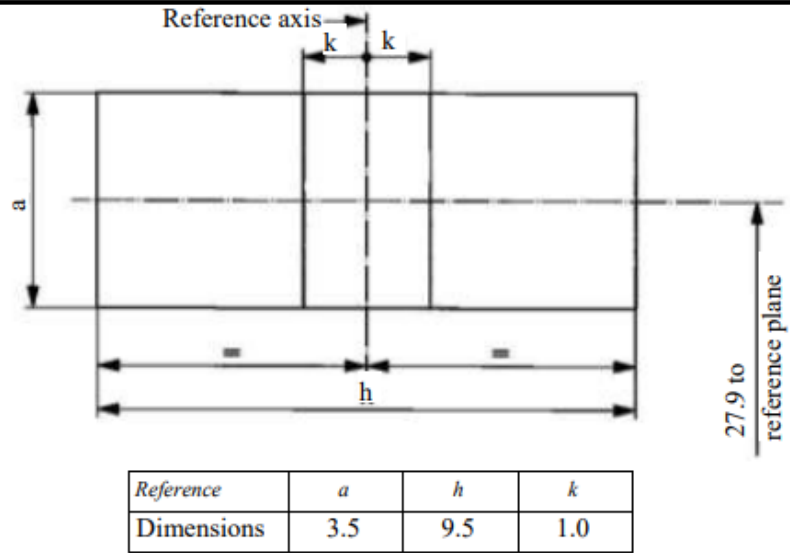
Sheet WT21/7W/3

Side elevation



Reference	a	b	c	d	u
Dimensions	3.5	3.0	4.8		5.1

Front elevation

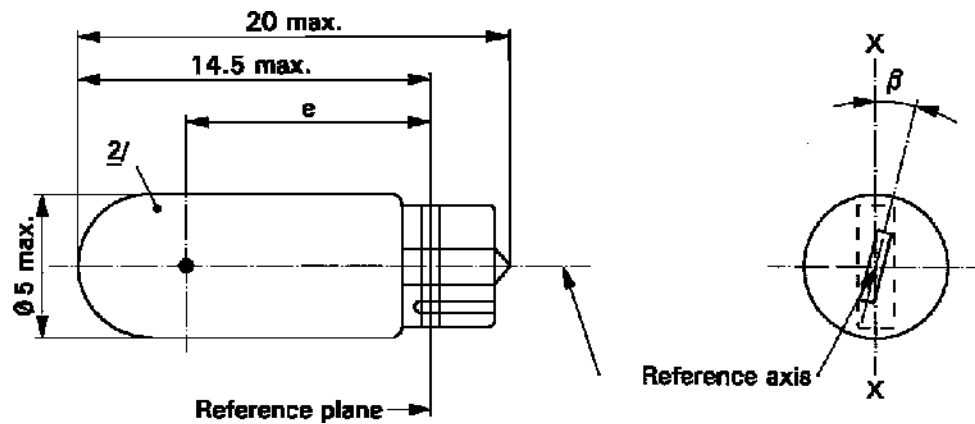


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CATEGORY WY2.3W

Sheet WY2.3W/1

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

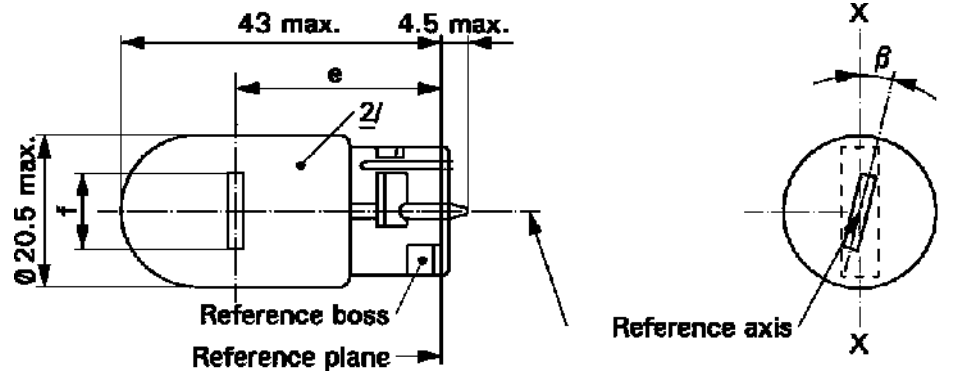


Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
<i>e</i>	10.3	10.8	11.3	10.8 ± 0.3
Lateral deviation ^{1/}			1.0	0.5 max

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 light sources shall be amber (see also footnote 3/).
- 3/ The light emitted from standard filament light sources shall be amber or white.

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

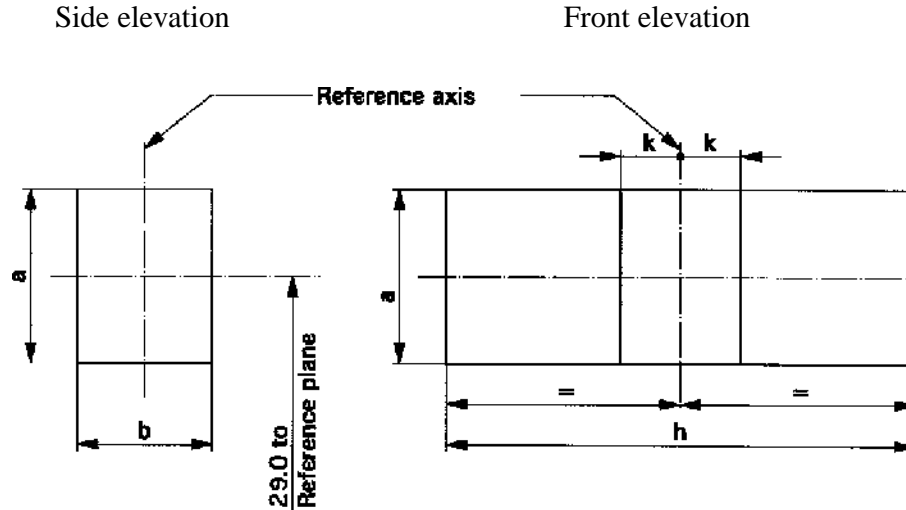


Dimensions in mm	Filament light sources of normal production			Standard filament light source
	min.	nom.	max.	
e		29.0 ^{2/}		29.0 ± 0.3
f			7.5	7.5 + 0/ - 2
Lateral deviation ^{1/}			^{2/}	0.5 max.
β	-15°	0°	+15°	0° ± 5°
Cap WX3x16d in accordance with IEC Publication 60061 (sheet 7004-105- 2 3)				
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 13.5V:				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.

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 $\pm 15^\circ$, to the plane through the axis X-X and the reference axis, whether a filament light source complies with the requirements.



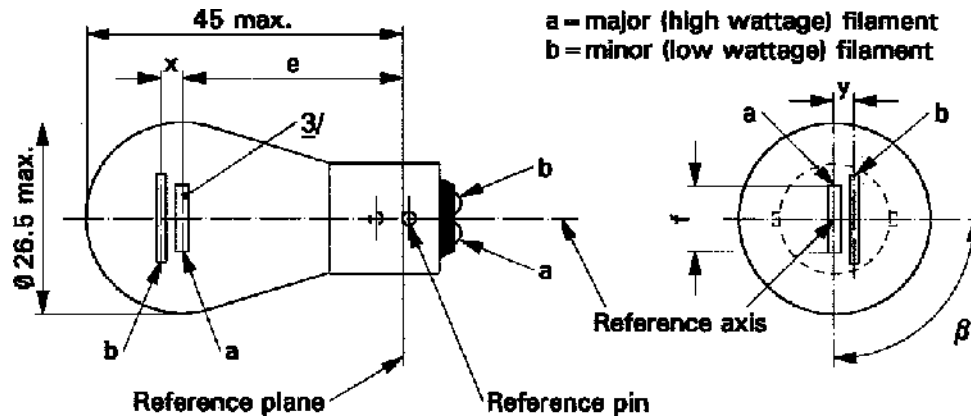
Reference	a	b	h	k
Dimension	3.5	3.0	9.5	1.0

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, i.e. $\pm 15^\circ$. 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 ($\pm 15^\circ$).
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 lamp



Electrical and photometric requirements:

Parameter	Production Lamps				Standard Lamp		
	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 \pm %	125 + 20%	26 + 20%	125 + 20%	26 + 20%		
Reference luminous flux at approximately 13.5 V		125 lm and 26 lm					

Dimensional requirements:

Dimensions in mm	Filament lamps of normal production ^{4/}			Standard filament lamp
	min.	nom.	max.	^{5/}
e		31.8 ^{1/}		31.8 \pm 0.3
f			7.0	7.0 + 0/- 2
Lateral deviation ^{2/}	^{1/}			0.3 max.
x, y	^{1/}			2.8 \pm 0.3
β	75° ^{1/}	90°	105°	90° \pm 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 lamp P21/5W.

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		<p>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°</p>
2		<p>Only applicable to filaments which can be inscribed in a rectangle of $b > 3h$.</p>
3		<p>Applicable to filaments which can be inscribed in a rectangle of $b \leq 3h$, whereby, however, $k < 2h$.</p>

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 $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$.
- 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 lamp-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 lamp-light source in bi-directional steps of about 30° until the area specified in 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 the centreline of the receiver coincides with the filament axis or 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.

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 $\pm 30^\circ$, 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:

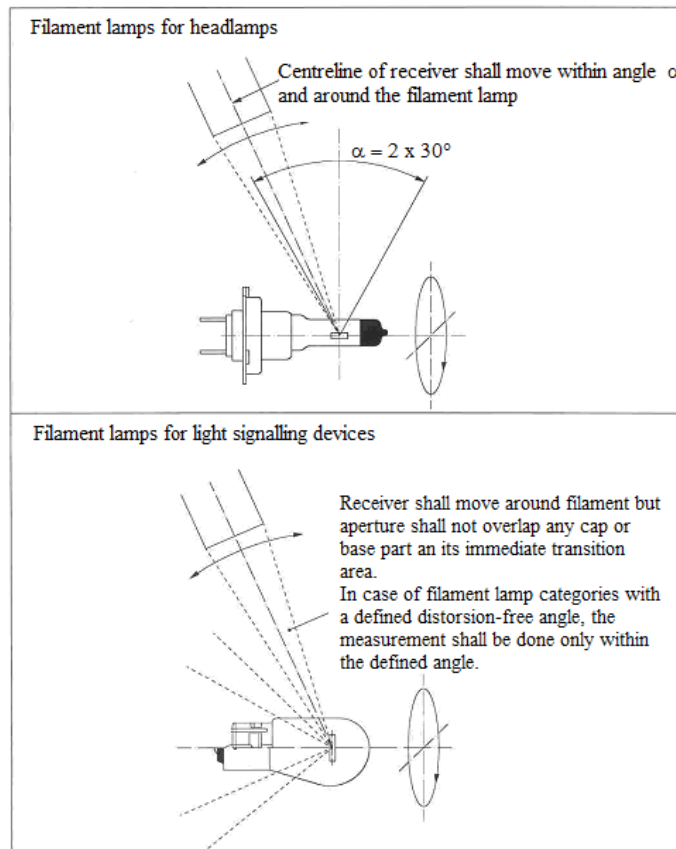
(a) The area claimed or covered by the cap of the filament light source; and

(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 COLOURIMETRIC 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 source 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 filament light source types	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
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 technology	20	1
External filament 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 **/	All light sources of one type	200	1
Colour endurance test	All filament light sources (emitting red, amber and white light) of one colour coating technology	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.

***/ Representative distribution over categories of 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.

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

<i>Number of test results of each characteristics</i>	<i>Qualifying limits for acceptance</i>
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, assuming an acceptance probability of at least 0.95.

Table G-3

Number of filament light sources in records	Qualifying limit	Number of filament light sources in records	Qualifying limit	Number of filament light sources in records	Qualifying limit
- 200	21	541 - 553	47	894 - 907	73
201 - 213	22	554 - 567	48	908 - 920	74
214 - 227	23	568 - 580	49	921 - 934	75
228 - 240	24	581 - 594	50	935 - 948	76
241 - 254	25	595 - 608	51	949 - 961	77
255 - 268	26	609 - 621	52	962 - 975	78
269 - 281	27	622 - 635	53	976 - 988	79
282 - 295	28	636 - 648	54	989 - 1,002	80
296 - 308	29	649 - 662	55	1,003 - 1,016	81
309 - 322	30	663 - 676	56	1,017 - 1,029	82
323 - 336	31	677 - 689	57	1,030 - 1,043	83
337 - 349	32	690 - 703	58	1,044 - 1,056	84
350 - 363	33	704 - 716	59	1,057 - 1,070	85
364 - 376	34	717 - 730	60	1,071 - 1,084	86
377 - 390	35	731 - 744	61	1,085 - 1,097	87
391 - 404	36	745 - 757	62	1,098 - 1,111	88
405 - 417	37	758 - 771	63	1,112 - 1,124	89
418 - 431	38	772 - 784	64	1,125 - 1,138	90
432 - 444	39	785 - 798	65	1,139 - 1,152	91
445 - 458	40	799 - 812	66	1,153 - 1,165	92
459 - 472	41	813 - 825	67	1,166 - 1,179	93
473 - 485	42	826 - 839	68	1,180 - 1,192	94
486 - 499	43	840 - 852	69	1,193 - 1,206	95
500 - 512	44	853 - 866	70	1,207 - 1,221	96
513 - 526	45	867 - 880	71	1,221 - 1,233	97
527 - 540	46	881 - 893	72	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 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

(See 3.6.3. and 8.3.1)

COLOUR ENDURANCE TEST

K-0 — Coloured filament lamps light sources for use in light signalling devices shall be operated under test conditions for colour endurance measurements as specified in K-1 below.

There after the colour of light shall be measured by the method specified in Annex E, and all measuring results, but for amber and red colour at least 80% of the measuring results, shall be within the limits specified in 3.6.

In case of colour filter coating, no cracks in this coating shall be visible without specific optical tools.

K-1 — General:

The test conditions of colour endurance measurements shall apply to coloured filament lamps light sources for use in light signalling devices. The applicable set of test conditions are indicated in tables K.1.a and K.1.b

- Switching modes (see K.6) in table K.1.a;
- Boxes in which the filament lamps light sources shall be mounted (see K.5) in table K.1.b

Table K.1. — Applicable set of test conditions for filament lamps light sources subjected to colour endurance measurements (See K-1)		
Table K.1.a — Applicable switching modes		
Filament lamps light sources		Applicable test conditions
Emitting	For use in	
Amber light	Intermittent operation	Figure K.5
Red light	Intermittent and continuous operation	Figure K.6
White light	Continuous operation	Figure K.7
Tables K.1.b — Applicable boxes of test racks		
Filament lamps light sources' maximum	Applicable box in table K.2	
> 0W < 10W	A	
> 10W < 20W	B	
> 20W < 30W	C	
> 30W < 45W	D	
Wattage	<ul style="list-style-type: none"> • When operating at test voltage; • In case of dual filament lamps light sources when both filaments are operated simultaneously; (AIS 034 (Part 1)(Rev. 1) :objective value of wattage)	

K.2 Ageing

Filament lamps light sources shall be aged at their test voltage for 60 minutes \pm 5 minutes. For dual filament lamps light sources, each filament shall be aged separately. Filament lamps light sources, which fail during the ageing period shall be replaced and ageing process re-applied.

K.3 Test Voltage

Filament lamps light sources shall be operated at the test voltage as specified in the relevant filament lamps data sheet.

K.4 Operating position

Filament lamps light sources shall be operated on test racks. The test racks shall be positioned horizontally in a climate chamber in such a way that temperature and relative humidity around each test rack are as specified in paragraph K.6. To facilitate air distribution the use of a fan is recommended. The test rack shall then be positioned so that the bulbs of filament lamps light sources are not facing the fan. Test racks shall not be stacked or overlapped.

K.5 Test rack

The test rack shall consist of a horizontal array of boxes as specified in Figures K.1 and K.2 and in table K.2. Front and bottom of box shall be open. The other faces shall be closed using 1 mm thick stainless steel. In case of an array of boxes total thickness of adjoining sides be 1 mm. Filament lamps light sources shall be mounted on their normal cap holders with the lamp light source axis and filament(s) horizontal, their positions relative to the box as specified by figures K.1 and K.2. In case of normal cap holders would not be resistant to temperature as specified in this annex other means may be applied to position filaments as prescribed.

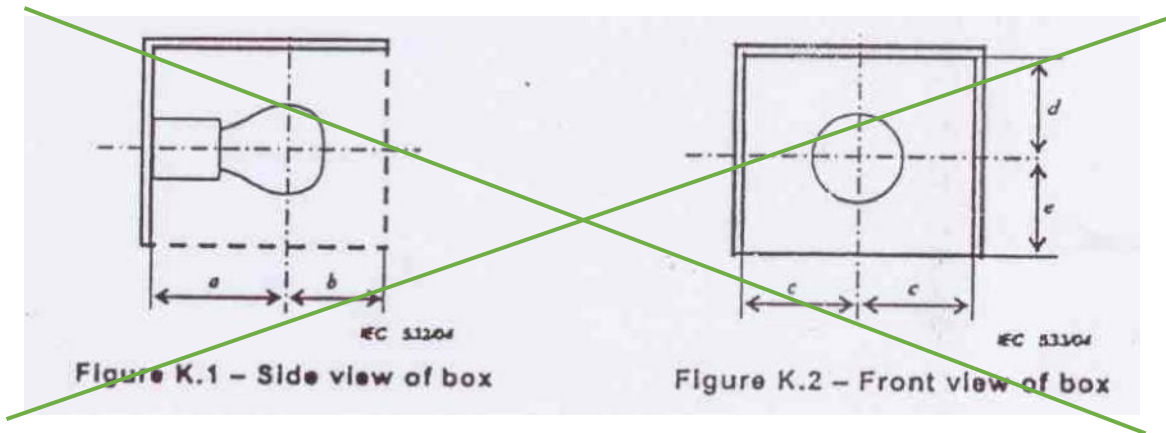


Table K.2 Dimensions of the applicable boxes and relative position of center of the filament					
Box	A mm	B mm	C mm	D mm	E mm
A	13	11	7.75	8	12
B	28	15	13	14	26
C	42	18	19	19	40
D	42	18	19	19	40

K.6 — Operating Cycles:

Filament **lumps-light sources** shall be operated in the climate chamber following 10 times a 24 h cycle of varying temperature, relative humidity and switching modes, as prescribed in tales K.1, K.3 and K.4 and figures K.3 to K.7

Table K.3 Timing during one operating cycle												
Beginning of cycle												End of cycle
t_0 h	t_1 h	t_2 h	t_3 h	t_4 h	t_5 h	t_6 h	t_7 h	t_8 h	t_9 h	t_{10} h	t_{11} h	t_{12} h
0	1	5	5:20	7	8	12	12:20	20	21	21:20	23	24

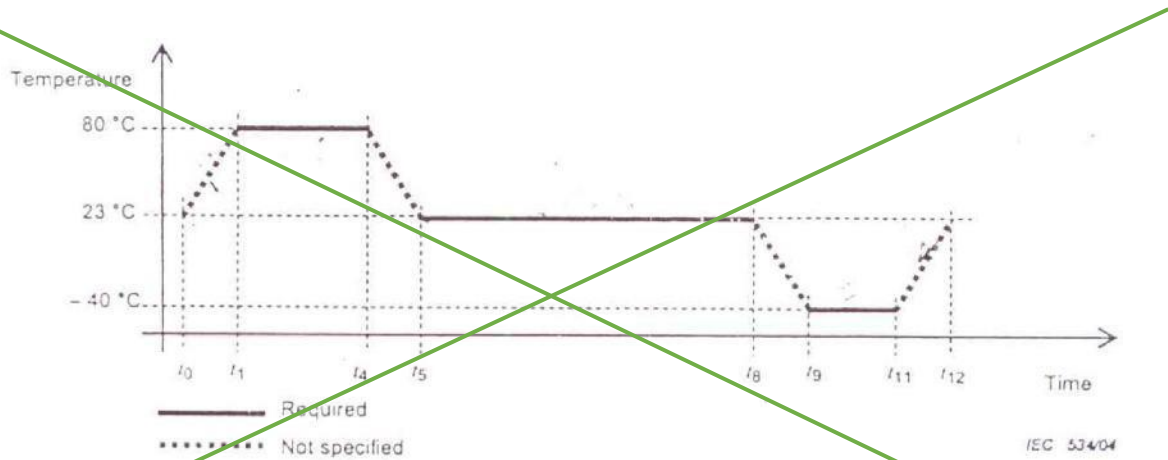


Figure K.3 – Temperature in the climate chamber during one operating cycle

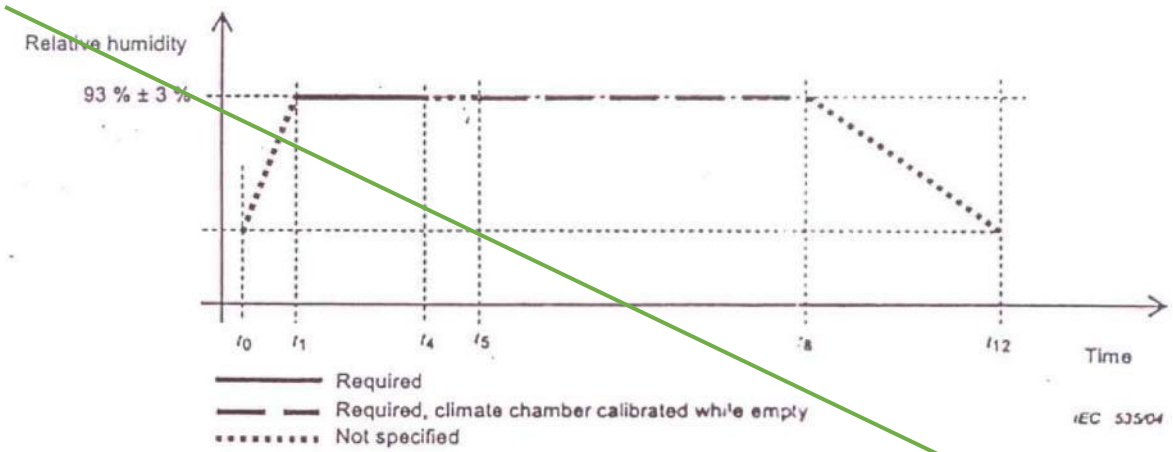


Figure K.4 – Relative humidity in the climate chamber during one operating cycle

Table K.4 – Switching modes of filament lamps light sources		
Mode	Filament switched	Common name of mode
1	Off	'Off' mode
2	For 15 s in intermittent operation with flashing frequency 90/min and on/off ratio 1:1 For 15 second off	'Intermittent' mode
3	In intermittent operation with flashing frequency 90/min and on/off ratio 1:1	'Flashing mode
4	For 5 min on and for 5 minutes off	'Interrupted on' mode
5	On	'On' mode

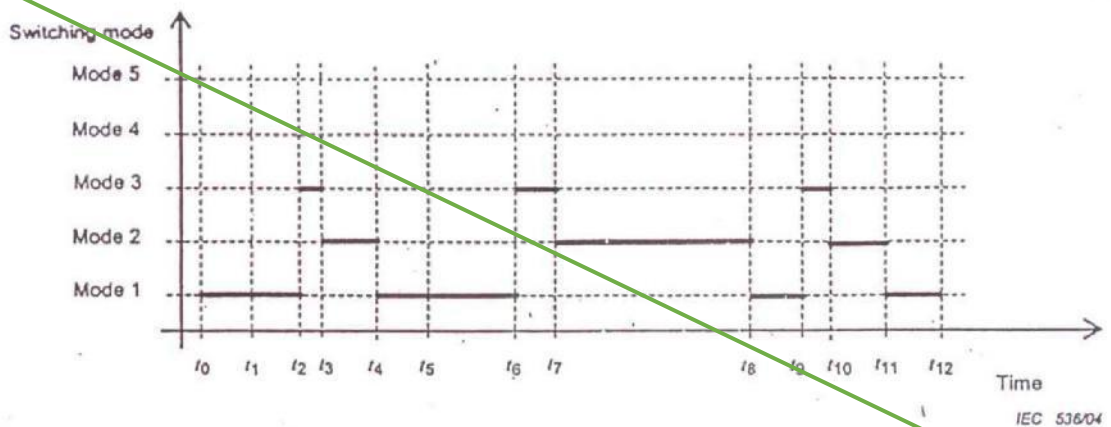


Figure K.5 – Switching modes of filament lamps for intermittent operation during one operating cycle

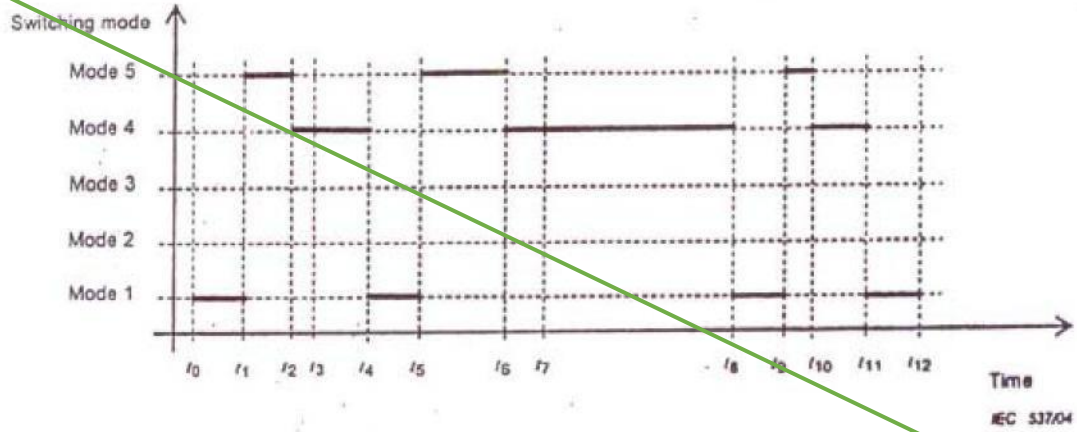


Figure K.6 – Switching modes of filament lamps for Intermittent and continuous operation during one operating cycle

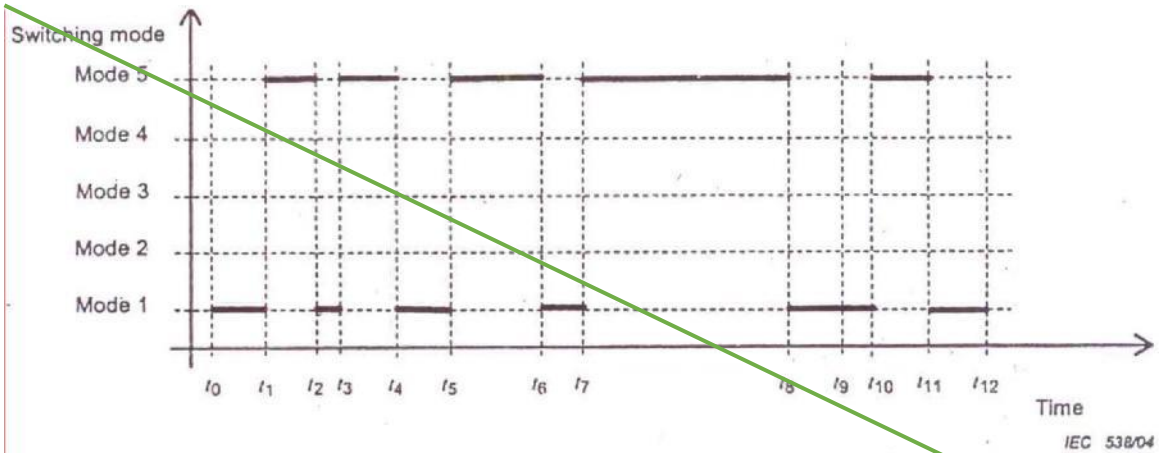


Figure K.7 – Switching modes of filament lamps for continuous operation during one operating cycle

K-7 Closure:

Filament lamps light sources shall be held at rest, switched off, at a room temperature of $23^{\circ}\text{C} + 2^{\circ}\text{C}$ for at least 2h after the end of the 10 operating cycles.

ANNEX M
(See Introduction)

COMMITTEE COMPOSITION *

Automotive Industry Standards Committee

Chairman	
	Director The Automotive Research Association of India, Pune
Members	Representing
Representative from	Ministry of Road Transport & Highways (Dept. of Road Transport & Highways), New Delhi
Representative from	Ministry of Heavy Industries & Public Enterprises (Department of Heavy Industry), New Delhi
	Office of the Development Commissioner, MSME, Ministry of Micro, Small & Medium Enterprises, New Delhi
	Bureau of Indian Standards, New Delhi
	Central Institute of Road Transport, Pune
	Indian Institute of Petroleum, Dehra Dun
	Vehicles Research & Development Establishment, Ahmednagar
	Society of Indian Automobile Manufacturers
	Tractor Manufacturers Association, New Delhi
	Automotive Components Manufacturers Association of India, New Delhi

Member Secretary

The Automotive Research Association of India, Pune

* At the time of approval of this Automotive Industry Standard (AIS)

