

**AMENDMENT NO. 2  
TO  
AIS – 034  
Automobile Lamps**

- 1.0 Page No. 3/177, Clause 4, Second sentence:  
Substitute following text for existing text  
“Unless otherwise specified in the relevant annex, the designation of caps/bases used in the annexes is as per IEC: 60061-1, Part 1”
- 2.0 Page No. 6/177, Table 1:  
Add following new lamp categories at the end of Table 1.

**Table 1  
(See 4)  
Lamp Categories**

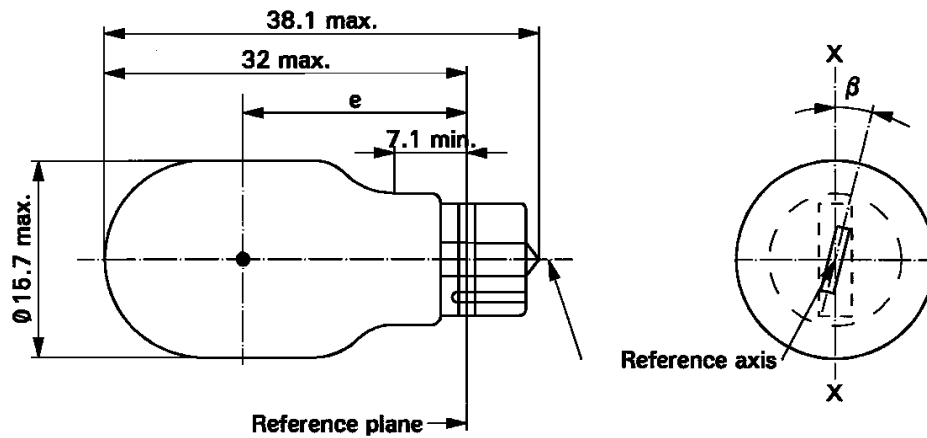
	<b>Category</b>	<b>Individual Reference numbers</b>	<b>Annex</b>
53	W10W	12W10W	A54
54	WY10W	12WY10W	A55
55	WY16W	12WY16W	A56
56	P18/5W	12P18/5W	A57
57	PR18/5W	12PR18/5W	A58

- 3.0 Page No. 158/177:  
Add following Annex 54 to Annex 58 after Annex 53.

**Annex-A54  
(See para 4)**

**Requirements of W10W Category Lamp**

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



### A54.1 Electrical and photometric requirements

Parameter		Production Lamps	Standard Lamp
Rated values	Volts	12	12
	Watts	10	10
Test voltage	Volts	13.5	13.5
Objective values	Watts	11 max.	11 max.
	Luminous flux	125 ± 20 %	
Reference luminous flux: 125 lm at approximately 13.5 V			

### A54.2 Dimensional requirements

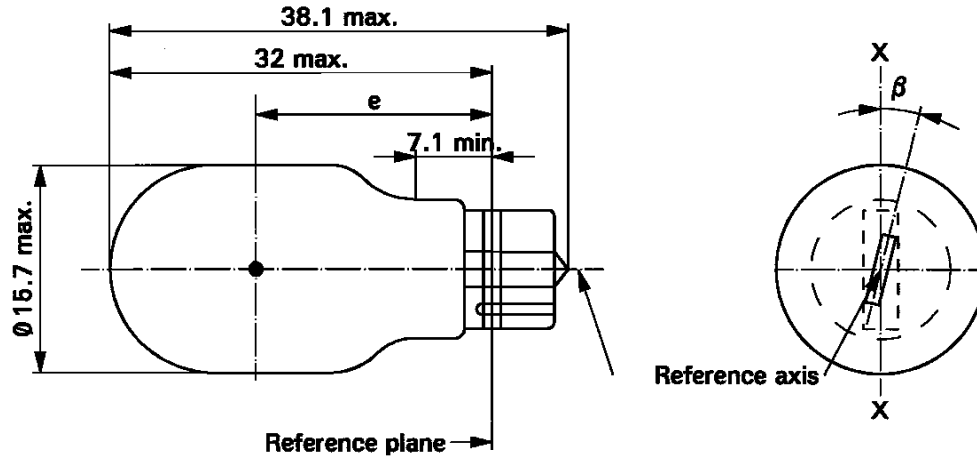
Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nom.	max.	
e	18.3	20.6	22.9	20.6 ± 0.3
Lateral deviation <sup>1/</sup>			1.0	0.5 max.
β	-15°	0°	+ 15°	0° ± 5°
Cap	W2.1x 9.5d			

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

**Annex-A55**  
(See para 4)

**Requirements of WY10W Category Lamp**

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



**A55.1 Electrical and photometric requirements:**

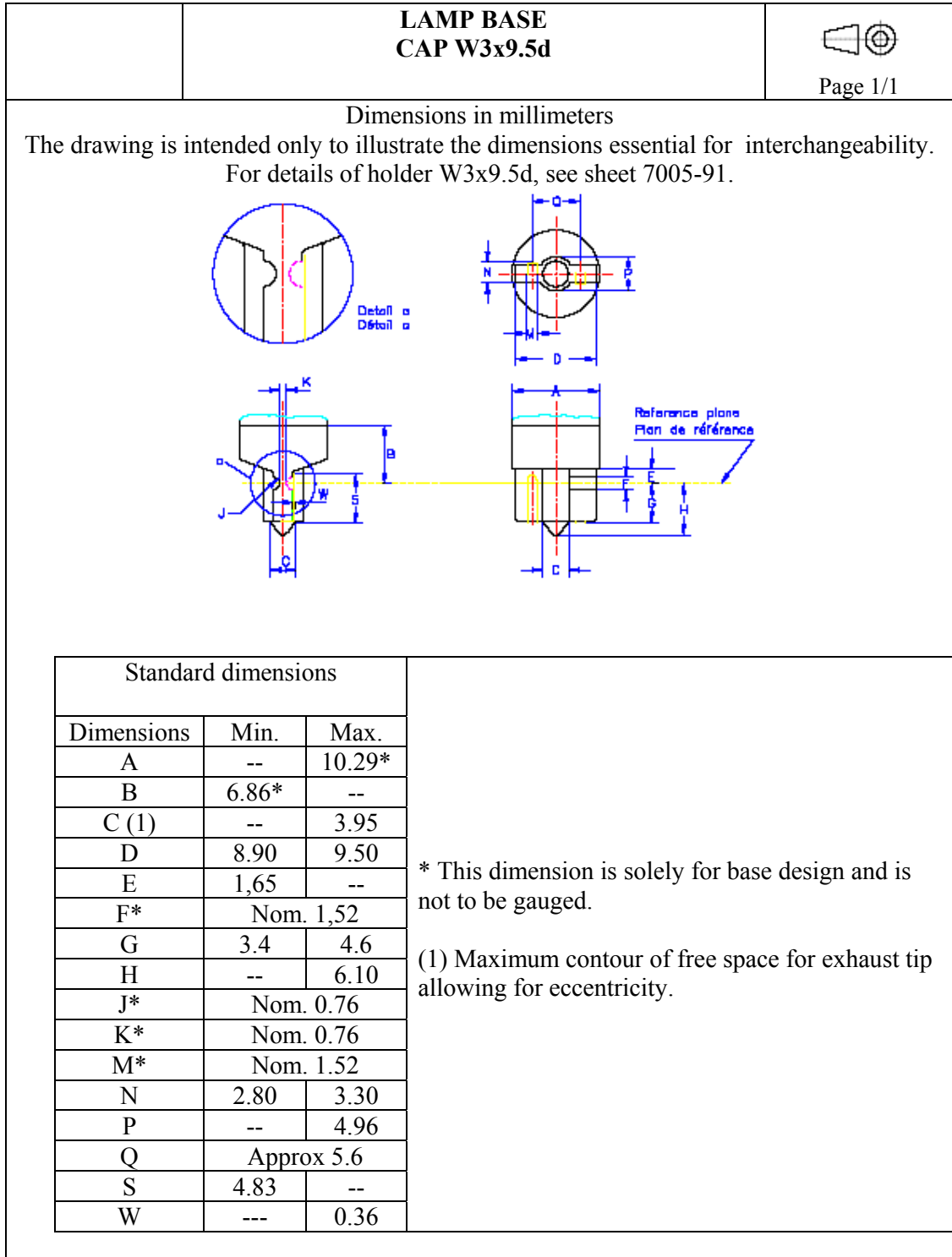
Parameter		Production Lamps	Standard Lamp
Rated values	Volts	12	12
	Watts	10	10
Test voltage	Volts	13.5	13.5
Objective values	Watts	11 max.	11 max.
	Luminous flux	75 $\pm$ 20 %	
Reference luminous flux at approximately 13.5 V:		White: 125 lm	
		Amber: 75 lm	

**A55.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nom.	max.	
e	18.3	20.6	22.9	20.6 $\pm$ 0.3
Lateral deviation <sup>1/</sup>			1.0	0.5 max.
$\beta$	-15°	0°	+ 15°	0° $\pm$ 5°
Cap	W3 x 9.5d – See A55.3			

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

A55.3 Cap W3x 9.5d

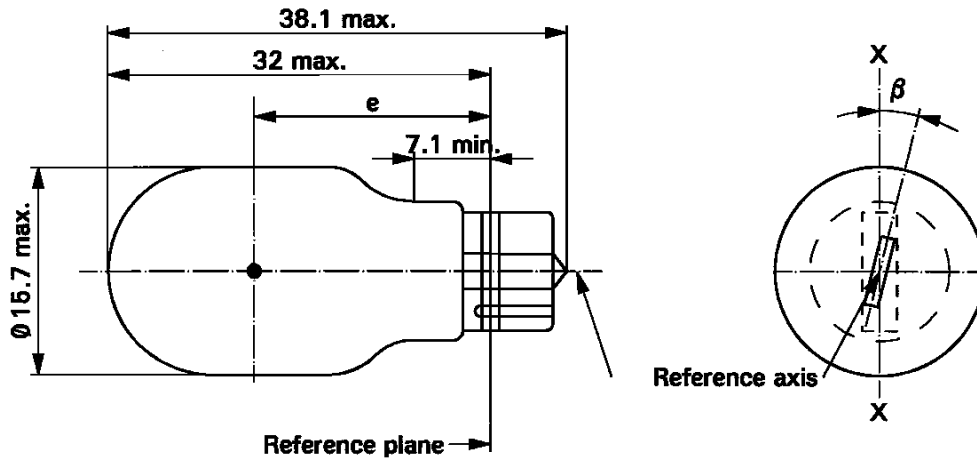


## Annex-A56

(See para 4)

### Requirements of WY16W Category Lamp

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



#### A56.1 Electrical and photometric requirements

Parameter		Production Lamps	Standard Lamp
Rated values	Volts	12	12
	Watts	16	10
Test voltage	Volts	13.5	13.5
Objective values	Watts	21.35 max.	21.35 max.
	Luminous flux	189 ± 20 %	
Reference luminous flux at approximately 13.5 V:		White: 310 lm	
		Amber: 189 lm	

#### A56.2 Dimensional requirements:

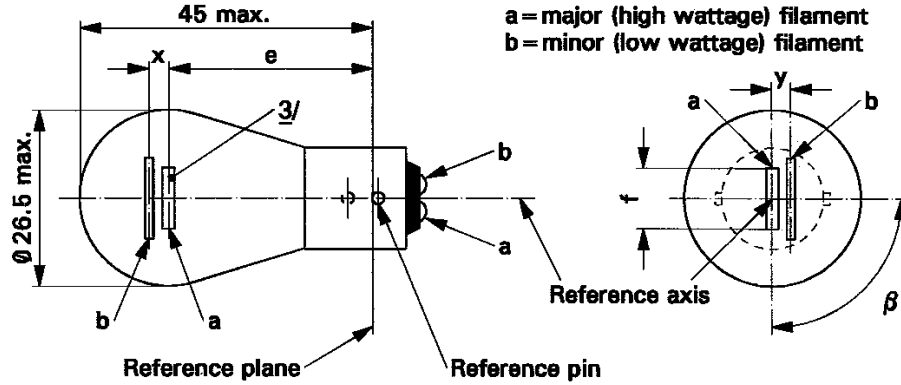
Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nom.	max.	
e	18.3	20.6	22.9	20.6 ± 0.3
Lateral deviation <sup>1/</sup>			1.0	0.5 max.
β	-15°	0°	+ 15°	0° ± 5°
Cap	W3x9.5d – See A55.3			

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

**Annex-A57**  
(See para 4)

**Requirements of P18/5W Category Lamp**

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



**A57.1 Electrical and photometric requirements**

Parameter		Production Lamps						Standard Lamp
Rated values	Volts	6		12		24		12
	Watts	18	5	18	5	18	5	18/5
Test voltage	Volts	6.75		13.5		28.0		13.5
Objective values	Watts	24.5 max.	6.6 max.	23.5 max.	6.6 max.	26.7 max.	11 max.	23.5 and 6.6 max.
	Luminous flux	325	35	325	35	325	40	
	$\pm$ %	15	20	15	20	15	20	
Reference luminous flux: 325 and 35 lm at approximately 13.5 V								

## A57.2 Dimensional requirements

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nom.	max.	
e	6, 12 V		31.8 <sup>1/</sup>		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	6, 12 V			7.0	7.0 + 0/- 2
Lateral deviation <sup>2/</sup>	6, 12 V			<sup>1/</sup>	0.3 max.
	24 V			1.5	
x, y	6, 12 V		<sup>1/</sup>		2.8 ± 0.3
x	24 V <sup>3/</sup>	-1.0	0	1.0	
y	24 V <sup>3/</sup>	1.8	2.8	3.8	
β		75°	90°	105°	90° ± 5°
Cap	BAY15d				

### Notes:

- <sup>1/</sup> These dimensions shall be checked by means of a "box-system". (See **A57.3**). "x" and "y" refer to the major (high-wattage) filament, not to the reference axis.
- <sup>2/</sup> 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.
- <sup>3/</sup> 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.

**A57.3 Screen projection requirements**

**A57.3.1** 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 lamp complies with the requirements.

**A57.3.2 Test procedure and requirements**

**A57.3.2.1** The filament lamp 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.  $15^\circ$ ). 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.

**A57.3.2.2 Side elevation**

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

**A57.3.2.2.1** 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;

**A57.3.2.2.2** the projection of the minor filament shall lie entirely:

**A57.3.2.2.2.1** 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;

**A57.3.2.2.2.2** 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  $25^\circ$ .

**A57.3.2.2.2.3** to the right of the projection of the major filament.

**A57.3.3 Front elevation**

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

**A57.3.3.1** 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;

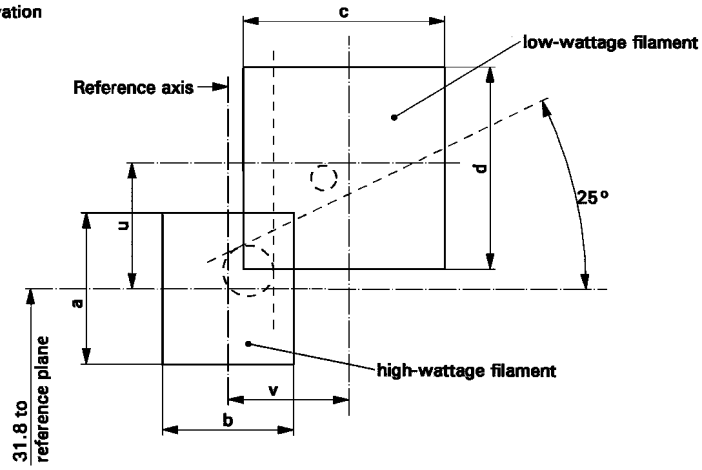
**A57.3.3.2** the centre of the major filament shall not be offset by more than distance "k" from the reference axis.

**A57.3.3.3** the centre of the minor filament axis shall not be offset from the reference axis by more than  $\pm 2$  mm ( $\pm 0.4$  mm for standard filament lamps).



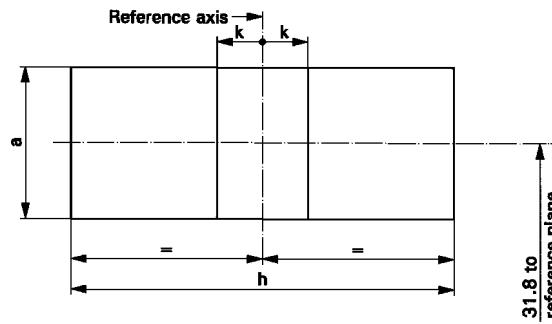
Figure A57.1

Side elevation



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

Front elevation



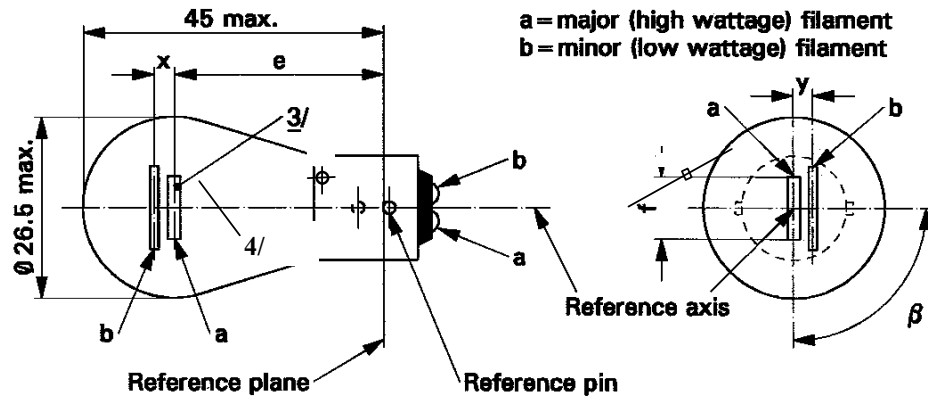
Reference	a	h	k
Dimensions	3.5	9.0	1.0

Dimensions in mm

**Annex-A58**  
(See para 4)

**Requirements of PR18/5W Category Lamp**

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



**A58.1 Electrical and photometric requirements**

Parameter		Production Lamps				Standard Lamp
Rated values	Volts	12		24		12
	Watts	18	5	18	5	18/5
Test voltage	Volts	13.5		28.0		13.5
Objective values	Watts	23.5 max.	6.6 max.	26.7 max.	11 max.	23.5 and 6.6 max.
	Luminous flux $\pm$ %	76	8	76	10	
		20	25	20	25	
Reference luminous flux at approximately 13.5 V		White: 325 lm and 35 lm Red: 76 lm and 8 lm				

## A58.2 Dimensional requirements

Dimensions in mm		Filament lamps of normal production <sup>4/</sup>			Standard filament lamp
		min.	nom.	max.	<sup>5/</sup>
e	12 V		31.8 <sup>1/</sup>		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V			7.0	7.0 + 0/- 2
Lateral deviation <sup>2/</sup>	12 V			<sup>1/</sup>	0.3 max.
	24 V			1.5	
x, y	12 V		<sup>1/</sup>		2.8 ± 0.3
x	24 V <sup>3/</sup>	-1.0	0	1.0	
y	24 V <sup>3/</sup>	1.8	2.8	3.8	
β		75°	90°	105°	90° ± 5°
Cap	BAW15d				

### Notes

- <sup>1/</sup> These dimensions shall be checked by means of a "box-system". (See A57.3). "x" and "y" refer to the major (high-wattage) filament, not to the reference axis.
- <sup>2/</sup> 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.
- <sup>3/</sup> 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
- <sup>4/</sup> The light emitted from normal production lamps shall be red (see also note <sup>5/</sup>).
- <sup>5/</sup> The light emitted from standard filament lamps shall be white or red.

3.0 Page No. 166/177, Table D1:

Add following new requirements at the end of Table D1

**Table D1**  
**Requirements for Double Filament Lamps.**

Category	Filament	Life requirements (h)		Lm%	Lm to be verified % of LSP
		LSP	LTQ		
P18/5W	Main	100	85	85	$50 \pm 5\%$
	Auxiliary	1000	850	85	$50 \pm 5\%$
PR18/5W	Main	100	85	85	$50 \pm 5\%$
	Auxiliary	1000	850	85	$50 \pm 5\%$

4.0 Page No. 168/177, Table D2:

Add following new requirements at the end of Table D2

**Table D2**  
**Requirements for Single filament lamps.**

Category	Life requirements (h)		Lm%	Lm to be verified % of LSP
	LSP*	LTQ		
W10W	200	156	85	$50 \pm 5\%$
WY10W	200	156	85	$50 \pm 5\%$
WY16W	200	156	85	$50 \pm 5\%$

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UNDER  
CENTRAL MOTOR VEHICLE RULES – TECHNICAL STANDING  
COMMITTEE  
SET-UP BY  
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS  
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)  
GOVERNMENT OF INDIA

August 2008

**AMENDMENT NO. 1**  
**TO**  
**AIS – 034**  
**Automobile Lamps**

1.0 Page No. 13/177, cl. 10.1

Substitute following text for existing text :

“ The life requirements of gas discharge light sources shall be as per paragraphs 5.3, 5.4 and 5.5 of CEI IEC 60810 Edition 2.2 (2002-02).

2.0 Page No. 18/177 , Add new clause as follows:

17. Conditions for filament lamps and gas discharge light sources not listed in Table 1: Categories incorporated in ECE regulations R37 and R99 and not listed in Table 1 are permitted if they comply with the following:

17.1 The dimensional requirements, colour and initial electrical and luminous requirements as per the details given in the applicable data sheets of ECE R37 for filament lamps and ECE R 99 for gas discharge light sources.

17.2 In the case of filament lamp, emitting amber or red light, the colour durability requirements as prescribed in ECE R 37 for that category.

17.3 Any other requirements incorporated in ECE R 37 or ECE R 99 as applicable.

17.4 The other requirements specified in this standard.

3.0 Page No. 165/177, Annex D, clause D1, 2<sup>nd</sup> line:

Substitute “--- given in the relevant tables D1, D2 or D3. ” for the existing text “--- given in the relevant tables D1/D2”.

**Table D3: Requirements for Filament Lamps described in clause 17.**

Category	Filament	Life (h)		Lm %	Lm to be verified at % of LSP
		LSP	LTQ		
Double filament halogen filament lamps intended for headlamps	Driving	150	126	85	$75 \pm 5\%$
	Passing	300	252	85	$75 \pm 5\%$
Signalling filament halogen filament lamps intended for headlamps	--	300	252	85	$75 \pm 5\%$
Double filament lamps intended for signalling devices	Main	100	85	85	$50 \pm 5\%$
	Auxiliary	1000	50	85	$50 \pm 5\%$
Single filament halogen filament lamps intended for signalling devices	--	200	156	85	$75 \pm 5\%$
Single filament non-halogen filament lamps intended for signalling devices	--	100	85	85	$50 \pm 5\%$

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THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA  
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ON BEHALF OF  
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER  
CENTRAL MOTOR VEHICLE RULES - TECHNICAL STANDING COMMITTEE

SET-UP BY  
MINISTRY OF SHIPPING, ROAD TRANSPORT & HIGHWAYS  
(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)

GOVERNMENT OF INDIA

July 2005

**AUTOMOTIVE INDUSTRY STANDARDS**

**Automobile Lamps**

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ON BEHALF OF :  
AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER  
CENTRAL MOTOR VEHICLE RULES - TECHNICAL STANDING COMMITTEE

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

December 2004

Status chart of the Standard to be used by the purchaser  
for updating the record

<b>Sr. No.</b>	<b>Corr-igenda.</b>	<b>Amend-ment</b>	<b>Revision</b>	<b>Date</b>	<b>Remark</b>	<b>Misc.</b>

**General Remarks :**



## 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 Ministry of Surface Transport (MOST) has constituted a permanent Automotive Industry Standard 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** This standard has been prepared for implementation of the mandatory requirements regarding lamps(bulbs) for use in automobiles for lights and light- signalling devices covered by the following standards:

AIS- 008/ 2001: Installation Requirements of Lighting and Light - Signalling Devices for Motor Vehicle having more than Three Wheels, Trailer and Semi-Trailer excluding Agricultural Tractor and Special Purpose Vehicle

AIS- 009/ 2001: Installation requirements of lighting and light signalling devices for 2 and 3 wheelers, their trailers and semi-trailers

AIS-030/ 2001: Installation requirements for lighting and light-signalling devices for agricultural tractor.

At present, certain clauses of the Indian Standard IS 1606: 1979 are notified in the Central Motor Vehicle Rules. This Indian Standard do not cover many of the types of bulbs which are a part of the ECE Regulation 37 or covered in the International Standard IEC 809.

**0.2** The CMVR Technical Committee had decided that there is a necessity to permit all the bulbs prescribed in ECE R37 and the performance requirements should be aligned with those specified in the above regulation. The test procedure and life requirements have been specified in this AIS in line with the details specified in IS 1606:1979, extrapolating, where applicable for the new auto lamps added.

**0.3** The currently notified Indian Standard includes many varieties of bulbs, for use in lights and light signalling devices. Quite a few of them are not covered either in ECE R37 or IEC 809. A panel of Bureau of Indian Standards constituted for revision of IS 1606 had done an extensive exercise to find out the need for retaining such bulbs in the standard and had found out that there are only three such bulbs not covered by ECE R37 which needed to be considered for Indian use. These have been included in this standard.

- 0.4** Alignment of the nomenclature of the autolamps has also been carried out in line with the international practice. For ready reference, the nomenclatures of the autolamps in this standard and the corresponding nomenclature used in the IS 1606:1979 are given in Annex F.
- 0.5** The proposal to align the life test requirements and the test procedure is being incorporated in the draft of third revision of IS 1606:1979, so that the alignment with the international levels of performance is implemented in a phased manner.
- 0.6** The requirements for non-replaceable light sources are covered separately.
- 0.7** For preparation of this standard, considerable assistance has been taken from the following International Standards:

ECE R37 Rev3 Amend2 Supp. 22 to 03 Series of amendments	Uniform provisions concerning the approval of filament lamps for use in approved lamp units of power driven vehicles and of their trailers.
ECE R 99 Rev. 01. Supp. 1 to original version of regulation	Uniform provisions concerning the approval of gas-discharge light sources for use in approved gas-discharge lamp units of power driven vehicles .
IEC 60809 Edition 2.2	Filament lamps for road vehicles - Dimensional, electrical and luminous requirements
IEC 60810 Edition 2.2	Lamps for Road vehicles - Performance requirements.

The Automotive Industry Standards Committee responsible for preparation of this standard is given in Annex : H

## Automobile Lamps

### 1.0 SCOPE

- 1.1 This standard covers the specification for lamps used for automobile lighting and light-signalling devices.

### 2.0 REFERENCES

IEC Publication 60061-1, Part 1: Lamp caps.

IEC Publication 60051: Direct acting indicating analogue electrical measuring instruments and their accessories.

IEC Publication 60810:Lamps for road vehicles- Performance requirements

IEC Publication 60410: Sampling plans and procedures for inspection by attributes

CIE Publication 15.2 Colorimetry, 1986.

### 3.0 DEFINITIONS

- 3.1 **Ageing Period:** is the period during which unused filament lamps or gas-discharge light sources are operated at their test voltage in order to stabilize their performance.

- 3.2 **Axial Displacement :** means the perpendicular distance of light centre from the axis of the cap.

- 3.3 **Ballast:** Specific electrical supply for the gas-discharge light source.

- 3.4 **Category:** The term “category” is used in this standard to describe basic design of the standardized filament lamps and gas-discharge light sources. Each category has a specific designation, for example, R2, H4, D2S etc.

- 3.5 **Conformity of Production :** means the compliance of the series production of a given type with the requirements of the relevant specification.

Production of lamps are of the same design as the approved type test sample.

- 3.6 **Gas-discharge Light Source (Gas Discharge Lamp):** light source in which the light is produced by a stabilized discharge arc.

- 3.7 **Inspection Test Quantity (ITQ):** is the number of lamps selected from a batch according to an agreed method, the test on which shall determine whether or not the batch complies with the requirements of marking (see 12)

- 3.8 **Life of Lamp:** is the total time for which a filament lamp is operated before becoming useless or regarded as such according to one of the following criteria:

a) The end of life is time until the filament fails.

b) The life of a dual filament lamp is the time until either filament fails, if the filament lamp is tested in a switching cycle involving alternative operation of both the filaments. The life of lamp is expressed in hours.

- 3.9 **Life Test Quantity (LTQ):** means the number of lamps selected from a batch according an agreed method, the life test measurements for individual lumens at 50% of the specified life hours on which shall determine whether or not the batch complies with the life performance requirements (See 10.)

- 3.10 **Light Centre** : means the geometrical centre of the filament.
- 3.11 **Light Centre Length** : means the distance from the light centre to a specified position on the lamp cap or base as shown in appropriate tables/figures.
- 3.12 **Lumen**: is the unit of luminous flux. It is equal to the flux emitted in a solid angle of one steradian by a uniform point source having an intensity of one candela.
- Note:** The candela (abbreviation: cd) is the unit of luminous intensity. It is of a magnitude such that the luminance of a full radiator at the temperature of solidification of platinum is 60 units of luminous intensity per square centimeter.
- 3.13 **Lumen Maintenance**: means the ratio of luminous flux of a lamp at a given time in its life to its initial luminous flux, the lamp being operated under specific conditions and expressed as a percentage.
- 3.14 **Production Filament Lamp** : is the filament lamp which shall comply with the requirements of this standard as indicated in the column “production lamps” in the relevant Annex.
- 3.15 **Rated Voltage** : means the voltage used to designate a filament lamp, usually the battery voltage (6,12,24 V) of the road vehicle supply network. In case of gas-discharge light source, input voltage marked on a ballast.
- 3.16 **Rated Value of any Specific Characteristic**: means value of a characteristic specified for operation of a filament lamp at test voltage and/or other specified conditions.
- 3.17 **Rating Test Quantity (RTQ)**: means the number of lamp selected from a batch according to an agreed method, the initial rating test on which shall determine whether or not the batch complies with the initial electrical and luminous requirements. (See 9).
- 3.18 **Reference Axis**: is defined with reference to the cap or base and with respect to which the positions of certain parts of the filament lamp are measured. In case of gas-discharge light source, an axis defined with reference to the cap and to which certain dimensions of gas-discharge light source are referred.
- 3.19 **Reference Luminous Flux**: is the specified luminous flux of a standard filament lamp at which the photometric characteristics of lighting and light-signalling devices shall be measured.
- 3.20 **Reference Plane**: is a plane defined with the reference to the cap or base and with respect to which the positions of certain parts of the filament lamp or gas-discharge light source, are measured.
- 3.21 **Standard (étalon) Filament Lamp**: a filament lamp emitting white or amber light with reduced dimensional tolerances, used for photometric testing of lighting and light-signalling devices. Standard filament lamps are specified in only one voltage rating for each category

- 3.22 **Type:** Filament lamps or gas-discharge light source of different types are lamps within the same category which differ in such essential respects as:
- Trade name or mark
  - Bulb design, in so far as these differences affect the optical results
  - Rated Voltage ( Not applicable in case of gas-discharge light source)
  - 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 colourless filament lamp or gas-discharge light source, does not constitute a change of type of the filament lamp or gas-discharge light source.
- 3.23 Filament lamps or gas-discharge light sources produced by same manufacturer differing only by trade name or mark may be considered to be of the same type.
- 3.24 **Type Test:** means a test or series of tests, made on a type test sample, for the purpose of checking compliance of the design of a given product with the requirements of the relevant specification.
- 3.25 **Type Test Sample :** means a sample consisting of one or more similar units, submitted by the manufacturer or responsible vendor for the purpose of type test.
- 3.26 **Rated Wattage :** means wattage (in watts) marked on filament lamp or in case of gas-discharge light source marked on gas-discharge light source and ballast, which may be incorporated into the designation of relevant category.
- 3.27 **Test Voltage:** means voltage at the filament lamp terminals for which the electrical and photometric characteristics of the filament lamp are intended and are to be tested. In case of gas-discharge light source, voltage at the input terminals of the ballast.
- 3.28 **Objective Values:** means design values of electrical and photometric characteristic to be achieved, within the specified tolerances, when the filament lamp is supplied with the current at its test voltage and in case of gas-discharge light sources, when it is energized by the ballast operated at test voltage.
- 3.29 **Standard (étalon) Gas-discharge Light Source:** means special gas-discharge light source used for the testing of headlamps. It has reduced dimensional, electrical and photometric characteristics as specified on the relevant Annex

#### 4.0 LAMP CATEGORIES

The categories of auto lamps covered by this standard are given in Table 1.

The designation of caps/bases used in the annexes is as per IEC: 60061-1, Part 1

For the purpose of type approval of filament lamps it is necessary only to check only those dimension related to fitment of the filament lamp in the bulb holder. This may be carried out by measurement or using an appropriate gauge.

## 5.0 REQUIREMENTS

### 5.1 General

- 5.1.1 Each sample submitted shall conform to the relevant specifications of this standard.
- 5.1.2 Filament lamps or gas-discharge 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. This condition is deemed to be satisfied if all the applicable conditions prescribed in this standard are complied with.
- 5.1.3 Filament lamp bulbs and gas-discharge light sources shall exhibit no scores or spots, which might impair their efficiency and their optical performance.
- 5.1.4 The cap shall be strong and firmly secured to the bulb.
- 5.1.5 To ascertain whether filament lamps and gas-discharge light sources conform to the requirements of paragraphs **5.1.3** to **5.1.4** above, a visual inspection, and a dimension check and, where necessary, a trial fitting shall be carried out.

### 5.2 **Mandatory:** The following are the mandatory requirements:

- 5.2.1 Dimensional Requirements (See **6**).
- 5.2.2 Colour (See **7**).
- 5.2.3 Check on optical quality(Applicable only to filament lamps of categories R2, H4 and HS1).(See **8**)
- 5.2.4 Initial electrical and luminous requirements: (See **9**).
- 5.2.5 Life performance (See **10**).
- 5.2.6 UV radiation for halogen lamps (See **11**)
- 5.2.7 Marking (See **12**)
- 5.2.8 Starting, run-up and hot-restrike characteristics for gas discharge lamps (See **9.3**)

**Table 1 (See 4)**  
**Lamp Categories**

	<b>Category</b>	<b>Individual Reference numbers</b>	<b>Annex</b>
1.	H1	6H1, 12H1, 24H1	A2
2.	H3	6H3, 12H3, 24H3	A3
3.	H4	12H4, 24H4	A4
4.	H7	12H7, 24H7	A9
5.	H8, H8A	12H8, 12H8A	A37
6.	H9, H9A	12H9, 12H9A	A41
7.	H10	12H10	A42
8.	H11, H11A	12H11, 24H11, 12H11A, 24H11A	A43
9.	H12	12H12	A44
10.	H13, H13A	12H13, 12H13A	A49
11.	H14	12H14	A52
12.	H27W/1, H27W/2	12 H27W/1, 12 H27W/2	A 30
13.	HB3, HB3A	12HB3, 12HB3A	A27
14.	HB4, HB4A	12HB4, 12HB4A	A28
15.	HIR1	12 HIR1	A38
16.	HIR2	12 HIR2	A40
17.	HS1	6HS1, 12HS1	A8
18.	HS2	6HS2W, 12 HS2W	A 25
19.	R2	6R2, 12R2, 24R2	A1
20.	S1, S2	6S1, 12S1, 6S2, 12S2,	A5
21.	S3	6S3, 12S3	A7
22.	C5W	6C5W, 12C5W, 24C5W	A15
23.	C10W	6C10W, 12C10W	A16
24.	C21W	6C21W, 12C21W, 24C21W	A17
25.	H6W	12H6W	A26
26.	H21W	12H21W, 24H21W	A34
27.	P19W, PS19W, PY19W, PSY19W,	12P19W, 12PS19W, 12PY19W, 12PSY19W	A47
28.	P21W	6P21W, 12P21W, 24P21W	A10
29.	P21/4W	12P21/4W, 24P21/4W	A11
30.	P21/5W	6P21/5W, 12P21/5W, 24P21/5W	A12
31.	P24W, PS24W, PY24W, PSY24W,	12P24W, 12PS24W, 12PY24W, 12PSY24W	A48
32.	P27W	12P27W	A31
33.	P27/7W	12P27/7W	A32
34.	PY21W	12PY21W, 24PY21W	A22
35.	PY27/7W	12PY27/7W	A39
36.	R5W	6R5W, 12R5W, 24R5W	A13
37.	R10W, RY10W	6R10W, 12R10W, 24R10W, 6RY10W, 12RY10W, 24RY10W,	A14
38.	R10/5W	6R10/5W, 12R10/5W	A20
39.	T1.4W	12T1.4W	A29
40.	T4W	6T4W, 12T4W, 24T4W	A18
41.	W2.3W	12W2.3W	A36

42.	W5W	6W5W, 12W5W, 24W5W	A19
43.	W16W	12W16W	A23
44.	W21W	12W21W	A35
45.	W21/5W	12W21/5W	A24
46.	WP21W, WPY21W	12WP21W, 12WPY21W	A21
47.	WY2.3W	12WY2.3W	A46
48.	WY5W	6WY5, 12WY5, 24WY5W	A33
49.	WY21W	12WY21W	A45
50.	F02	F02	A53
51.	D1S/D2S	12 D1S, 12D2S	A50
52.	D1R/D2R	12 D1R, 12D2R	A51

## 6.0 DIMENSIONAL REQUIREMENTS

6.1 The dimensions of the filament lamp and gas-discharge light source shall be as per the details given in the relevant Annex (See Table 1). Unless otherwise stated, all dimensions given in the annexes are in millimeter. The drawings in these annexes are given only to illustrate essential dimensions, which are to be verified.

### 6.2. Filament Position and Dimensions

6.2.1 The geometric shapes of the filament shall in principle be as specified in the filament lamp data sheets of relevant Annex (See Table 1).

6.2.2 For line filaments the correct position and shape shall be checked as specified in the relevant Annex (See Table 1).

6.2.3 If the filament is shown on the filament lamp data sheet in at least one view as a point, the position of the luminous centre shall be determined in conformity with **B2 of Annex B**.

6.2.4 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 lamp. 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.

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

6.2.4.2 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.

6.2.5 The position and dimensions of the filament shall be measured with the filament lamps being supplied with current at a voltage of 90 per cent to 100 per cent of the test voltage.

Alternatively, this may be carried out by projection system (shadow graph).

6.2.6 Further details regarding checking of dimensions and shapes are given in **Annex B**



### 6.3 Position and dimensions of electrodes, arc and stripes for gas discharge lamps:

- 6.3.1 The geometric position of the electrodes shall be as specified on the relevant data sheet. An example of a method of measuring arc and electrodes position is given in Annex E. Other methods may be used.
- 6.3.2 The position and dimensions of the light source electrodes shall be measured before the ageing period, the gas-discharge light source unlit and using optical methods through the glass envelope.
- 6.3.3 The shape and the displacement of the arc shall conform to the requirements as given on the relevant data sheet.
- 6.3.4 The measurement shall be made after ageing with the light source supplied by the ballast at test voltage.
- 6.3.5 The position and dimension and transmission of the stripes shall comply with the requirements as given on the relevant data sheet.
- 6.3.6 The measurement shall be made after ageing with the light source supplied by the ballast at test voltage.

### 7.0 COLOUR

- 7.1 The colour of the light emitted by the filament lamp and gas-discharge light source shall be white, unless otherwise prescribed on the relevant Annex. The light emitted shall satisfy the condition prescribed in 7.1.1 for white light.  
Lamps with selective yellow colour are permitted only for lamps where yellow colour is permitted, e.g. front fog lamps.
- 7.1.1 The colour of the colourless/clear bulb may be verified by visual inspection. The chromaticity co-ordinates need be measured only in case of doubt and the colorimetric characteristics of the light emitted, expressed in CIE chromaticity co-ordinates, shall lie within the following limits.

Towards blue	$x \geq 0.310$
Towards yellow	$x \leq 0.500$
Towards green	$y \leq 0.150 + 0.640 x$
Towards green	$y \leq 0.440$
Towards purple	$y \geq 0.050 + 0.750 x$
Towards red	$y \geq 0.382$

7.1.2 The minimum red content of a gas-discharge lamp emitting white light shall be such that:

$$K_{red} = \frac{\int_{\lambda=610nm}^{780nm} E_e(\lambda).V(\lambda).d\lambda}{\int_{\lambda=380nm}^{780nm} E_e(\lambda).V(\lambda).d\lambda} \geq 0.05$$

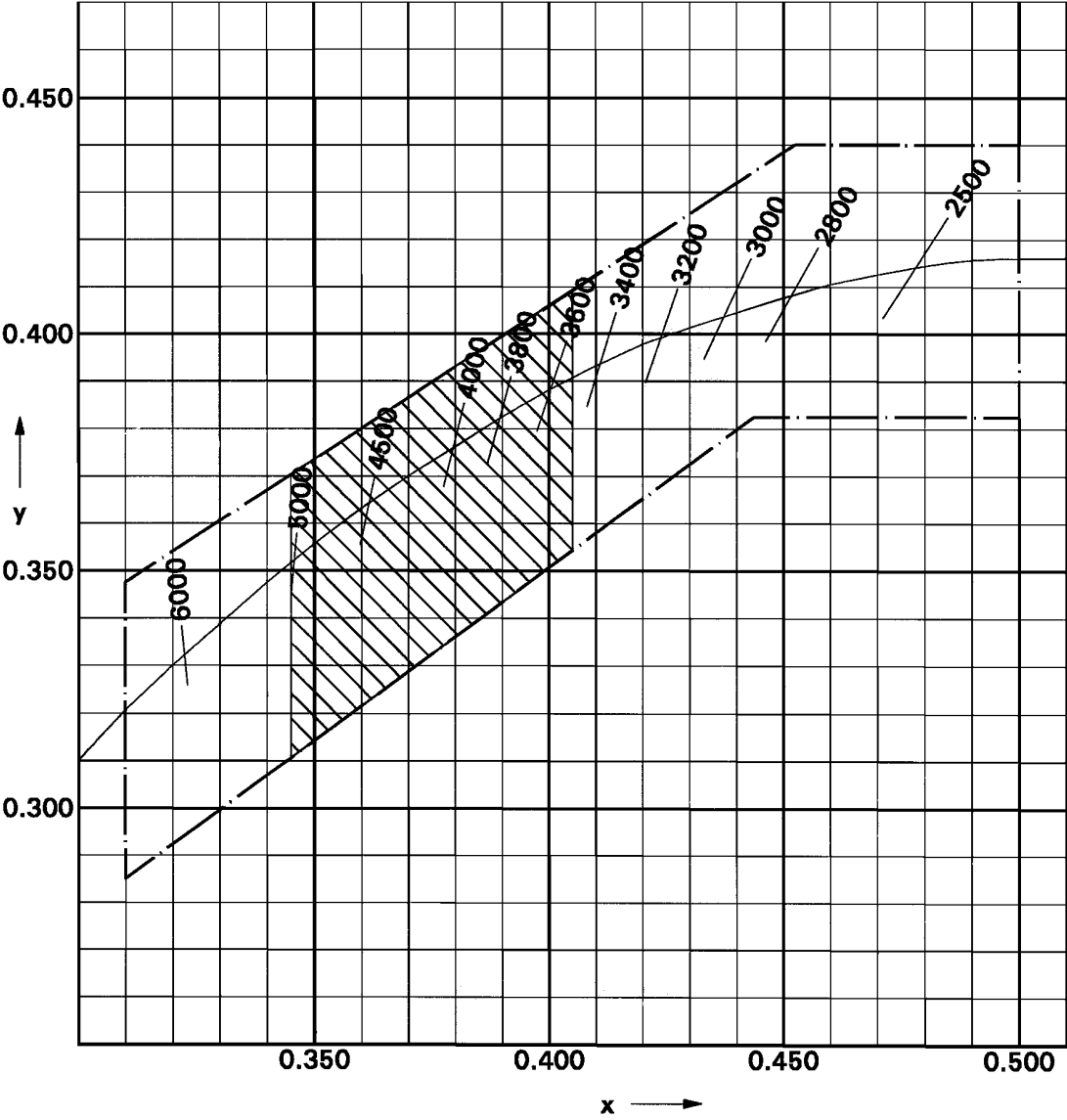
where:

- $E_e(\lambda)$  [W/nm] is the spectral distribution of the radiant flux;
- $V(\lambda)$  [1] is the spectral luminous efficiency;
- $\lambda$  [nm] is the wavelength.

This value shall be calculated using intervals of one nanometre.

7.1.3 **Figure 1** shows the colour tolerance area for colour white and the restricted tolerance area for the gas-discharge lamps.

Figure 1 (See 7.1.3)  
Colour Tolerance Area for Colour White and the Restricted Tolerance Area  
for the Gas-discharge Lamps



- 7.2 In the case of amber coloured lamps, selective-yellow lamp or outer bulb, the colorimetric characteristics, expressed in CIE chromaticity co-ordinates shall lie within the limits given in **Table 2**.
- 7.3 The colour and the transmission of the bulb of filament lamps emitting coloured light shall be measured by the method specified in Annex C.
- 7.4 Each measured value shall lie within the required tolerance area. Moreover, in the case of filament lamps 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 Publication 15.2 Colorimetry, 1986).

For Conformity of Production purposes and for amber colour only, at least 80 per cent of the measuring results shall lie within the required tolerance area.

**Table 2: Coordinates for colour. (See 7.2)**

Limit towards	Amber		Selective Yellow
	Alternative 1	Alternative 2	
Red	$y \geq 0.398$	$y \geq 0.390$	$y \geq 0.138 + 0.580x$
Green	$y \leq 0.429$	$y \leq x - 0.120$	$y \leq 1.290x - 0.100$
White	$z \leq 0.007$	$y \leq 0.790 - 0.670x$	$y \geq 0.966 - x$ , ( $y \geq 0.940 - x$ and $y = 0.440$ for filament lamps for front fog lamps)
Spectral value	Not applicable		$y \leq 0.992 - x$

**8.0 CHECK ON OPTICAL QUALITY**

- 8.1. The check on optical quality is applicable only to filament lamps of categories R2, H4 and HS1.  
This check on optical quality shall be carried out at a voltage such that the measuring luminous flux is obtained; the specifications **9.2.6** are to be observed accordingly.

8.2. For 12-Volt Filament Lamps Emitting White Light

The sample which most nearly conforms to the requirements laid down for the standard filament lamp shall be tested in a standard headlamp as specified in paragraph **8.5** and it shall be verified whether the assembly comprising the aforesaid headlamp and the filament lamp being tested meets the light-distribution requirements laid down for the passing-beam in the relevant standard.

8.3. For 6-Volt and 24-Volt Filament Lamps Emitting White Light

The sample, which most nearly conforms to the nominal dimension values, shall be tested in a standard headlamp as specified in paragraph **8.5**.

It shall be verified whether the assembly comprising the aforesaid headlamp and the filament lamp being tested meets the light-distribution requirements laid down for the passing-beam in the relevant standard. Deviations not exceeding 10 % of the minimum values will be acceptable.

8.4 Filament lamps having a selective-yellow bulb or outer bulb shall be tested in the same manner as described in **8.2** and **8.3** in a standard headlamp as specified in **8.5** to ensure that the illumination complies with at least 85 per cent for 12-Volt filament lamps, and at least 77 per cent for 6-Volt and 24-Volt filament lamps, 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.

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

8.5.1. It satisfies the pertinent conditions of approval;

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

8.5.3. With a standard filament lamp it produces at the various points and in the various zones specified for the headlamp type concerned, illumination shall be

- Not more than 90 % of the maximum limits;
- Not less than 120% of the minimum limits prescribed for the headlamp type concerned.

**9.0 INITIAL ELECTRICAL AND LUMINOUS REQUIREMENTS**

9.1 Filament lamp and gas-discharge light source wattage and luminous flux, in addition voltage in case of gas-discharge light source, shall comply with the limiting values given in the relevant Annexes (See Table 1), measured as per the procedure given in 9.2

9.2 **Test Conditions for Measurement of Electrical and Luminous Characteristics**

9.2.1 **Ageing**

9.2.1.1 Filament lamps shall be aged at their test voltage for approximately one hour. The test voltage is indicated in the relevant Annex. (See Table 1).

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.

- 9.2.1.2 In the case of gas discharge lamps with exception of the starting test, all tests shall be carried out with light sources which have been aged for a minimum of 15 cycles having the following switching cycle:

45 minutes	On
15 seconds	Off
5 minutes	On
10 minutes	Off

- 9.2.1.3 For dual filament lamps, each filament shall be aged separately.
- 9.2.1.4 In the case of a filament lamp having a coated bulb and in case of gas-discharge light source, a coloured (outer ) bulb, after the ageing period corresponding to paragraph **9.2.1**, 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.
- 9.2.2** Electrical and photometric measurements shall be carried out at the test voltage, specified in the relevant Annex. (See Table 1)
- 9.2.3** Electrical measurements shall be carried out with instruments being of a precision appropriate to the requirements, at least class 0.2 according to IEC 60051)  
In the case of gas discharge lamps, before any measurement, the light source shall be stabilized for a period of 15 minutes.
- 9.2.4** Luminous flux shall be measured in a suitable integrating photometer.
- 9.2.5** Unless otherwise specified, electrical and photometric measurements shall be carried out at the test voltage.
- 9.2.6** The luminous flux (in lumen) specified on the filament lamp data sheets of Annex A is valid for filament lamps emitting white light unless a special colour is stated there.  
In the case filament lamps, where selective-yellow colour is allowed, the luminous flux of the filament lamp with the selective-yellow outer bulb shall be at least 85% of the specified luminous flux of the relevant filament lamp emitting white light.
- 9.2.7** For the purpose of the test for initial readings, the lamps shall burn in the vertical position, with the cap up. In the case of festoon lamps, they shall burn in a horizontal position. For life test and ageing, they shall be burnt horizontally. In the case of lamps for headlight, the plane of main filament shall be horizontal during the durability tests.

In the case of gas discharge lamps, the burning position shall be horizontal within  $\pm 10^\circ$  with the lead wire down. Ageing and testing positions shall be identical. If the lamp is accidentally operated in the wrong direction, it shall be re-aged before measurements begin. During ageing and measurements no electrically conducting objects shall be allowed within a cylinder having a diameter of 32 mm and a length of 60 mm concentric with the reference axis and symmetric to the arc. Moreover stray magnetic fields shall be avoided.

### **9.3 Starting, Run-up and Hot-restrike Characteristics for Gas-discharge Lamps:**

#### **9.3.1 General**

For starting, run-up and hot-restrike tests and for the measurement of electrical and photometric characteristics, the gas-discharge light source shall be operated in free air with an ambient temperature of  $25^\circ \pm 5^\circ \text{C}$ .

#### **9.3.2 Ballast**

All tests and measurements shall be carried out with the ballast submitted by the lamp manufacturer. The power supply used for the starting and run-up tests shall be qualified to secure the quick rise of the high current pulse.

#### **9.3.3 Starting Test**

The starting test shall be applied to light sources, which have not been aged and have not been used for a period of at least 24 hours prior to the test.

The gas-discharge light source shall start directly and remain alight.

#### **9.3.4 Run-up Test**

The run-up test shall be applied to light sources, which have not been used for a period of at least 1 hour prior to the test.

The gas-discharge light source shall emit at least:

- After 1 second : 25 per cent of its objective luminous flux;
- After 4 seconds: 80 per cent of its objective luminous flux.

The objective luminous flux as indicated on the relevant data sheet.

#### **9.3.5 Hot Restrike Test**

The light source shall be started and be operated with the ballast at test voltage for a period of 15 minutes. Then the supply voltage to the ballast shall be switched off for a switch-off period as indicated on the relevant data sheet and be switched on again.

The gas-discharge light source shall restart directly after being switched-off for a period as indicated on the data sheet. After one second the light source shall emit at least 80 per cent of its objective luminous flux.

### **10.0 LIFE PERFORMANCE**

10.1 The life requirements of gas discharge lamps (D1S, D2S, D1R, and D2R) shall be as per paragraphs 5.3, 5.4 and 5.5 of CEI IEC60810 Edition 2.2 (2002-02).

10.2 In the case of other filament lamps, the individual lamp and lumen maintenance of individual lamp at the specified percentage of the specified life shall comply with the requirements of the relevant Table in Annex D. If a lamp does not comply with the individual lumen maintenance at  $50 \pm 5\%$  life, it shall be considered to have failed at 46% life. (See relevant tables in Annex D.)

The test procedure for the life performance shall be as given in Annex D

**11.0 UV RADIATION**

11.1 The UV radiation of a halogen lamp shall be such that:

$$K_1 = \frac{\int_{\lambda=315nm}^{400nm} E_e(\lambda).d\lambda}{780nm} \leq 2 \times 10^{-4} \text{ W/lm}$$

$$683 \int_{\lambda=380nm} E_e(\lambda).V(\lambda).d\lambda$$

$$K_2 = \frac{\int_{\lambda=250nm}^{315nm} E_e(\lambda).d\lambda}{780nm} \leq 2 \times 10^{-6} \text{ W/lm}$$

$$683 \int_{\lambda=380nm} E_e(\lambda).V(\lambda).d\lambda$$

where:

- $E_e(\lambda)$  [W/nm] is the spectral distribution of the radiant flux;
- $V(\lambda)$  [1] is the spectral luminous efficiency;
- $\lambda$  [nm] is the wave length.

This value shall be calculated using intervals of five nanometres.

11.2 The UV radiation of a gas-discharge lamp shall be such that:

$$k_{uv} = \frac{\int_{\lambda=250nm}^{400nm} E_e(\lambda).S(\lambda).d\lambda}{780nm} \leq 10^{-5} \text{ W/lm}$$

$$k_m \int_{\lambda=380nm} E_e(\lambda).S(\lambda).d\lambda$$

Where

- $S(\lambda)$  is the spectral weighting function
- $k_m = 683$  [lm/W] is the photometric radiation equivalent;
- $E_e(\lambda)$  [W/nm] is the spectral distribution of the radiant flux;
- $V(\lambda)$  [1] is the spectral luminous efficiency;
- $\lambda$  [nm] is the wave length.



- 11.2.1 This value shall be calculated using intervals of one nanometre.
- 11.2.2 The UV-radiation shall be weighted according to the values as indicated in the following **Table 3**.  
Wavelengths chosen are representative; other values should be interpolated. (Values according to "IRPA/INIRC Guidelines on limits of exposure to ultraviolet radiation").

**Table: 3 Weightage factor (See 11.2.2)**

$\lambda$	$S(\lambda)$	$\lambda$	$S(\lambda)$	$\lambda$	$S(\lambda)$
250	0.430	305	0.060	360	0.00013
255	0.520	310	0.015	365	0.00011
260	0.650	315	0.003	370	0.000090
265	0.810	320	0.001	375	0.000077
270	1.000	325	0.00050	380	0.000064
275	0.960	330	0.00041	385	0.000053
280	0.880	335	0.00034	390	0.000044
285	0.770	340	0.00028	395	0.000036
290	0.640	345	0.00024	400	0.000030
295	0.540	350	0.00020		
300	0.300	355	0.00016		

**12.0 MARKING**

- 12.1** Each lamp shall be distinctly and indelibly marked on the cap or bulb with the following:
- 12.1.1 Trade name or Mark of the manufacturer
- 12.1.2 The rated voltage. However, for filament lamps for which only a 12 V type is standardized and the maximum allowed bulb diameter of which does not exceed 7.5 mm, the rated voltage need not be marked;
- 12.1.3 Rated Wattage(in the sequence, principal filament/secondary filament for dual-filament lamps); this need not be indicated separately if it is part of the designation of the relevant filament lamp category;
- 12.1.4 The designation of the relevant category (See table 1). The wattage character "W" of this designation need not be marked when the maximum allowed bulb diameter of the filament lamp type does not exceed 7.5 mm
- 12.1.5 Halogen filament lamps meeting the requirements of **11** shall be marked with a "U". (UV radiation)
- 12.1.6 The lamp may also be marked with the "ISI" Standard Mark. The use of Standard Mark is governed by the provisions of Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The details of the conditions under which the license for the use of Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

- 12.1.7 **Any additional markings required by other statutory requirements.**
- 12.1.8 In the case of gas discharge lamps, the ballast used for the type approval of the light source shall be marked with type and trade mark identification and with the rated voltage and wattage, as indicated on the relevant lamp data sheet
- 12.2 If the marking is provided on the bulb, it shall not adversely affect the luminous characteristics.

### **13.0 APPLICATION FOR TYPE APPROVAL**

#### **13.1. The following information shall be submitted at the time of application for type approval:**

- 13.1.1 Trade name or mark of the device:
- 13.1.2 Manufacturer's name for the type of device:
- 13.1.3 Manufacturer's name and address:
- 13.1.4 If applicable, name and address of manufacturer's representative:
- 13.1.5 Category of filament lamp/ gas-discharge light source
- 13.1.6 Rated voltage
- 13.1.7 Rated wattage
- 13.1.8 Colour of the light emitted: White/amber/Selective-yellow
- 13.1.9 Drawings in triplicate, sufficiently detailed to permit identification of the type and a brief technical description;
- 13.1.10 In the case of a type of filament lamp or gas-discharge light source, differing only by the trade name or mark from a type that has already been approved it shall be sufficient to submit 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;
- 13.1.11 Number of samples to be submitted of each colour, which has been applied for as given below:

#### **For single filament lamps:**

- 10 number of samples for life test
- 5 number of samples for other tests

#### **For double filament lamps:**

- 20 number of samples for life test
- 5 number of samples for other tests

#### **For gas-discharge light sources :**

- 10 number of samples with ballast for life test
- 3 number of samples for other tests

At the manufacturer's option, in case the filament lamps used for checking the initial rating, dimensions etc. may be used for life test or the lamps used for life test of one filament may be used for life test of other filament. The number of samples may be reduced accordingly.

- 13.1.12. In the case of gas discharge lamps, the description of the ballast, its identification and number of samples of the ballast as needed for testing the gas discharge lamps.

**13.2 Changes in the Specification:**

- 13.2.1 Every modification pertaining to the information declared in accordance with **13.1** shall be intimated by the manufacturer to the certifying agency.

- 13.2.2 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 may then consider, whether,

- a) the type with the changed specifications still complies with provisions; or,
- b) any further verification is required to establish compliance.

For considering whether any further verification is required or not, guidelines given in para **13.3** (Criteria for Extension of Approval) may be used.

- 13.2.3 In case of **13.2.2 b)**, verification for only those parameters, which are affected by the modifications needs to be carried out

- 13.2.4 In case of fulfillment of criterion of para **13.2.2a)** or after results of further verification as per para of **13.2.2 b)** are successful, the approval of compliance shall be extended for the changes carried out.

**13.3 Criteria for Extension of Approval:**

Till the details are finalized, the Criteria shall be as agreed between the test agency and manufacturer.

**14.0 STANDARD LAMPS:**

**14.1 Standard Filament Lamps :**

Additional requirements for standard (étalon) filament lamps are given on the relevant Annexes.

Bulbs of standard (étalon) filament lamps emitting white light shall not alter the CIE trichromatic coordinates of a luminous source having a colour temperature of 2856 K by more than 0.010 units in the x and/or y direction.

For standard (étalon) filament lamps emitting amber light, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

**14.2 Standard Gas-Discharge Light Sources:**

Standard (étalon) gas-discharge light sources shall comply with the requirements applicable to type approval light sources and to the specific requirements as stated in relevant data sheets of Annex. Standard light source shall emit white light.

**15.0 REQUIREMENTS FOR CONFORMITY OF PRODUCTION:**

The requirements and methods of establishing conformity of production are given in Annex G

**16.0 SPECIAL REQUIREMENTS:**

There are certain special requirements prescribed for use on headlamps of the vehicle is given below. These conditions are expected to be covered in the corresponding standards for headlamps and this para becomes redundant after that.

**16.1 For HIR1 and H9 Filament Lamps:**

HIR1 and/or H9 filament lamps shall only be permitted to produce passing beam in conjunction with the installation of headlamp cleaning device(s) conforming to ECE Regulation No. 45 <sup>(1)</sup>. In addition, with respect to vertical inclination, the provision of paragraph 6.2.6.2.2. of AIS008/2001 shall not be applied when these lamps are installed.

This restriction shall apply as long as there is no general agreement on the use of levelling devices and headlamp cleaners with respect to the level of the performance of the headlamp.

**16.2 Gas Discharge Lamps:**

16.2.1 In Gas discharge lamps (categories D1S/D2S and D1R/D2R) are permitted in conjunction with complying the requirements of AIS-012

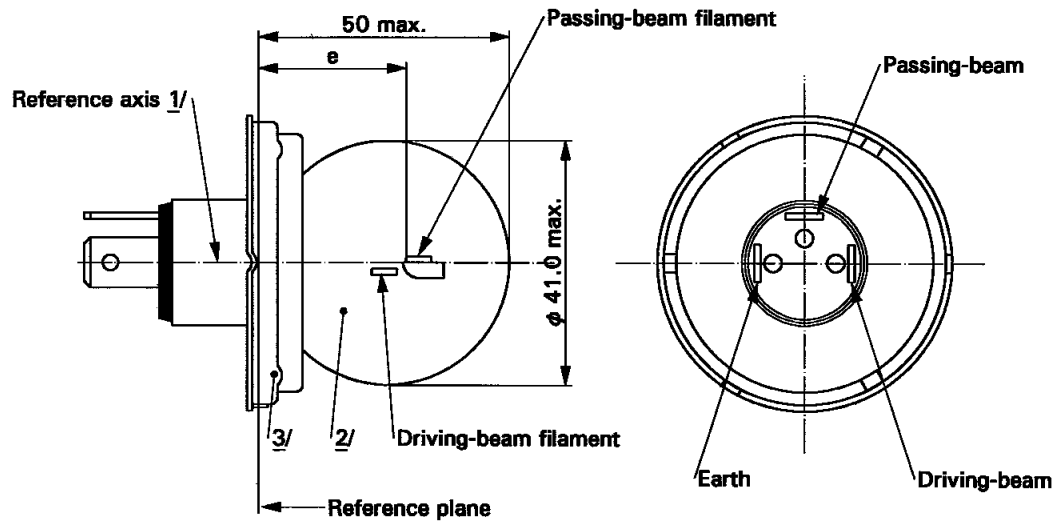
16.2.2 Dipped beam headlamps shall only be permitted to produce passing beam in conjunction with the installation of headlamp cleaning device(s) conforming to ECE Regulation No. 45 <sup>(1)</sup>. In addition, with respect to vertical inclination, the provision of paragraph 6.2.6.2.2 of AIS008/2001 shall not be applied when these lamps are installed.

This restriction shall apply as long as there is no general agreement on the use of levelling devices and headlamp cleaners with respect to the level of the performance of the headlamp.

**Note:**

- (1) Automotive Industry Standard in line with ECE R 45 is under formulation

**Annex-A1 (See para 4)  
Requirements of R2 Category Lamps**



**Figure A1.1**

**A1.1 Electrical, & photometric requirements:**

Parameter		Production Lamp						Standard Lamp	
Reference No.		6R2		12R2		24R2			
Rated Volt		6	4/	12	4/	24	4/	12	4/
Rated Watt		45	40	45	40	55	50	45	40
Test Volt		6.3		13.2		28.0		13.2	
Objective Value	Watt	53 max.	47 max.	57 max.	51 max.	76 max.	69 max.	52	46
	Lumen	720 min.	570 ±15%	860 min.	675 ±15%	1000 min.	860 ±15%	+0 %/ -10 %	± 5 %
Measuring flux 5/		-	450	-	450	-	450		
Reference luminous flux at approximately 12V								700	450

**Notes:**

- 1/ The reference axis is perpendicular to the reference plane and passes through the centre of the 45 mm cap diameter.
- 2/ The bulb shall be colourless 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 lamp 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 **8.0** of this standard.

A1.2 Position and dimensions of shield and filaments: 6/

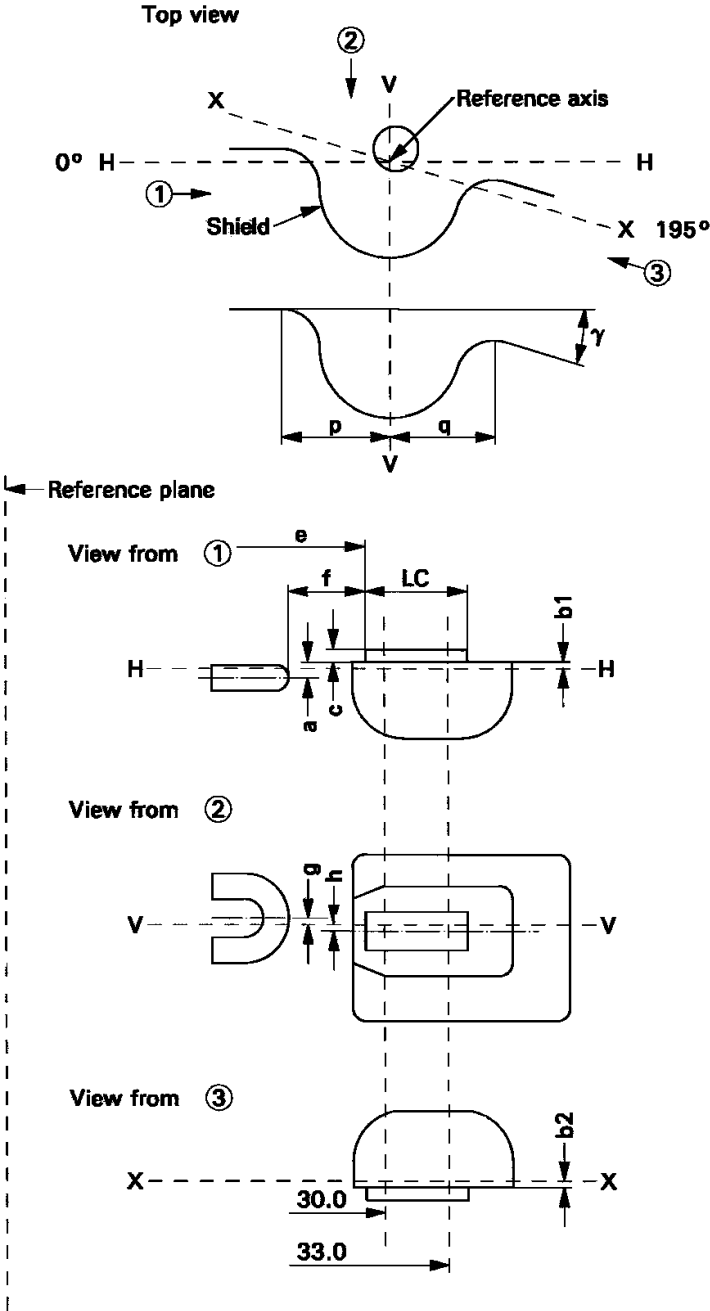


Figure A1.2

Table A1.1 Dimensions and tolerances

Dimensions in mm		Tolerance			
		Filament lamps of normal production		Standard filament lamp	
		6V	12V	24V	12V
a		0.60		± 0.35	± 0.15
b1/30.0	<u>7/</u>	0.20		± 0.35	± 0.15
b1/33.0		b1/30.0 mv	<u>8/</u>		
b2/30.0	<u>7/</u>	0.20		± 0.35	± 0.15
b2/33.0		b2/30.0 mv	<u>8/</u>		
c/30.0	<u>7/</u>	0.50		± 0,30	± 0.15
c/33.0		c/30.0 mv	<u>8/</u>		
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	<u>7/</u>	0		± 0.50	± 0.30
h/33.0		h/30.0 mv	<u>8/</u>		
1/2(p/33-q/33)	<u>7/</u>	0		± 0.60	± 0.30
lc		5.5		± 1.50	± 0.50
γ	<u>9/</u>	15° nom.			
Cap				P45t-41	

Foot Notes:

- 6/ The position and dimensions of the shield and filaments shall be checked by means of the method of measurement as described in **A1.3**.
- 7/ To be measured at the distance from the reference plane indicated in millimetres behind the stroke.
- 8/ mv = measured value.
- 9/ The angle  $\gamma$  is only for shield design and has not to be checked on finished filament lamps.

### A1.3 Method of measuring internal elements of R2 lamps:

#### A1.3.1 General

**A1.3.1.1** The lamps shall be measured in a horizontal normal operating position, reference notch down.

**A1.3.1.2** Each lamp filament shall be aged as per **9.2.1.1** Immediately prior to a measurement the filament shall be operated at east 2 minutes at the test voltage. Measurement on filament shall be carried out at test voltage.

#### A1.3.2 Reference axis, reference plane and planes for measurements

**A1.3.2.1** Reference Axis is the line perpendicular to reference plane and passing through the centre of the 45 mm cap ring diameter.

**A1.3.2.2** Reference plane is the plane formed by the seating points of the cap-ring.

**A1.3.2.3** Plane V-V is the plane perpendicular to the reference plane containing the reference axis and the centre line of the locating notch.

- A1.3.2.4** Plane H-H is the plane perpendicular to the reference plane and plane V-V containing the reference axis.
- A1.3.2.5** Plane X-X is the plane perpendicular to the reference plane containing the reference axis and forming an angle of  $15^{\circ}$  to the plane H-H, which is turned clockwise towards the locating notch, seen from the top of the bulb.
- A1.3.2.6** Plane  $Y_1$ - $Y_1$  is a plane parallel to the reference plane at a distance of 30.0mm from it.
- A1.3.2.7** Plane  $Y_2$ - $Y_2$  is a plane parallel to the reference plane at a distance of 33.0 mm from it.

Note: In the case of very short filaments, an intersection of plane  $Y_2$ - $Y_2$  with the filament may not be possible. In such cases plane  $Y_2$ - $Y_2$  will be moved in the direction to plane  $Y_1$ - $Y_1$  until intersections are possible. These intersections are then MP13 and MP 14 which have to be measured.

**A1.3.3 Viewing directions (See fig A1.3)**

- A1.3.3.1** Viewing direction (1) is perpendicular to plane V-V, seen from the side of the left hand shield edge.
- A1.3.3.2** Viewing direction (2) is perpendicular to plane H-H, seen from the side opposite to the location notch.
- A1.3.3.3** Viewing direction (3) is parallel to plane X-X and reference plane, seen from the right hand side of shield turned  $15^{\circ}$ .

**A1.3.4 Measuring Points (MP):**

The following points as specified in figures **A1.3** and **A1.4** shall be measured. Measurements shall be perpendicular to the viewing directions respectively.

**A1.3.4.1 Viewing direction (1)**

MP1 and MP12: The intersections of the silhouette of shield edge with planes  $Y_1$ - $Y_1$  and  $Y_2$ - $Y_2$

MP2 and MP13: The intersections of the upper rim of the envelope of the dipped beam filament with planes  $Y_1$ - $Y_1$  and  $Y_2$ - $Y_2$ , farthest from plane H-H. (See also the note in **A1.3.2.7**.)

MP4 and MP8: Intersections of the outer part of respectively the first and last luminous turn of the dipped beam filament with the silhouette of the shield.

MP5: Apex of the coil turn as defined for MP11.

MP11: The centre of the main beam filament being the centre of:

- The coil turn farthest from reference plane for arc shaped filaments;
- The middle turn for transversal, or at least partly transversal filaments.

**A1.3.4.2 Viewing direction (2)**

MP7: The centre of coil turn as defined for MP11

MP6 and MP14: The intersections of dipped beam filament axis with planes  $Y_1$ - $Y_1$  and  $Y_2$ - $Y_2$ .



MP9 and MP10: The intersections of the sunk area of the shield with plane Y<sub>2</sub>-Y<sub>2</sub>

Note: MP5 and MP7 may not be seen from viewing direction (2), in which case both points will be measured from the opposite side.

**A1.3.4.3 Viewing direction (3)**

MP3 and MP15: The intersections of the silhouette of the 15° bent part of the shield with planes Y<sub>1</sub>-Y<sub>1</sub> and Y<sub>2</sub>-Y<sub>2</sub>.

**A1.3.5 Dimensions to be measured:**

The table A2 states the dimensions to be measured. Values and tolerances given in table A1.1

**Table A1.2: Dimensions to be measured. (See A1.3.5)**

Distance	Measured perpendicular to plane	Viewing direction	Dimension
MP1 to MP11	H-H	(1)	A
MP1 to H-H	H-H	(1)	b <sub>1</sub> / 30.0 <u>7</u> / <sub>l</sub>
MP12 to H-H	H-H	(1)	b <sub>1</sub> / 33.0 <u>7</u> / <sub>l</sub>
MP3 to X-X	X-X	(3)	b <sub>2</sub> / 30.0 <u>7</u> / <sub>l</sub>
MP15 to X-X	X-X	(3)	b <sub>2</sub> / 33.0 <u>7</u> / <sub>l</sub>
MP9 to V-V	V-V	(2)	p/ 33.0 <u>7</u> / <sub>l</sub>
MP10 to V-V	V-V	(2)	q/ 33.0 <u>7</u> / <sub>l</sub>
MP2 to MP1	H-H	(1)	c/ 30.0 <u>7</u> / <sub>l</sub>
MP13 to MP12	H-H	(1)	c/ 33.0 <u>7</u> / <sub>l</sub>
MP6 to V-V	V-V	(2)	h/ 30.0 <u>7</u> / <sub>l</sub>
MP14 to V-V	V-V	(2)	h/ 33.0 <u>7</u> / <sub>l</sub>
MP4 to Reference plane	Reference plane	(1)	E
MP4 to MP5	Reference plane	(1)	F
MP7 to V-V	V-V	(2)	G
MP4 to MP8	Reference plane	(1)	Lc

**Figure A 1.3**

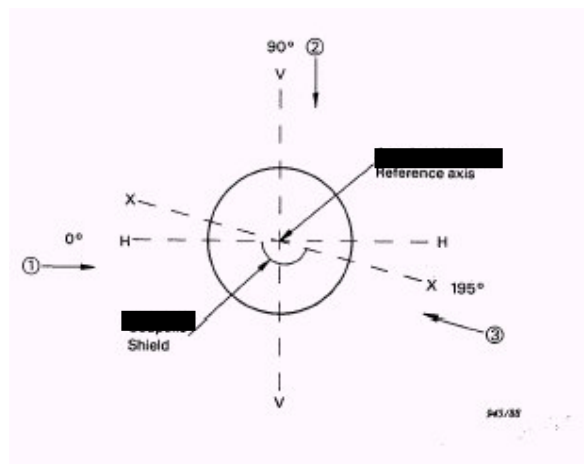
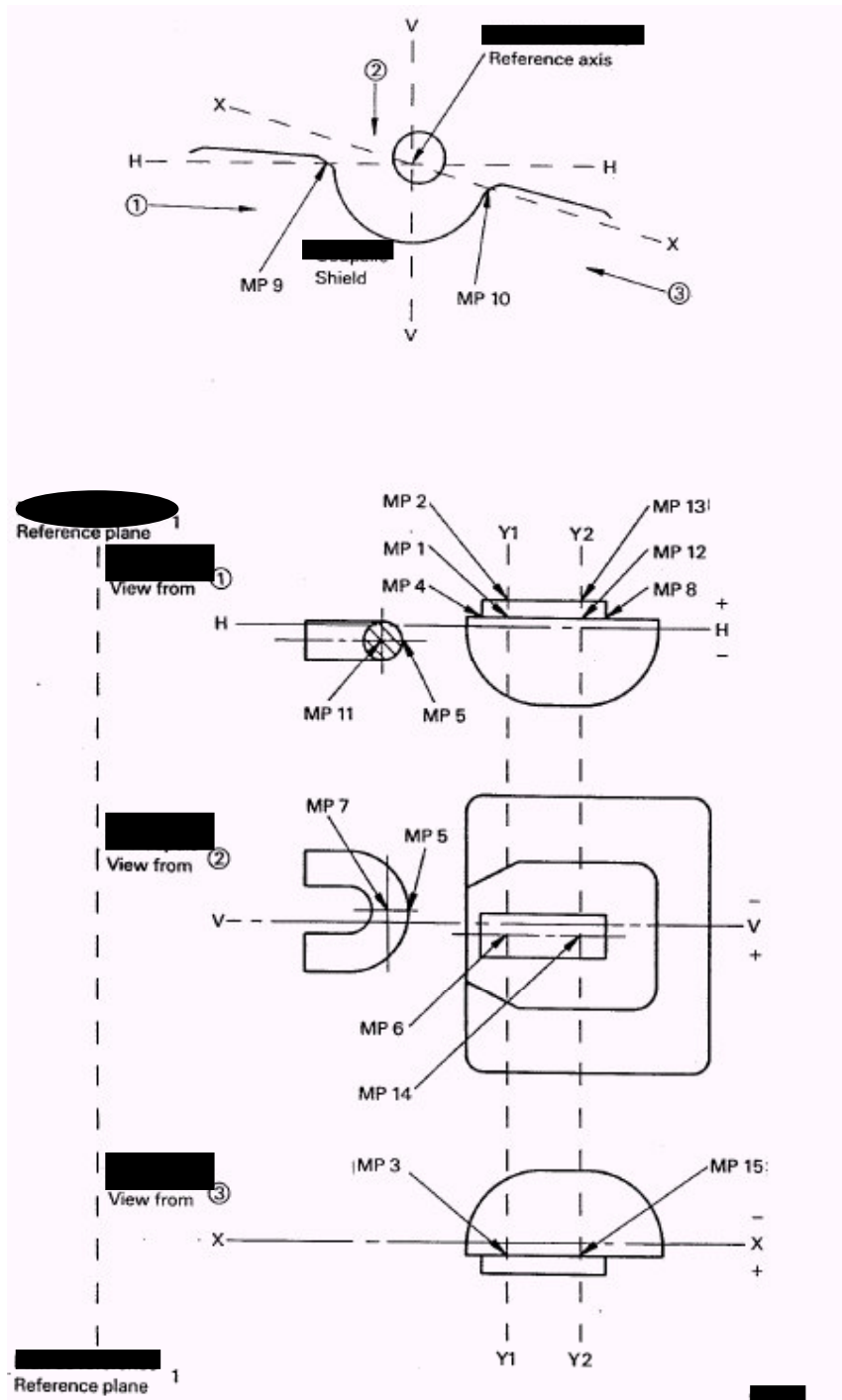


Figure A1.4



Annex-A2 (See para 4)  
Requirements of H1 Category Lamps

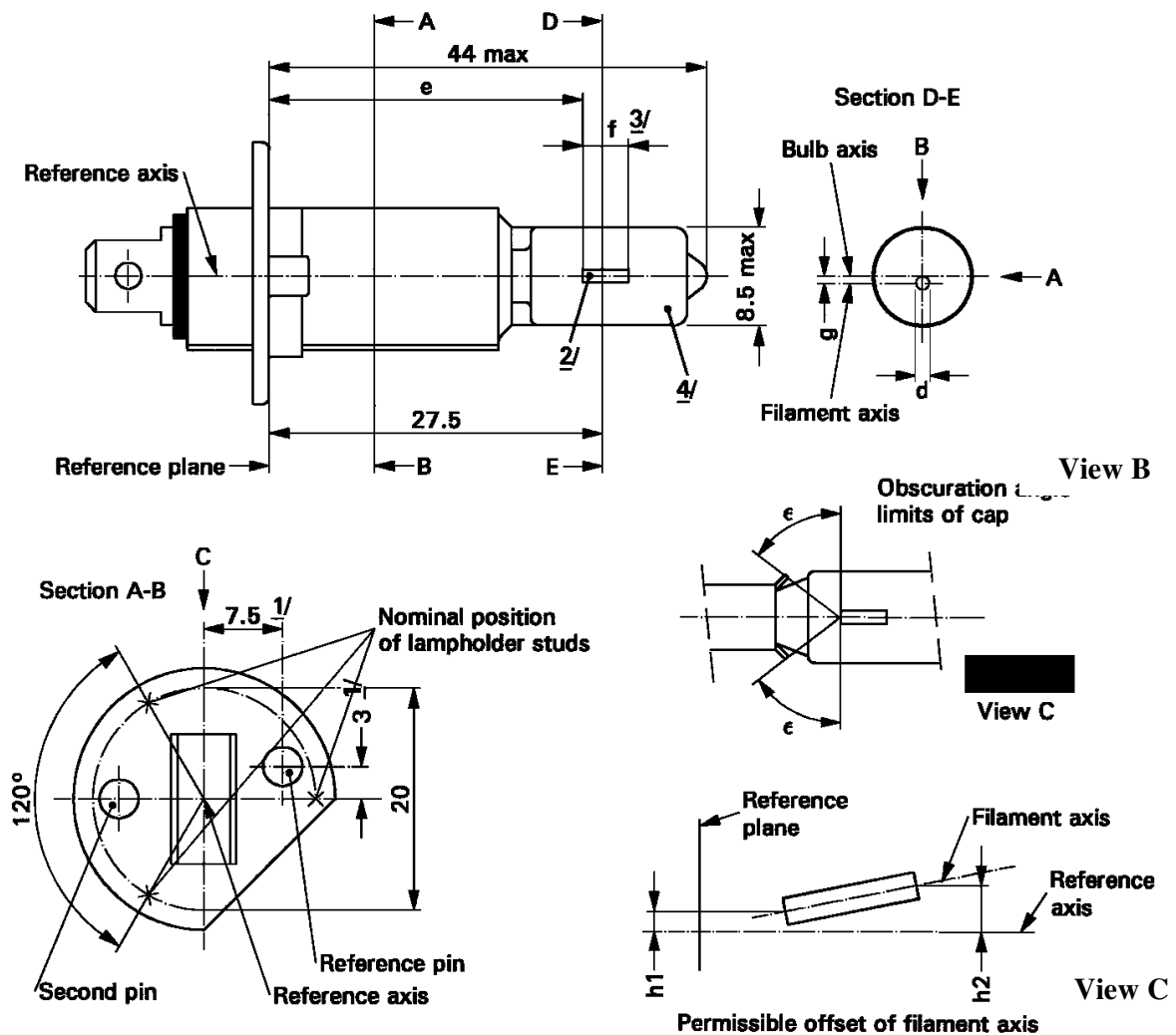


Figure A2.1

## Notes:

- 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 lamp being viewed as shown in the figure). The internal design should then be 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 bulb shall be colourless or selective yellow.

**A2.1 Electrical, & photometric requirements:**

Parameter		Production Lamp			Standard Lamp
Reference No.		6H1	12H1	24H1	
Rated Volt		6	12	24	12
Rated Watt		55		70	55
Test Volt		6.3	13.2	28.0	13.2
Objective value	Watt	63 max.	68 max.	84 max.	68 max.
	Lumen	1350± 15%	1550± 15%	1900± 15%	
Reference luminous flux: 1150 at approximately 12 V					

**A2.1 Dimensional requirements:**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	6 V	12 V	24 V	12 V
e <u>6/</u> <u>10/</u>	25.0 <u>9/</u>			25.0 ± 0.15
f <u>6/</u> <u>10/</u>	4.5 ± 1.0	5.0 ± 0.5	5.5 ± 1.0	5.0 +0.50/-0.00
g <u>7/</u> <u>8/</u>	0.5 d ± 0.5 d			0.5 d ± 0.25 d
h1	<u>9/</u>			0 ± 0.20 <u>5/</u>
h2	<u>9/</u>			0 ± 0.25 <u>5/</u>
ε	45° ± 12°			45° ± 3°
Cap	P14.5s			

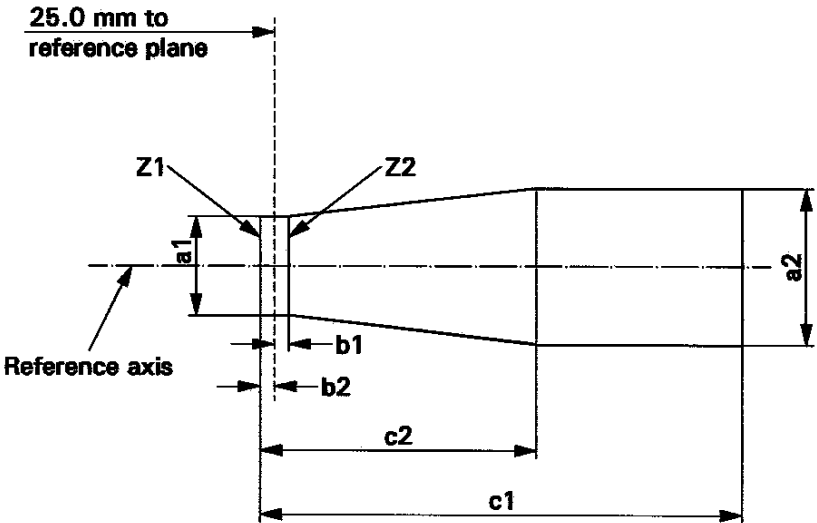
Foot Notes:

- 5/ The eccentricity is measured only in the horizontal and vertical directions of the filament lamp 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", Figure A2.2.
- 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.

**A2.3 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 lamp complies with the requirements.

Figure A2.2



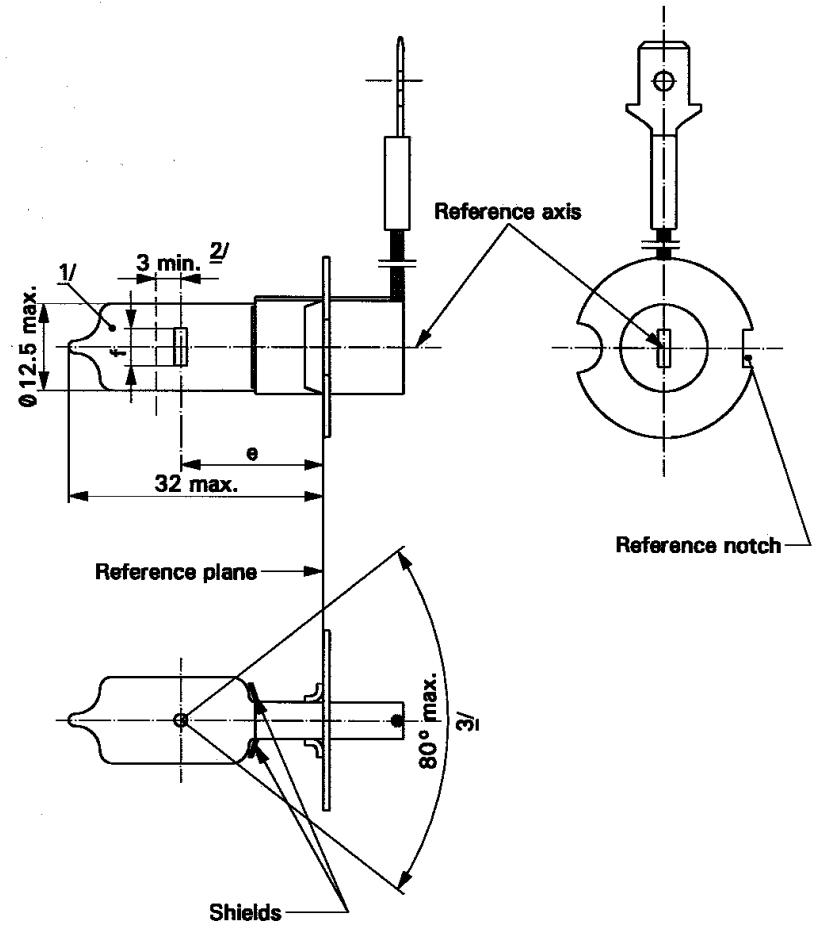
	a1	a2	b1	b2	c1	c2
6 V	1.4d	1.9 d	0.25		6	3.5
12 V					6	4.5
24 V					7	4.5

d = diameter of filament.

The filament position is checked solely in directions A and B as shown in Figure A2.1.

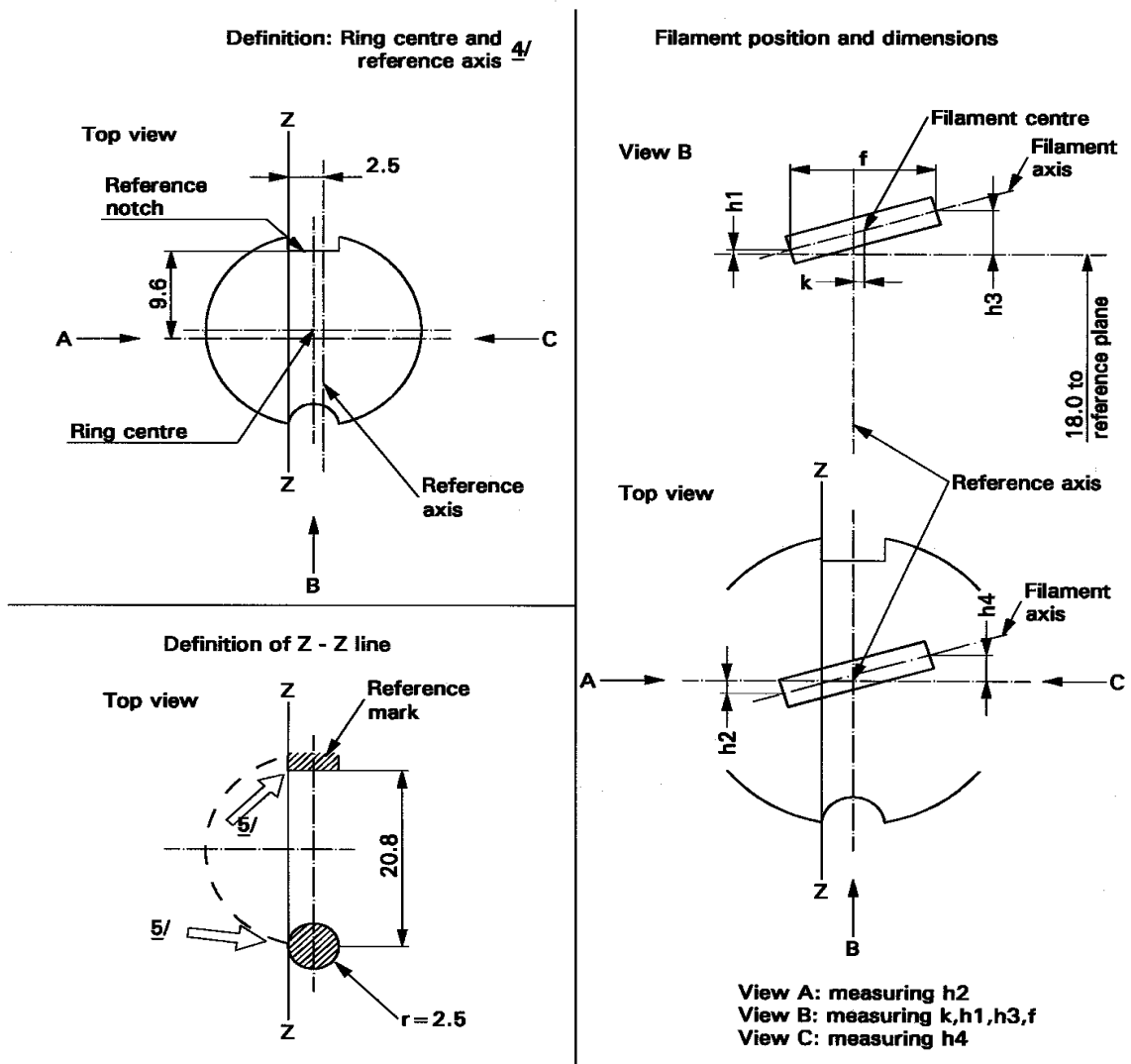
The filament shall lie entirely within the limits shown.  
 The beginning of the filament as defined on note 10/, shall lie between lines Z1 and Z2.

Annex-A3 (See para 4)  
 Requirements of H3 Category Lamps  
 Figure A3.1



- 1/ Bulb shall be colourless 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  $80^\circ$  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  $90^\circ$ .

Figure A3.2



**Notes:**

- <sup>4/</sup> 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.
- <sup>5/</sup> The cap shall be pressed in these directions.

**A3.1 Electrical and photometric requirements:**

Parameter	Production Lamps			Standard Lamp	
	6H3	12H3	24H3		
Ref. No.	6H3	12H3	24H3		
Rated Volt	6	12	24	12	
Rated Watt	55		70	55	
Test Volt	6.3	13.2	28.0	13.2	
Objective values	Watt	63 max.	68 max.	84 max.	68 max.
	Lumen	1050 +15%	1450+15%	1750+15%	-
Reference luminous flux: 1100 lm at approximately 12 V					

**A3.2 Dimensional requirements**

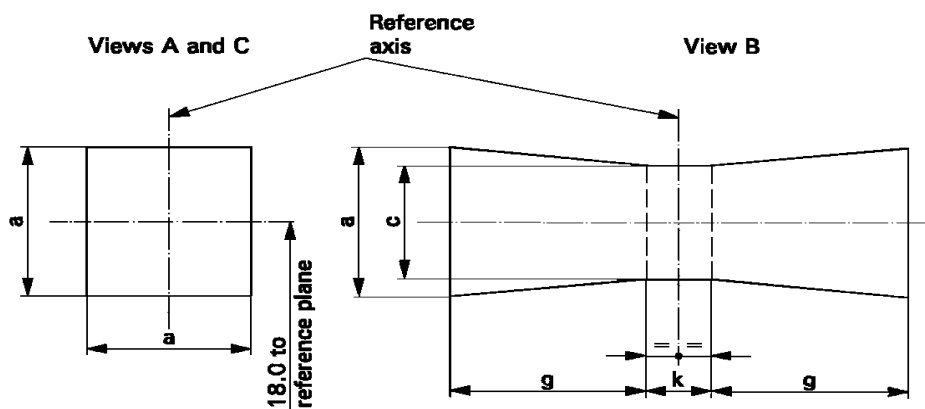
Dimensions in mm	Filaments lamps of normal production			Standard filament lamp
	6 V	12 V	24 V	12 V
e	18.0 <u>6/</u>			18.0
f <u>8/</u>	3.0 min.	4.0 min.		5.0 ± 0.50
k	0	<u>6/</u>		0 ± 0.20
h1, h3	0	<u>6/</u>		0 ± 0.15 <u>7/</u>
h2, h4	0	<u>6/</u>		0 ± 0.25 <u>7/</u>
Cap	PK 22s			

**Notes**

- 6/ To be checked by means of a "Box-System" as per **A3.3**.
- 7/ For standard filament lamps, 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.

**A3.3 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 lamp complies with the requirements.



**Figure A3.3**

	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.



Annex-A4 (See para 4)  
 Requirements of H4 Category Lamps

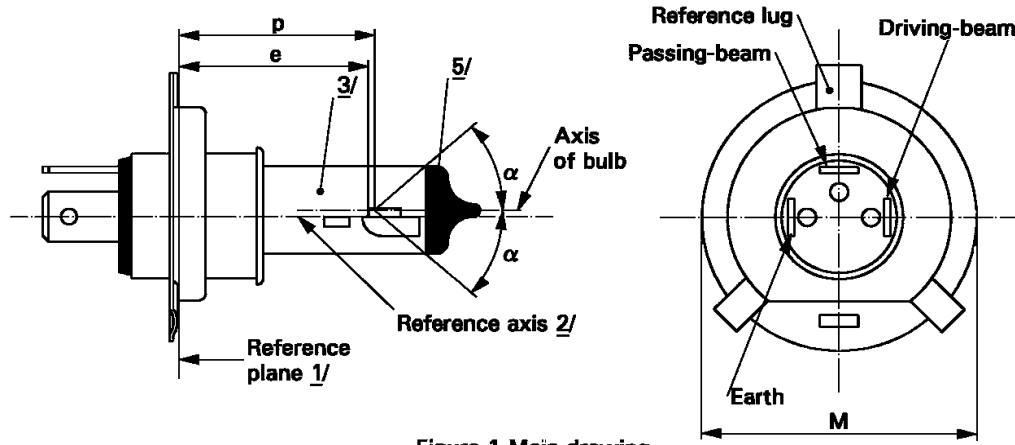


Figure 1 Main drawing

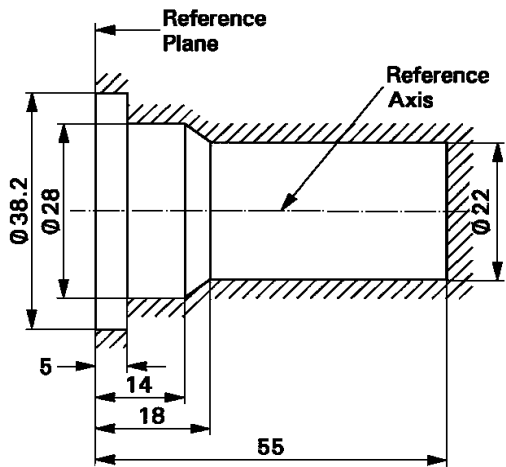


Figure 2

Maximum lamp outlines 4/

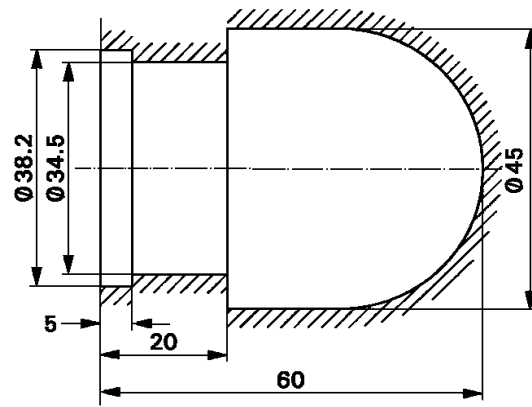


Figure 3

Figure A4.1

Notes:

- 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 bulb shall be colourless or selective yellow.
- 4/ The bulb and supports shall not exceed the envelope as in figure 2 of figure A4.1. However, where a selective-yellow outer bulb is used, the bulb and supports shall not exceed the envelope as in figure 3 of figure A4.1.
- 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.

**A4.1 Electrical and photometric requirements:**

Parameter		Production Lamps				Standard Lamp	
Ref. No.		12H4		24H4			
Rated Volt		12 <u>6/</u>		24 <u>6/</u>		12 <u>6/</u>	
Rated Watt		60	55	75	70	60	55
Test Volt		13.2		28.0		13.2	
Objective values	Watt	75 max.	68 max.	85 max.	80 max.	75 max.	68 max.
	Lumen	1650 ±15%	1000 ±15%	1900 ±15%	1200 ±15%		
Measuring flux <u>7/</u> lm		-	750	-	800		
Reference luminous flux at approximately 12 V						1250	750

**A4.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production		Standard filament lamp
	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	P43 t -38		

Notes

6/ The values 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.

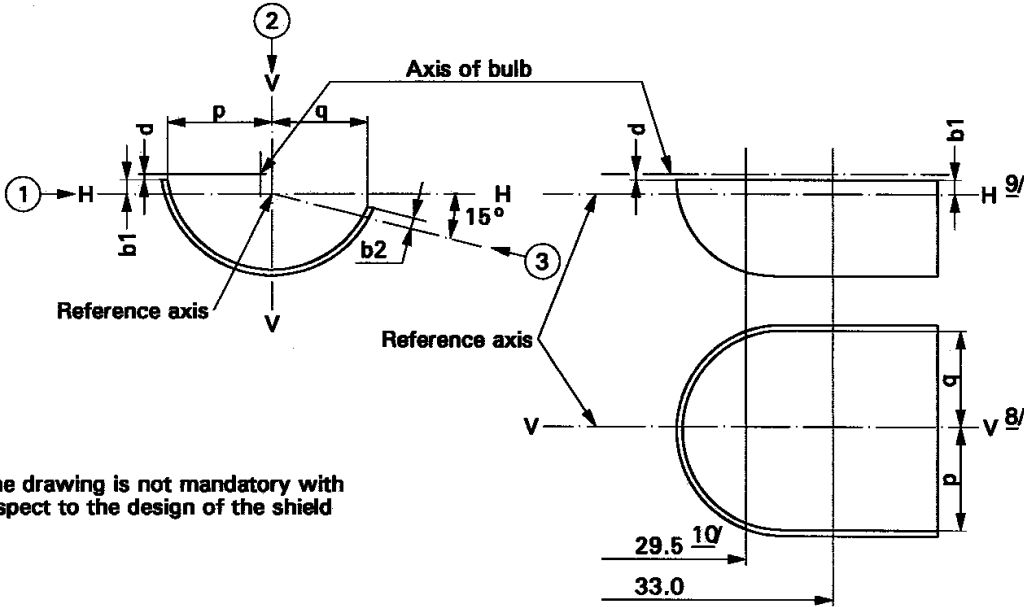
7/ Measuring luminous flux for measuring according to **8.0** of this standard.

**Table A4.1: Dimensions referred to in Figure A4.2**

Reference <u>*/</u>	Dimension <u>**/</u>		Tolerance		
			Filaments lamps of normal production		Standard filament lamp
	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	b1/30.0	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	b2/30.0	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	c/30.0	0.6	0.75	± 0.35	± 0.20
c/33	c/29.5 mv	c/c30.0 mv	± 0.35		± 0.15
d	min. 0.1		-		-
e <u>13/</u>	28.5	29.0	+ 0.35 - 0.25	± 0.35	+ 0.20 - 0.00
f <u>11/ 12/ 14/</u>	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	h/30.0	0	± 0.50		± 0.30
h/33	h/29.5 mv	h/30.0 mv	± 0.35		± 0.20
l <sub>R</sub> <u>11/ 14/</u>	4.5	5.25	± 0.80		± 0.40
l <sub>C</sub> <u>11/ 14/</u>	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

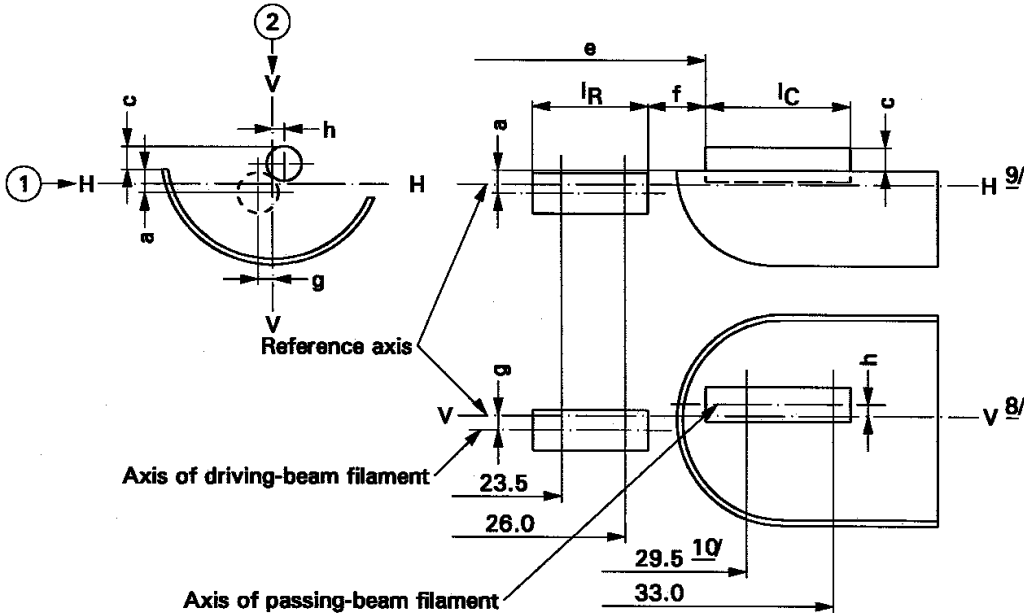
A4.4 Position of shield:

Figure A4.2



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

Position of filaments



- \*/    "/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.
- 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 foot-note 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 foot-note 11/.

**Additional explanations to Figure A4.2.**

The dimensions below are measured in three directions:

- 1   for dimensions a, b1, 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 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 lamps) 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, shall be as per **A4.3**

**A4.3       Method of measuring internal elements of H4 and HS1 lamps:**

**A4.3.1     General**

**A4.3.1.1** The lamps shall be measured in a horizontal normal operating position, reference lug up.

**A4.3.1.2** Each filament shall be aged as per **9.2.1.1**. Immediately prior to a measurement the filament shall be operated at least 2 minutes at the test voltage. Measurements on filament shall be carried out at test voltage.

**A4.3.2     Reference axis, reference plane and planes for measurements**

**A4.3.2.1** Reference Axis is the line perpendicular to reference plane and passing through the centre of the circle of diameter M of cap ring.

- A4.3.2.2** Reference plane is the plane formed by the seating points of three lugs.
- A4.3.2.3** Plane V-V is the plane perpendicular to the reference plane containing the reference axis and the centre line of the reference lug.
- A4.3.2.4** Plane H-H is the plane perpendicular to the reference plane and plane V-V containing the reference axis.
- A4.3.2.5** Plane X-X is the plane perpendicular to the reference plane containing the reference axis and forming an angle of  $15^{\circ}$  to the plane H-H, which is turned clockwise away from the reference lug, seen from the top of bulb.
- A4.3.2.6** Plane Y<sub>1</sub>-Y<sub>1</sub> is a plane parallel to the reference plane at a distance of 29.5 mm from it. (30.0mm for the 24V type)
- A4.3.2.7** Plane Y<sub>2</sub>-Y<sub>2</sub> is a plane parallel to the reference plane at a distance of 33.0 mm from it. (31.0mm for category HS1).
- A4.2.1.8** Plane Y<sub>3</sub>-Y<sub>3</sub> is a plane parallel to the reference plane at a distance of 23.5 mm from it. (25.0 mm for category HS1).
- A4.2.1.9** Plane Y<sub>4</sub>-Y<sub>4</sub> is a plane parallel to the reference plane at a distance of 26.0 mm from it.
- A4.2.1.10** Plane Y<sub>5</sub>-Y<sub>5</sub> is a plane parallel to the reference plane at distance of 28.95 mm from it. (29.25 mm for 24 volt type).
- A4.3.3** **Viewing directions (See fig A4.3)**
- A4.3.3.1** Viewing direction (1) is perpendicular to plane V-V, seen from the side of the left-hand shield edge.
- A4.3.3.2** Viewing direction (2) is perpendicular to plane H-H, seen from the side of reference lug.
- A4.3.3.3** Viewing direction (3) is parallel to plane X-X and reference plane, seen from the side of the right hand shield edge.
- A4.3.4** **Measuring Points (MP):**  
The following points as specified in figures **A4.4** and **A4.5** shall be measured. Measurements shall be made perpendicular to the viewing directions respectively.
- A4.3.4.1** **Shield and filaments:( See figure A4.4)**
- A4.3.4.1.1** **Viewing direction (1)**  
MP1 and MP12: The intersections of the main beam filament axis with planes Y<sub>3</sub>-Y<sub>3</sub> and Y<sub>4</sub>-Y<sub>4</sub>  
MP3 and MP4: The intersections of the shield edge with planes Y<sub>1</sub>-Y<sub>1</sub> and Y<sub>2</sub>-Y<sub>2</sub>.  
MP5 and MP6: Intersections of the envelope of the dipped beam filament with planes Y<sub>1</sub>-Y<sub>1</sub> and Y<sub>2</sub>-Y<sub>2</sub> farthest from plane H-H.  
MP7: Intersection of the bulb axis with plane Y<sub>1</sub>-Y<sub>1</sub>  
MP8 and MP11: The intersections of the outer part of respectively the first and last luminous turn of the dipped beam filament with the shield edge.

MP9 and MP10: The intersections of the outer part of respectively the first and last luminous turn of the main beam filament with the centre line (axis) of that filament.

**A4.3.4.1.2 Viewing direction (2)**

MP12 and MP13: The intersections of the main beam filament axis with planes  $Y_3$ - $Y_3$  and  $Y_4$ - $Y_4$ .

MP14 and MP15: The intersections of the dipped beam filament axis with planes  $Y_1$ - $Y_1$  and  $Y_2$ - $Y_2$ .

MP16 and MP17: The intersections of the shield edges with plane  $Y_2$ - $Y_2$

**A4.3.4.1.3 Viewing direction (3)**

MP18 and MP19: The intersections of the shield edge with planes  $Y_1$ - $Y_1$  and  $Y_2$ - $Y_2$ .

**A4.3.4.2 Top obscuration:( See figure A4.5)**

**A4.3.4.2.1 Viewing direction (1)**

MP20: The intersections of the top obscuration with a plane parallel to plane V-V and containing the bulb axis.

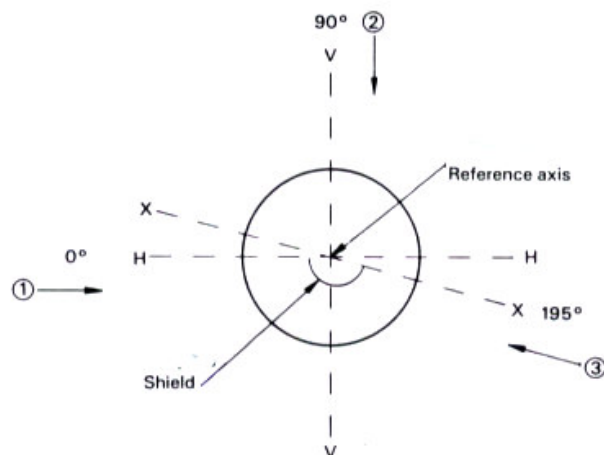
**A4.3.4.2.2 Viewing direction (2)**

MP23: Intersection of the bulb axis with plane  $Y_5$ - $Y_5$ .

MP21 and MP22: Intersections of the top obscuration with a plane parallel to plane H-H and containing the bulb axis.

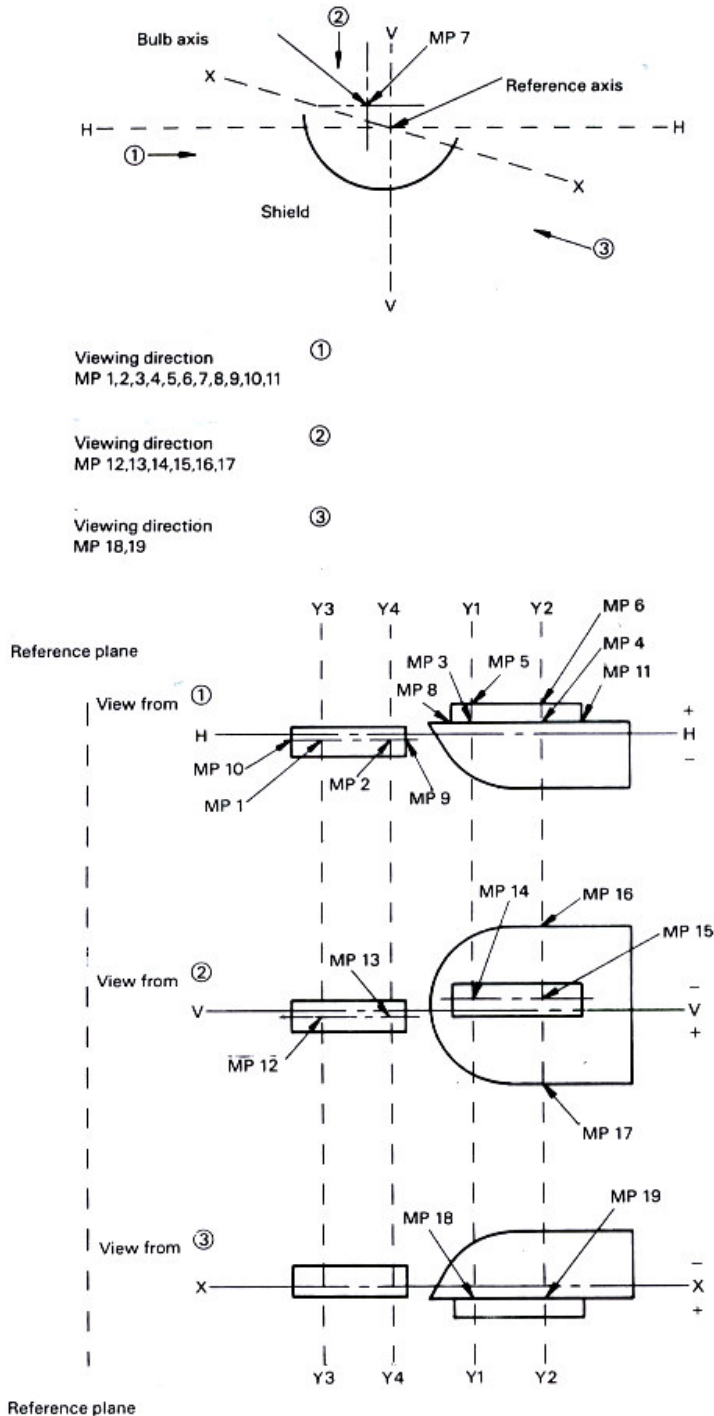
**A4.3.5** The Table A4.2 states the dimensions to be measured. Values and tolerances given in tables A4.1 and A8.1 for H4 and HS1 respectively.

**Figure A4.3**



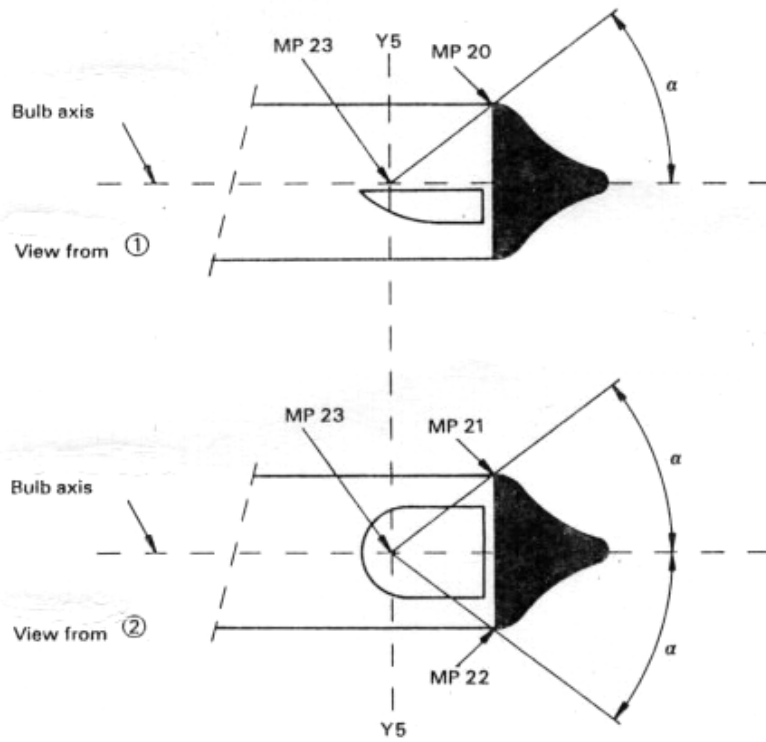
Viewing directions, seen from the top of the lamp.

Figure A4.4



Position of measuring points [REDACTED]

Figure A 4.5



Top obscuration.



Table A4.2 Distances to be measured. (See A4.3.5)

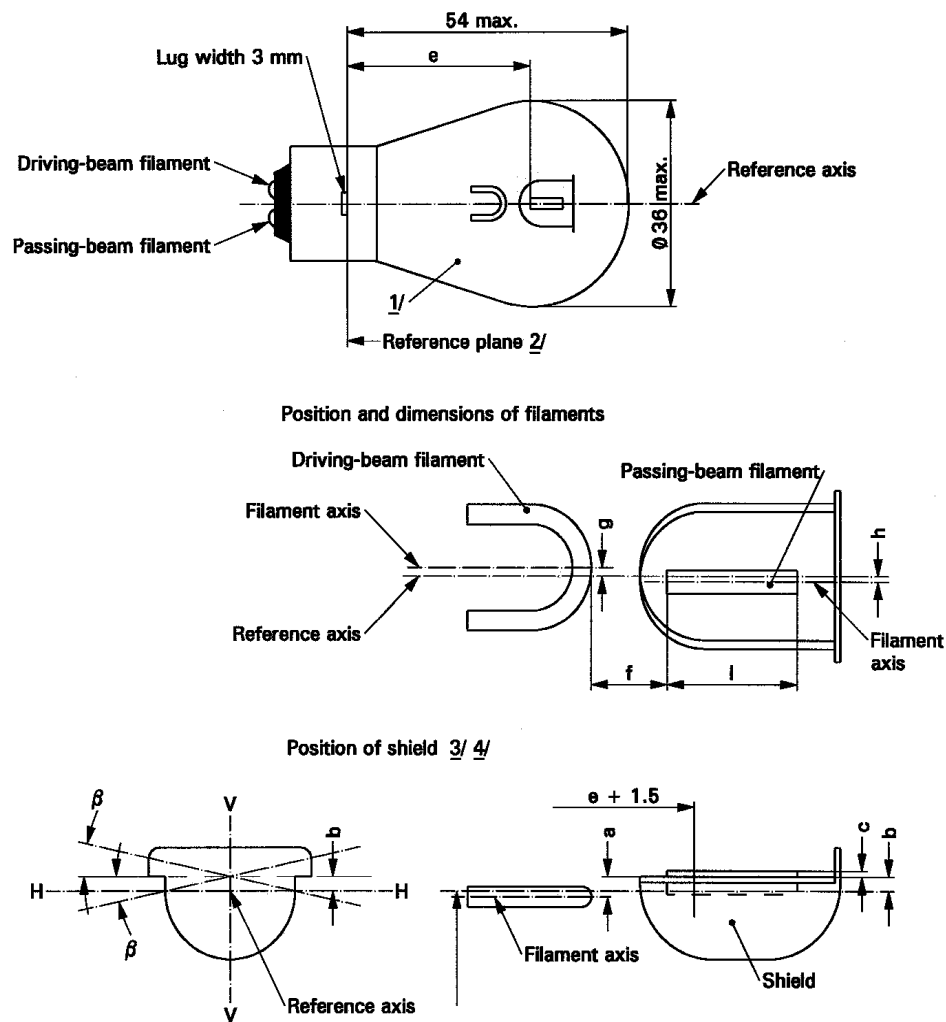
Distance (See figure A4.4)	Measured perpendicular to plane	Viewing direction	Dimension	
			12V <sup>(3)</sup>	24V
MP2 to MP3	H-H	(1)	A/26.0 <sup>#</sup>	
MP1 to MP3 <sup>(1)</sup>	H-H	(1)	A/23.5 <sup>#</sup>	
MP3 to H-H	H-H	(1)	b <sub>1</sub> /29.5 <sup>#</sup>	b <sub>1</sub> /30.0 <sup>#</sup>
MP4 to H-H <sup>(1)</sup>	H-H	(1)	B <sub>1</sub> /33.0 <sup>#</sup>	
MP18 to X-X	X-X	(3)	b <sub>2</sub> /29.5 <sup>#</sup>	b <sub>2</sub> /30.0 <sup>#</sup>
MP19 to X-X <sup>(2)</sup>	X-X	(3)	B <sub>2</sub> /33.0 <sup>#</sup>	
MP3 to MP5	H-H	(1)	c/29.5 <sup>#</sup>	c/30.0 <sup>#</sup>
MP4 to MP6 <sup>(2)</sup>	H-H	(1)	C/33.0 <sup>#</sup>	
MP7 to MP3	H-H	(1)	D	
MP8 to Reference plane	Reference plane	(1)	E	
MP8 to MP9	Reference plane	(1)	F	
MP13 to V-V	V-V	(2)	G/26.0 <sup>#</sup>	
MP12 to V-V <sup>(1)</sup>	V-V	(2)	G/23.5 <sup>#</sup>	
MP14 to V-V	V-V	(2)	h/29.5 <sup>#</sup>	h/30.0 <sup>#</sup>
MP15 to V-V	V-V	(2)	H/33.0 <sup>#</sup>	
MP9 to MP10	Reference plane	(1)	I <sub>R</sub>	
MP8 to MP11	Reference plane	(1)	I <sub>C</sub>	
MP16 to V-V <sup>(2)</sup>	V-V	(2)	P/33.0 <sup>#</sup>	
MP17 to V-V <sup>(2)</sup>	V-V	(2)	Q/33.0 <sup>#</sup>	
Angle $\alpha$ (see fig. A4.5)				
MP23 to MP20	H-H	(1)	$\alpha$	
MP23 to MP21	V-V	(2)	$\alpha$	
MP23 to MP22	V-V	(2)	$\alpha$	

<sup>#</sup> Dimension to be measured at the distance from the reference plane indicated after the stroke in mm.

- (1) For HS1, this dimension shall be measured at 25.0 mm distance from the reference plane.
- (2) For HS1, this dimension shall be measured at 31.0 mm distance from the reference plane.
- (3) These dimensions are applicable to 6V HS1 also.

**Annex-A5 (See para 4)**  
**Requirements of S1 & S2 Category Lamps**

Figure A5.1

**Notes:**

- 1/ The bulb shall be colourless 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

**A5.1 Electrical and photometric requirements:**

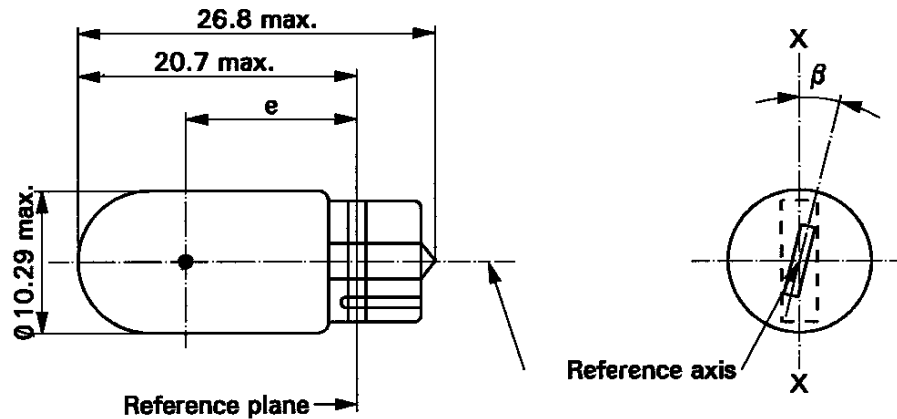
Parameter		Production Lamps				Standard Lamp	
Ref. No.	S1	6S1		12S1			
	S2	6S2		12S2			
Rated Volt		6 <u>7/</u>		12 <u>7/</u>		6	
Rated Watt	S1	25	25	25	25	25	25
	S2	35	35	35	35	35	35
Test Volt for S1		6.75		13.5		6.75	
Test Volt for S2		6.3		13.5		13.5	
Objective values S1	Watt	25 ± 5%	25 ± 5%	25 ± 5%	25 ± 5%	25 ± 5%	25 ± 5%
	Lumen	435 ± 20%	315 ± 20%	435 ± 20%	315 ± 20%	-	
Objective values S2	Watt	35 ± 5%	35 ± 5%	35 ± 5%	35 ± 5%	35 ± 5%	35 ± 5%
	Lumen	650 ± 20%	465 ± 20%	650 ± 20%	465 ± 20%	-	
Reference luminous flux for S1: 398 and 284 lm at approximately 6 V							
Reference luminous flux for S2: 568 and 426 lm at approximately 12 V							

**A5.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	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 <u>5/</u>	0.2	0.5	0.8	0.5 ± 0.15
b <u>5/</u>	- 0.15	0.2	0.55	0.2 ± 0.15
a <u>5/</u>	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 <u>5/ 6/</u>	- 2°30'	0°	+2°30'	0° ± 1°
Cap	BA 20d			

- 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.

**Annex-A6 (See para 4)  
Requirements of W3W Category Lamps**



**Figure A6.1**

**A6.1 Electrical and photometric requirements:**

Parameter		Production Lamps			Standard Lamp
		6W3W	12 W3W	24 W3W	
Ref. No.		6	12	24	12
Rated Volt		6	12	24	12
Rated Watt		3			3
Test Volt		6.75	13.5	28.0	13.5
Objective values	Watt	3.45 max.		4.6 max.	3.45 max.
	Lumen	22 ± 30 %			
Reference luminous flux: 22 lm at approximately 13.5 V					

**A6.2 Dimensional requirements**

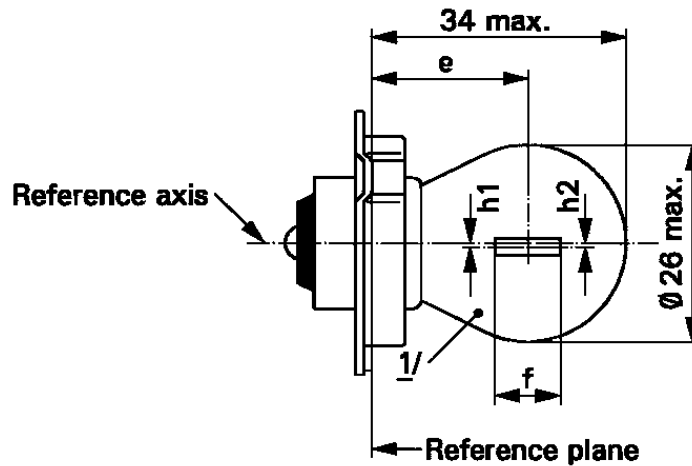
Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nom.	max.	
e	11.2	12.7	14.2	12.7 ± 0.3
Lateral deviation <sup>1/</sup>			1.5	0.5 max
β	- 15°	0°	+ 15°	0° ± 5°
Cap	W2.1x9.5d			

Notes:

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

**Annex-A7 (See para 4)  
Requirements of S3 Category Lamps**

Figure A7.1

**A7.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		6S3	12S3	
Rated Volt		6	12	6
Rated Watt		15		15
Test Volt		6.75	13.5	6.75
Objective values	Watt	15 ± 6%		15 ± 6%
	Lumen	240 ± 15%		-
Reference luminous flux: 240 lm at approximately 6.75 V				

**A7.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nom.	max.	
e	<u>2/</u>	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	<u>3/</u>	- 0.5	0	0.5	0 ± 0.3
Cap		P26s			

**Notes:**

- 1/ The bulb shall be colourless 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.

**Annex-A8 (See para 4)  
Requirements of HS1 Category Lamps**

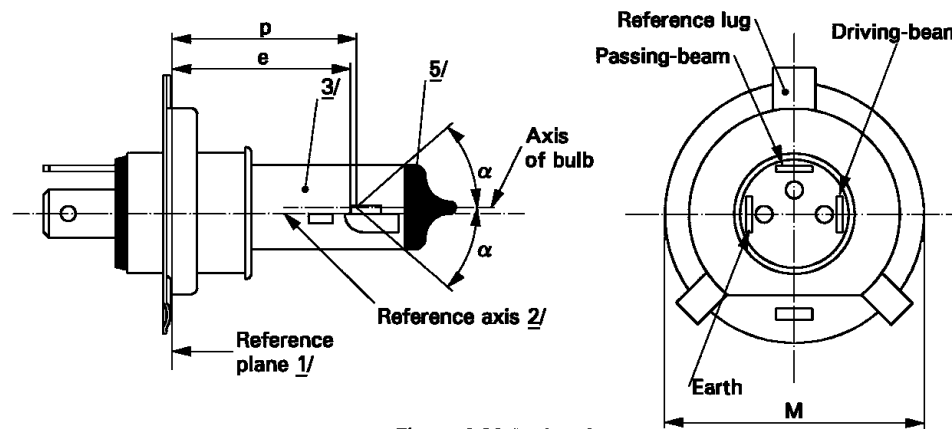


Figure 1 Main drawing

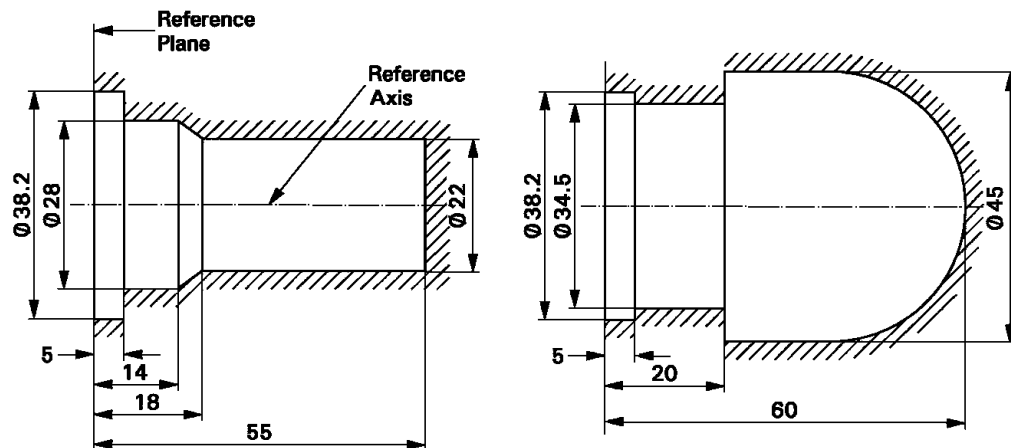


Figure 2

Maximum lamp outlines 4/

Figure 3

Figure A8.1

**Notes:**

- 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 bulb shall be colourless or selective yellow.
- 4/ The bulb and supports shall not exceed the envelope as in figure 2 of figure A8.1. However, where a selective-yellow outer bulb is used the bulb and supports shall not exceed the envelope as in figure 3 of figure A8.1.
- 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.

**A8.1 Electrical and photometric requirements:**

Parameter		Production Lamps				Standard Lamp	
Ref. No.		6HS1		12HS1			
Rated Volt		6	<u>6/</u>	12	<u>6/</u>	12	<u>6/</u>
Rated Watt		35	35	35	35	35	35
Test Volt		6.3		13.2		13.2	
Objective values	Watt	35 $\pm$ 5%	35 $\pm$ 5%	35 $\pm$ 5%	35 $\pm$ 5%	35 $\pm$ 5%	35 $\pm$ 5%
	Lumen	700 $\pm$ 15%	440 $\pm$ 15%	825 $\pm$ 15%	525 $\pm$ 15%		
Measuring flux <u>7/</u> lm		-	-	-	450		
Reference luminous flux at approximately 12 V						700	450

**A8.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production		Standard filament lamp
	6 V	12 V	12 V
e	28.5 + 0.45/ - 0.25		28.5 + 0.20/-0.00
p	28.95		28.95
$\alpha$	max. 40°		max. 40°
Cap	PX43 t		

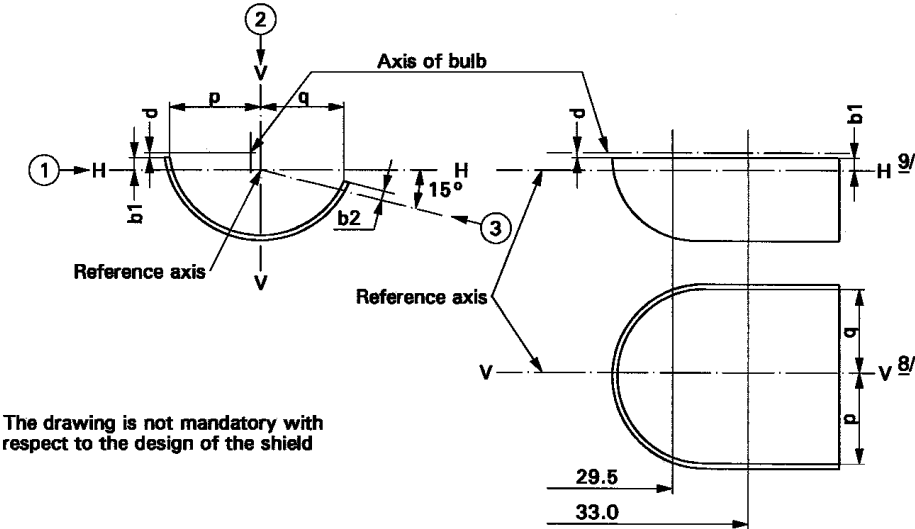
Notes

6/ The value 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 **8.0** of this standard.

A8.3 Position of shield:

Figure A8.2



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

Position of filaments

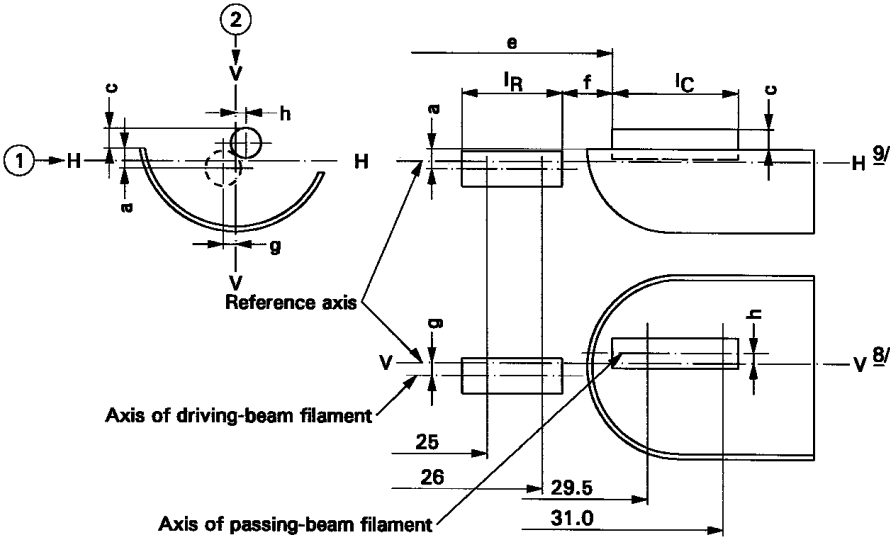




Table of the dimensions (in mm) referred to in Figure A8.2

Reference <u>*/</u>		Dimensions <u>**/</u>		Tolerance		
				Filaments lamps of normal production		Standard filament lamp
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 <u>13/</u>		28.5		+ 0.45 / - 0.25		+0.20 / -0.00
f <u>11/ 12/ 14/</u>		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
I <sub>R</sub> <u>11/ 14/</u>		3.5	4.0	± 0.80		± 0.40
I <sub>C</sub> <u>11/ 12/</u>		3.3	4.5	± 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" means the value measured at a distance of 29.5 mm from the reference plane.

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 foot-note 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 foot-note 11/.

**Additional explanations to Figure A8.2**

The dimensions below are measured in three directions:

- 1 for dimensions a, b<sub>1</sub>, c, d, e, f, I<sub>R</sub> and I<sub>C</sub>;
- 2 for dimensions g, h, p and q;
- 3 for dimension b<sub>2</sub>.

Dimensions p and q are measured in planes parallel to and 33 mm away from the reference plane.

Dimensions b<sub>1</sub> and b<sub>2</sub> 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, shall be as per **A4.3** of Annex A4.

**Annex-A9 (See para 4)  
Requirements of H7 Category Lamps**

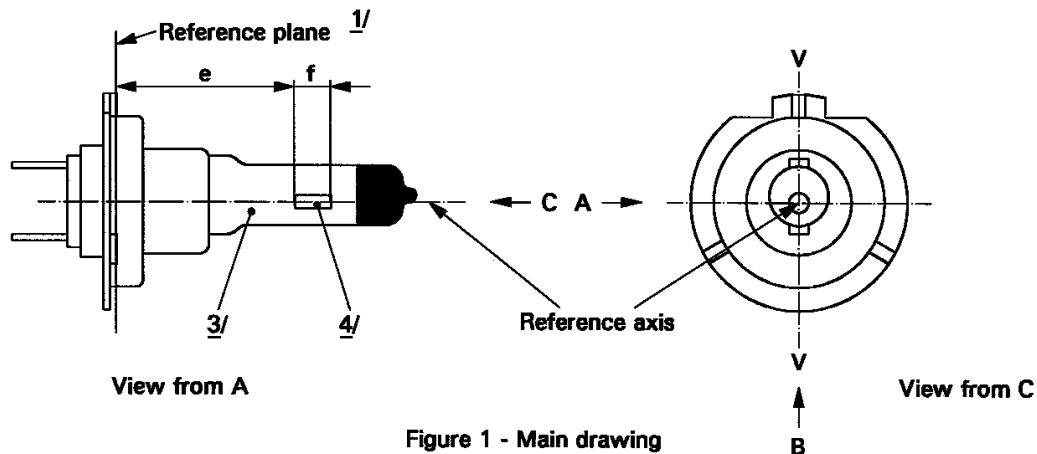


Figure 1 - Main drawing

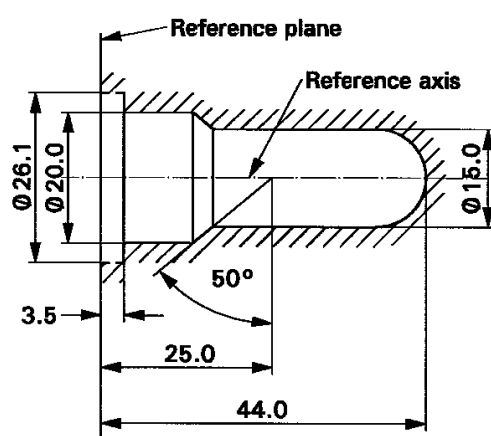


Figure 2 - Maximum lamp outline 5/

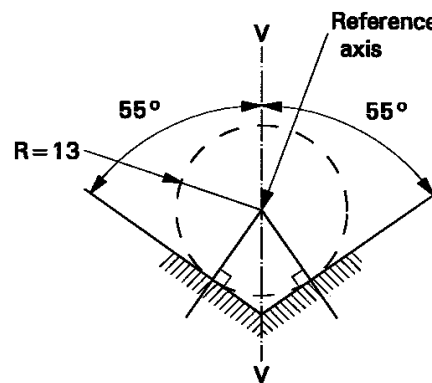


Figure 3 - Definition of reference axis 2/

Figure A9.1

**Notes:**

- 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 of figure A9.1.
- 3/ The bulb shall be colourless or selective yellow.
- 4/ Notes concerning the filament diameter.
  - No actual diameter restrictions apply.
  - For the same manufacturer, the design diameter of standard filament lamp and filament lamp of normal production shall be the same.
- 5/ Glass bulb and supports shall not exceed the envelope as indicated in figure 2 of figure A9.1. The envelope is concentric to the reference axis.

Figure A9.2

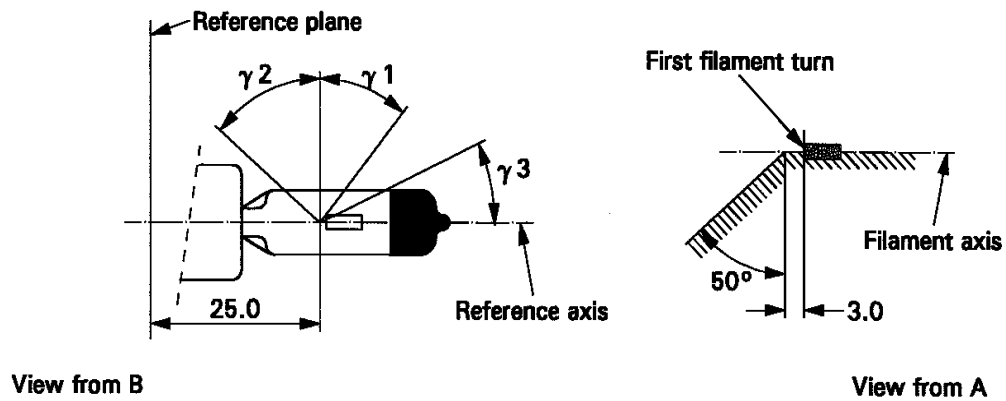


Figure 4  
Distortion free area and black top 6/ 7/

Figure 5  
Metal free zone 8/

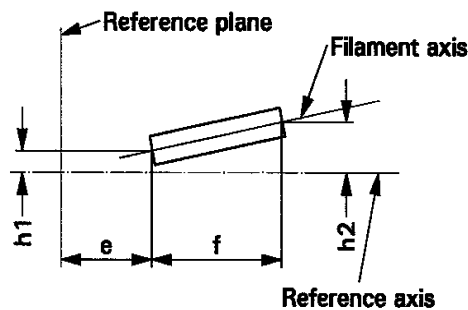


Figure 6  
Permissible offset of filament axis  
(for standard filament lamps only)

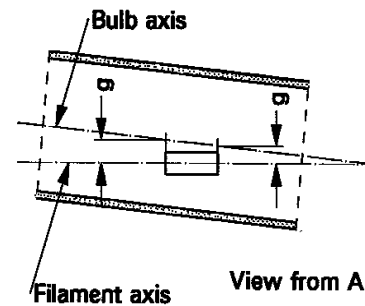


Figure 7  
Bulb eccentricity

**Notes:**

- 6/ Glass bulb shall be optically distortion free within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 7/ The obscuration shall extend at least to angle  $\gamma_3$  and shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference.
- 8/ The internal design of the lamp 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 A9.1).

No metal parts other than filament turns shall be located in the shaded area as seen in figure 5 in Figure A9.2.

**A9.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		12H7	24H7	
Rated Volt		12	24	12
Rated Watt		55	70	55
Test Volt		13.2	28.0	13.2
Objective values	Watt	58 max.	75 max.	58 max.
	Lumen	1500 ± 10 %	1750 ± 10 %	
Reference luminous flux: 1100 at approximately 12 V				

**A9.2 Dimensional requirements**

Dimensions in mm	Filaments lamps of normal production		Standard filament lamp
	12 V	24 V	12 V
e <u>9/</u>	25.0 <u>10/</u>		25.0 ± 0.1
f <u>9/</u>	4.1 <u>10/</u>	4.9 <u>10/</u>	4.1 ± 0.1
g <u>12/</u>	0.5 min.		
h1 <u>11/</u>	0	<u>10/</u>	0 ± 0.10
h2 <u>11/</u>	0	<u>10/</u>	0 ± 0.15
γ1	40° min.		40° min.
γ2	50° min.		50° min.
γ3	30° min.		30° min.
Cap	PX 26d		

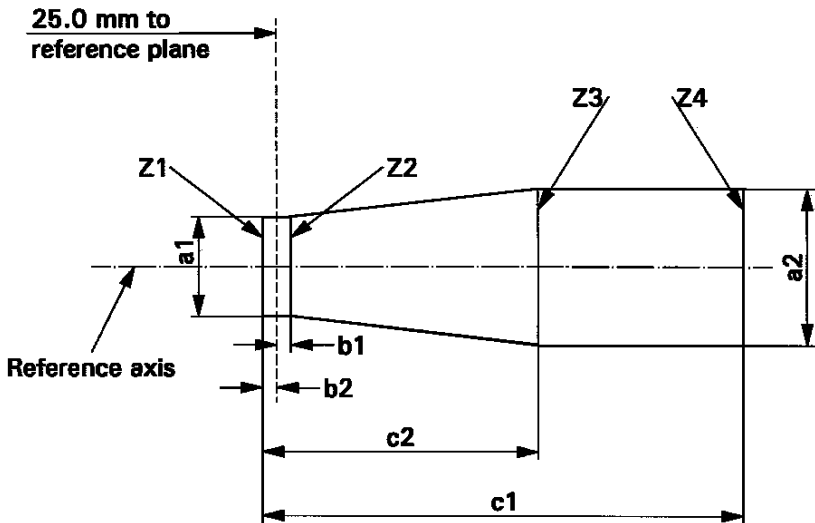
**Notes:**

- 9/ The ends of the filament are defined as the points where, when the viewing direction is direction A as shown in Figure A9.1, the projection of the outside of the end turns crosses the filament axis.
- 10/ To be checked by means of a "Box System", Figure A9.3
- 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 A9.1. 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.

**A9.3 Screen projection requirements**

**A9.3.1** 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 lamp complies with the requirements

**Figure A9.3**



	a1	a2	B1	b2	c1	c2
12 V	d + 0.30	d + 0.50	0.2	0.2	4.6	4.0
24V	d + 0.60	d + 1.00	0.25	0.25	5.9	4.4

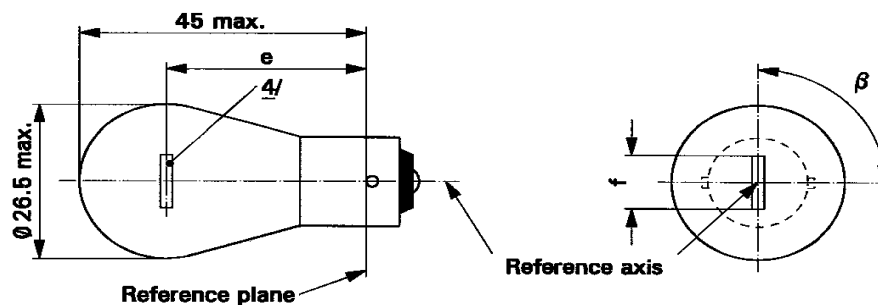
d = diameter of filament

The filament position is checked solely in directions A and B as shown in Figure1 of figure A9.1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined in note 9/, shall lie between lines Z1 and Z2 and between Z3 and Z4

**Annex-A10 (See para 4)**  
**Requirements of P21W Category Lamps**



**Figure A10.1**

**A10.1 Electrical and photometric requirements:**

Parameter	Production Lamps			Standard Lamp
	6P21W	12P21W	24P21W	
Ref. No.	6P21W	12P21W	24P21W	
Rated Volt	6	12	24	12
Rated Watt	21			21
Test Volt	6.75	13.5	28.0	13.5
Watt	27.6 max.	26.5 max.	29.7 max.	26.5 max.
Lumen	460 ± 15 %			
Reference luminous flux: 460 lm at approximately 13.5 V				

**A10.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		Min.	nom.	max.	
e	6, 12 V		31.8 <u>3/</u>		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 <u>1/</u>	6, 12 V			<u>3/</u>	0.3 max.
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap		BA15s <u>2/</u>			

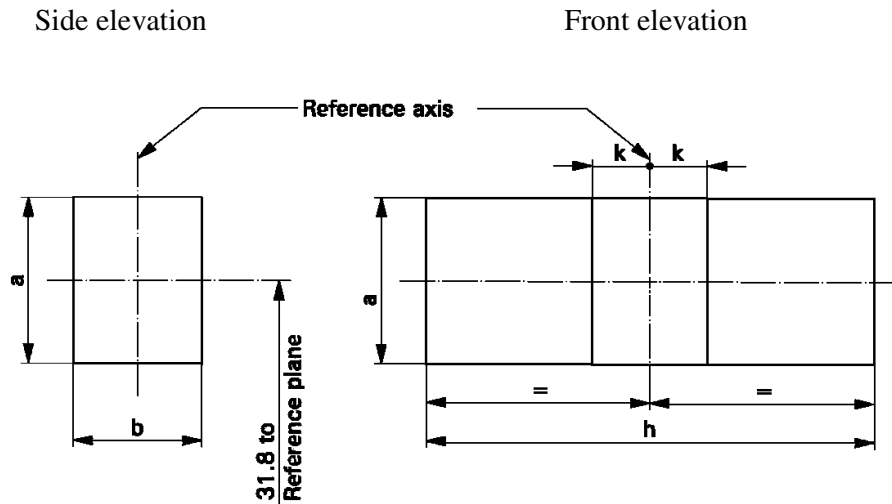
**Notes:**

- 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 lamps with cap BA 15d may be used for special purposes; they have the same dimensions.
- 3/ To be checked by means of a box system, as per **A10.2**.
- 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 **A10.2**, apply. If it is V-shaped, the filament ends shall be at the same distance within ± 3 mm from the reference plane.

**A10.3 Screen projection requirements**

**A10.3.1** 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 and the reference axis, whether a filament lamp complies with the requirements.

**Figure A10.2**



Reference	A	b	h	K
Dimension	3.5	3.0	9.0	1.0

**A10.3.2 Test procedures and requirements.**

**A10.3.2.1** The filament lamp 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.

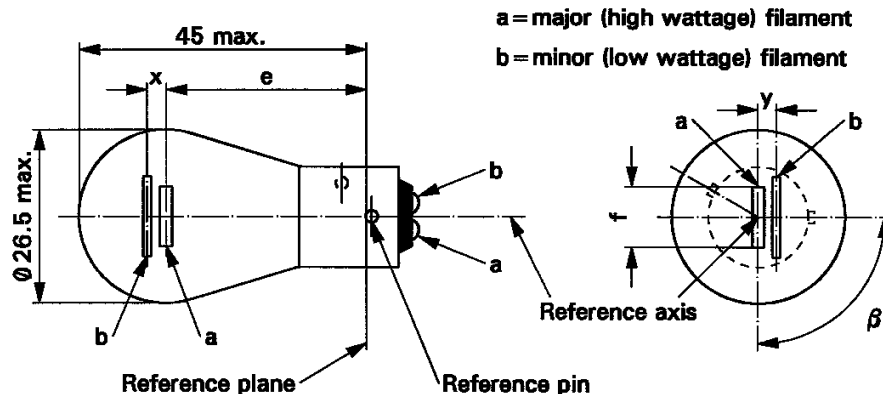
**A10.3.2.2 Side elevation:** The filament lamp placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

**A10.3.2.3 Front elevation:** The filament lamp placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to the filament axis:

- a) 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; and
- b) the centre of the filament shall not be offset by more than distance "k" from the reference axis.



**Annex-A11 (See para 4)  
Requirements of P21/4W Category Lamps**



**Figure A11.1**

**A11.1 Electrical and photometric requirements:**

Parameter		Production Lamps				Standard Lamp
Ref. No.		12P21/4W		24P21/4W		
Rated Volt		12		24		12
Rated Watt		21	4	21	4	21/4
Test Volt		13.5		28.0		13.5
Objective values	Watt	26.5 max.	5.5 max.	29.7 max.	8.8 max.	26.5/5.5 max.
	Lumen	440±15%	15±20%	440±15%	20±20%	
Reference luminous flux: 440 lm and 15 lm at approximately 13.5 V						

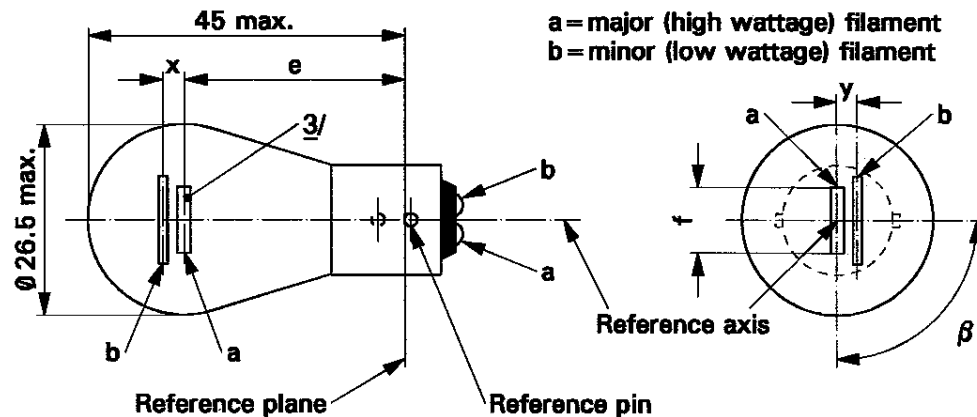
**A11.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nom.	max.	
e		31.8 <u>3/</u>		31.8 ± 0.3
f			7.0	7.0 + 0/- 2
Lateral deviation			<u>1/</u>	0.3 max. <u>2/</u>
x,y		<u>1/</u>		2.8 ± 0.5
β	75° <u>1/</u>	90° <u>1/</u>	105° <u>1/</u>	90° ± 5°
Cap	BAZ 15d			

**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. 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 lamp P21/5W (Refer **A12.3** of Annex A12).

**Annex-A12 (See para 4)  
Requirements of P21/5W Category Lamps**



**Figure A12.1**

**A12.1 Electrical and photometric requirements:**

Parameter		Production Lamps						Standard Lamp
Ref. No.		6P21/5W		12P21/5W		24P21/5W		
Rated Volt		6		12		24		12
Rated Watt		21	5	21	5	21	5	21/5
Test Volt		6.75		13.5		28.0		13.5
Objective values	Watt (max)	27.6	6.6	26.5	6.6	29.7	11	26.5 and 6.6 max.
	Lumen	440 ±15%	35 ±20%	440± 15%	35 ±20%	440 ±15%	40 ±20%	
Reference luminous flux: 440 lm and 35 lm at approximately 13.5 V								

**A12.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nom.	max.	
e	6, 12 V		31.8 <u>1/</u>		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	6, 12 V			7.0	7.0 + 0/- 2
	24 V			<u>1/</u>	
Lateral deviation <u>2/</u>	6, 12 V			<u>1/</u>	0.3 max.
	24 V			1.5	
x, y	6, 12 V		<u>1/</u>		2.8 ± 0.3
x	24 V <u>3/</u>	-1.0	0	1.0	
y	24 V <u>3/</u>	1.8	2.8	3.8	
β		75°	90°	105°	90° ± 5°
Cap		BAY15d			

Notes:

- 1/ These dimensions shall be checked by means of a "box-system" as per A12.3. "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  $\pm 3$  mm from the reference plane.

### A12.3 Screen projection requirements

A12.3.1 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 lamp complies with the requirements.

### A12.3.2 Test procedure and requirements.

A12.3.2.1 The filament lamp 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 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.

A12.3.2.2 **Side elevation:** The filament lamp placed with the cap down, the reference axis vertical, the reference pin to the right and the major filament seen end-on:

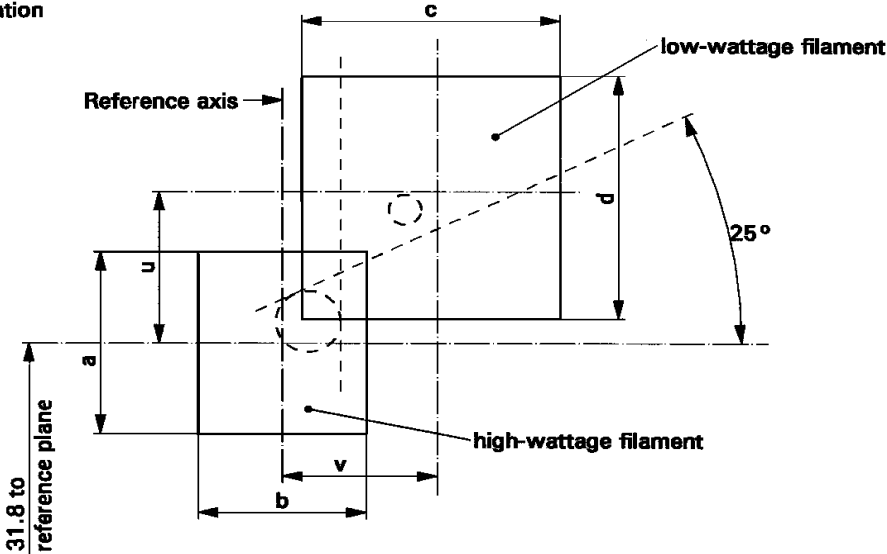
- (a) the projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;
- (b) the projection of the minor filament shall lie entirely:  
 within a rectangle of width "c" and height "d" having 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;  
 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  $25^\circ$ .  
 to the right of the projection of the major filament.

A12.3.2.3 **Front elevation:** The filament lamp being placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to axis of the major filament:

- (a) 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;
- (b) the centre of the major filament shall not be offset by more than distance "k" from the reference axis.
- (c) the centre of the minor filament axis shall not be offset from the reference axis by more than  $\pm 2$  mm ( $\pm 0.4$  mm for standard filament lamps).

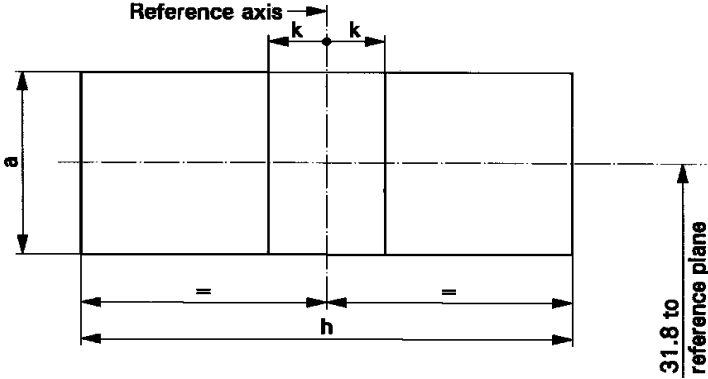
Figure A12.2

Side elevation



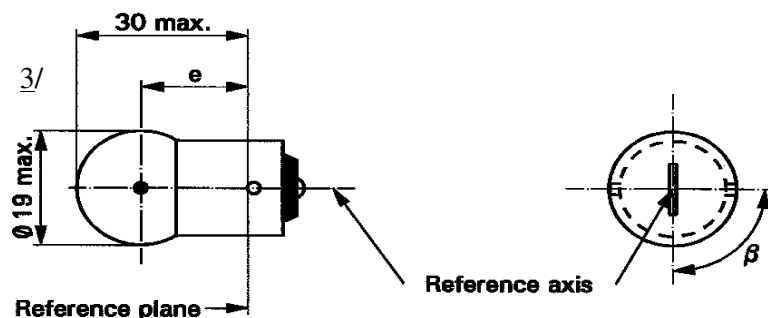
Reference	a	b	c	d	u	v
Dimensions	3.5	3.0	4.8		2.8	

Front elevation



Reference	a	h	k
Dimensions	3.5	9.0	1.0

**Annex-A13 (See para 4)  
Requirements of R5W Category Lamps**



**Figure A13.1**

**A13.1 Electrical and photometric requirements:**

Parameter		Production Lamps			Standard Lamp
		6R5W	12R5W	24R5W	
Ref. No.		6	12	24	
Rated Volt		6	12	24	12
Rated Watt		5			5
Test Volt		6.75	13.5	28.0	13.5
Objective values	Watt	5.5 max.		7.7 max.	5.5 max.
	Lumen	50 ± 20 %			
Reference luminous flux: 50 lm at approximately 13.5 V					

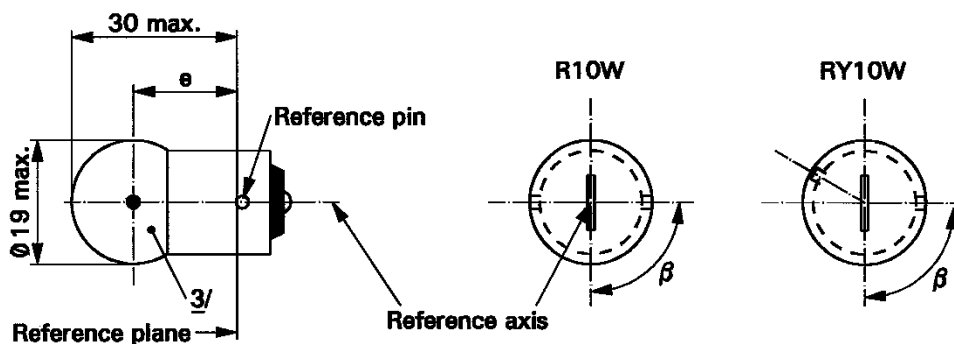
**A13.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nom.	max.	
e	17.5	19.0	20.5	19.0 ± 0.3
Lateral deviation <u>2/</u>			1.5	0.3 max.
β	60°	90°	120°	90° ± 5°
Cap	BA15s <u>1/</u>			

**Notes:**

- 1/ Filament lamps with cap BA 15d 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 pins.
- 3/ Cylindrical (tubular) shape is also permitted

**Annex-A14 (See para 4)  
Requirements of R10W & RY10W Category Lamps**



**Figure A14.1**

**A14.1 Electrical and photometric requirements:**

Parameter		Production Lamps			Standard Lamp
Ref. No.		6R10W, 6RY10W	12R10W, 12RY10W	24R10W, 24RY10W	
Rated Volt		6	12	24	12
Rated Watt		10			10
Test Volt		6.75	13.5	28.0	13.5
Objective values	Watt	11 max.		14 max.	11 max.
	Lumen	R10W	125 ± 20 %		
		RY10W	75 ± 20 %		
Reference luminous flux		R10W	125 lm at approximately 13.5 V		
		RY10W	75 lm at approximately 13.5 V		

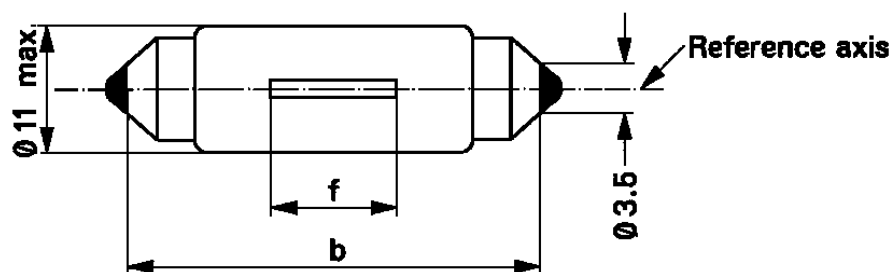
**A14.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	Nom.	max.	
E		17.5	19.0	20.5	19.0 ± 0.3
Lateral deviation <u>2/</u>				1.5	0.3 max.
β		60°	90°	120°	90° ± 5°
Cap	R10W	BA15s <u>1/</u>			
	RY10W	BAU15s			

Notes:

- 1/ Filament lamps 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 pins.
- 3/ The light emitted from filament lamps of normal production shall be white for category R10W and amber for category RY10W. From standard filament lamp it shall be white for category R10W and white or amber for category RY10W. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

**Annex-A15 (See para 4)  
Requirements of C5W Category Lamps**



**Figure A15.1**

**A15.1 Electrical and photometric requirements:**

Parameter		Production Lamps			Standard Lamp
		6C5W	12C5W	24C5W	
Ref. No.		6C5W	12C5W	24C5W	
Rated Volt		6	12	24	12
Rated Watt		5			5
Test Volt		6.75	13.5	28.0	13.5
Objective values	Watt	5.5 max.			5.5 max.
	Lumen	45 ± 20 %			
Reference luminous flux: 45 lm at approximately 13.5 V					

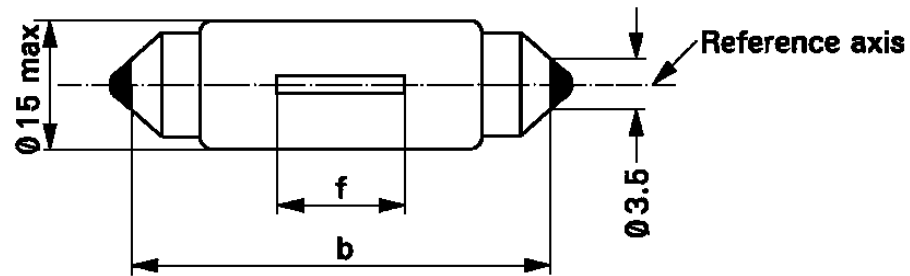
**A15.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament
	min.	Nom.	max.	
b <u>1/</u>	34.0	35.0	36.0	35.0 ± 0.5
f <u>2/ 3/</u>	7.5 <u>4/</u>		15 <u>5/</u>	9 ± 1.5
Cap	SV 8.5			

Notes:

- 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 lamp and placed symmetrically about the filament lamp centre.  
The diameter of the cylinder is for 6 V and 12 V filament lamps:  $d + 4$  mm (for standard filament lamps:  $d + 2$  mm) and for 24 V filament lamps:  $d + 5$  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 lamp shall not be more than  $\pm 2.0$  mm (for standard filament lamps:  $\pm 0.5$  mm) measured in the direction of the reference axis.
- 4/ 4.5 mm for 6 V filament lamps.
- 5/ 16.5 mm for 24 V filament lamps

**Annex-A16 (See para 4)  
Requirements of C10W Category Lamps**



**Figure A16.1**

**A16.1 Electrical and photometric requirements:**

Parameter	Production Lamps		Standard Lamp
Ref. No.	6C10W	12C10W	
Rated Volt	6	12	12
Rated Watt	10		10
Test Volt	6.75	13.5	
Watt	10 $\pm$ 10%		10 $\pm$ 10% AT 13.5V
Lumen	115 $\pm$ 15%		-
Reference luminous flux: 115 lm at approximately 13.5 V			

**A16.2 Dimensional requirements:**

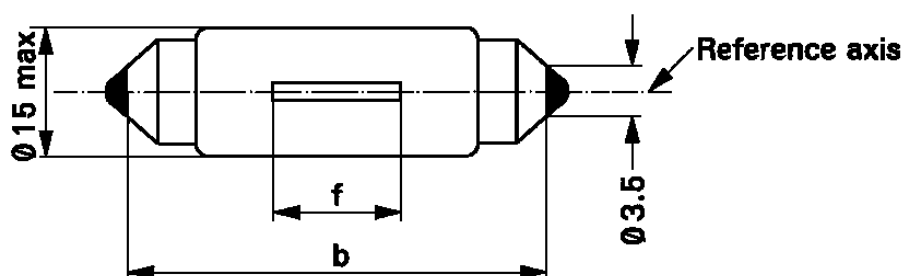
See fig A16.1	Production Lamps			Standard Lamp
	Minimum	Nominal	Maximum	
b <sup>(1)</sup>	39	40	41	40 $\pm$ 0.5
f <sup>(2), (3)</sup>				
Cap	SV8.5			

Foot Notes:

- (1) This dimension corresponds to the distance between two apertures of 3.5mm diameter each bearing against one of the caps.
- (2) The filament shall be housed in a cylinder 19mm long co-axial with the filament lamp axis and placed symmetrically about the lamp centre. The diameter of this cylinder is for 6-volt and 12 volt lamps: d+4 mm for standard filament lamps” d+2mm) and 24 volt filaments lamps d+5mm, “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 lamp’s length should not be more than + 2.0 mm (for standard filament lamps:  $\pm$  0.5 mm) measured in the direction of the reference axis.



Annex-A17 (See para 4)  
Requirements of C21W Category Lamps



**Figure A17.1**

**A17.1 Electrical and photometric requirements:**

Parameter		Production Lamps			Standard Lamp
		6C21W	12C21W	24C21W	
Ref. No.		6	12	24	
Rated Volt		6	12	24	12
Rated Watt		21			21
Test Volt		6.75	13.5	28	
Objective values	Watt	26.5 max.		28_max	26.5 max.
	Lumen	460± 15%			-
Reference luminous flux: 460 lm at approximately 13.5 V					

**A17.2 Dimensional requirements:**

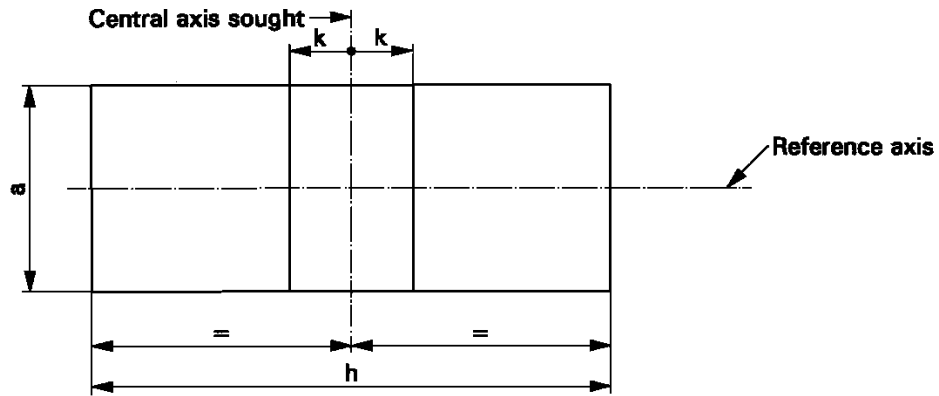
See fig A17.1	Production Lamps			Standard Lamp
	Minimum	Nominal	Maximum	
b <u>1/</u>	40	41	42	41 ± 0.5
f <u>2/</u>	7.5		10.5	8 ± 1
Cap	SV8.5			

Foot Notes:

- 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"; **Figure A17.2**

**A17.3 Screen projection requirements**

**A17.3.1** 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 lamp's length, whether a filament lamp complies with the requirements.



**Figure A17.2**

	a	h	K
filament lamps of normal production	4.0 + d	14.5	2.0
standard filament lamp	2.0 + d	14.5	0.5

d = nominal filament diameter as stated by the manufacturer.

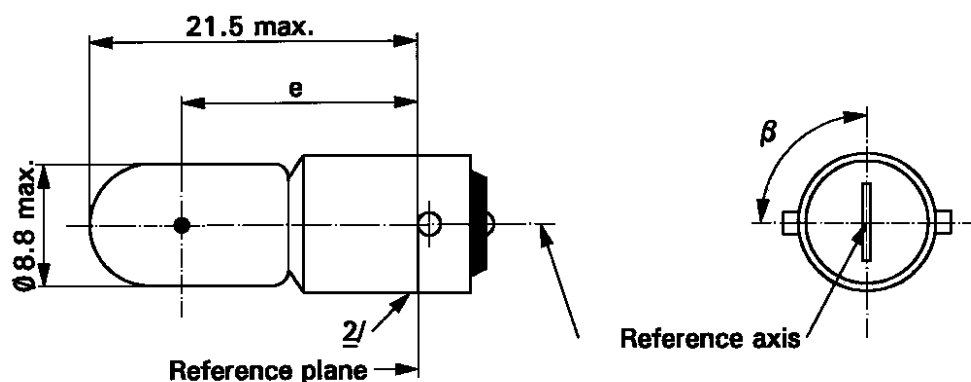
**A17.3.2 Test procedure and requirements.**

**A17.3.2.1** The filament lamp 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 lamp. The central axis sought on the screen shall coincide with the centre of the filament lamp length.

**A17.3.2.2 Front elevation**

- (a) The projection of the filament shall lie entirely within the rectangle when the filament lamp is rotated through 360°.
- (b) The centre of the filament shall not be offset by more than distance "k" from the central axis sought.

**Annex-A18 (See para 4)  
Requirements of T4W Category Lamps**



**Figure A18.1**

**A18.1 Electrical and photometric requirements:**

Parameter	Production Lamps			Standard Lamp
	6T4W	12T4W	24T4W	
Ref. No.	6T4W	12T4W	24T4W	
Rated Volt	6	12	24	12
Rated Watt	4			4
Test Volt	6.75	13.5	28.0	13.5
	Watt	4.4 max.	5.5 max.	4.4 max.
	Lumen	35 ± 20 %		-
Reference luminous flux: 35 lm at approximately 13.5 V				

**A18.2 Dimensional requirements:**

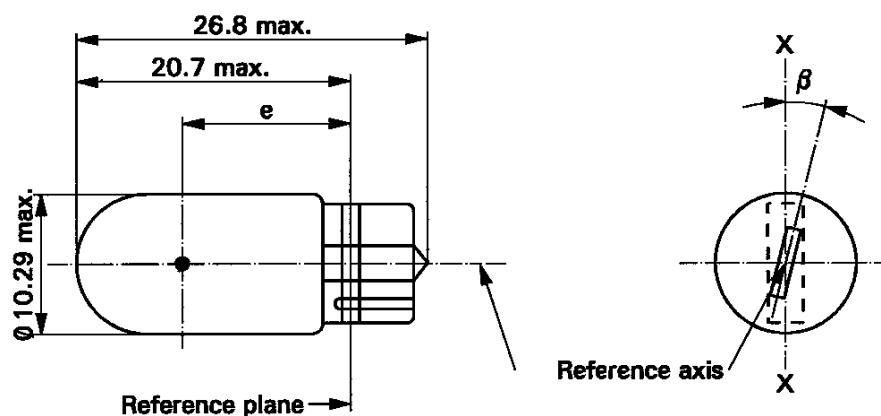
Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nom.	max.	
e	13.5	15.0	16.5	15.0 ± 0.3
Lateral deviation <u>1/</u>			1.5	0.5 max
β		90°		90° ± 5°
Cap	BA 9s			

Notes:

- 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.

However, projection of soldering on the areas not covered by dimension s “N” of Sheet 7004-14-8 of IEC Publication 60061-1, Part 1 may be allowed.

**Annex-A19 (See para 4)  
Requirements of W5W Category Lamps**



**Figure A19.1**

**A19.1 Electrical and photometric requirements:**

Parameter	Production Lamps			Standard Lamp
	6W5W	12W5W	24W5W	
Ref. No.	6W5W	12W5W	24W5W	
Rated Volt	6	12	24	12
Rated Watt	5			5
Test Volt	6.75	13.5	28.0	13.5
Objective values	Watt	5.5 max.		5.5 max.
	Lumen	50 ± 20 %		
Reference luminous flux: 50 lm at approximately 13.5 V				

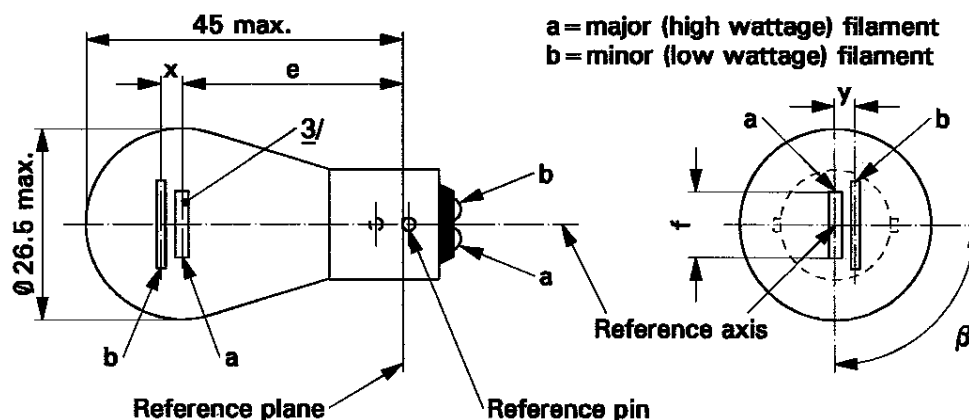
**A19.2 Dimensional requirements:**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nom.	max.	
e	11.2	12.7	14.2	12.7 ± 0.3
Lateral deviation <u>1/</u>			1.5	0.5 max
$\beta$	- 15°	0°	+ 15°	0° ± 5°
Cap	W2.1x9.5d			

Notes:

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

**Annex-A20 (See para 4)**  
**Requirements of R10/5W Category Lamps**



**Figure A20.1**

**A20.1 Electrical and photometric requirements:**

Parameter		Production Lamps				Standard Lamp	
Reference No.		6R10/5W		12R10/5W			
Rated Volt		6		12		12	
Rated Watt		10	5	10	5	10	5
Test Volt		6.75		13.5			
Objective values	Watt (max)	11	6.6	11	6.6	11	6.6
	Lumen	125 +20%	26 +20%	125 +20%	26 +20%		
Reference luminous flux: 125 lm and 26 lm at approx. 13.5 V.							

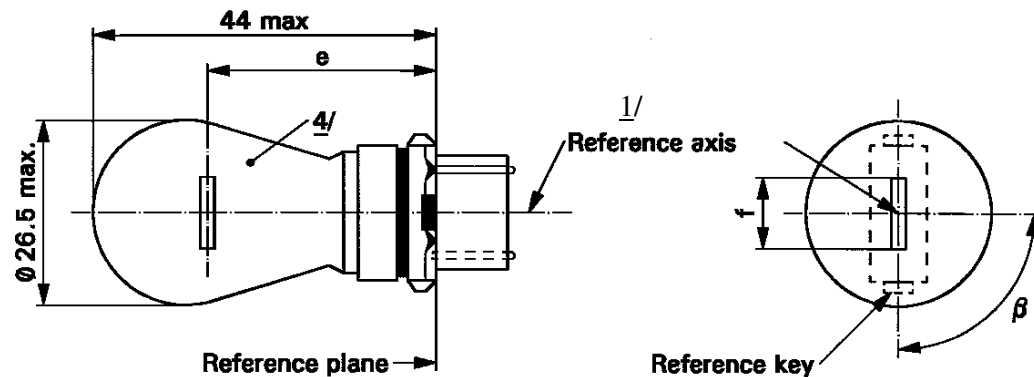
**A20.2 Dimensional requirements**

See fig A20.1	Production Lamps			Standard Lamp
	Minimum	Nominal	Maximum	
e		31.8 <sup>(1)</sup>		31.8 ± 0.3
f			7.0	7.0 + 0.0/-0.2
Lateral deviation <sup>(2)</sup>		(1)		0.3 max
x, y		(1)		2.8 ± 0.3
β	75° <sup>(1)</sup>	90°	105°	90° ± 5°
Cap	BAY15d			

Notes:

- (1) These dimensions to be checked by means of a 'box system' (see A12.3) based on the dimensions and tolerances shown above. "x" and "y" refer to the main (high wattage) filament and to the lamp 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.

**Annex-A21 (See para 4)  
Requirements of WP21W, WPY21W Category Lamps**



**Figure A21.1**

**A21.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		12WP21W	12WPY21W	
Rated Volt		12		12
Rated Watt		21		21
Test Volt		13.5		13.5
Objective values	Watt	26.5 max.		26.5 max.
	Lumen	460 ± 15%	280 ± 20%	-
Reference luminous flux at approximately 13.5 V		Clear bulb: 460 lm Amber bulb: 280lm		

**A21.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nom.	max.	
e			27.9 <sup>3/</sup>		27.9 ± 0.3
f		5.5	6.0	7.0	6.0 ± 0.5
Lateral deviation <sup>2/</sup>				<sup>3/</sup>	0.0 ± 0.4
β		75° <sup>3/</sup>	90°	105° <sup>3/</sup>	90° ± 5°
Cap:	WP21W				WY 2.5x16d
	WPY21W				WZ 2.5x16d

Notes:

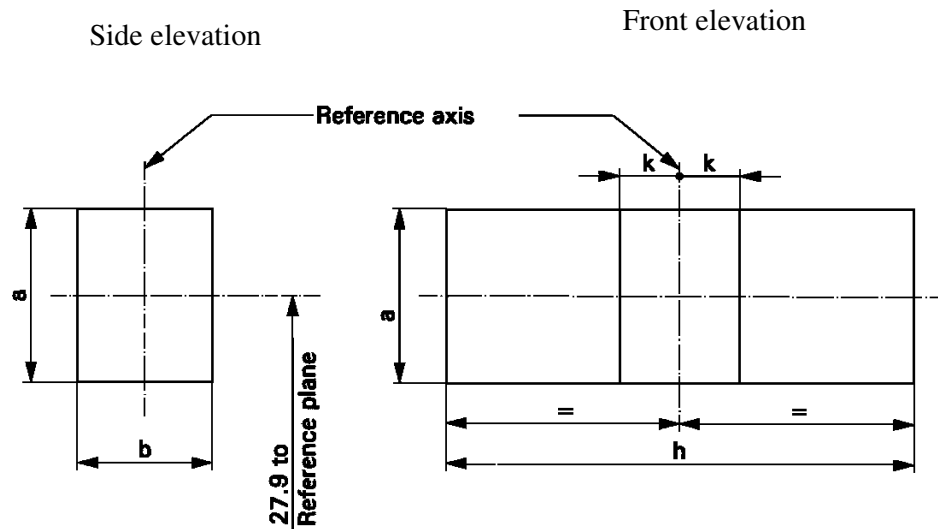
- <sup>1/</sup> The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.
- <sup>2/</sup> Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis through the reference keys.
- <sup>3/</sup> To be checked by means of a "Box-System"; as per **A21.3**.

- 4/ The light emitted from filament lamps of normal production shall be white for category WP21W and amber for category WPY21W. From standard filament lamps it shall be white for category WP21 W and white or amber for category WPY21W. For amber filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

**A21.3 Screen projection requirements**

**A21.3.1** 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 lamp complies with the requirements

**Figure A21.2**



Reference	A	B	h	K
Dimension	3.5	3.0	9.0	1.0

**A21.3.2 Test procedures and requirements.**

**A21.3.2.1** The filament lamp 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.

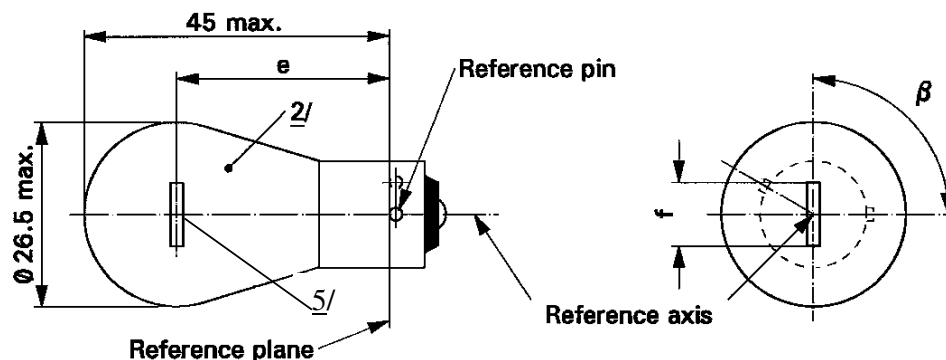
**A21.3.2.2** Side elevation: The filament lamp placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

**A21.3.2.3** Front elevation: The filament lamp placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to the filament axis:

- a) 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.
- b) The centre of the filament shall not be offset by more than distance "k" from the reference axis.



**Annex-A22 (See para 4)  
Requirements of PY21W Category Lamps**



**Figure A22.1**

**A22.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		12PY21W	24PY21W	
Rated Volt		12	24	12
Rated Watt		21		21
Test Volt		13.5	28.0	13.5
Objective values	Watt	26.5 max.	29.7 max.	26.5 max.
	Lumen	280 ± 20%		
Reference luminous flux at approximately 13.5 V:			Clear bulb: 460 lm	Amber bulb: 280 lm

**A22.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nom.	max.	<u>4/</u>
e	12 V		31.8 <u>3/</u>		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V			7.0	7.0 +0/-2
Lateral deviation <u>1/</u>	12 V			<u>3/</u>	0.3 max.
	24 V			1.5	
β		75°	90°	105°	90° ± 5°
Cap		BAU 15s			

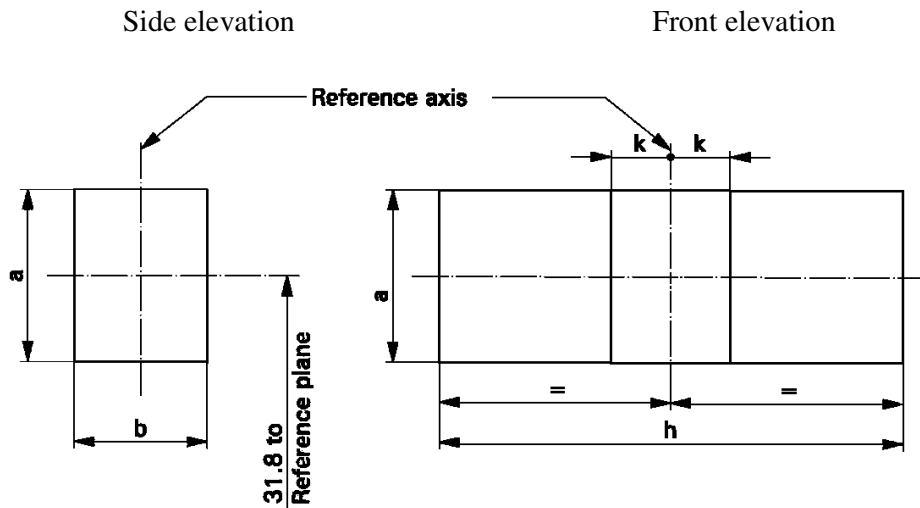
**Notes:**

- 1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.
- 2/ The light emitted from production lamps shall be amber. (see also note 4/).
- 3/ To be checked by means of a "Box-System"; as per **A22.3**.
- 4/ The light emitted from standard filament lamps shall be amber or white. For amber filament lamps, changes of the bulb temperatures shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.
- 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 shall apply. If it is V-shaped, the filament ends shall be at the same distance within ± 3 mm from the reference plane.

**A22.3 Screen projection requirements**

**A22.3.1** 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 reference pin and the reference axis, whether a filament lamp complies with the requirements.

**Figure A22.2**



Reference	A	b	h	k
Dimension	3.5	3.0	9.0	1.0

**A22.3.2. Test procedures and requirements.**

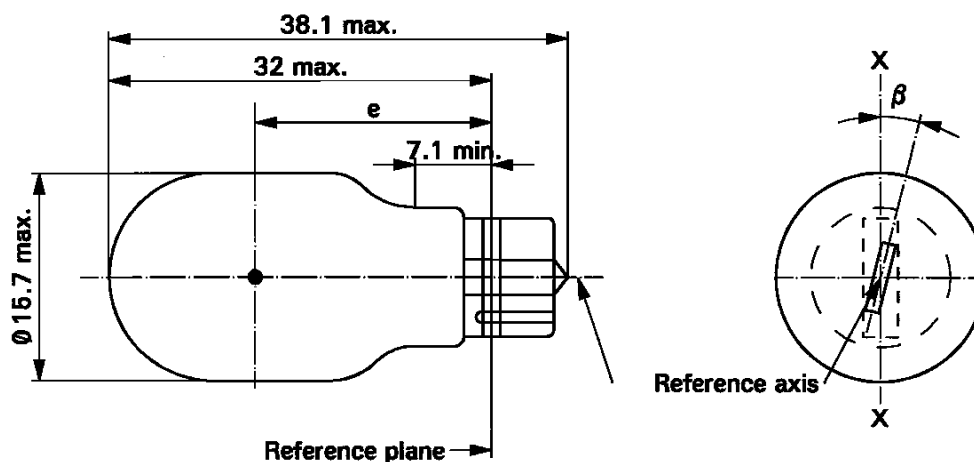
**A22.3.2.1** The filament lamp is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits. The holder is then so rotated that an end view of the filament is seen on the screen on to which the image of the filament is projected. The end view of the filament shall be obtained within the angular displacements tolerance limits.

**A22.3.2.2** Side elevation: The filament lamp 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.

**A22.3.2.3** Front elevation: The filament lamp placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to the filament axis:

- (a) 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.
- (b) The centre of the filament shall not be offset by more than distance "k" from the reference axis.

**Annex-A23 (See para 4)  
Requirements of W16W Category Lamps**



**Figure A23.1**

**A23.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12W16W	
Rated Volt		12	12
Rated Watt		16	16
Test Volt		13.5	13.5
Objective values	Watt	21.35 max.	21.35 max.
	Lumen	310 ± 20 %	
Reference luminous flux: 310 lm at approximately 13.5 V			

**A23.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nom.	max.	
e	18.3	20.6	22.9	20.6 ± 0.3
Lateral deviation <u>1/</u>			1.0	0.5 max.
β	-15°	0°	+ 15°	0° ± 5°
Cap	W2.1x9.5d			

Notes:

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

Annex-A24 (See para 4)  
 Requirements of W21/5W Category Lamps

a = major (high wattage) filament  
 b = minor (low wattage) filament

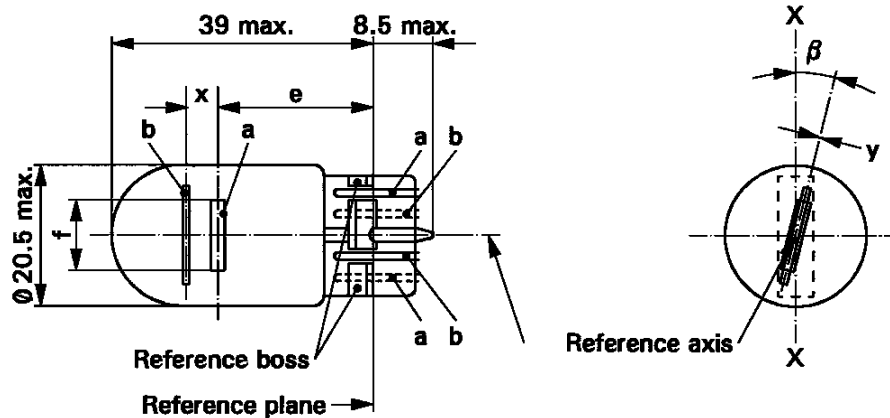


Figure A24.1

A24.1 Electrical and photometric requirements:

Parameter		Production Lamps		Standard Lamp	
Ref. No.		12W21/5W			
Rated Volt		12		12	
Rated Watt		21	5	21	5
Test Volt		13.5		13.5	
Objective values	Watt	26.5 max.	6.6 max.	26.5 max.	6.6 max.
	Lumen	440 ± 15 %	35 ± 20 %		
Reference luminous flux: 440 and 35 lm at approximately 13.5 V					

A24.2 Dimensional requirements

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nom.	max.	
e		25.0 <u>1/</u>		25.0 ± 0.3
f			7.5	7.5 + 0/ - 2
Lateral deviation <u>2/</u>			<u>1/</u>	0.3 max.
x <u>3/</u>		2.8 <u>1/</u>		2.8 ± 0.3
y <u>3/</u>		0.0 <u>1/</u>		0.0 ± 0.3
β	-15° <u>1/</u>	0°	+15° <u>1/</u>	0° ± 5°
Cap	W3 x 16q			

Notes:

- 1/ To be checked by means of a "Box-System"; (A24.3 and Figure A24.2)
- 2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.
- 3/ "x" and "y" denote the offset of the axis of the minor filament with respect to the axis of the major filament.

**A24.3 Screen projection Requirements:**

- A24.3.1** 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 lamp complies with the requirements.

**A24.3.2 Test procedure and requirements.**

**A24.3.2.1** The filament lamp 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. ( $\pm 15^\circ$ ).

**A24.3.2.2** Side elevation: The filament lamp placed with the cap down, the reference axis vertical and the major filament seen end-on:

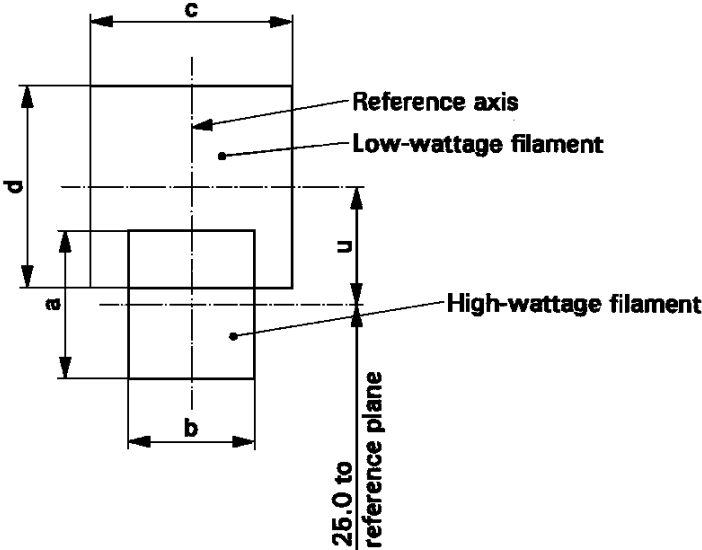
- (a) the projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;
- (b) the projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having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

**A24.3.2.3** Front elevation: The filament lamp being placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to axis of the major filament:

- (a) 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;
- (b) the centre of the major filament shall not be offset by more than distance "k" from the reference axis.
- (c) the centre of the minor filament axis shall not be offset from the reference axis by more than  $\pm 2$  mm ( $\pm 0.4$  mm for standard filament lamps).

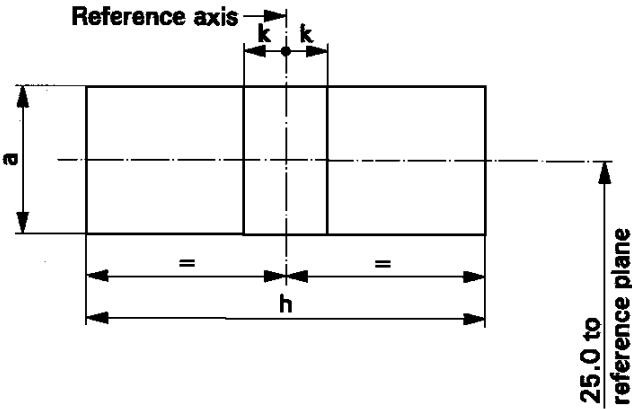
Figure A24.2

Side elevation



Reference	a	b	c	d	u
Dimensions	3.5	3.0	4.8		2.8

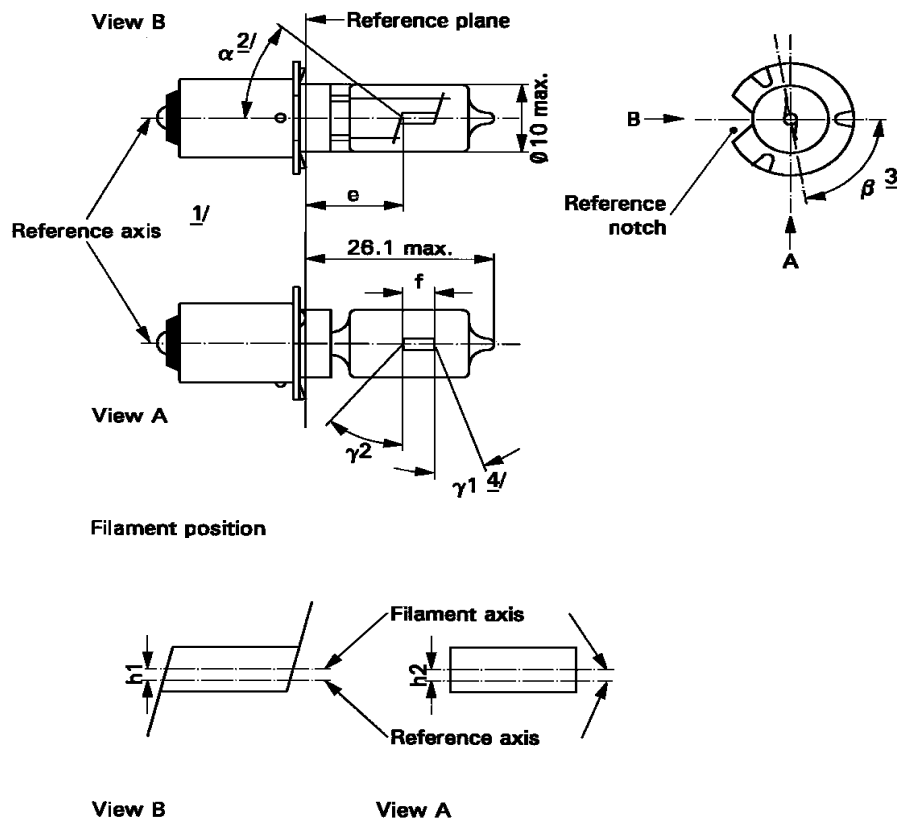
Front elevation



Reference	a	h	k
Dimensions	3.5	9.5	1.0



Annex-A25 (See para 4)  
Requirements of HS2 Category Lamps  
Figure A25.1



**Notes:**

- 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  $\alpha$ .
- 3/ Angle  $\beta$  denotes the position of the plane through the inner leads with reference to the reference notch.
- 4/ In the area between the outer legs of the angles  $\gamma_1$  and  $\gamma_2$ , the bulb shall have no optically distorting areas and the curvature of the bulb shall have a radius not less than 50% of the actual bulb diameter.

**A25.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		6HS2	12 HS2	
Rated Volt		6	12	6
Rated Watt		15		15
Test Volt		6.75	13.5	6.75
Objective values	Watt	15 $\pm$ 6%		15 $\pm$ 6%
	Lumen	320 $\pm$ 15%		-
Reference luminous flux: 320 lm at approx. 6.75 V.				

**A25.2 Dimensional requirements**

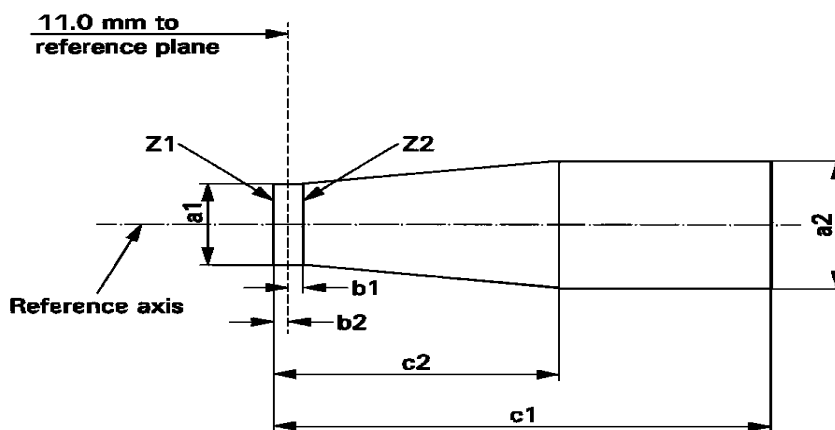
Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nominal.	max.	
e			11.0 <u>5/</u>		$11.0 \pm 0.15$
f <u>6/</u>	6 V	1.5	2.5	3.0	$2.5 \pm 0.15$
	12 V	2.0	3.0	4.0	
h1, h2			<u>5/</u>		$0 \pm 0.15$
$\alpha$ <u>2/</u>				$40^\circ$	
$\beta$ <u>3/</u>		$75^\circ$	$90^\circ$	$105^\circ$	$90^\circ \pm 5^\circ$
$\gamma 1$ <u>4/</u>		$15^\circ$			$15^\circ$ min.
$\gamma 2$ <u>4/</u>		$40^\circ$			$40^\circ$ min.
Cap		PX13.5s			

**Notes:** 5/ To be checked by means of the "box system", as per **A25.3**

6/ In order to avoid rapid filament failure, the supply voltage shall not exceed 8 V for 6 V filament lamps and 15 V for 12 V types.

**A25.3 Screen projection requirements:**

This test is used to determine, by checking whether the filament lamp complies with the requirements by checking whether the filament lamp 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

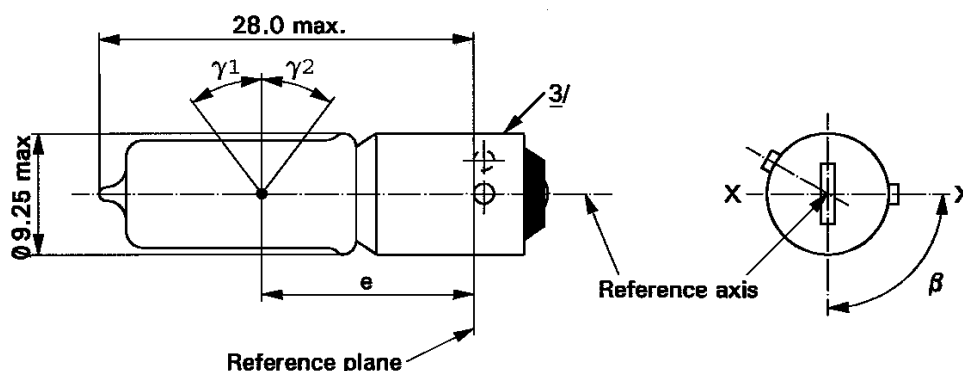
d= actual filament diameter

The filament shall lie entirely within the limits shown.

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

**Annex-A26 (See para 4)  
Requirements of H6W Category Lamps**

Figure A26.1

**A26.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12H6W	
Rated Volt		12	12
Rated Watt		6	6
Test Volt		13.5	13.5
Objective values	Watt	7.35 max.	7.35 max.
	Lumen	125 ± 12 %	-
Reference luminous flux: 125 lm at approximately 13.5 V			

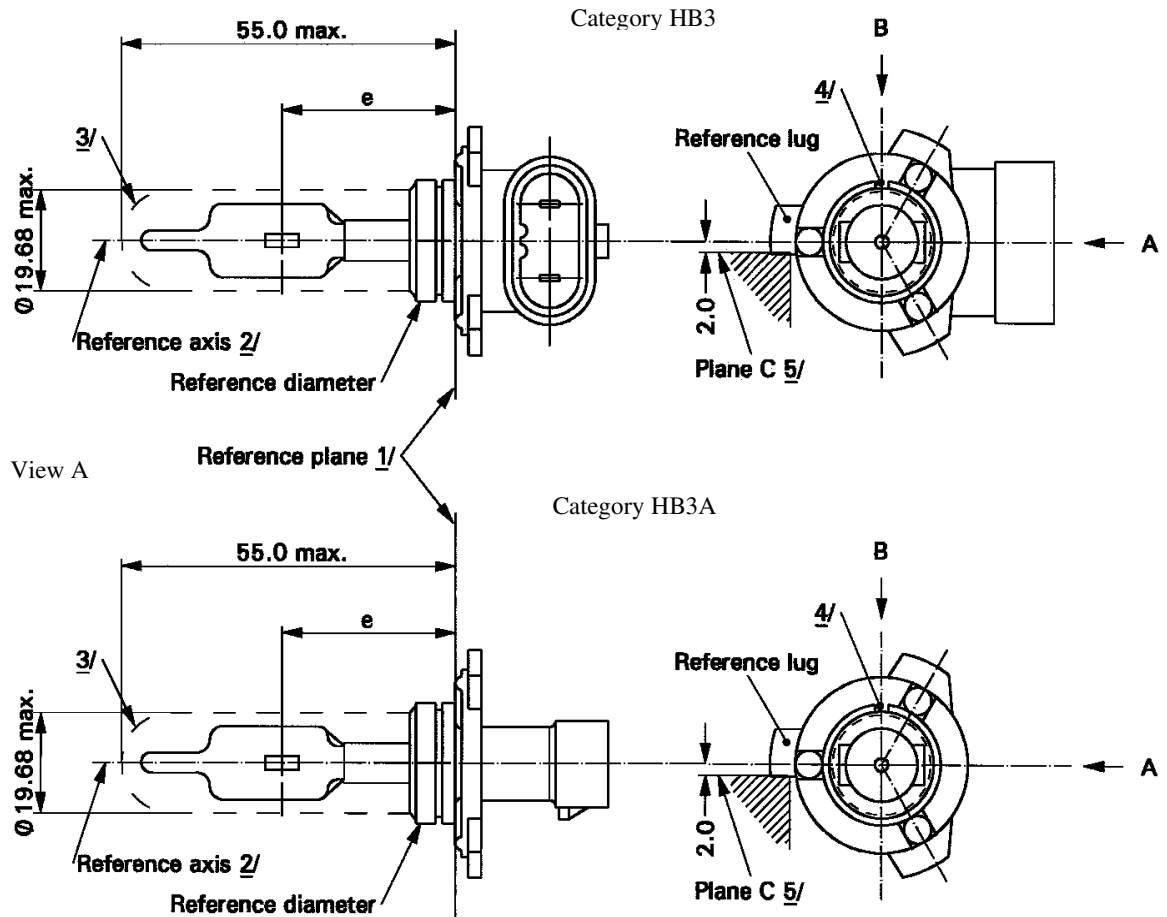
**A25.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nominal.	max.	
e	14.25	15.0	15.75	15.0 ± 0.25
Lateral deviation <u>1/</u>			0.75	0.4 max
$\beta$	82.5°	90°	97.5°	90° ± 5°
$\gamma_1, \gamma_2$ <u>2/</u>	30°			30° min.
Cap	BAX 9s			

Notes:

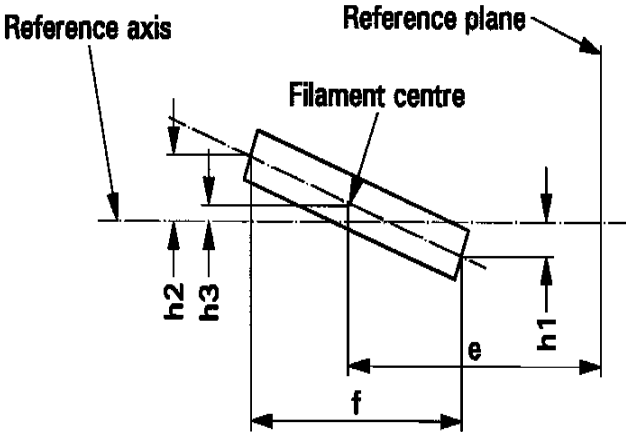
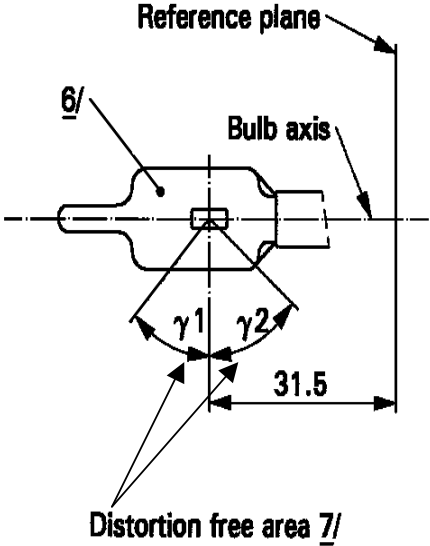
- 1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.
- 2/ In the area between the outer legs of the angles  $\gamma_1$  and  $\gamma_2$ , the bulb shall have no optically distorting areas and the curvature of the bulb shall have a radius not less than 50 % of the actual bulb diameter.
- 3/ Over the entire length of the cap there shall be no projections of soldering exceeding the permissible maximum diameter of the cap.

Annex-A27 (See para 4)  
Requirements of HB3, HB3A Category Lamps  
Figure A27.1



- Notes:**
- 1/ The reference plane is the plane defined by the meeting points of cap-holder fit.
  - 2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.
  - 3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the lamp key.
  - 4/ The keyway is mandatory.
  - 5/ The filament lamp shall be rotated in the measuring holder until the reference lug contacts plane C of the holder

Figure A27.2



**Filament position and dimensions**

- Notes:**
- 6/ The bulb shall be colourless or selective yellow.
  - 7/ Glass bulb periphery shall be optically distortion-free axially within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .

**A27.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12HB3, 12HB3A	
Rated Volt		12	12
Rated Watt		60	60
Test Volt		13.2	13.2
Objective values	Watt	73 max.	73 max.
	Lumen	1860 ± 12 %	-
Reference luminous flux: 1300 lm at approximately 12 V			

**A27.2 Dimensional requirements**

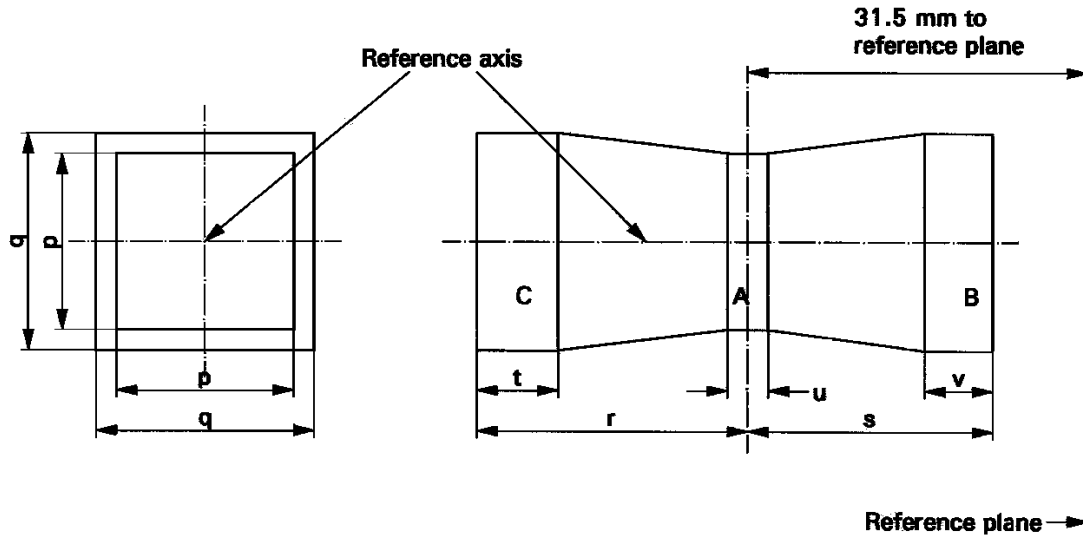
Dimensions in mm <u>12/</u>		Tolerances	
		Filament lamps of normal production	Standard filament lamp
e <u>9/ 11/</u>	31.5	<u>10/</u>	± 0.16
f <u>9/ 11/</u>	5.1	<u>10/</u>	± 0.16
h1, h2	0	<u>10/</u>	± 0.15 <u>8/</u>
h3	0	<u>10/</u>	± 0.08 <u>8/</u>
γ1	45° min.	-	-
γ2	52° min.	-	-
Cap	Cap P20 d <u>13/</u>		

**Notes**

- 8/ The eccentricity is measured only in viewing directions \*/ A and B as shown in the Figure A27.1. 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 **A27.1**.
- 10/ To be checked by means of a "Box-System"; (**A27.3**). \*/
- 11/ 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.
- 12/ Dimensions shall be checked with O-ring removed.
- 13/ Filament lamp HB3 shall be equipped with the right-angle cap and filament lamp 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 positions.

**A27.3 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 lamp 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 in Figure A27.1.

The filament shall lie entirely within the limits shown.

The beginning of the filament as defined in, note 11/, shall lie in volume "B" and the end of the filament in volume "C".

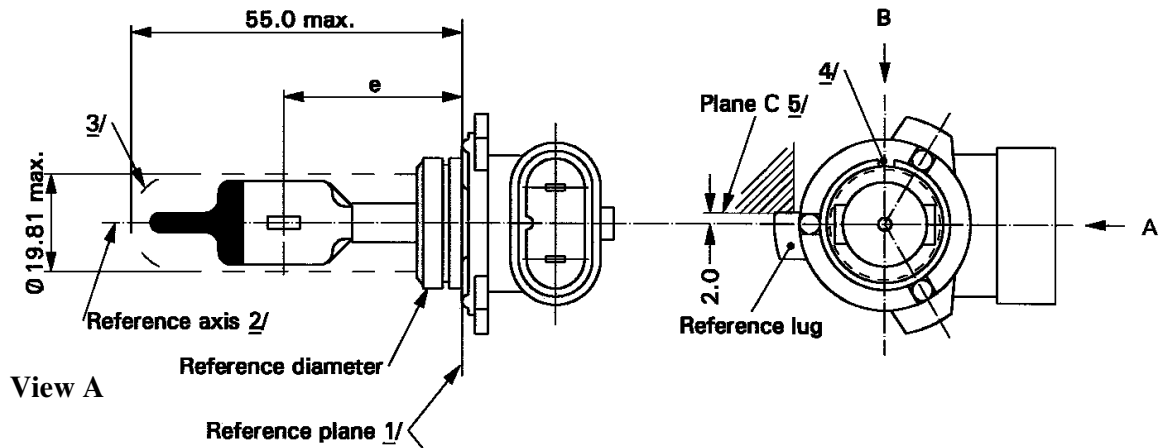
Volume "A" does not involve any filament centre requirement.



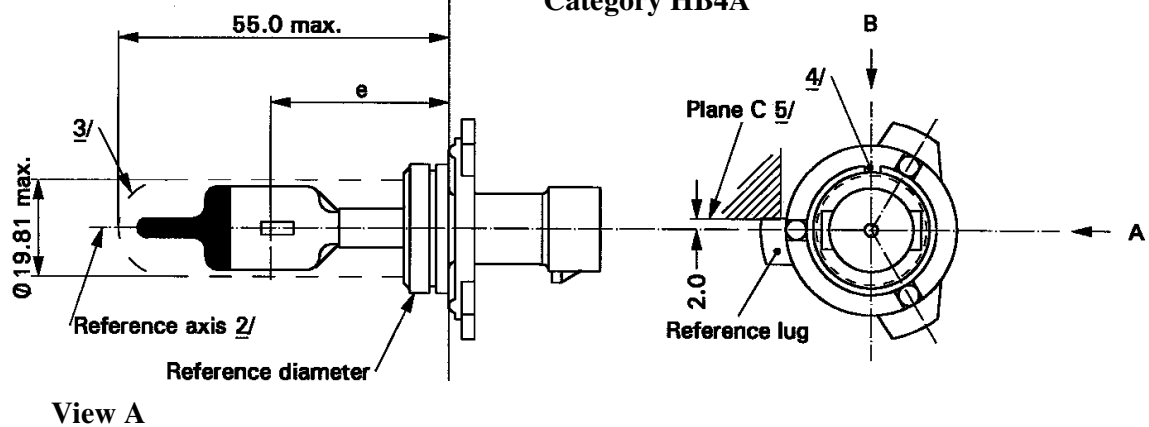
Annex-A28 (See para 4)  
Requirements of HB4, HB4A Category Lamps

Figure A28.1

Category HB4

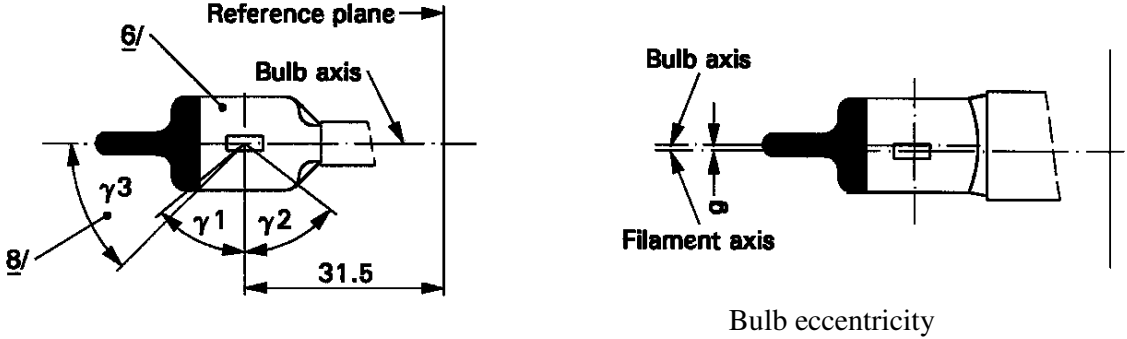


Category HB4A

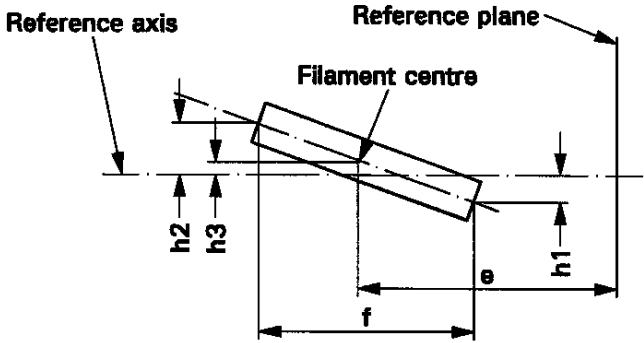


- Notes:
- 1/ The reference plane is the plane defined by the meeting points of cap-holder fit
  - 2/ The reference axis is perpendicular to the reference plane and concentric with the reference diameter of the cap.
  - 3/ Glass bulb and supports shall not exceed the envelope and shall not interfere with insertion past the lamp key. The envelope is concentric to the reference axis
  - 4/ The keyway is mandatory.
  - 5/ The filament shall be rotated in the measuring holder until the reference lug contacts plane C of the holder.

Figure A28.2



Distortion free area 7/ and black top 8/



**Notes:**

- 6/ The bulb shall be colourless or selective yellow.
- 7/ Glass bulb periphery shall be optically distortion-free axially within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 8/ The obscuration shall extend to at least angle  $\gamma_3$  and shall be at least as far as the undistorted part of the bulb defined by angle  $\gamma_1$ .

**A28.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12HB4, 12HB4A	
Rated Volt		12	12
Rated Watt		51	51
Test Volt		13.2	13.2
Objective values	Watt	62 max.	62 max.
	Lumen	1095 ± 15 %	-
Reference luminous flux: 825 lm at approximately 12 V			

**A28.2 Dimensional requirements**

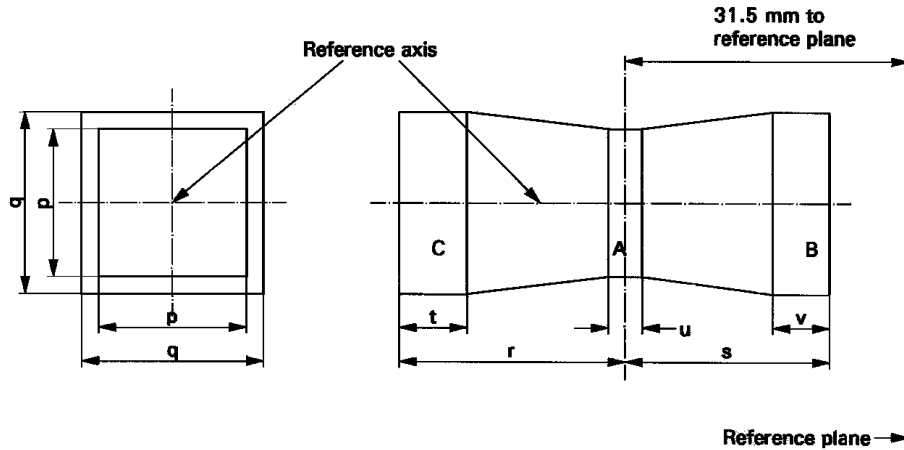
Dimensions in mm	<b>13/</b>	<b>Tolerances</b>	
	Nominal	Filament lamps of normal production	Standard filament lamp
e	<u>10/</u> <u>12/</u>	31.5	<u>11/</u> ± 0.16
f	<u>10/</u> <u>12/</u>	5.1	<u>11/</u> ± 0.16
h1, h2		0	<u>11/</u> ± 0.15 <u>9/</u>
h3		0	<u>11/</u> ± 0.08 <u>9/</u>
g	<u>10/</u>	0.75	± 0.5 ± 0.3
γ1		50° min.	- -
γ2		52° min.	- -
γ3		45°	± 5° ± 5°
Cap			P22d <u>14/</u>

**Notes**

- 9/ The eccentricity is measured only in viewing directions \*/ A and B as shown in the Figure A28.1. 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 A28.1.
- 11/ To be checked by means of a "Box-System"; A28.3 \*/
- 12/ The ends of the filament are defined as the points where, when the viewing direction \*/ as defined in note 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 lamp HB4 shall be equipped with the right-angle cap and filament lamp 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 positions.

**A28.3 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 lamp 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 in Figure A28.1.

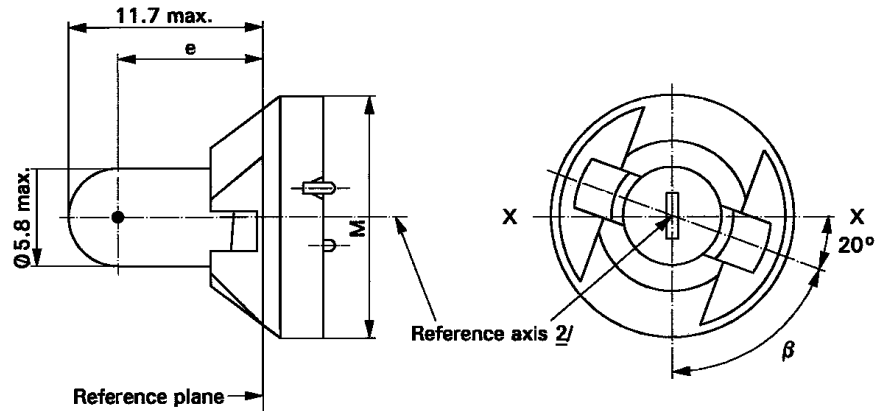
The filament shall lie entirely within the limits shown.

The beginning of the filament as defined on 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.

**Annex-A29 (See para 4)  
Requirements of T1.4W Category Lamps**

**Figure A29.1**



**A29.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12T1.4W	
Rated Volt		12	12
Rated Watt		1.4	1.4
Test Volt		13.5	13.5
Objective values	Watt	1.54 max.	1.54 max.
	Lumen	8 ± 15 %	-
Reference luminous flux: 8 lm at approximately 13.5 V			

**A29.2 Dimensional requirements**

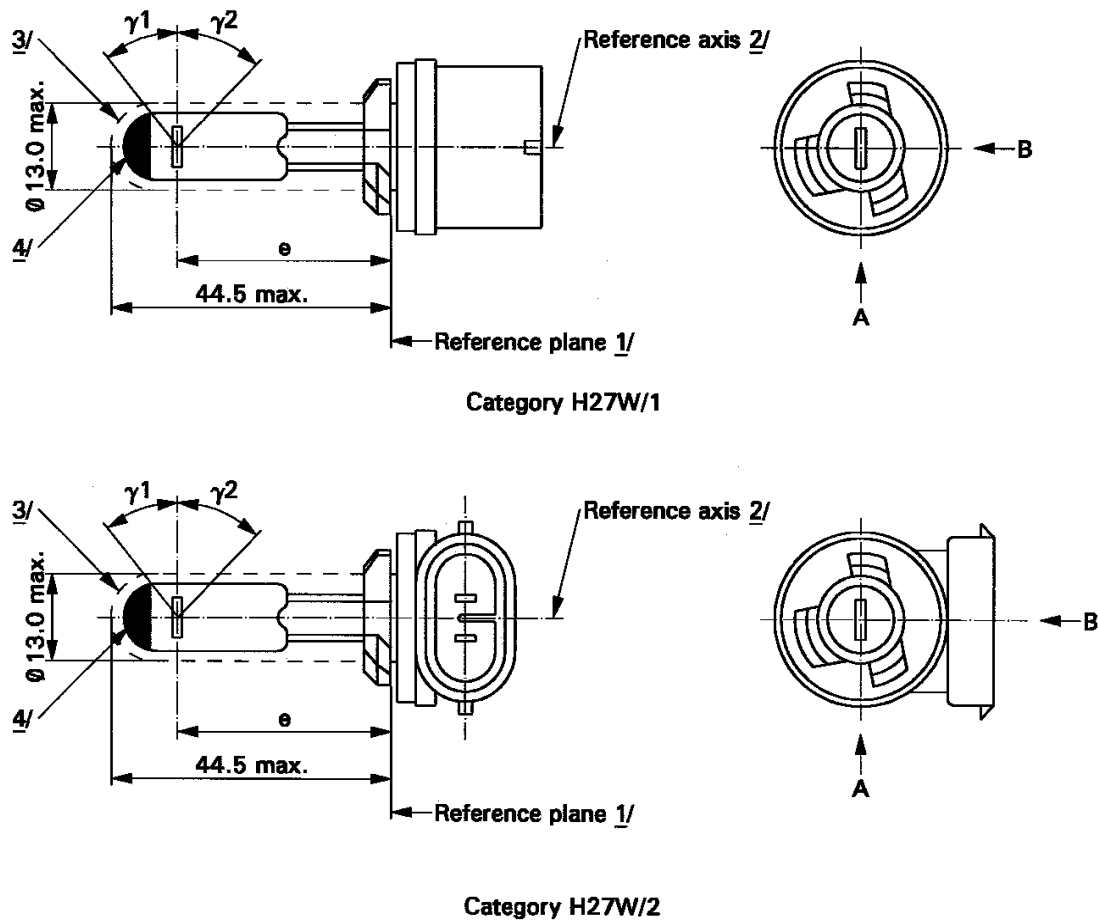
Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nominal.	max.	
e	7.6	8.3	9.0	8.3 ± 0.35
Lateral deviation 1/			0.7	0.35 max
β	55°	70°	85°	70° ± 5°
Cap	P11.5d			

Notes:

- 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".

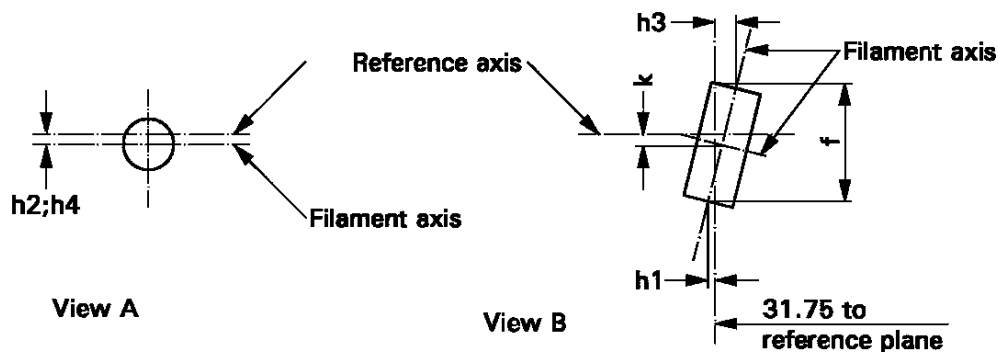
Annex-A30 (See para 4)  
Requirements of H27W/1 & H27W/2 Category Lamps

Figure A30.1

**Notes:**

- 1/ The reference plane is defined by the plane formed by the underside of the bevelled lead-in flange of the cap.
- 2/ The reference axis is perpendicular to the reference plane and passes through the centre of the 13.10 mm cap diameter.
- 3/ Glass bulb and supports shall not exceed the size of a theoretical cylinder centred on the reference axis.
- 4/ The obscuration shall extend over the whole bulb top including the bulb cylindrical portion up to the intersection with  $\gamma_1$ .

Figure A30.2 Filament dimensions and position

**A30.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12 H27W/1, 12 H27W/2	
Rated Volt		12	12
Rated Watt		27	27
Test Volt		13.5	13.5
Objective values	Watt	31 max.	31 max.
	Lumen	477 ± 15 %	-
Reference luminous flux: 477 lm at approximately 13.5 V			

**A30.2 Dimensional requirements**

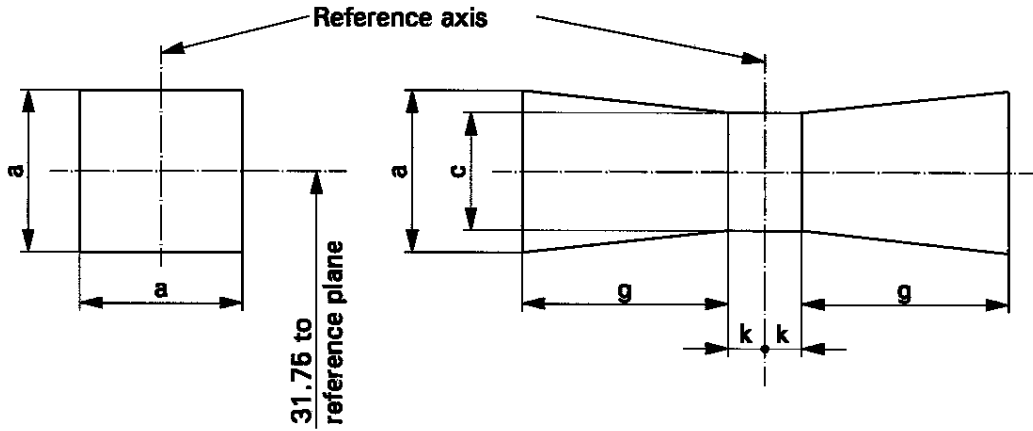
Dimensions in mm	Tolerances	
	Filament lamps of normal production	Standard filament lamp
e	31.75 <u>6/</u>	31.75 ± 0.25
f <u>8/</u>	4.8 max.	4.2 ± 0.20
K <u>9/</u>	0 <u>6/</u>	0.0 ± 0.25
h1, h2, h3, h4 <u>7/</u>	0 <u>6/</u>	0.0 ± 0.25
γ1 <u>5/</u>	38° nom.	38° nom.
γ2 <u>5/</u>	44° nom.	44° nom.
Cap	H27W/1: PG13 and H27W/2: PGJ 13	

**Notes**

- 5/ Glass bulb shall be optically distortion free within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 6/ To be checked by means of a "box system", **A30.3**
- 7/ For standard filament lamps, 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.

**A30.3 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 lamp complies with the requirements.



Reference	a	C	k	G
Dimensions	d + 1.2	d + 1.0	0.5	2.4

d = actual diameter of filament

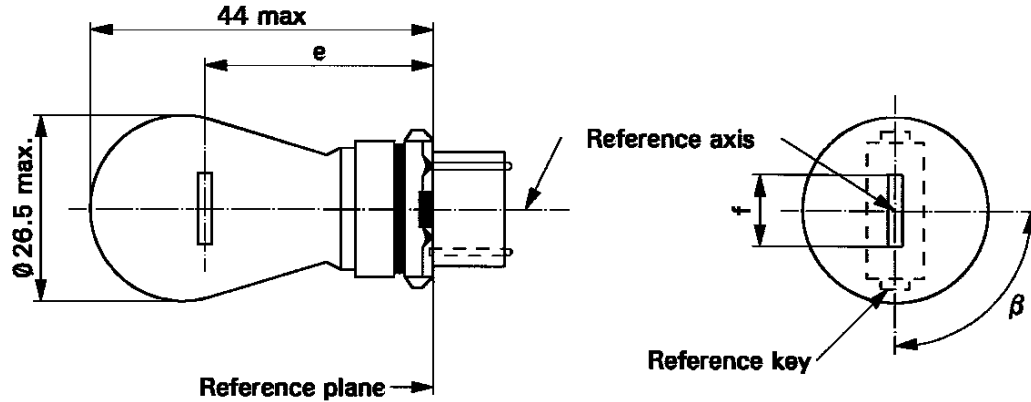
The filament shall lie entirely within the limits shown.

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



**Annex-A31 (See para 4)  
Requirements of P27W Category Lamps**

**Figure A31.1**



**A31.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12P27W	
Rated Volt		12	12
Rated Watt		27	27
Test Volt		13.5	13.5
Objective values	Watt	32.1 max.	32.1 max.
	Lumen	475 $\pm$ 15 %	-
Reference luminous flux: 475 lm at approximately 13.5 V			

**A31.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	Nominal.	max.	
e		27.9 <u>3/</u>		27.9 $\pm$ 0.3
f			9.9	9.9 + 0/ - 2
Lateral deviation <u>2/</u>			<u>3/</u>	0.0 $\pm$ 0.4
$\beta$	75° <u>3/</u>	90°	105° <u>3/</u>	90° $\pm$ 5°
Cap	W2.5x16d			

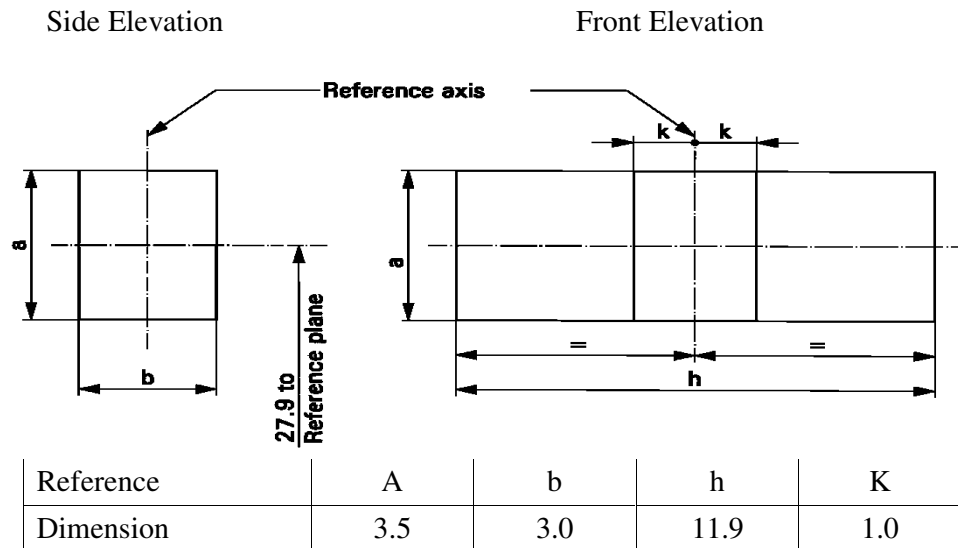
Notes:

- 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", as per **A31.3**.

**A31.3 Screen projection requirements**

**A31.3.1** 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 lamp complies with the requirements.

**Figure A31.2**



**A31.3.2** Test procedures and requirements.

**A31.3.2.1** The filament lamp 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.

**A31.3.2.2 Side elevation**

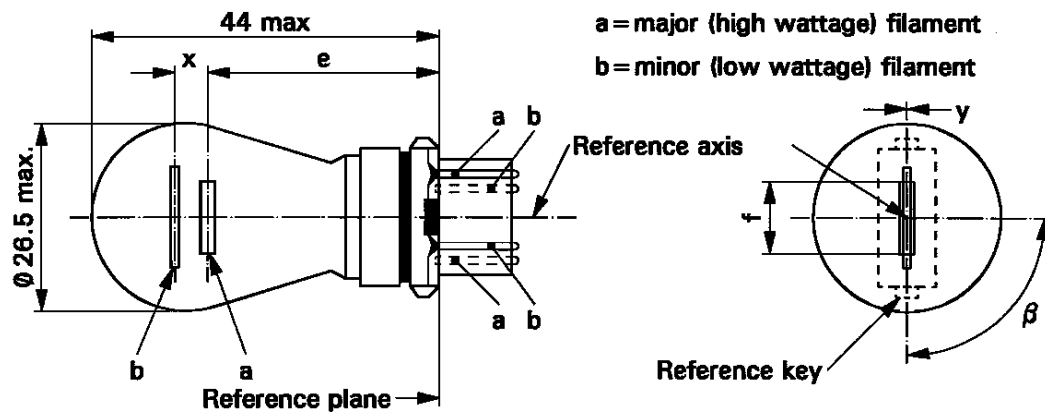
The filament lamp placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

**A31.3.2.3 Front elevation**

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

- a) 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.
- b) The centre of the filament shall not be offset by more than distance "k" from the reference axis.

**Annex-A32 (See para 4)**  
**Requirements of P27/7W Category Lamps**  
**Figure A32.1**



**A32.1 Electrical and photometric requirements:**

Parameter	Production Lamps		Standard Lamp		
Ref. No.	12P27/7W				
Rated Volt	12				
Rated Watt	27	7	27	7	
Test Volt	13.5				
Objective values	Watt	32.1 max.	8.5 max.	32.1 max.	8.5 max.
	Lumen	475 ± 15 %	36 ± 15 %	-	
Reference luminous flux: 475 and 36 lm at approximately 13.5 V					

**A32.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nominal.	max.	
e		27.9 <u>3/</u>		27.9 ± 0.3
f			9.9	9.9 + 0/ - 2
Lateral deviation <u>2/</u>			<u>3/</u>	0.0 ± 0.4
x <u>4/</u>		5.1 <u>3/</u>		5.1 ± 0.5
y <u>4/</u>		0.0 <u>3/</u>		0.0 ± 0.5
β	75° <u>3/</u>	90°	105° <u>3/</u>	90° ± 5°
Cap	W2.5x16q			

Notes:

- 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", A32.3.
- 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.

### **A32.3 Screen projection requirements**

**A32.3.1** 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 lamp complies with the requirements.

### **A32.3.2 Test procedures and requirements.**

**A32.3.2.1** The filament lamp 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.

#### **A32.3.2.2 Side elevation**

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

- a) 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;
- b) 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.

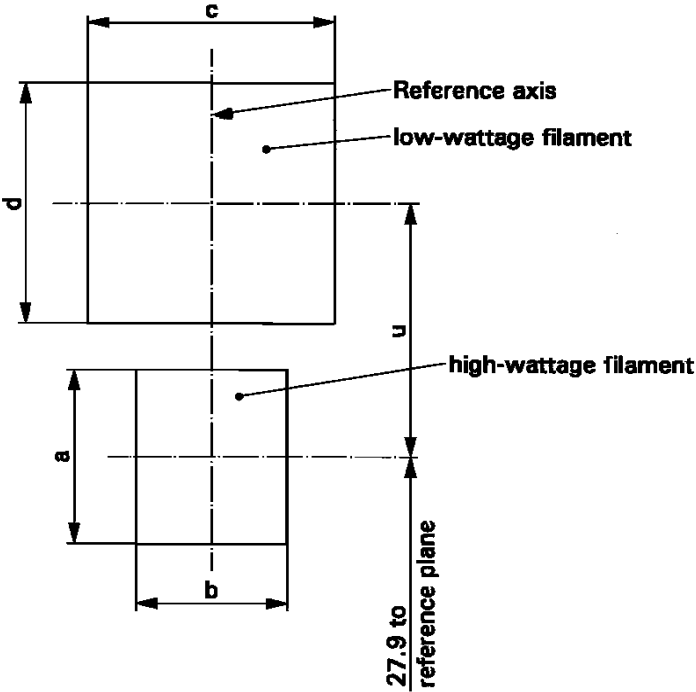
#### **A32.3.2.3 Front elevation**

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

- a) 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;
- b) the centre of the major filament shall not be offset by more than distance "k" from the reference axis;
- c) the centre of the minor filament axis shall not be offset from the reference axis by more than  $\pm 2$  mm ( $\pm 0.4$  mm for standard filament lamps).

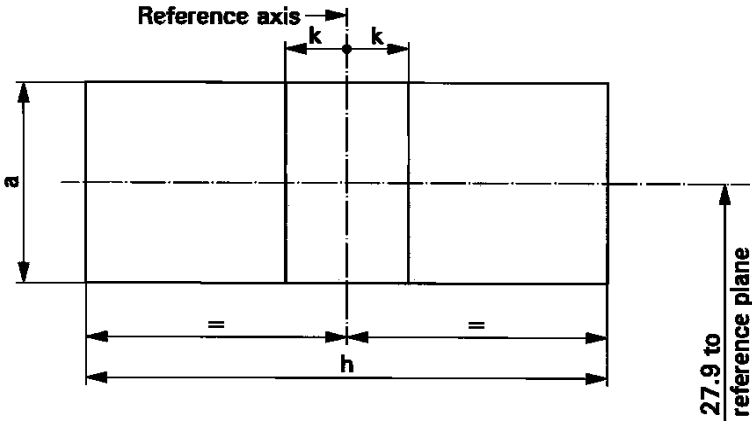
Figure A32.2

Side elevation



Reference	a	b	c	d	u
Dimensions	3.5	3.0	4.8		5.1

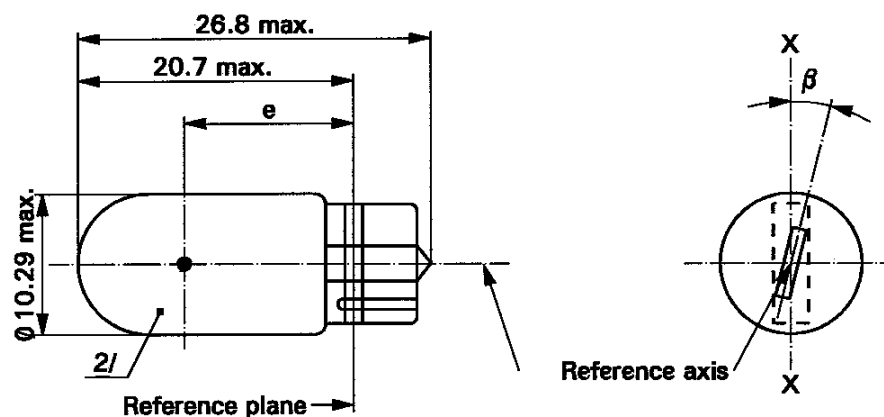
Front elevation



Reference	a	h	k
Dimensions	3.5	11.9	1.0

**Annex-A33 (See para 4)  
Requirements of WY5W Category Lamps**

Figure A33.1

**A33.1 Electrical and photometric requirements:**

Parameter	Production Lamps			Standard Lamp
	6WY5W	12WY5W	24WY5W	
Ref. No.	6WY5W	12WY5W	24WY5W	
Rated Volt	6	12	24	12
Rated Watt	5			5
Test Volt	6.75	13.5	28.0	13.5
Objective values	Watt	5.5 max.		5.5 max.
	Lumen	30 ± 20 %		-
Reference luminous flux at approximately 13.5 V:	Clear bulb: 50 lm			
	Amber bulb: 30 lm			

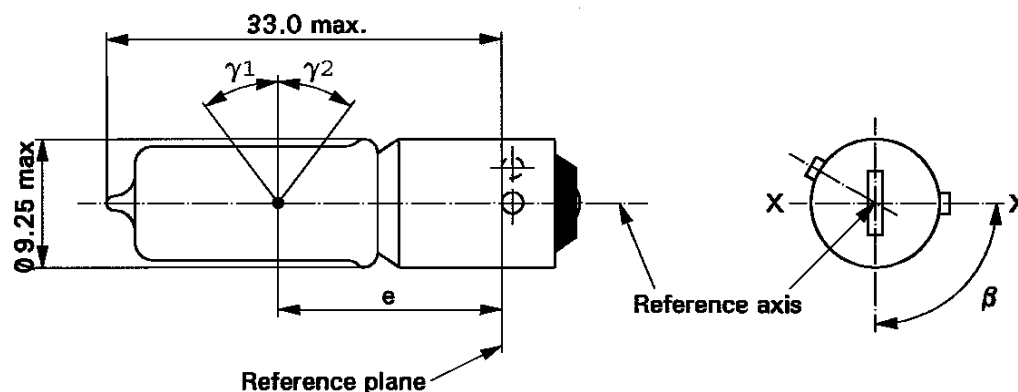
**A33.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp <sup>3/</sup>
	min.	nominal.	max.	
e	11.2	12.7	14.2	12.7 ± 0.3
Lateral deviation <sup>1/</sup>			1.5	0.5 max
β	- 15°	0°	+ 15°	0° ± 5°
Cap	W2.1x9.5d			

**Notes:**

- <sup>1/</sup> Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.
- <sup>2/</sup> The bulb of production filament lamps shall be amber. (See also note <sup>3/</sup>).
- <sup>3/</sup> The bulb of standard filament lamps shall be amber or clear. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover the colour shall be in the lower part of the tolerance area.

**Annex-A34 (See para 4)  
Requirements of H21W Category Lamps**



**Figure A34.1**

**A34.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		12H21W	24H21W	
Rated Volt		12	24	12
Rated Watt		21	21	21
Test Volt		13.5	28.0	13.5
Objective values	Watt	26.25 max.	29.4 max.	26.25 max.
	Lumen	600 ± 12 %	600 ± 15 %	-
Reference luminous flux: 600 lm at approximately 13.5 V				

**A34.2 Dimensional requirements**

Dimensions in mm		Filament lamps of normal production			Standard filament lamp
		min.	nominal.	max.	
e			20.0 <u>1/</u>		20.0 ± 0.25
f	12 V			3.8	3.8 + 0/ - 1
	24 V			4.5	
Lateral deviation <u>2/</u>				<u>1/</u>	0.0 ± 0.15 <u>3/</u>
β		82.5°	90°	97.5°	90° ± 5°
γ1, γ2 <u>4/</u>		45°			45° min.
Cap		BAY9s			

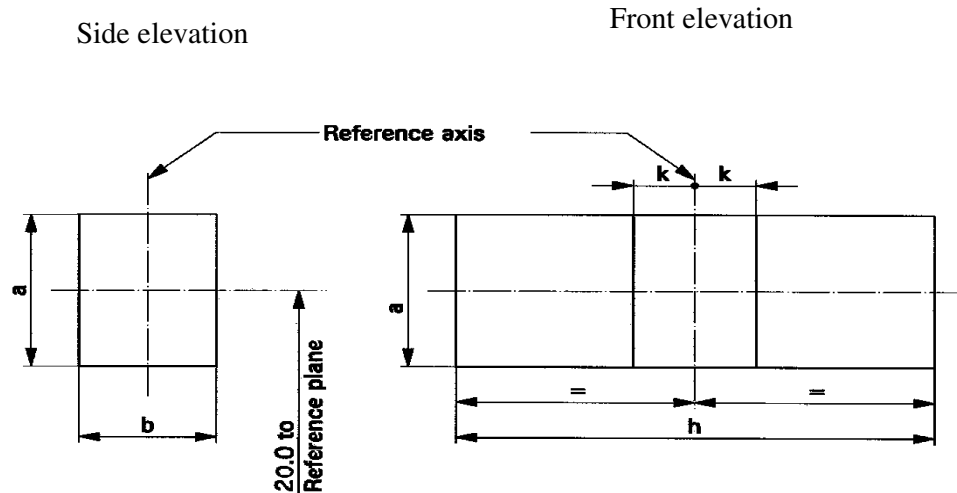
**Notes:**

- 1/ To be checked by means of a "box system", A34.3
- 2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.
- 3/ The lateral deviation with respect to the plane perpendicular to axis X-X, is measured in the position described in A34.3.2.1.
- 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% of the actual bulb diameter.

**A34.3 Screen projection requirements**

**A34.3.1** 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 lamp complies with the requirements

**Figure A34.2**



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		

**A34.3.2 Test procedures and requirements.**

**A34.3.2.1** The filament lamp 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.

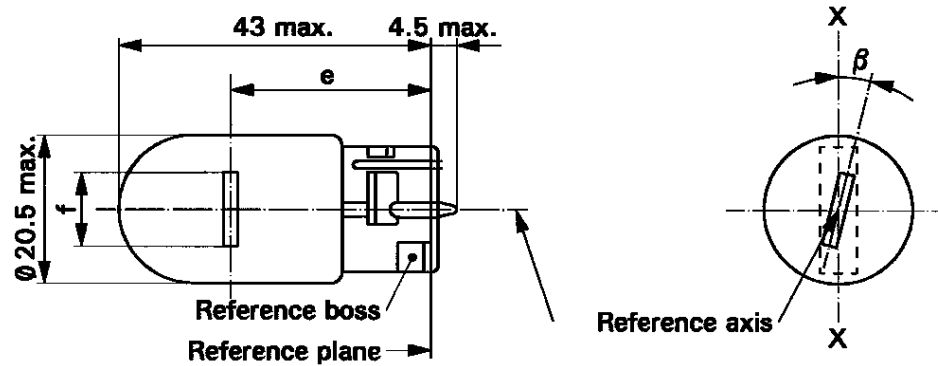
**A34.3.2.2 Side elevation:** The filament lamp placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

**A34.3.2.3 Front elevation:** The filament lamp placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to the filament axis:

- a) 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;
- b) the centre of the filament shall not be offset by more than distance "k" from the reference axis.



**Annex-A35 (See para 4)**  
**Requirements of W21W Category Lamps**



**Figure A35.1**

**A35.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12W21W	
Rated Volt		12	12
Rated Watt		21	21
Test Volt		13.5	13.5
Objective values	Watt	26.5 max.	26.5 max.
	Lumen	460 ± 15 %	-
Reference luminous flux: 460 lm at approximately 13.5 V			

**A35.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nominal.	max.	
e		29.0 <u>2/</u>		29.0 ± 0.3
f			7.5	7.5 + 0/ - 2
Lateral deviation <u>1/</u>			<u>2/</u>	0.5 max.
β	-15°	0°	+15°	0° ± 5°
Cap	W3x16d			

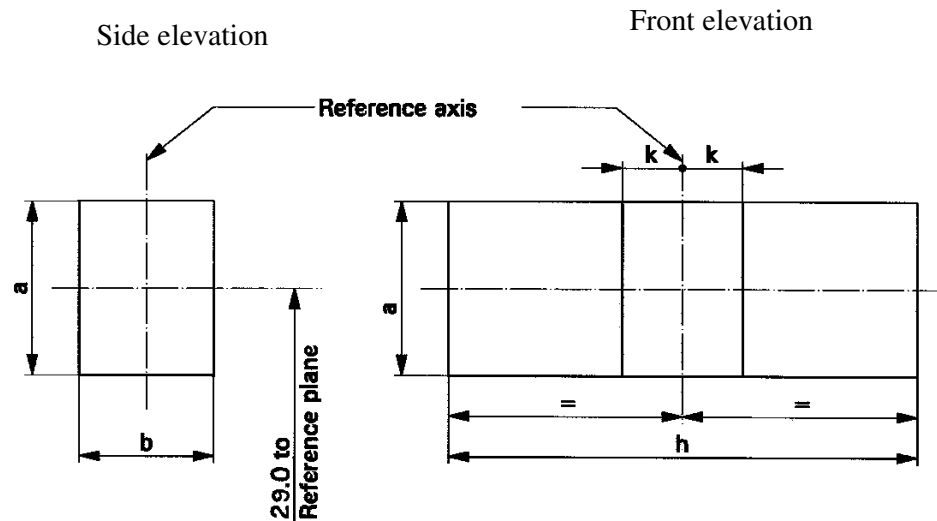
Notes:

- 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 A35.3.

### A35.3 Screen projection requirements

**A35.3.1** 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 lamp complies with the requirements.

**Figure A35.2**



Reference	a	b	h	K
Dimension	3.5	3.0	9.5	1.0

### A35.3.2 Test procedures and requirements.

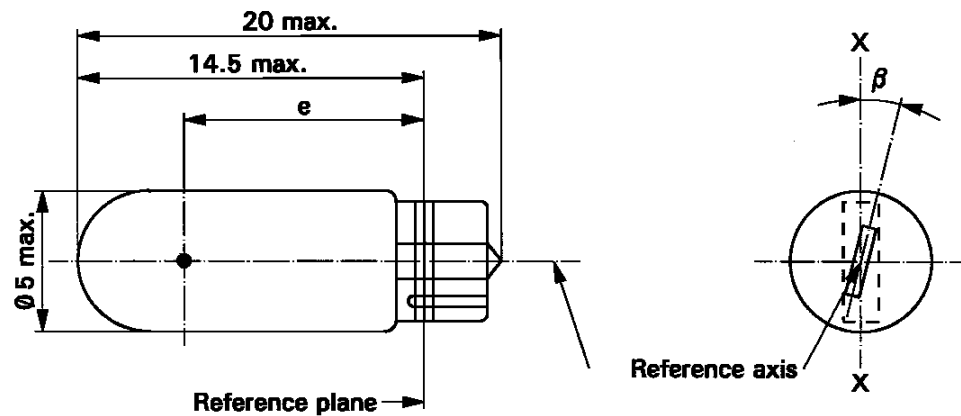
**A35.3.2.1** The filament lamp is placed in a holder capable of being rotated about its axis and having either a calibrated scale or fixed stops corresponding to the angular displacement tolerance limits, i.e.  $\pm 15^\circ$ . The holder is then so rotated that an end view of the filament is seen on 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 ( $\pm 15^\circ$ ).

**A35.3.2.2 Side elevation:** The filament lamp 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.

**A35.3.2.3 Front elevation:** The filament lamp placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to the filament axis:

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

**Annex-A36 (See para 4)  
Requirements of W2.3W Category Lamps**



**Figure A36.1**

**A36.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12W2.3W	
Rated Volt		12	12
Rated Watt		2.3	2.3
Test Volt		13.5	13.5
Objective values	Watt	2.5 max.	2.5 max.
	Lumen	18.6 ± 20 %	-
Reference luminous flux: 18.6 lm at approximately 13.5 V			

**A36.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nominal.	max.	
e	10.3	10.8	11.3	10.8 ± 0.3
Lateral deviation <u>1/</u>			1.0	0.5 max
β	- 15°	0°	+ 15°	0° ± 5°
Cap	W2x4.6d			

Notes:

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

**Annex-A37 (See para 4)  
Requirements of H8 &H8A Category Lamps**

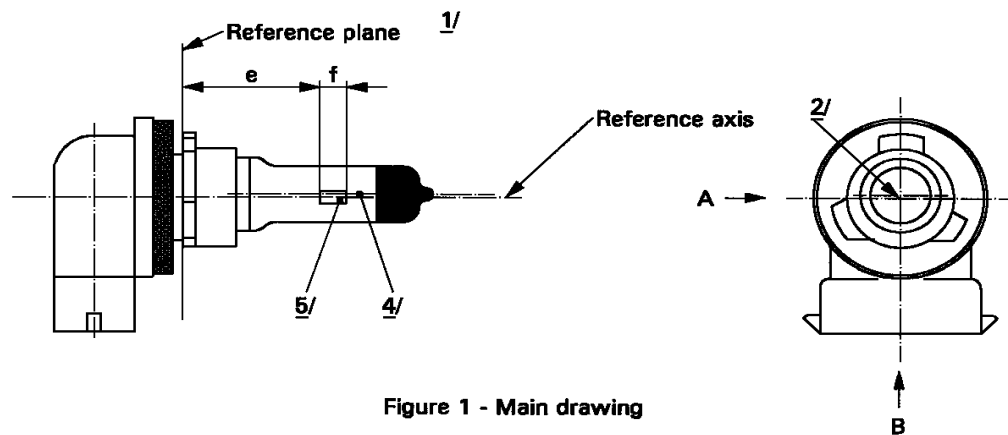


Figure 1 - Main drawing

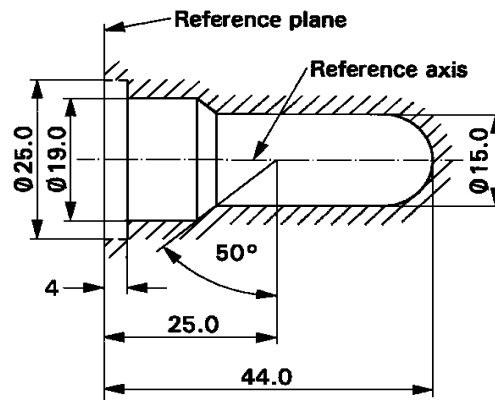


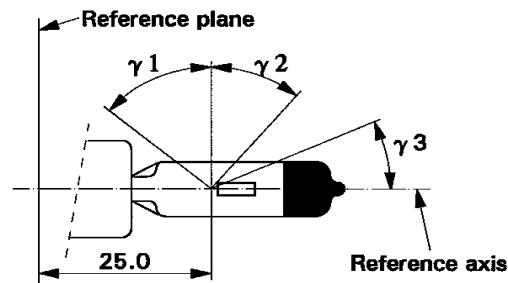
Figure 2 - Maximum lamp outline <sup>3/</sup>

**Figure A37.1**

**Notes:**

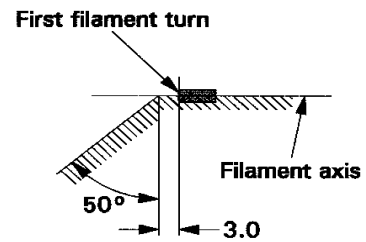
- 1/ The reference plane is the plane formed by the underside of the bevelled lead-in flange of the cap.
- 2/ The reference axis is perpendicular to the reference plane and passes through the centre of the 19 mm cap diameter.
- 3/ Glass bulb and supports shall not exceed the envelope as indicated in figure 2 of figure A37.1. The envelope is concentric to the reference axis.
- 4/ The bulb shall be colourless or selective yellow.
- 5/ Notes concerning the filament diameter.
  - No actual diameter restrictions apply.
  - For the same manufacturer, the design diameter of standard (étalon) filament lamp and filament lamp of normal production shall be the same.

Figure A37.2



View B

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



View A

Figure 4  
Metal free zone 8/

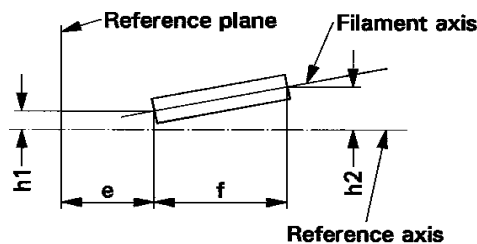


Figure 5  
Permissible offset of filament axis 9/  
(for standard filament lamps only)

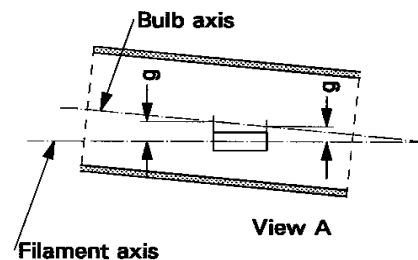


Figure 6  
Bulb eccentricity 10/

**Notes:**

- 6/ Glass bulb shall be optically distortion free within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 7/ The obscuration shall extend at least to angle  $\gamma_3$  and shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference.
- 8/ The internal design of the lamp 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 of Figure A37.1). No metal parts other than filament turns shall be located in the shaded area as seen in figure 4 of Fig A37.2.
- 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 of Figure A37.1. 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.

**A37.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12H8, 12H8A	
Rated Volt		12	12
Rated Watt		35	35
Test Volt		13.2	13.2
Objective values	Watt	43 max.	43 max.
	Lumen	800 ± 15 %	-
Reference luminous flux: 600 lm at approximately 12 V			

**A37.2 Dimensional requirements**

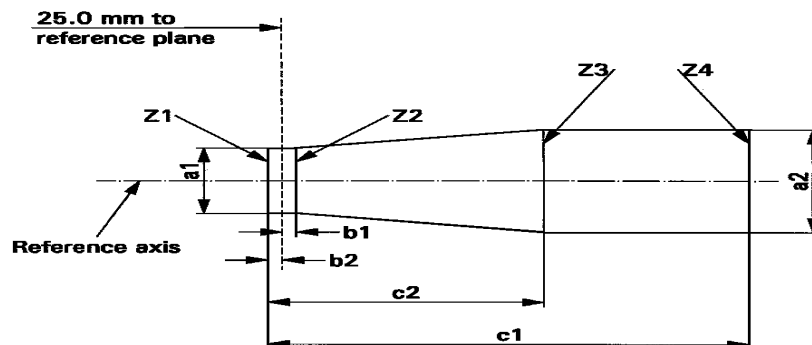
Dimensions in mm		Filament lamps of normal production	Standard filament lamp
e	<u>11/</u>	25.0 <u>12/</u>	25.0 ± 0.1
f	<u>11/</u>	3.7 <u>12/</u>	3.7 ± 0.1
g		0.5 minimum	
h1		0 <u>12/</u>	0 ± 0.1
h2		0 <u>12/</u>	0 ± 0.15
γ1		50° minimum	50° minimum
γ2		40° minimum	40° minimum
γ3		30° minimum	30° minimum
Cap	12H8,	PGJ19-1	
	12H8A	PGJX19-1	

**Notes:**

- 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 Figure A37.1, the projection of the outside of the end turns crosses the filament axis.
- 12/ To be checked by means of a "Box System", A37.3.

**A37.3 Screen projection requirements**

- A37.3.1** 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 lamp complies with the requirements.

**Figure A37.2**

**AIS-034**

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

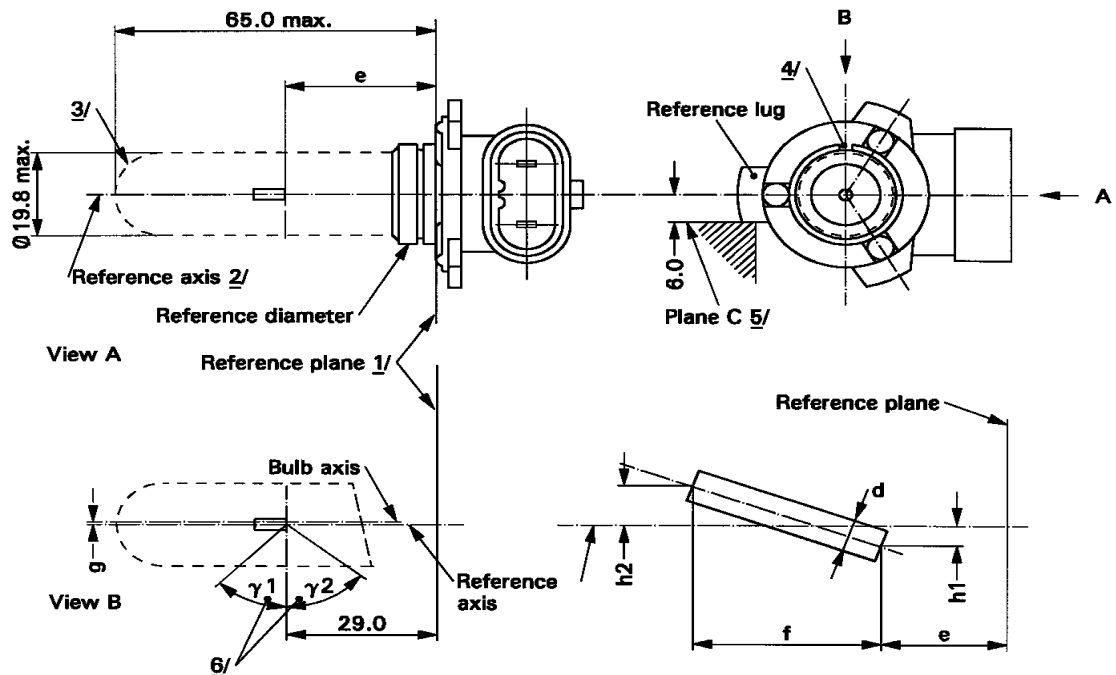
d = diameter of filament

The filament position is checked solely in directions A and B as shown in figure 1 of **Figure A37.1**.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined in note 11/, shall lie between lines Z1 and Z2 and between Z3 and Z4

**Annex-A38 (See para 4)  
Requirements of HIR1 Category Lamps**



**Figure A38.1**

**Notes:**

- 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  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .

**A38.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12 HIR1	
Rated Volt		12	12
Rated Watt		65	65
Test Volt		13.2	13.2
Objective values	Watt	73 max.	73 max.
	Lumen	2500 $\pm$ 15 %	-
Reference luminous flux: 1840 lm at approximately 12 V			



**A38.2 Dimensional requirements**

Dimensions in mm <u>11/</u>		Tolerances	
		Filament lamps of normal production	Standard filament lamp
e <u>8/</u> <u>10/</u>	29	<u>9/</u>	± 0.16
f <u>8/</u> <u>10/</u>	5.1	<u>9/</u>	± 0.16
g <u>8/</u>	0	+ 0.7/ - 0.0	+ 0.4/ - 0.0
h1, h2	0	<u>9/</u>	± 0.15 <u>7/</u>
d	1.6 max.		
γ1	50° min.	-	-
γ2	50° min.	-	-
Cap		PX20 d	

**Notes:**

7/ The eccentricity is measured only in viewing directions A and B as shown in the Figure A38.1. 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 in Figure A38.1

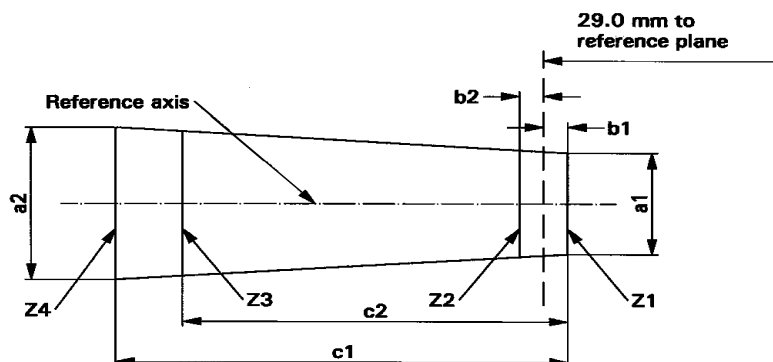
9/ To be checked by means of a "Box-System"; as per A38.3

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.

**A38.3 Screen projection requirements**

**A38.3.1** 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 lamp complies with the requirements.



**Figure A38.2**

**AIS-034**

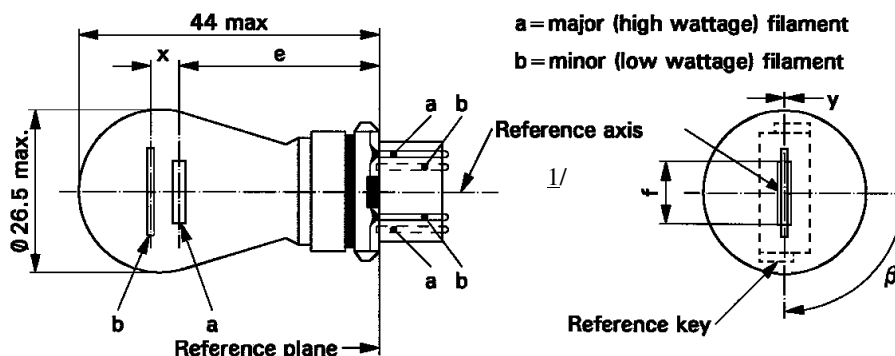
	a1	a2	B1	b2	c1	c2
12 V	$d + 0.4$	$d + 0.8$	0.35	0.35	6.1	5.2

$d$  = diameter of filament

The filament position is checked solely in directions A and B as shown in Figure A38.1.

The ends of the filament as defined in note 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

**Annex-A39 (See para 4)  
Requirements of PY27/7W Category Lamps**



**Figure A39.1**

**A39.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp	
Ref. No.		12PY27/7W			
Rated Volt		12		12	
Rated Watt		27	7	27	7
Test Volt		13.5		13.5	
Objective values	Watt	32.1 max.	8.5 max.	32.1 max.	8.5 max.
	Lumen	280 ± 15 %	21 ± 15 %	-	
Reference luminous flux at approximately 13.5 V:		clear bulb: 475 and 36 lm amber bulb: 280 and 21 lm			

**A39.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nominal.	max.	
e		27.9 <u>3/</u>		27.9 ± 0.3
f			9.9	9.9 + 0/ - 2
Lateral deviation <u>2/</u>			<u>3/</u>	0.0 ± 0.4
x <u>4/</u>		5.1 <u>3/</u>		5.1 ± 0.5
y <u>4/</u>		0.0 <u>3/</u>		0.0 ± 0.5
β	75° <u>3/</u>	90°	105° <u>3/</u>	90° ± 5°
Cap	WX2.5x16q			

**Notes:**

- 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, A39.3

- 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 bulb of production lamps shall be amber. (See also note 6/)
- 6/ The bulb of standard filament lamps shall be amber or clear. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

### **A39.3 Screen projection requirements**

**A39.3.1** 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 lamp complies with the requirements.

### **A39.3.2 Test procedures and requirements.**

**A39.3.2.1** The filament lamp 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.

**A39.3.2.2 Side elevation:** The filament lamp placed with the cap down, the reference axis vertical, the reference key to the right and the major filament seen end-on:

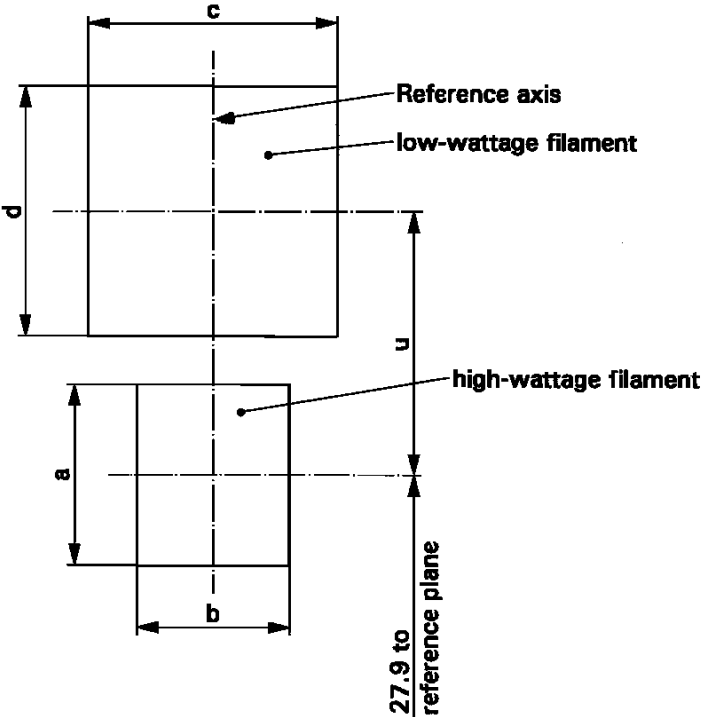
- a) the projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;
- b) the projection of the minor filament shall lie entirely within a rectangle of width "c" and height "d" having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

**A39.3.2.3 Front elevation:** The filament lamp being placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to axis of the major filament:

- a) 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;
- b) the centre of the major filament shall not be offset by more than distance "k" from the reference axis.
- c) the centre of the minor filament axis shall not be offset from the reference axis by more than  $\pm 2$  mm ( $\pm 0.4$  mm for standard filament lamps).

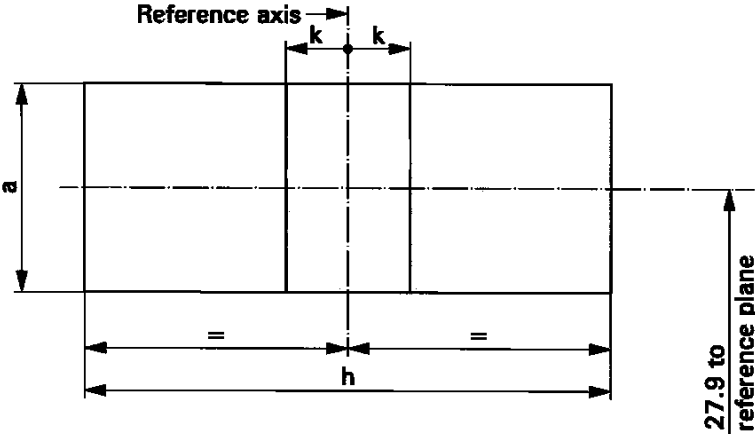
Figure A39.2

Side elevation



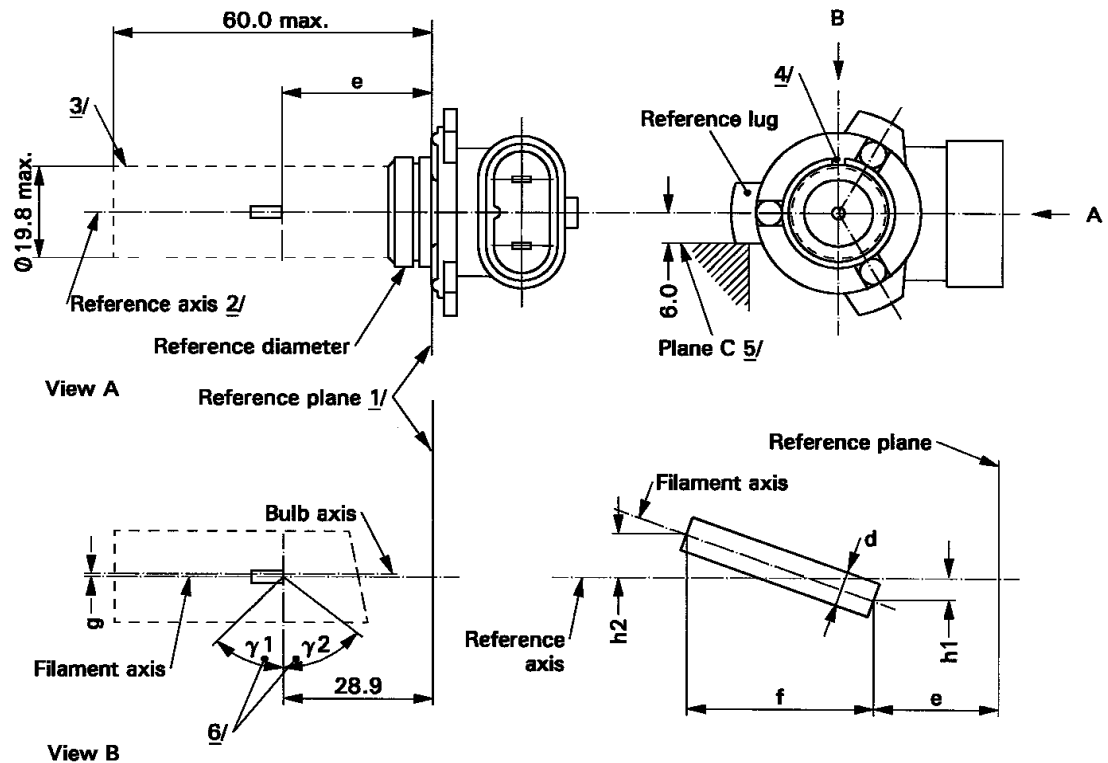
Reference	a	b	c	d	u
Dimensions	3.5	3.0	4.8		5.1

Front elevation



Reference	a	h	k
Dimensions	3.5	11.9	1.0

**Annex-A40 (See para 4)**  
**Requirements of HIR2 Category Lamps**  
**Figure A40.1**

**Notes:**

- 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 lamp 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  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .

**A40.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12 HIR2	
Rated Volt		12	12
Rated Watt		55	55
Test Volt		13.2	13.2
Objective values	Watt	63 max.	63 max.
	Lumen	1875 ± 15 %	-
Reference luminous flux: 1355 lm at approximately 12 V			

**A40.2 Dimensional requirements**

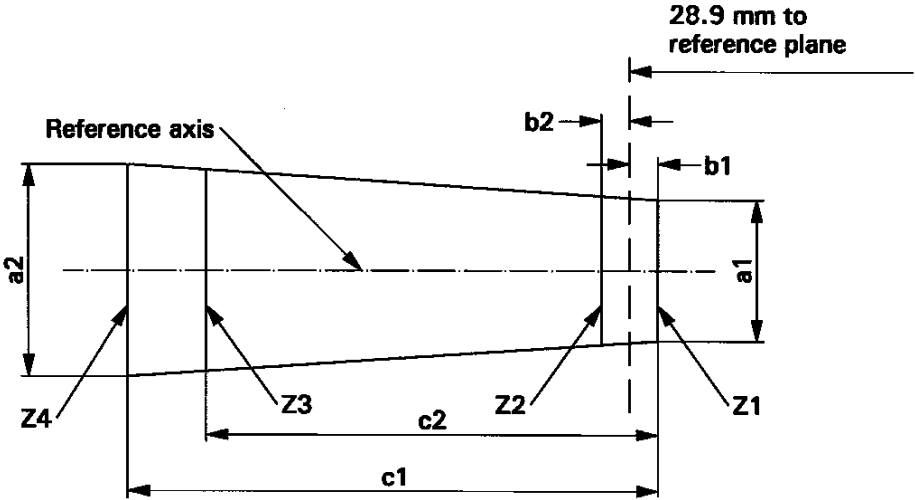
Dimensions in mm <u>11/</u>		Tolerances	
		Filament lamps of normal production	Standard filament lamp
e <u>8/</u> <u>10/</u>	28.9	<u>9/</u>	± 0.16
f <u>8/</u> <u>10/</u>	5.3	<u>9/</u>	± 0.16
g <u>8/</u>	0	+ 0.7 / - 0.0	+ 0.4 / - 0.0
h1, h2	0	<u>9/</u>	± 0.15 <u>7/</u>
d	1.6 max.	-	-
γ1	50° min.	-	-
γ2	50° min.	-	-
Cap	PX22d		

**Notes:**

- 7/ The eccentricity is measured only in viewing directions A and B as shown in Figure A40.1. 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 Figure A40.1.
- 9/ To be checked by means of a "Box-System"; A40.3
- 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 removed.

**A40.3 Screen projection requirements**

**A40.3.1** 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 lamp complies with the requirements.



**Figure A40.2**

	a1	a2	B1	b2	c1	c2
12 V	d + 0.4	d + 0.8	0.35	0.35	6.6	5.7

d = diameter of filament

The filament position is checked solely in directions A and B as shown in Figure A40.1.

The ends of the filament as defined in note 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.



Annex-A41 (See para 4)  
Requirements of H9, H9A Category Lamps

Figure A41.1

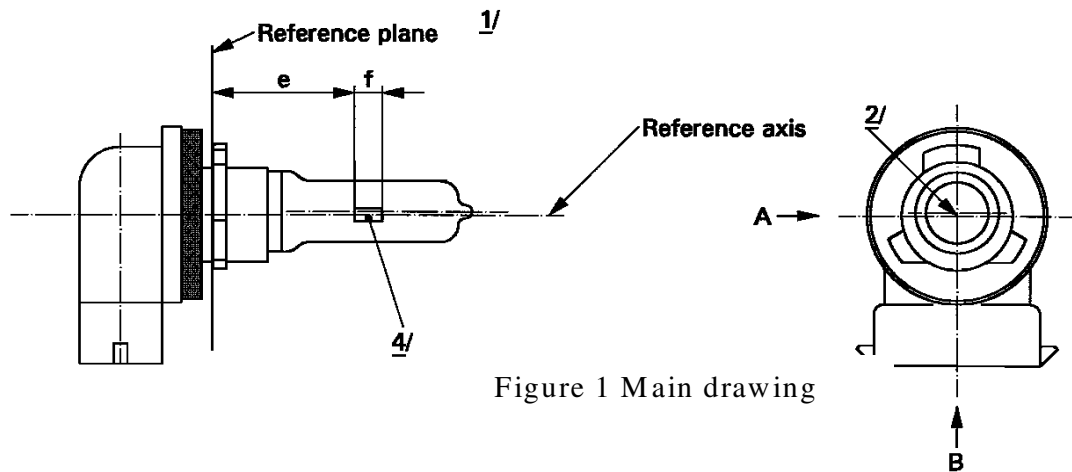
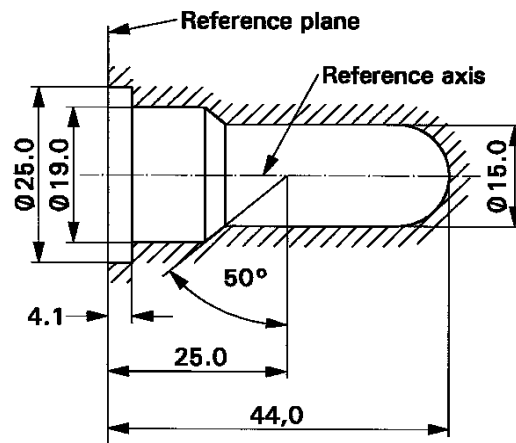


Figure 1 Main drawing

Figure 2 Max.  
Lamp outline 3 /**Notes:**

- 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 passes through the centre of the 19 mm cap diameter.
- 3/ Glass bulb and supports shall not exceed the envelope as indicated in figure 2 of Figure A41.1. The envelope is concentric to the reference axis.
- 4/ Notes concerning the filament diameter.
- No actual diameter restrictions apply.
  - For the same manufacturer, the design diameter of standard (étalon) filament lamp and filament lamp of normal production shall be the same.

Figure A41.2

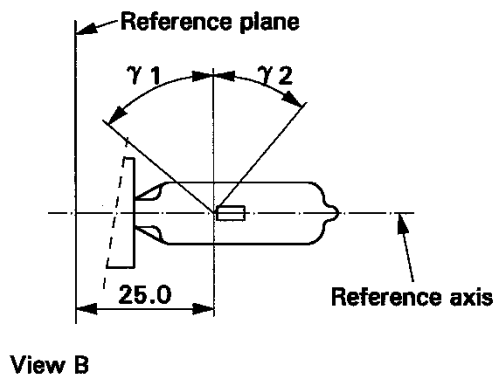


Figure 3  
Distortion free area 5/

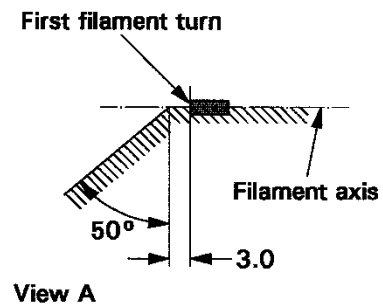


Figure 4  
Metal free zone 6/

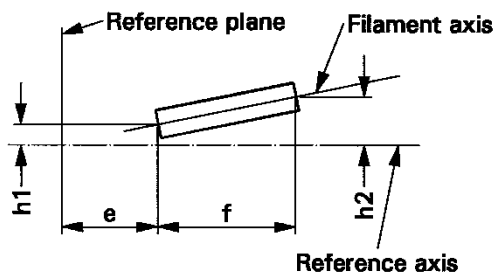


Figure 5  
Permissible offset of filament axis 7/  
(for standard filament lamps only)

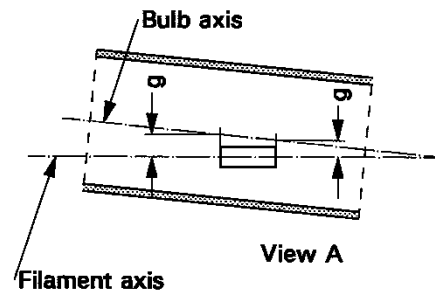


Figure 6  
Bulb eccentricity 8/

**Notes:**

- 5/ Glass bulb shall be optically distortion free within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 6/ The internal design of the lamp 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 of Figure A41.1). No metal parts other than filament turns shall be located in the shaded area as seen in figure 4 of Figure A41.2.
- 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 of Figure A41.1. 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.

**A41.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12H9, 12H9A	
Rated Volt		12	12
Rated Watt		65	65
Test Volt		13.2	13.2
Objective values	Watt	73 max.	73 max.
	Lumen	2100 ± 10%	-
Reference luminous flux: 1500 lm at approximately 12 V			

**A41.2 Dimensional requirements**

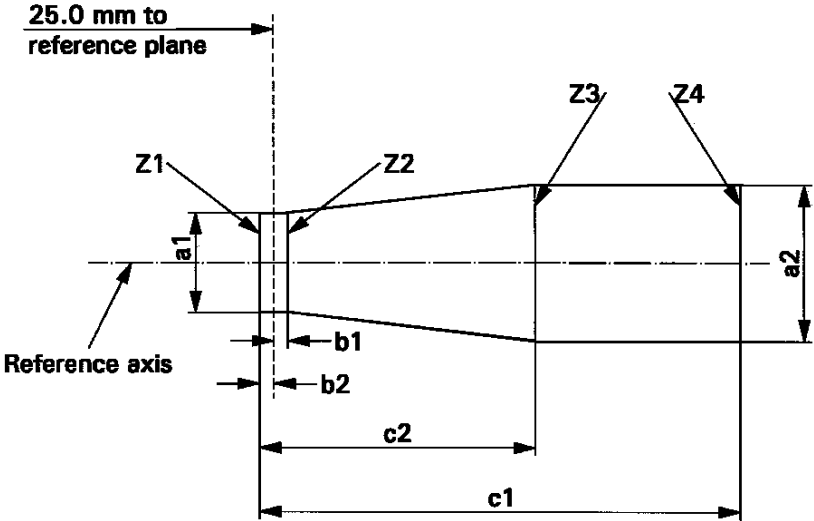
Dimensions		Tolerances	
		Filaments lamps of normal production	Standard filament lamp
e <u>9/</u> <u>10/</u>	25	<u>11/</u>	± 0.10
f <u>9/</u> <u>10/</u>	4.8	<u>11/</u>	± 0.10
g <u>9/</u>	0.70	± 0.5	± 0.30
h1	0	<u>11/</u>	± 0.10 <u>12/</u>
h2	0	<u>11/</u>	± 0.15 <u>12/</u>
γ1	50° minimum.	-	-
γ2	40° minimum.	-	-
Cap	12H9,	PGJ19-5	
	12H9A	PGJX19-5	

**Notes:**

- 9/ The viewing direction is direction A as shown in figure 1 of Figure A41.1
- 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", A41.3
- 12/ The eccentricity is measured only in viewing directions A and B as shown in figure 1 of Figure A41.1. 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.

**A41.3 Screen projection requirements**

**A41.3.1** 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 lamp complies with the requirements.



**Figure A41.2**

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

d = diameter of filament

The filament position is checked solely in directions A and B as shown in figure 1 of Figure A41.1.

The filament shall lie entirely within the limits shown.

The ends of the filament as defined in note 10/, shall lie between lines Z1 and Z2 and between Z3 and Z4

Annex-A42 (See para 4)  
Requirements of H10 Category Lamps

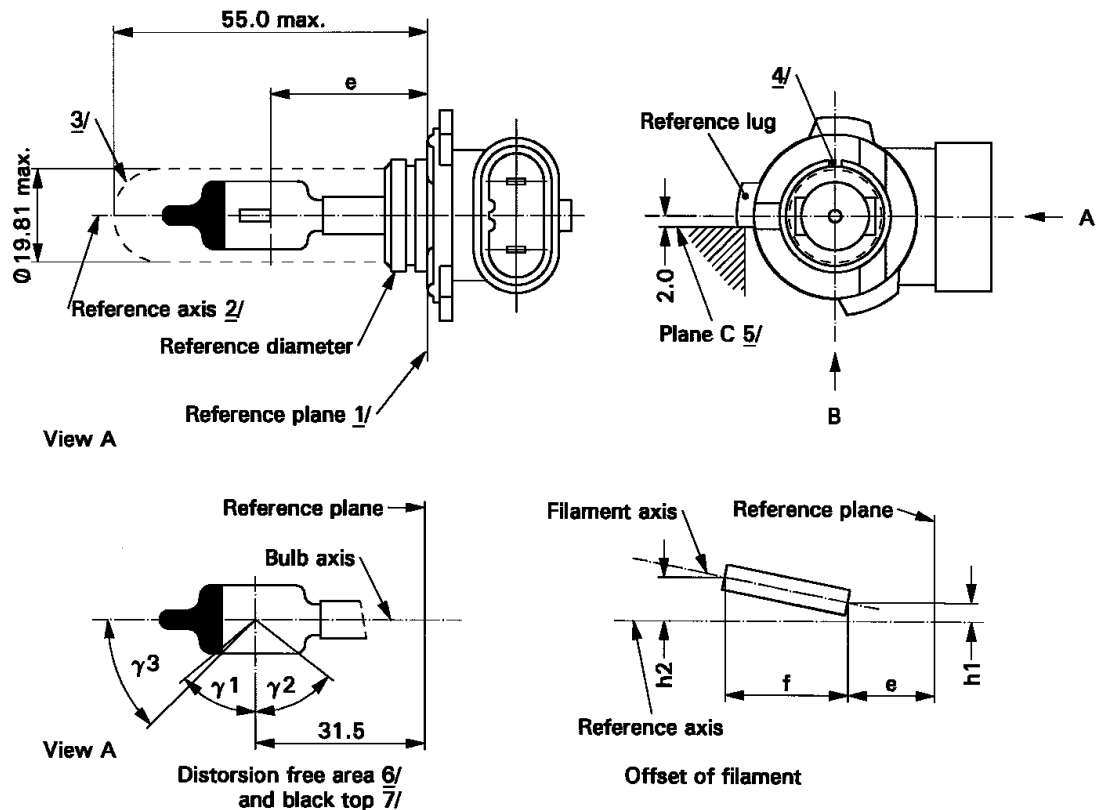


Figure A42.1

**Notes:**

- 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 lamp 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  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 7/ The obscuration shall extend to at least angle  $\gamma_3$  and shall be at least as far as the undistorted part of the bulb defined by angle  $\gamma_1$ .

**A42.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12H10	
Rated Volt		12	12
Rated Watt		42	42
Test Volt		13.2	13.2
Objective values	Watt	50 max.	50 max.
	Lumen	850 ± 15 %	-
Reference luminous flux: 600 lm at approximately 12 V			

**A42.2 Dimensional requirements**

Dimensions in mm <u>8/</u>		Tolerance	
		Filament lamps of normal production	Standard filament lamp
e <u>9/ 10/</u>	28.9	<u>11/</u>	± 0.16
f <u>9/ 10/</u>	5.2	<u>11/</u>	± 0.16
h1, h2	0	<u>11/</u>	± 0.15 <u>12/</u>
γ1	50° minimum.	-	-
γ2	52° minimum.	-	-
γ3	45°	± 5°	± 5°
Cap		PY20d	

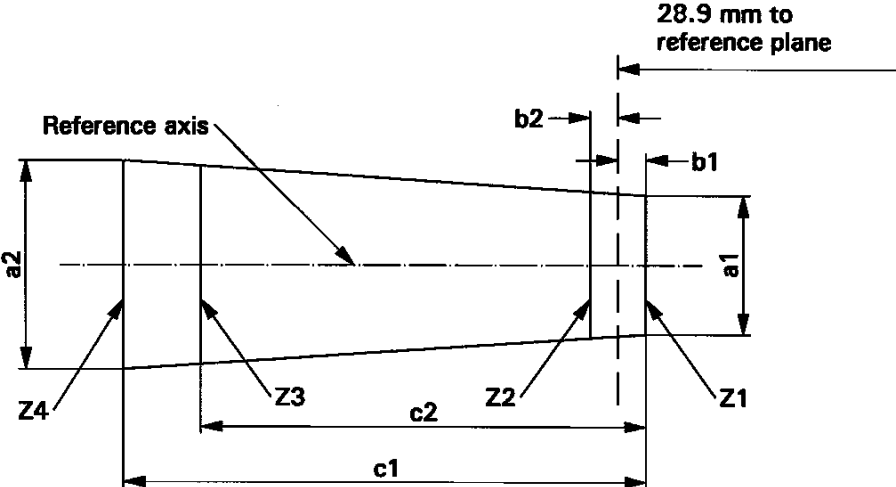
**Notes:**

- 8/ Dimensions shall be checked with O-ring removed.
- 9/ The viewing direction is direction \*/ B as shown in Figure A42.1
- 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", A42.3. \*/
- 12/ The eccentricity is measured only in viewing directions \*/ A and B as shown in Figure A42.1. 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.

**A42.3 Screen projection requirements**

**A42.3.1** 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 lamp complies with the requirements.

**Figure A42.2**



	a1	a2	B1	b2	c1	c2
12 V	1.4 d	1.8 d	0.25	0.25	6.1	4.9

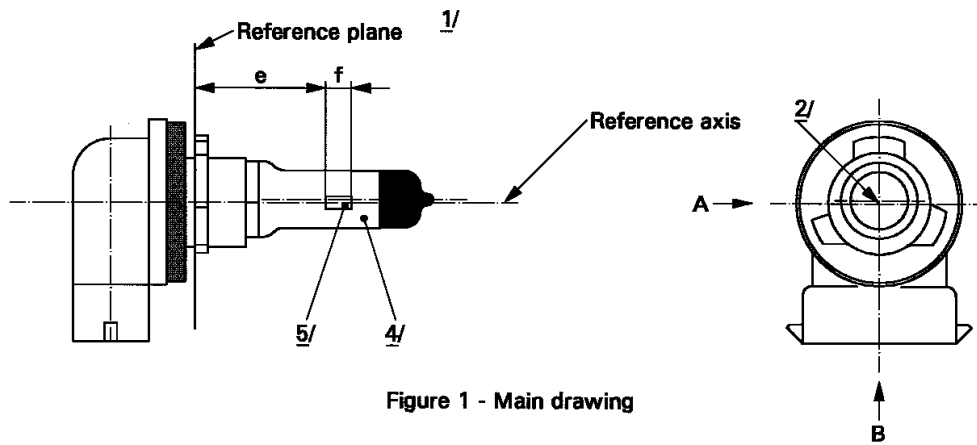
d = diameter of filament

The filament position is checked solely in directions A and B as shown in Figure A42.1.

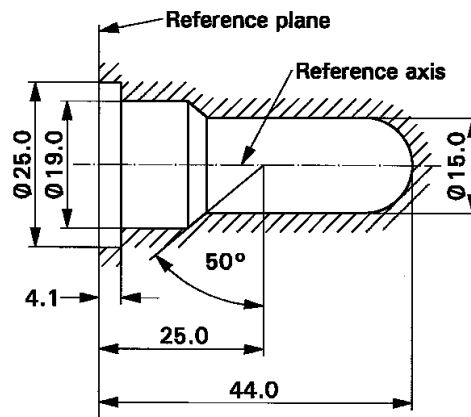
The filament shall lie entirely within the limits shown.

The ends of the filament as defined in note 10/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

**Annex-A43 (See para 4)  
Requirements of H11, H11A Category Lamps**



**Figure 1 - Main drawing**



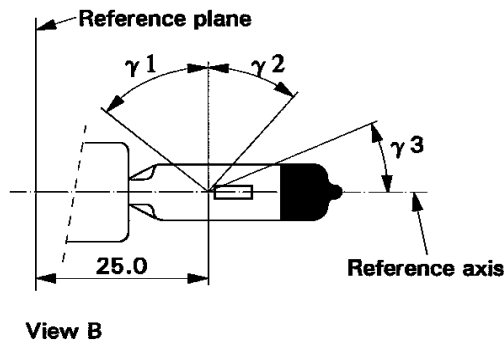
**Figure 2 - Maximum lamp outline 3/**

**Figure A43.1**

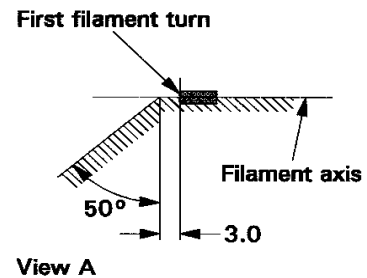
**Notes:**

- 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 passes through the centre of the 19 mm cap diameter.
- 3/ Glass bulb and supports shall not exceed the envelope as indicated in figure 2 of Figure A43.1. The envelope is concentric to the reference axis.
- 4/ The bulb shall be colourless or selective yellow.
- 5/ Notes concerning the filament diameter.
  - No actual diameter restrictions apply.
  - For the same manufacturer, the design diameter of standard filament lamp and filament lamp 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/

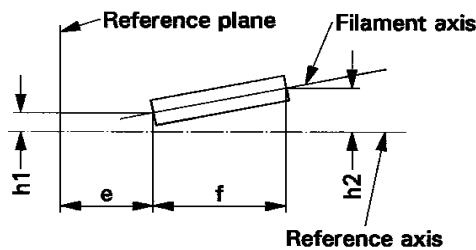
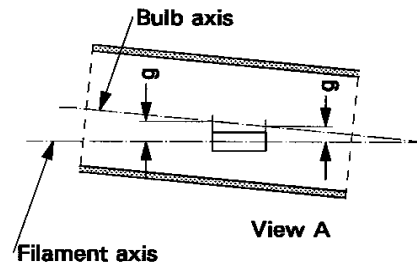


Figure 5  
Permissible offset of filament axis 9/  
(for standard filament lamps only)



View A  
Figure 6  
Bulb eccentricity 10/

### Figure A43.2

#### Notes:

- 6/ Glass bulb shall be optically distortion free within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 7/ The obscuration shall extend at least to angle  $\gamma_3$  and shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference.
- 8/ The internal design of the lamp 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 of Figure A43.1).  
No metal parts other than filament turns shall be located in the shaded area as seen in figure 4 of Figure A43.2.
- 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 of Figure A43.1. 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.

**A43.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp
Ref. No.		12H11, 12H11A	24H11, 24H11A	
Rated Volt		12	24	12
Rated Watt		55	70	55
Test Volt		13.2	28.0	13.2
Objective values	Watt	62 max.	80 max.	62 max.
	Lumen	1350 ± 10 %	1600 ± 10 %	-
Reference luminous flux: 1000 lm at approximately 12 V				

**A43.2 Dimensional requirements**

Dimensions in mm		Filaments lamps of normal production		Standard filament lamp
		12 V	24 V	12 V
e	<u>11/</u>	25.0 <u>12/</u>		25.0 ± 0.1
f	<u>11/</u>	4.5	5.3 <u>12/</u>	4.5 ± 0.1
G		0.5 min.		
h1		0 <u>12/</u>		0 ± 0.1
h2		0 <u>12/</u>		0 ± 0.15
$\gamma_1$		50° minimum.		50° minimum.
$\gamma_2$		40° minimum.		40° minimum.
$\gamma_3$		30° minimum.		30° minimum.
Cap	H11	PGJ19-2		
	H11A	PGJX19-2		

**Notes:**

11/ The ends of the filament are defined as the points where, when the viewing direction is View A as shown in figure 1 of Figure A43.1 the projection of the outside of the end turns crosses the filament axis.

12/ To be checked by means of a "Box System", A43.3.

**A43.3 Screen projection requirements**

**A43.3.1** 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 lamp complies with the requirements.

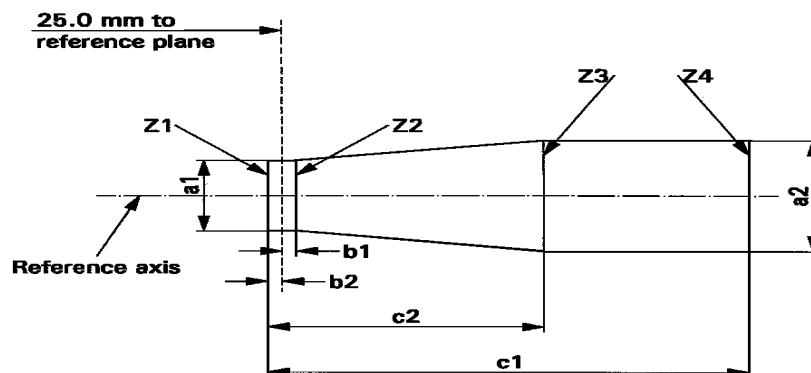


Figure A43.2

**AIS-034**

	a1	a2	B1	b2	c1	c2
12 V	$d + 0.3$	$d + 0.5$	0.2	0.2	5.0	4.0
24 V	$d + 0.6$	$d + 1.0$	0.25	0.25	6.3	4.6

$d$  = diameter of filament

The filament position is checked solely in directions A and B as shown in figure 1 of Figure A43.1.

The filament shall lie entirely within the limits shown.

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

Annex-A44 (See para 4)  
Requirements of H12 Category Lamps

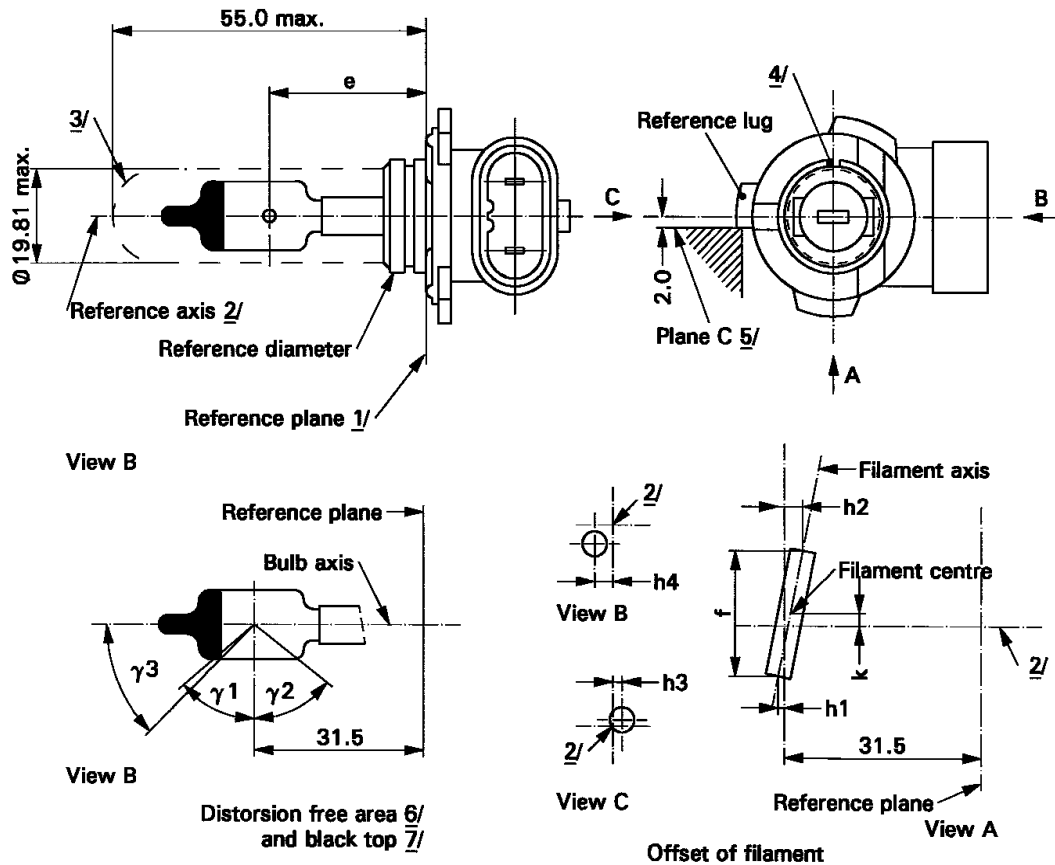


Figure A44.1

**Notes:**

- 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 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  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 7/ The obscuration shall extend to at least angle  $\gamma_3$  and shall be at least as far as the undistorted part of the bulb defined by angle  $\gamma_1$ .

**A44.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12H12	
Rated Volt		12	12
Rated Watt		53	53
Test Volt		13.2	13.2
Objective values	Watt	61 max.	61 max.
	Lumen	1050 ± 15 %	-
Reference luminous flux: 775 lm at approximately 12 V			

**A44.2 Dimensional requirements**

Dimensions in mm <u>8/</u>		Tolerance	
		Filament lamps of normal production	Standard filament lamp
e <u>9/</u> <u>10/</u>	31.5	<u>11/</u>	± 0.16
f <u>9/</u> <u>10/</u>	5.5	<u>11/</u>	± 0.16
h1, h2, h3, h4	0	<u>11/</u>	± 0.15 <u>12/</u>
k	0	<u>11/</u>	± 0.15 <u>13/</u>
γ1	50° minimum.	-	-
γ2	52° minimum.	-	-
γ3	45°	± 5°	± 5°
Cap		PZ20d	

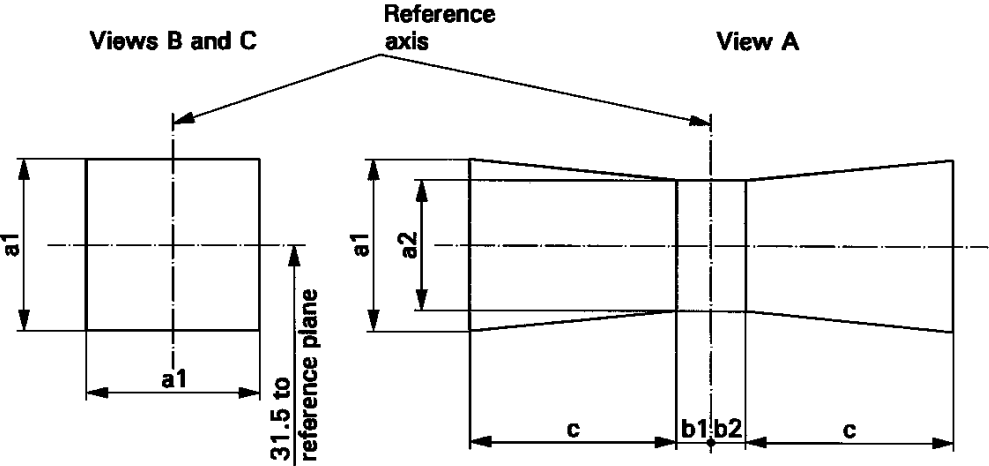
**Notes:**

- 8/ Dimensions shall be checked with O-ring removed.
- 9/ The viewing direction is direction A as shown in the Figure **A44.1**
- 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" as per **A44.3**.
- 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 Figure A44.1. 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.

**A44.3 Screen projection requirements**

- A44.3.1** 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 lamp complies with the requirements.

Figure A44.2



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

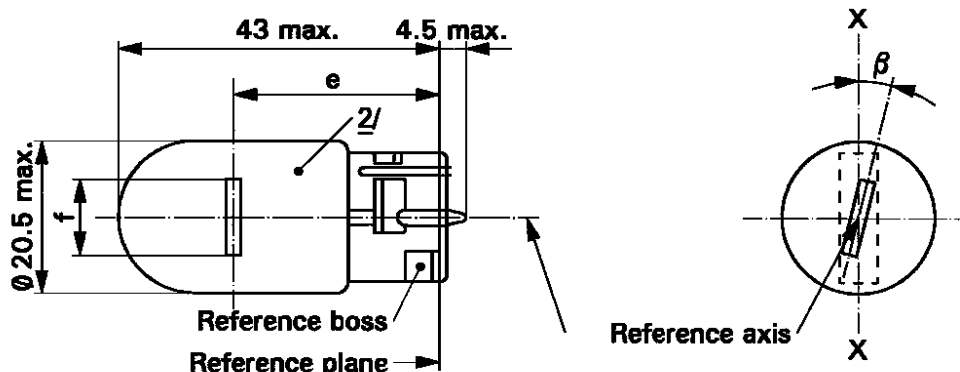
d = diameter of filament

For the directions of view A, B and C, see Figure A44.1.

The filament shall lie entirely within the limits shown.

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

**Annex-A45 (See para 4)  
Requirements of WY21W Category Lamps**



**Figure A45.1**

**A45.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12WY21W	
Rated Volt		12	12
Rated Watt		21	21
Test Volt		13.5	13.5
Objective values	Watt	26.5 max.	26.5 max.
	Lumen	280 ± 20 %	-
Reference luminous flux approximately 13.5 V		Clear bulb: 460 lm Amber bulb: 280 lm	

**A45.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nominal.	max.	
e		29.0 <u>2/</u>		29.0 ± 0.3
f			7.5	7.5 + 0/ - 2
Lateral deviation <u>1/</u>			<u>2/</u>	0.5 max.
β	-15°	0°	+15°	0° ± 5°
Cap	WX3x16d			

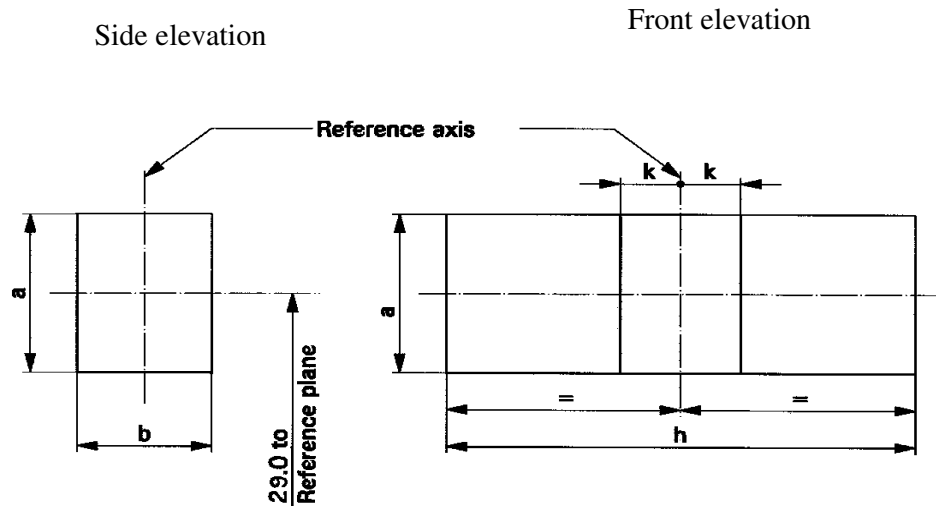
Notes:

- 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 bulb of production lamps shall be amber. (See also note 4/).
- 3/ To be checked by means of a "Box-System" as per **A45.3**
- 4/ The bulb of standard filament lamps shall be amber or clear. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover the colour shall be in the lower part of the tolerance area.

**A45.3 Screen projection requirements**

**A45.3.1** 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 lamp complies with the requirements.

**Figure A45.2**



Reference	A	b	h	K
Dimension	3.5	3.0	9.5	1.0

**A45.3.2 Test procedures and requirements.**

**A45.3.2.1** The filament lamp 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 ( $\pm 15^\circ$ ).

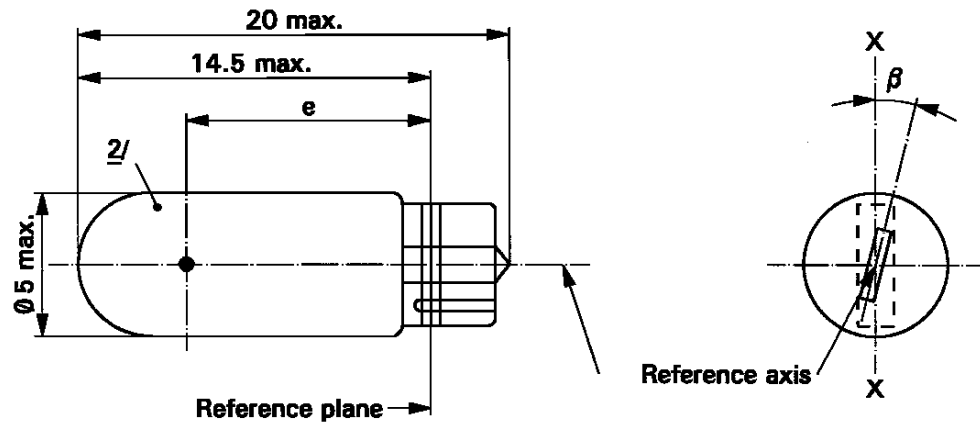
**A45.3.2.2 Side elevation:** The filament lamp placed with the cap down, the reference axis vertical and the filament seen end-on, the projection of the filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament.

**A45.3.2.3 Front elevation:** The filament lamp placed with the cap down and the reference axis vertical, the filament lamp being viewed in a direction at right angles to the filament axis:

- a) 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.
- b) The centre of the filament shall not be offset by more than distance "k" from the reference axis.



**Annex-A46 (See para 4)  
Requirements of WY2.3W Category Lamps**



**Figure A46.1**

**A46.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12WY2.3W	
Rated Volt		12	12
Rated Watt		2.3	2.3
Test Volt		13.5	13.5
Objective values	Watt	2.5 max.	2.5 max.
	Lumen	11.2 ± 20 %	-
Reference luminous flux at approximately 13.5 V		Clear bulb 18.6 lm	
		Amber bulb 11.2 lm	

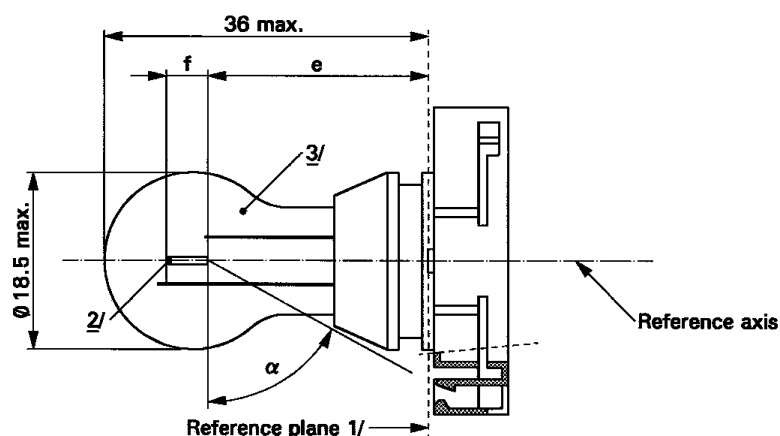
**A46.2 Dimensional requirements**

Dimensions in mm	Filament lamps of normal production			Standard filament lamp
	min.	nominal.	max.	
e	10.3	10.8	11.3	10.8 ± 0.3
Lateral deviation <u>1/</u>			1.0	0.5 max
β	- 15°	0°	+ 15°	0° ± 5°
Cap	W2x4.6d			

**Notes:**

- 1/ Maximum lateral deviation of filament center from two mutually perpendicular planes both containing the reference axis and one containing axis X-X.
- 2/ The light emitted from production lamps shall be amber. (see also note 3/).
- 3/ The light emitted from standard filament lamps shall be amber or white. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

**Annex-A47 (See para 4)**  
**Requirements of P19W, PS19W, PY19W, PSY19W, Categories of Lamps**



**Figure A47.1**

**Notes:**

- 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  $d \text{ max.} = 1.1 \text{ mm}$ .  
 3/ The light emitted from normal production lamps shall be white for categories P19W and PS19 W and amber for categories PY19W and PSY19W. (See also note 8/)

**A47.1 Electrical and photometric requirements:**

Parameter	Production Lamps				Standard Lamp
	12P19W	12PS19W	12PY19W	12PSY19W	
Ref. No.	12P19W	12PS19W	12PY19W	12PSY19W	
Rated Volt	12				12
Rated Watt	19				19
Test Volt	13.5				13.5
Objective values	Watt	20 max.			20 max.
	Lumen	350 ± 15 %		215 ± 20 %	
Reference luminous flux at approximately 13.5 V	Clear bulb 350 lm		Amber bulb 215 lm		

**A47.2 Dimensional requirements**

Dimensions in mm 4/	Filament lamps of normal production			Standard filament lamp
	min.	nominal	max.	
e 5/ 6/		24.0		24.0
f 5/ 6/		4.0		4.0 ± 0.2
α 7/	61.5°			61.5° min.
Cap	For P19W cap PGU20/1			
	For PS19W cap PG20/1			
	For PY19W cap PGU20/2			
	For PSY19W cap PG20/2			

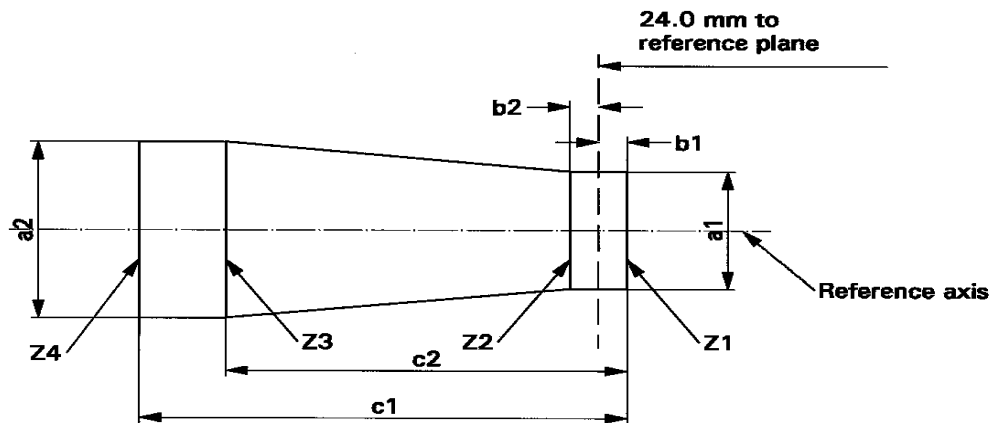
**Notes:**

- 4/ For categories PS19W and PSY19W, dimensions shall be checked with O-ring removed.
- 5/ The filament position is checked by means of a "Box-System" A47.3
- 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 Figure A47.1 the projection of the outside of the end turns crosses the filament axis.
- 7/ No part of the cap beyond to the reference plane shall interfere with angle  $\alpha$ . The bulb shall be optically distortion free within the angle  $2\alpha + 180^\circ$ .
- 8/ The light emitted from standard filament lamps shall be white for categories P19W and PS19W and white or amber for categories PY19W and PSY19W. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

**A47.3 Screen projection requirements**

**A47.3.1** 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 lamp complies with the requirements.

**Figure A47.2**



	a1	a2	b1, b2	c1	c2
Filament lamps of normal production	2.9	3.9	0.5	5.2	3.8
Standard filament lamps	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 in note 6/, 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.

**Annex-A48 (See para 4)**  
**Requirements of P24W, PS24W, PY24W, PSY24W, Categories of Lamps**

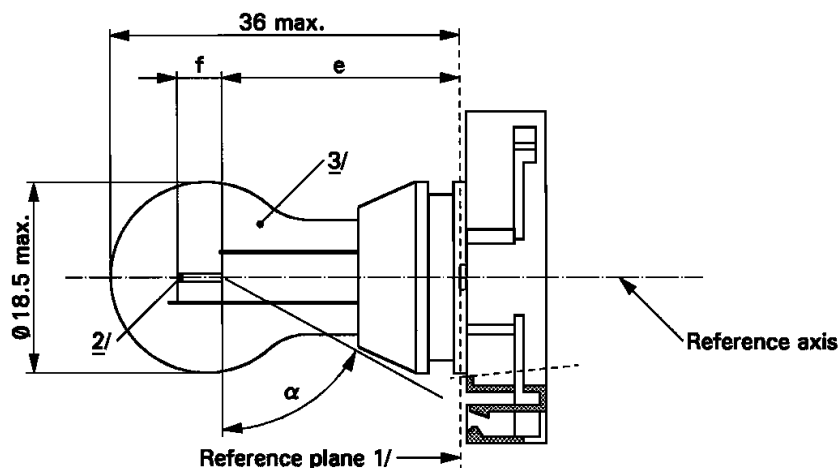


Figure A48.1

**Notes:**

- 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  $d_{max.} = 1.1 \text{ mm}$ .  
 3/ The light emitted from normal production lamps shall be white for categories P24W and PS24 W and amber for categories PY24W and PSY24W. (See also note 8/)

**A48.1 Electrical and photometric requirements:**

Parameter		Production Lamps				Standard Lamp
Ref. No.		12P24W	12PS24W	12PY24W	12PSY24W	
Rated Volt		12				12
Rated Watt		24				24
Test Volt		13.5				13.5
Objective values	Watt	25 max.				25 max.
	Lumen	500 +10/-20 %		300 +15/-25 %		
Reference luminous flux at approximately 13.5 V		Clear bulb 500 lm		Amber bulb 300 lm		

**A48.2 Dimensional requirements**

Dimensions in mm 4/	Filament lamps of normal production			Standard filament lamp
	min.	nominal	max.	
e 5/ 6/		24.0		24.0
f 5/ 6/		4.0		$4.0 \pm 0.2$
$\alpha$ 7/	$61.5^\circ$		1/	$61.5^\circ \text{ min.}$
Cap	For P24W cap PGU20/3			
	For PS24W cap PG20/3			
	For PY24W cap PGU20/4			
	For PSY24W cap PG20/4			

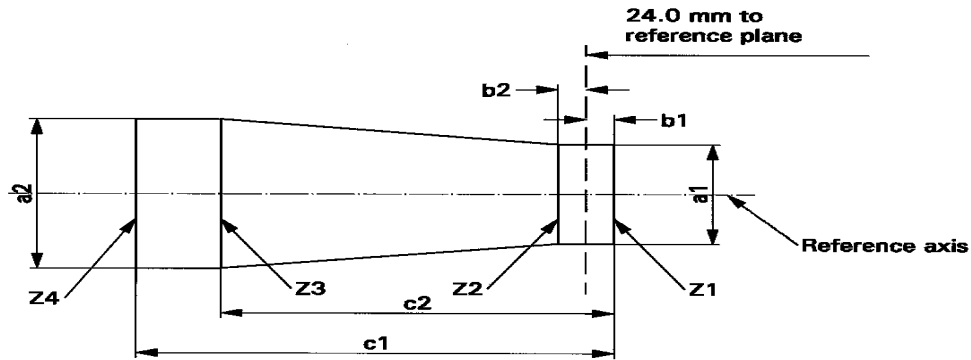
**Notes:**

- 4/ For categories PS24W and PSY24W, dimensions shall be checked with O-ring removed.
- 5/ The filament position is checked by means of a "Box-System"; A48.3.
- 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 Figure A48.1, the projection of the outside of the end turns crosses the filament axis.
- 7/ No part of the cap beyond to the reference plane shall interfere with angle  $\alpha$ . The bulb shall be optically distortion free within the angle  $2\alpha + 180^\circ$ .
- 8/ The light emitted from standard filament lamps shall be white for categories P24W and PS24W and white or amber for categories PY24W and PSY24W. For amber standard filament lamps, changes of the bulb temperature shall not affect the luminous flux which might impair photometric measurements of signalling devices. Moreover, the colour shall be in the lower part of the tolerance area.

**A48.3 Screen projection requirements**

**A48.3.1** 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 lamp complies with the requirements.

**Figure A48.2**



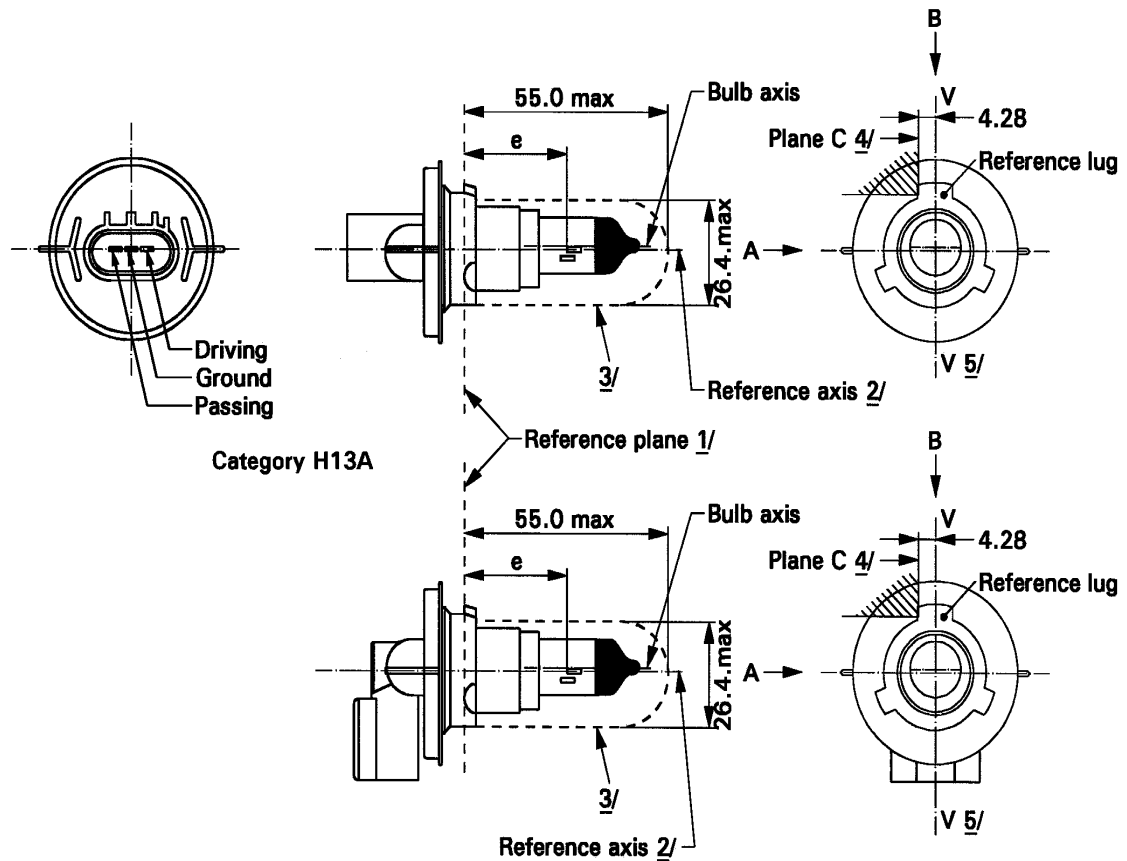
	A1	a2	b1, b2	c1	c2
Filament lamps of normal production	2.9	3.9	0.5	5.2	3.8
Standard filament lamps	1.5	1.7	0.25	4.7	3.8

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 in note 6/, shall lie between Z1 and Z2 and between the lines Z3 and Z4.

The filament shall lie entirely within the limits shown.

**Annex-A49 (See para 4)**  
**Requirements of H13 and H13A Category Lamps**  
**Category H13**



**Figure 1 Main drawing**

**Figure A49.1**

**Notes:**

- 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 of Figure A49.2
- 3/ Glass bulb and supports shall not exceed the envelope as indicated. The envelope is concentric to the reference axis.
- 4/ The filament lamp 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 passes through the reference axis and parallel to plane C.

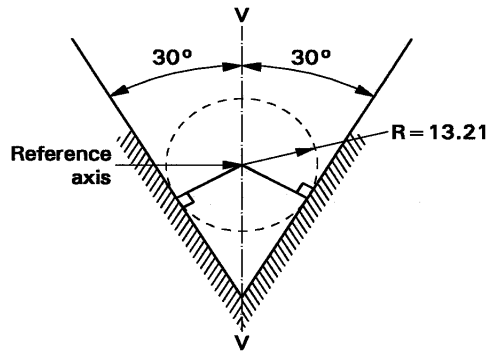
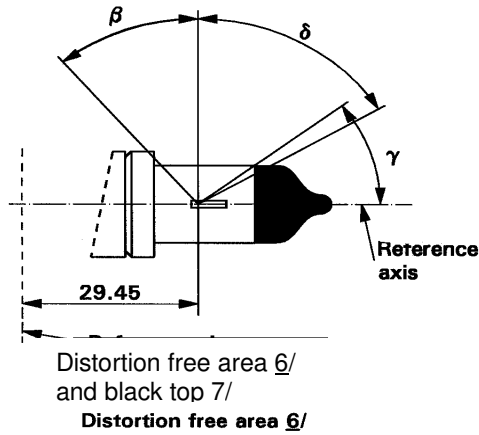
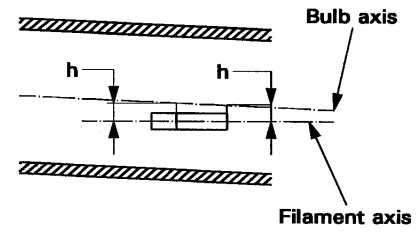


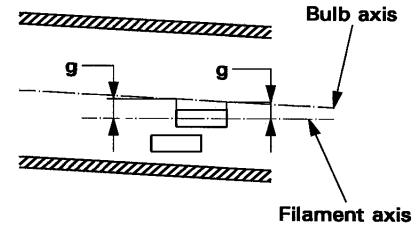
Figure 2  
Definition of reference axis 2/



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



View from B



View from A

Figure 4  
Bulb offset 8/

Figure A49.2

Notes:

- 6/ Glass bulb shall be optically distortion-free axially within the angles  $\beta$  and  $\delta$ . This requirement applies to the whole bulb circumference within the angles  $\beta$  and  $\delta$ .
- 7/ The obscuration shall extend to at least angle  $\gamma$  and shall extend at least to the cylindrical part of the bulb on the whole bulb circumference.
- 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.

Figure A49.3

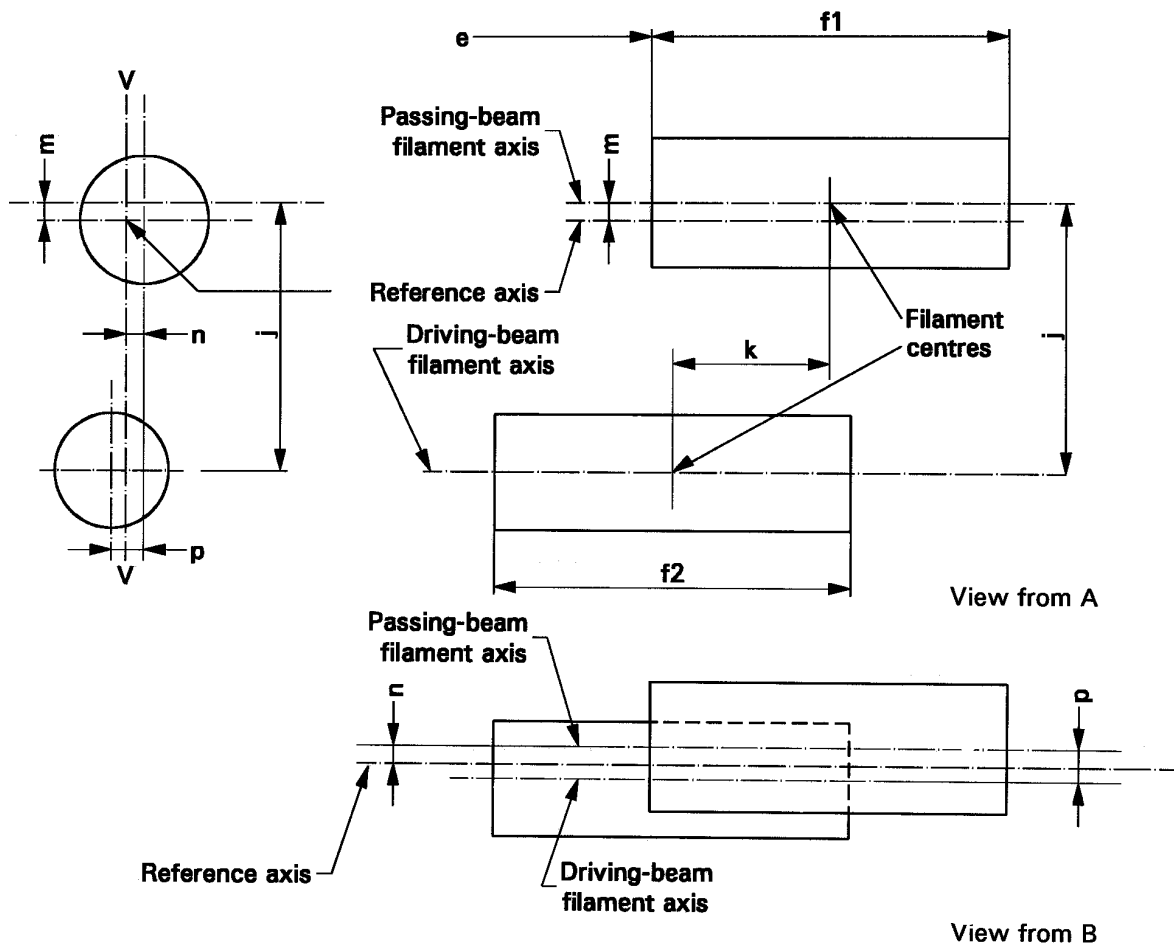


Figure 5  
Position and dimensions of filaments 9/ 10/ 11/ 12/

**Notes:**

- 9/ Dimensions j, k and p are measured from the centre of the passing-beam filament to the centre of the driving-beam filament.
- 10/ Dimensions m and n are measured from the reference axis to the centre of the passing-beam filament.
- 11/ Both filaments axis are to be held within a  $2^\circ$  tilt with respect to the reference axis about the centre of the respective filament.
- 12/ Notes concerning the filament diameters.
- No actual diameter restrictions apply .
  - For the same manufacturer, the design filament diameter of standard filament lamp and filament lamp of normal production shall be the same.



**A49.1 Electrical and photometric requirements: 15/**

Parameter		Production Lamps		Standard Lamp	
Ref. No.		12H13, 12H13A			
		Driving filament	Passing filament	Driving filament	Passing filament
Rated Volt		12		12	
Rated Watt		55	60	55	60
Test Volt		13.2		13.2	
Objective values	Watt	68 max.	75 max.	68 max.	75 max.
	Lumen	1100 ± 15 %	1700 ± 15 %	-	
Reference luminous flux: 800/1200 lm at approximately 12 V					

**A49.2 Dimensional requirements**

Dimensions in mm		Tolerance	
		Filament lamps of normal production	Standard filament lamp
e 13/	29.45	± 0.20	± 0.10
f1 13/	4.6	± 0.50	± 0.25
f2 13/	4.6	± 0.50	± 0.25
g 8/ 14/	d1 /2	± 0.40	± 0.20
h 8/	0	± 0.30	± 0.15
j 9/	2.5	± 0.20	± 0.10
k 9/	2.0	± 0.20	± 0.10
m 10/	0	± 0.20	± 0.13
n 10/	0	± 0.20	± 0.13
p 9/	0	± 0.08	± 0.08
β	42° minimum	-	-
δ	52° minimum	-	-
γ	43°	+0/-5°	+0/-5°
Cap	P26.4t for H13; PJ26.4t for H13A:		

**Notes:**

- 13/ The ends of the filament are defined as the points where, when the viewing direction A as shown in Figure A49.1, the projection of the outside of the end turns crosses the filament axis.
- 14/ d1 is the actual diameter of the passing-beam filament.
- 15/ The values indicated in the left hand columns relates to passing beam filament and those indicated in the right hand columns to the driving beam filament.

Annex-A50 (See para 4)  
Requirements of D1S AND D2S Categories of the gas-discharge Lamps

Figure A50.1 - Category D1S - Type with cables - Cap PK32d-2

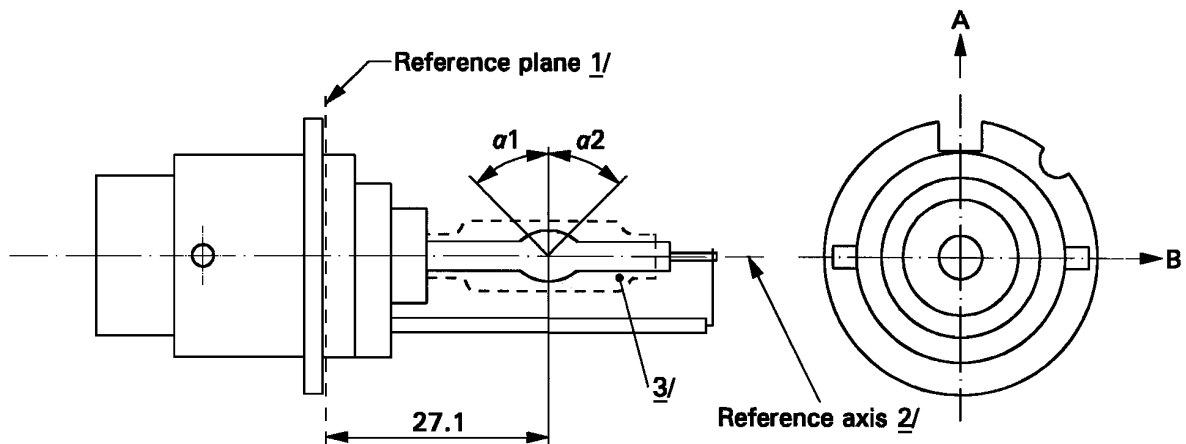
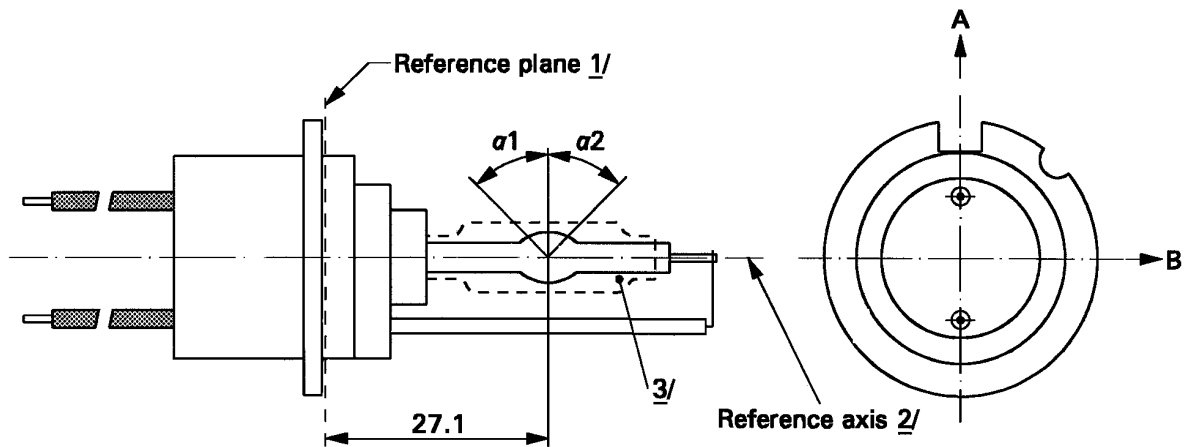


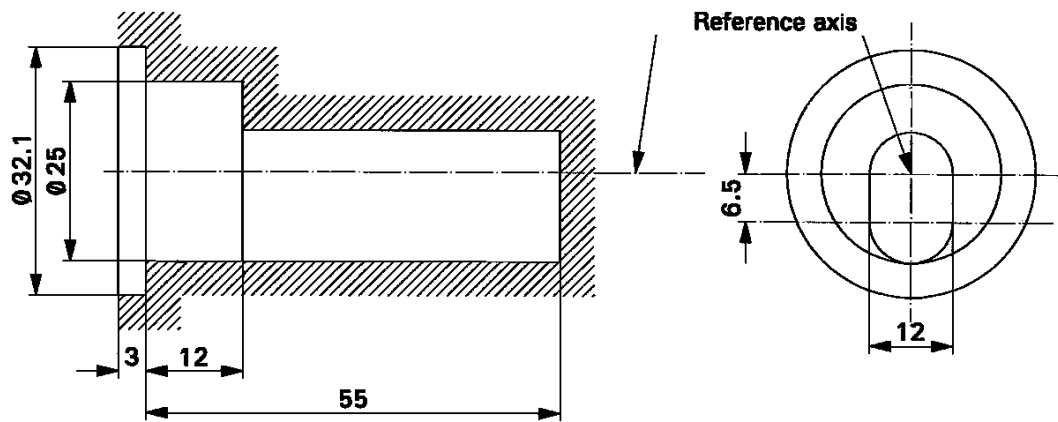
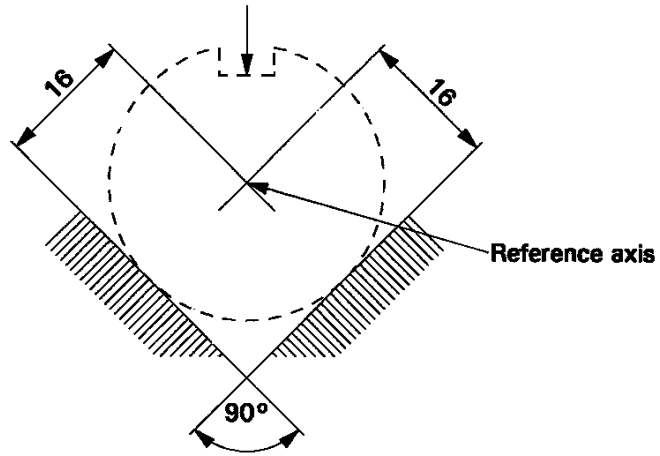
Figure A50.2 - Category D2S - Type with connector - Cap P32d-2

Notes:

- 1/ The reference plane is defined by the positions on the surface of the holder on which the three supporting bosses of the cap ring will rest.
- 2/ See Figures A50.3 and A50.4.
- 3/ When measured at a distance of 27.1 mm from the reference plane and with respect to the mid-point of the inner bulb, the outer bulb shall have an eccentricity of 1 mm max.

**Figure A50.3 Definition of reference axis 4/**

The cap shall be pushed in this direction



**Figure A50.4 Maximum lamp outline 5/**

Notes:

- 4/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two parallel lines as indicated in figure A50.3.
- 5/ Glass bulb and supports shall not exceed the envelope, as indicated in figure A50.4. The envelop is concentric with the reference axis.

**A50.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12D1S, 12 D2S	
Rated voltage of the ballast		12 <u>7/</u>	12
Rated wattage		35	35
Test voltage		13.5	13.5
Lamp voltage		85± 17	85± 8
Lamp wattage		35± 3	35± 0.5
Luminous flux		3200± 450	3200± 150
Colour coordinates	Objective	$x = 0.375$	$y = 0.375$
	Tolerance area <u>8/</u>	$x \geq 0.345$ $y \leq 0.150 + 0.640 x$ $x \leq 0.405$ $y \geq^* 0.050 + 0.750 x$	
Hot-restrike switch-off time(s)		10	10

**A50.2 Dimensional requirements**

Dimensions		Production lamps	Standard lamps
Position of electrodes		See <b>A50.3</b>	
Position and form of the arc		See <b>A50.4</b>	
$\alpha 1, \alpha 2$ <u>6/</u>		55° min.	55° min.
Cap	Category D1S:	PK32d-2	
	Category D2S:	P32d-2	

Notes:

6/ The part of the bulb within the angles  $\alpha 1$  and  $\alpha 2$  shall be the light emitting part. This part shall be as homogeneous in form as possible and shall be optically distortion free. This applies to the whole bulb circumference within the angles  $\alpha 1$  and  $\alpha 2$ .

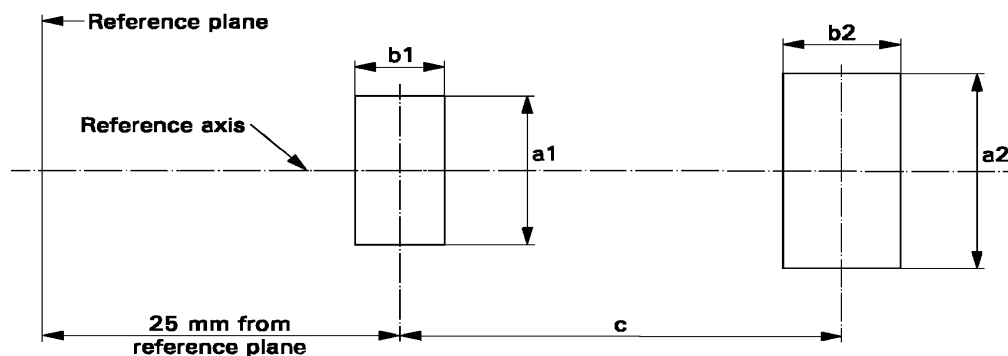
7/ Application voltages of ballasts may differ from 12 V.

8/ See **6.3.1** and Annex J.

**A50.3 Position of the electrodes:**

**A50.3.1** This test is used to determine whether the electrodes are correctly positioned relative to the reference axis and the reference plane.

**Figure A50.5: Measuring direction: light source side and top view**



Dimension in mm	Production lamps	Standard lamps
a1	$D + 0.2$	$d + 0.1$
a2	$D + 0.5$	$d + 0.25$
b1	0.3	0.15
b2	0.6	0.3
c	4.2	4.2

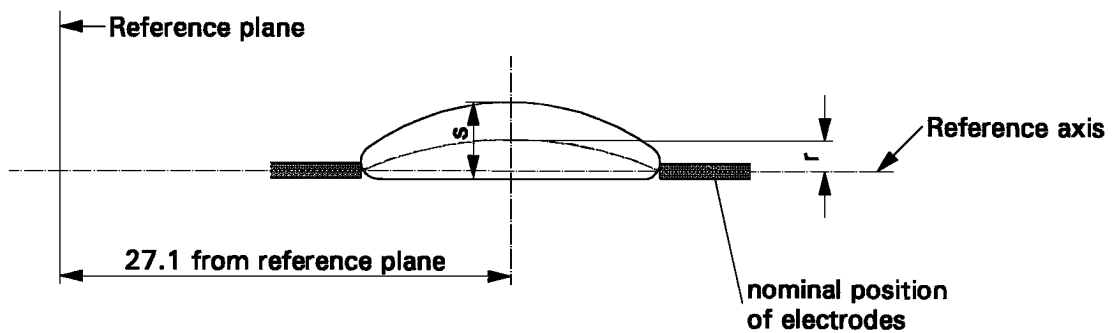
$d = \text{diameter of the electrode} < 0.3$

The top of the electrode nearest to the reference plane shall be positioned in the area defined by a1 and b1. The top of the electrode furthest from the reference plane shall be positioned in the area defined by a2 and b2.

**A50.4 Position and form of the arc**

**A50.4.1** This test is used to determine the form of the arc and its position relative to the reference axis and the reference plane by measuring its bending and diffusion in the cross section at a distance 27.1 mm from the reference plane. The form of the arc is for illustration purposes only.

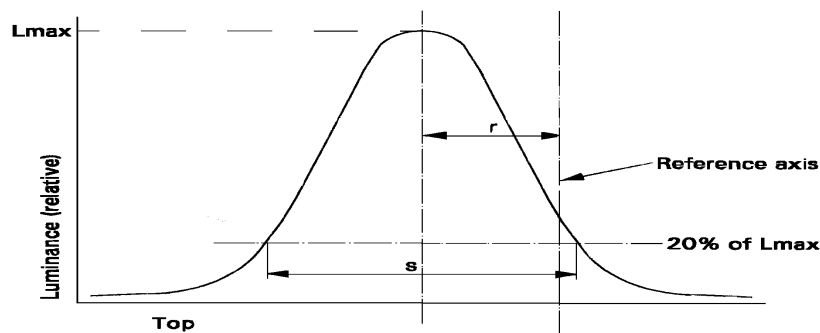
**Figure A50.6: Measuring direction- light source side view**



**A50.4.2** When measuring the relative luminance distribution in the central cross section as indicated in the drawing above, the maximum value shall be located within the distance r from the reference axis. The point of 20% of the maximum value shall be within s.

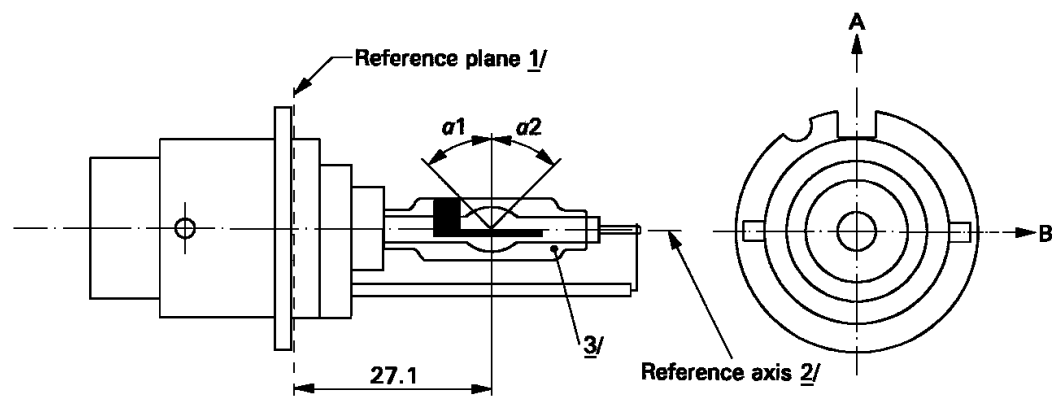
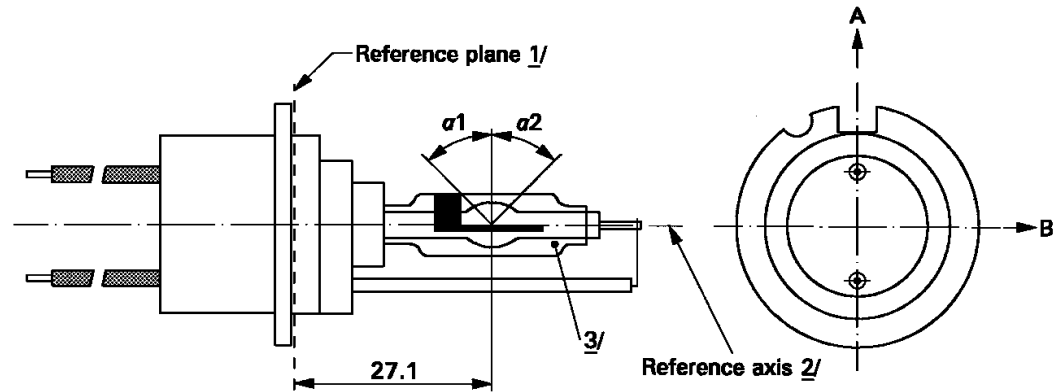
Dimension in mm	Production lamps	Standard lamps
r	$0.50 \pm 0.40$	$0.50 \pm 0.20$
s	$1.10 \pm 0.40$	$1.10 \pm 0.25$

**Figure A50.7: Determination of arc bending r and arc diffusion s**



**Annex-A51 (See para 4)  
Requirements of D1R AND D2R Categories of the gas-discharge Lamps**

**Figure A51.1 - Category D1R - Type with cables - Cap PK 32d-3**



**Figure A51.2 - Category D2R - Type with connector - Cap P 32d-3**

Notes:

- 1/ The reference plane is defined by the positions on the surface of the holder on which the three supporting bosses of the cap ring will rest.
- 2/ See Figures A51.3 and A51.4.
- 3/ With respect to the reference axis, when measured at a distance of 27.1 mm from the reference plane the eccentricity of the outer bulb shall be less than  $\pm 0.5$  mm in direction B and less than  $+ 1$  mm  $- 0.5$  mm in direction A.

Figure A51.3 Definition of reference axis 4/

The cap shall be pushed in this direction

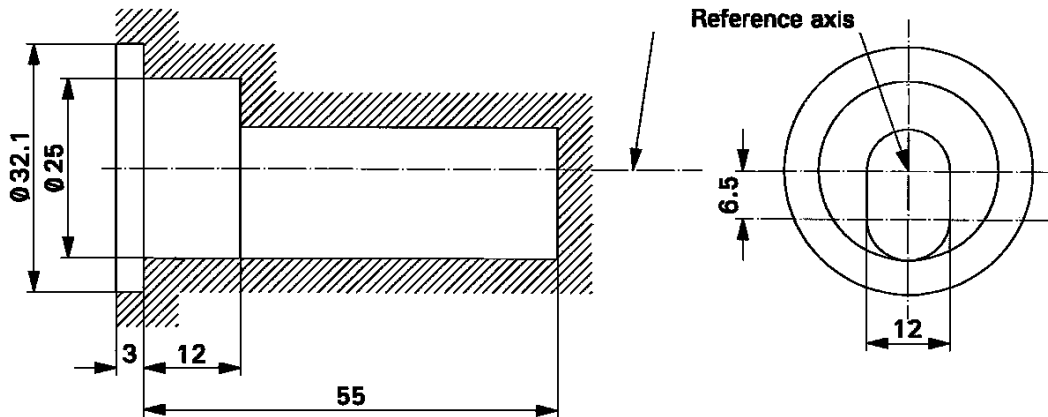
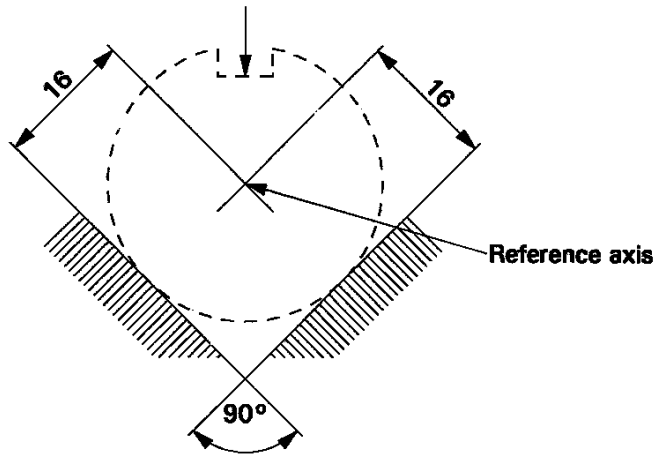


Figure A51.4 Maximum lamp outline 5/

Notes:

- 4/ The reference axis is perpendicular to the reference plane and crosses the intersection of the two parallel lines as indicated in figure A51.3.
- 5/ Glass bulb and supports shall not exceed the envelope, as indicated in figure A51.4. The envelop is concentric with the reference axis.

**A51.1 Electrical and photometric requirements:**

Parameter		Production Lamps	Standard Lamp
Ref. No.		12D1R, 12 D2R	
Rated voltage of the ballast		12 <u>7/</u>	12
Rated wattage		35	35
Test voltage		13.5	13.5
Lamp voltage		$85 \pm 17$	$85 \pm 8$
Lamp wattage		$35 \pm 3$	$35 \pm 0.5$
Luminous flux		$2800 \pm 450$	$2800 \pm 150$
Colour coordinates	Objective	$x = 0.375$	$y = 0.375$
	Tolerance area <u>8/</u>	$x \geq 0.345$ $x \leq 0.405$	$y \leq 0.150 + 0.640 x$ $y \leq 0.050 + 0.750 x$
Hot-restrike switch-off time (s)		10	10

**A51.2 Dimensional requirements**

Dimensions		Production lamps	Standard lamps
Position of electrodes		See <b>A51.3</b>	
Position and form of the arc		See <b>A51.4</b>	
Position of the black stripes		See <b>A51.5</b>	
$\alpha 1$ <u>6/</u>		$45^\circ \pm 5^\circ$	
$\alpha 2$ <u>6/</u>		45° min.	
Cap	Category D1R:	PK32d-3	
	Category D2R:	P32d-3	

Notes:

6/ The part of the bulb within the angles  $\alpha 1$  and  $\alpha 2$  shall be the light emitting part. This part shall be as homogeneous in form as possible and shall be optically distortion free. This applies to the whole bulb circumference within the angles  $\alpha 1$  and  $\alpha 2$  except for the black stripes.

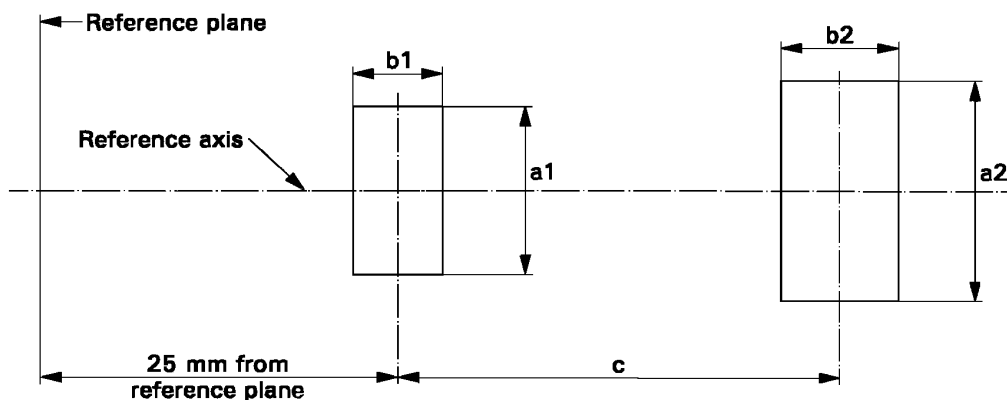
7/ Application voltages of ballasts may differ from 12 V.

8/ See **6.3.1** and Annex J.

**A51.3 Position of the electrodes:**

**A51.3.1** This test is used to determine whether the electrodes are correctly positioned relative to the reference axis and the reference plane.

**Figure A51.5: Measuring direction: light source side and top view**





Dimension in mm	Production lamps	Standard lamps	d = diameter of the electrode < 0.3
a1	d + 0.5	d + 0.2	
a2	d + 0.7	d + 0.35	
b1	0.4	0.15	
b2	0.8	0.3	
c	4.2	4.2	

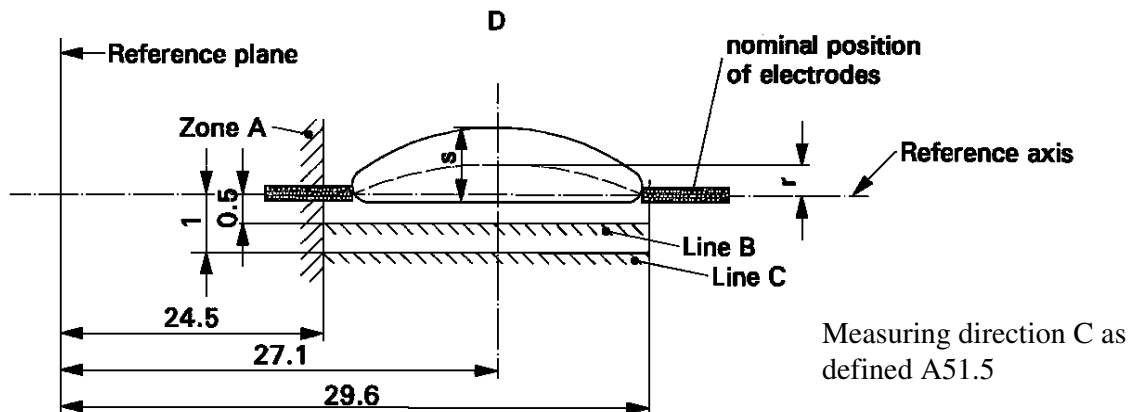
The top of the electrode nearest to the reference plane shall be positioned in the area defined by a1 and b1. The top of the electrode furthest from the reference plane shall be positioned in the area defined by a2 and b2.

**A51.4 Position and form of the arc**

**A51.4.1** This test is used to determine the form and sharpness of the arc and its position relative to the reference axis and plane by measuring its bending and diffusion in the central cross section D and by measuring stray light intensities in Zone A and at lines B and C.

The form of the arc is for illustration purposes only.

**Figure A51.6: Measuring direction- light source side view**



**A51.4.2** When measuring the luminances from measuring direction B as defined in Figure A51.8 with a set-up as outlined in Annex G, however with a circular field of 0.2M mm diameter., the relative luminance expressed as a percentage of L max (at cross section D) shall be:

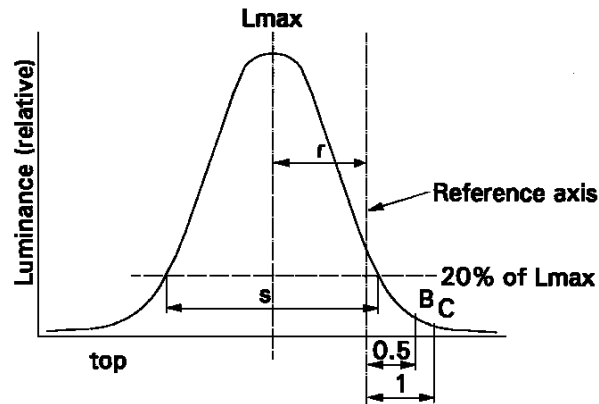
Dimension in mm	Production lamps	Standard lamps
r	0.50 ± 0.25	0.50 ± 0.20
s	1.10 ± 0.25	1.10 ± 0.25

When measuring the luminances from measuring direction B as defined A51.5 with a set-up as outlined in Annex J, however with a circular field of 0.2M mm diameter., the relative luminance expressed as a percentage of L max (at cross section D) shall be:

Zone A	≤ 4.5 %	Line B	≤ 15 %	Line C	≤ 5.0 %
--------	---------	--------	--------	--------	---------

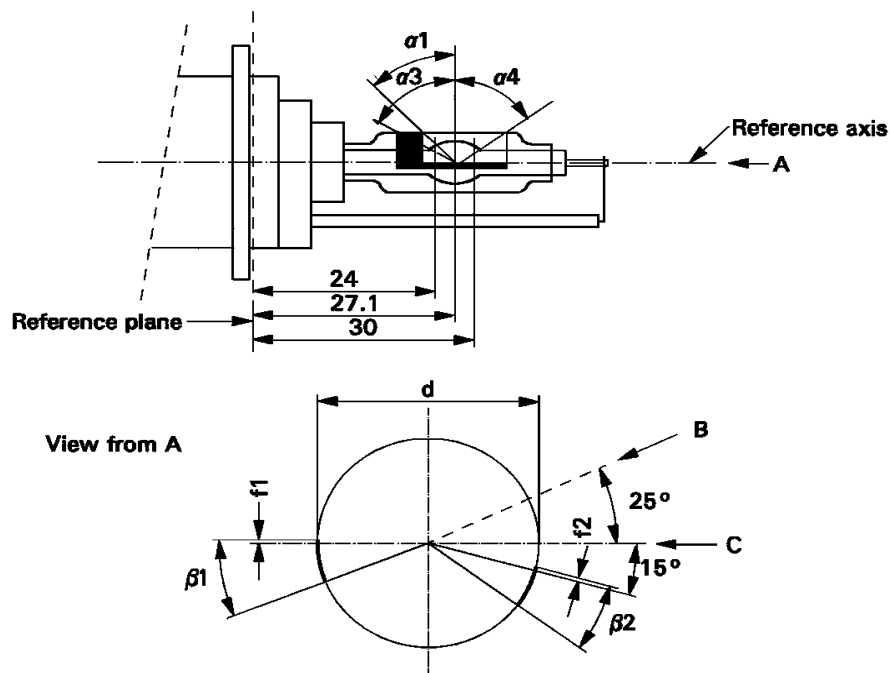
The area of zone A is defined by the black coating, the outer bulb and a plane at 24.5 mm from the reference plane.

Figure A51.7: Determination of arc bending  $r$ , arc diffusion  $s$  and luminance  $L_{max}$



**A51.5 Position of black stripes:** This test is used to determine whether the black stripes are correctly positioned relative to the reference axis and the reference plane.

Figure A51.8



When measuring the luminance distribution of the arc in the central cross section as defined in A51.4.2, after having turned the light source so that the black stripe is covering the arc, the measured luminance shall be  $\pm 0.5\%$  of  $L_{max}$ . In the area defined by  $\alpha 1$  and  $\alpha 3$  the black coating may be replaced by any other means which prevents light transmission through the specified area.

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<b>Dimensions</b>	<b>Production lamps</b>	<b>Standard lamps</b>
$\alpha 1$		$45^\circ \pm 5^\circ$
$\alpha 3$		$70^\circ \text{ min.}$
$\alpha 4$		$65^\circ \text{ min.}$
$\beta 1/24, \beta 1/30, \beta 2/24, \beta 2/30$		$25^\circ \pm 5^\circ$
f1/24, f2/24 <u>9/</u>	$0.15 \pm 0.25$	$0.15 \pm 0.20$
f1/30 <u>9/</u>	f1/24 mv $\pm 0.15$ <u>10/</u>	f1/24 mv $\pm 0.1$
f2/30 <u>9/</u>	f2/24 mv $\pm 0.15$ <u>10/</u>	f2/24 mv $\pm 0.1$
f1/24 mv - f2/24 mv	$\pm 0.3 \text{ max.}$	$\pm 0.2 \text{ max.}$
D		$9 \pm 1$

Notes

<u>9/</u>	"f1/.." means dimension f1 to be measured at the distance from the reference plane indicated in mm after the stroke.
<u>10/</u>	" /24 mv" means the value measured at a distance of 24 mm from the reference plane.

Annex-A52 (See para 4)  
Requirements of H14 Category Lamps

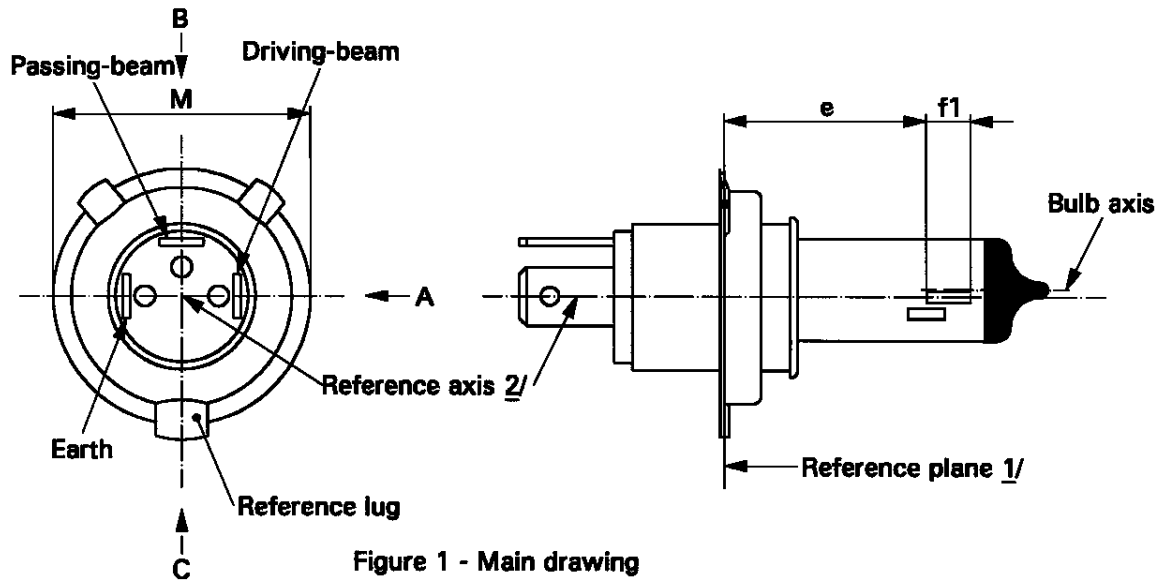


Figure 1 - Main drawing

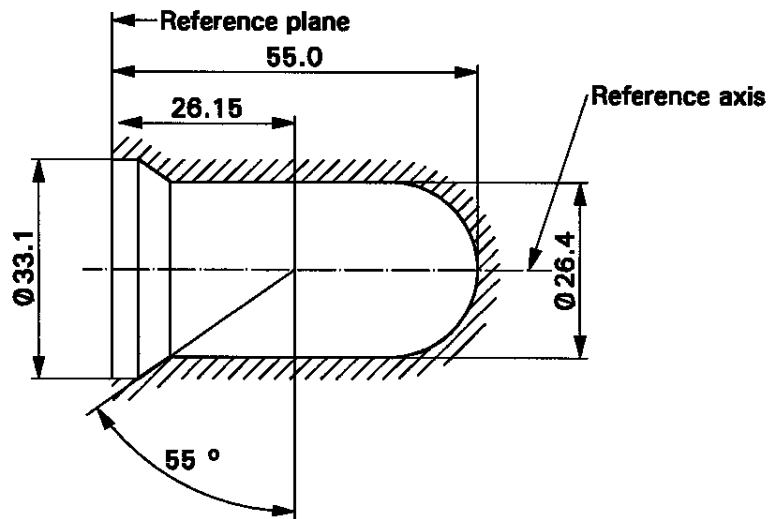


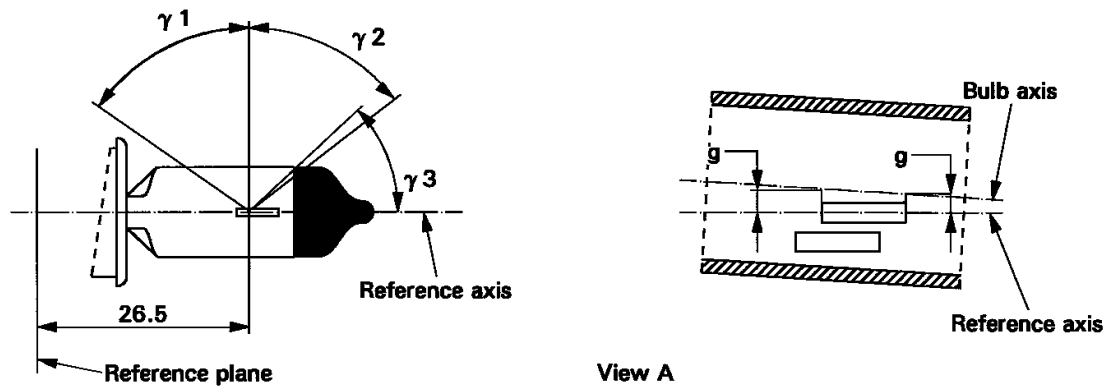
Figure 2 - Maximum lamp outline 3/

Figure A52.1

**Notes:**

- 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 of Figure A52.1. The envelope is concentric to the reference axis.

Figure A52.2



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

Figure 4 - Bulb eccentricity 6/

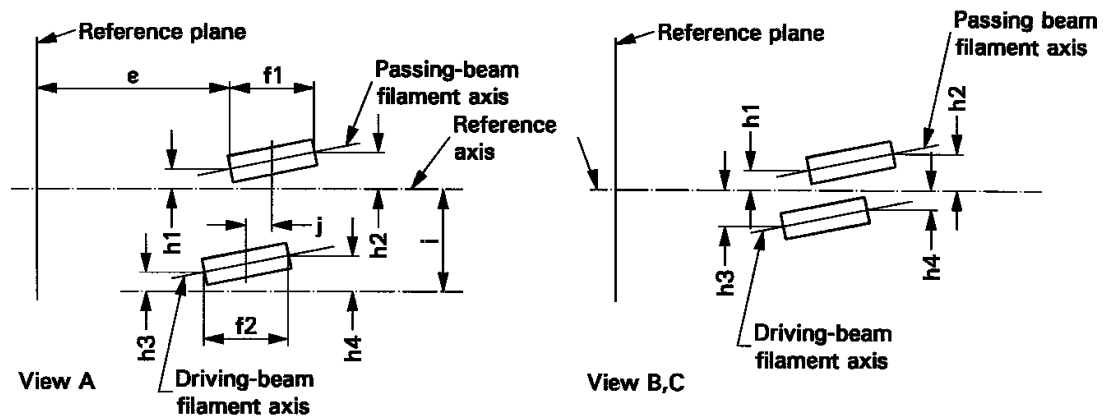


Figure 5- Offset of filament axis 7/ (for standard filament lamps only)

Notes:

- 4/ Glass bulb shall be optically distortion free within the angles  $\gamma_1$  and  $\gamma_2$ . This requirement applies to the whole bulb circumference within the angles  $\gamma_1$  and  $\gamma_2$ .
- 5/ The obscuration shall extend at least to angle  $\gamma_3$  and shall extend at least to the cylindrical part of the bulb on the whole bulb top circumference.
- 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 **Figure 49.1**. 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.

**A52.1 Electrical and photometric requirements:**

Parameter		Production Lamps		Standard Lamp	
Ref. No.		12H14			
		Driving filament	Passing filament	Driving filament	Passing filament
Rated Volt		12		12	
Rated Watt		55	60	55	60
Test Volt		13.2		13.2	
Objective values	Watt	68 max.	75 max.	68 max.	75 max.
	Lumen	1150 ± 15 %	1750 ± 15 %	-	
Reference luminous flux: 860/1300 lm at approximately 12 V					

**A52.2 Dimensional requirements**

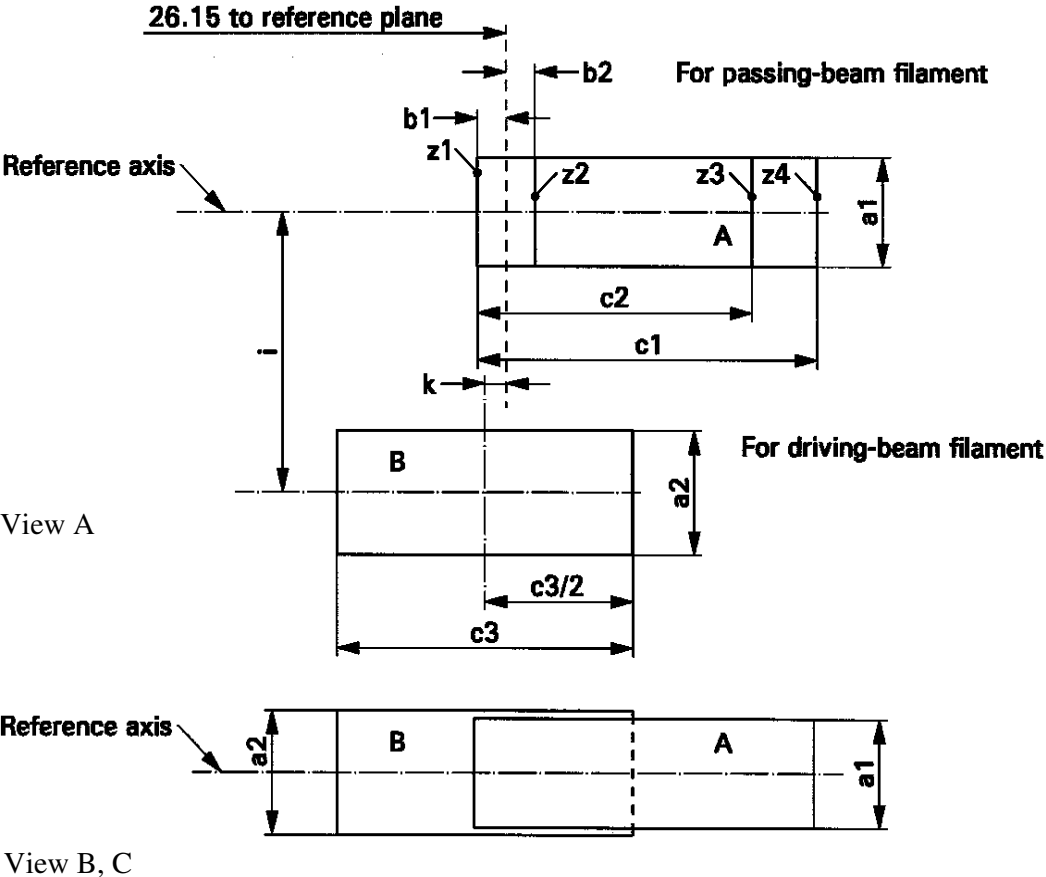
Dimensions in mm			Tolerance	
			Filament lamps of normal production	Standard filament lamp
e	8/	26.15	12/	± 0.1
f1	8/ 9/	5.3	12/	± 0.1
f2	8/ 9/	5.0	12/	± 0.1
g		0.3 min.		
h1		0	12/	± 0.1
h2		0	12/	± 0.15
h3		0	12/	± 0.15
h4		0	12/	± 0.15
i		2.7		-
j		2.5	12/	± 0.1
γ1		55° min.	-	-
γ2		52° min.	-	-
γ3		43°	0/-5°	0/5°
Cap	P38t-33			

**Notes:**

- 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 Figure A52.1, 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/ "d1" represents the diameter of the passing-beam filament and "d2" represents the diameter of the driving-beam filament.
- 11/ Notes concerning the filaments diameter.  
 - No actual diameter restrictions apply.  
 - For the same manufacture, the design diameter of standard filament lamps and filament lamps of normal production shall be the same.
- 12/ To be checked by means of a "Box system"; See A12.3.

**A12.3 Screen projection requirements**

**A12.3.1** 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 lamp complies with the requirements.



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

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

The positions of the filaments are checked solely in directions A, B and C as shown in figure 1 on Figure A52.1.

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 in note 8/ shall lie between lines Z1 and Z2 and between lines Z3 and Z4.

**Annex-A53 (See para 4)**  
**Requirements of F02 Category Lamps**

**A53.1 Electrical and photometric requirements:**

<b>Parameter</b>		<b>Production Lamps</b>	
Ref. No.		F02	
Rated Volt		12	
Rated Watt		50	
Test Volt		13.2	
Objective values	Watt	Maximum	61.0
		Minimum	50.0
	Lumen	Minimum	1150

**A53.2 Dimensional requirements**

<b>Parameter</b>	<b>Production Lamps</b>
Diameter	29 Max
Overall Length	64.0 Max
Length Pin to Solder	16.0
Light Center length	21.5+0.55
Cap	P36S

**Note:** This bulb is intended only for use for working lamp (plough lamp) of agricultural tractors.



## Annex B (See 6.2.3 &amp; 6.2.6)

**Luminous Centre and Shapes of Lamp Filaments**

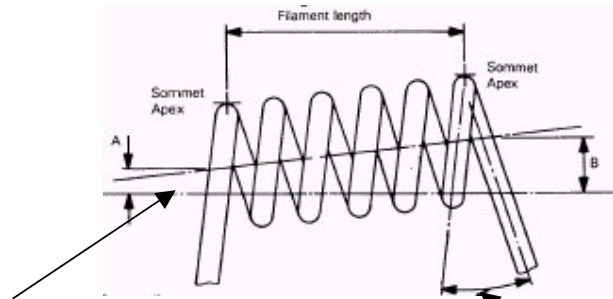
- B1** Save as possibly otherwise stated on the filament lamp data sheets, this Annex is applicable to the determination of the luminous centre of different filament shapes.
- Unless otherwise specified in the relevant filament lamp data sheet, the filament length is the distance between the filament extremities as defined in clause 6.2.4 (see figure B1) measured either parallel with, or perpendicular to, the reference axis according to the type of filament.
- B2** If the filament is shown as a point on a filament lamp data sheet (6.2.3) the filament shape is optional and the luminous centre of the filament shall be determined as specified in figure B2.
- The sidelines of the circumscribed rectangles in Nos. 2 and 3 are parallel and perpendicular, respectively, to the reference axis.
- The luminous center is the intersection of the dash-dot lines.
- B3.0** Unless otherwise specified in the relevant filament lamp data sheet, in cases where the filament position is dimensioned by offsets, these are defined as the distances between the intersection points of the extreme turns as defined in B3.1, with the actual filament axis, and the filament reference line (see figure B1).
- B3.1** Unless otherwise specified in the relevant filament lamp data sheet, the extreme filament turns are defined as the first and last turn that in projection are fully at the correct helix angle. A turn is considered to be at the correct helix angle if its pitch does not exceed 150 % of that of the average pitch.
- B4.** Unless otherwise specified in the relevant filament lamp data sheet, in cases where the filament position is toleranced by lateral deviations, these are defined as the distance between the reference axis or plane and the centre of the filament, determined as specified in 6.2.3. Lateral deviations are mostly given in two mutually perpendicular planes. These two deviations together with the tolerance on the light centre length, determine the deviation of the centre of the filament with respect to an x, y, z system of co-ordinates (see figure B3).
- B5.** The filament shape and position of some filament lamps with line filaments are checked by means of a so-called box system. This system is used to determine whether the filament is correctly positioned relative to the reference plane and also whether the light centre length is within certain limits. Magnified targets of the permitted limits as given on the relevant filament lamp data sheet are drawn on the test screens and positioned correctly with respect to the reference axis and reference plane. Images of the filament with the same degree of magnification are then projected on to the test screens. These images shall fall entirely within the target areas and, if required, the ends or centre of the filament shall fall within the specified limits.

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The ends of the filament are defined as the points, where, when viewing in a given direction, the projection of the outside of the first and last turn crosses the filament reference line. The centre of the filament is the halfway distance between the crossings.

- B6** In the case of filament lamps produced using continuous filament technique, the maximum filament length “f” shown in the relevant data sheets are permitted to be 1.75 times “f”. Refer Figure B4.

Figure B1. (See B1)



Filament reference line (the theoretical position of the filament with respect to the reference axis and reference plane as defined on the relevant Annex.

Angle

Figure B2. (See B4.)

No.	Filament shapes	Observations
1		<p>With <math>b &gt; 1.5 h</math>, the deviation of the filament axis with respect to a plane normal to the reference axis shall not exceed <math>15^\circ</math></p>
2		<p>Only applicable to filaments which can be inscribed in a rectangle of <math>b &gt; 3h</math>.</p>
3		<p>Applicable to filaments which can be inscribed in a rectangle of <math>b \leq 3h</math>, (<math>k &lt; 2h</math>)</p>

Figure B3 (See B4.)

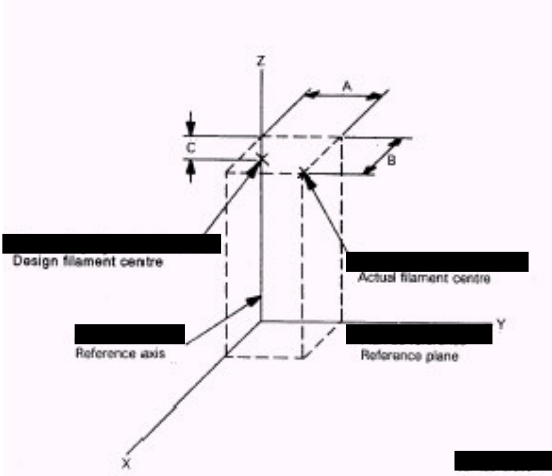
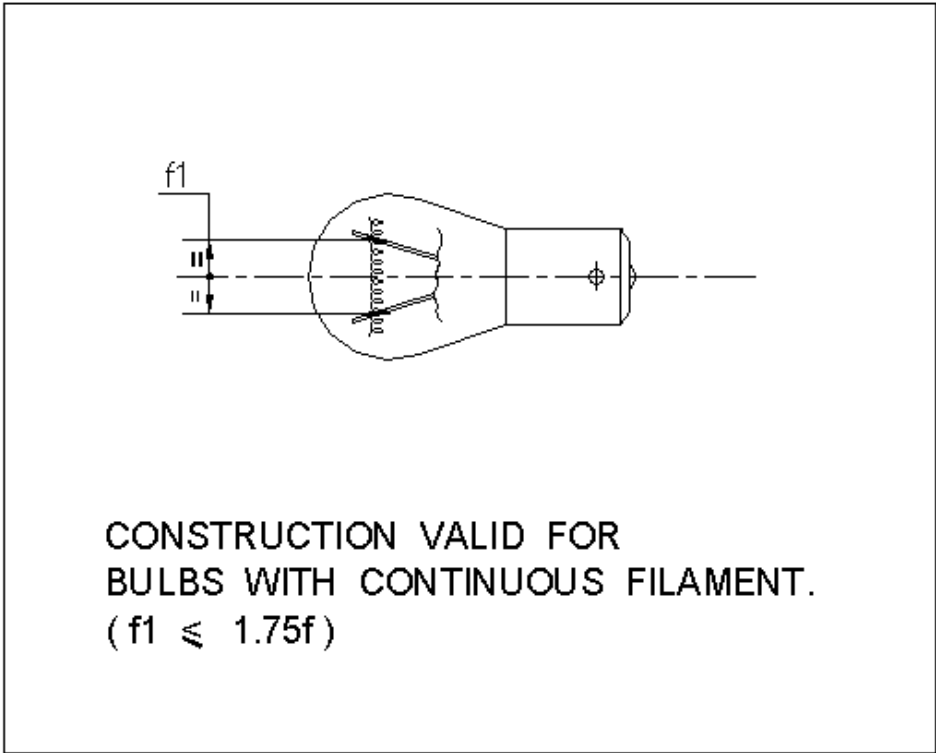


Figure B4 (See B6) Filament length for continuous filament lamps



**Annex C (See Para 7.3)**  
**Checking the Colour of Filament Lamps**

**C1. General**

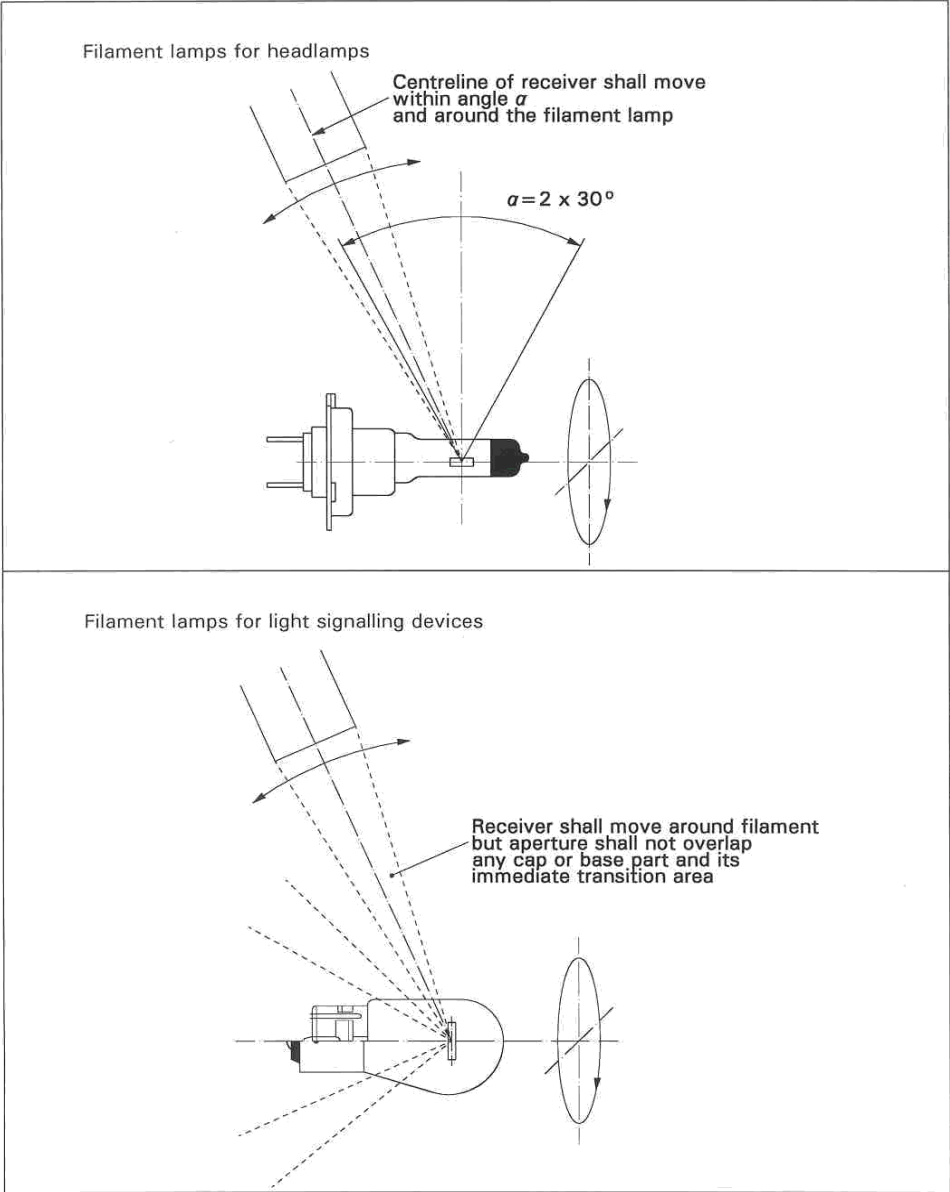
- C1.1.** Measurements shall be made on finished lamps. Filament lamps with secondary (outer) bulb acting as colour filter shall be handled as filament lamp with primary bulb.
- C1.2.** Tests shall be made at an ambient temperature of  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ .
- C1.3.** Tests shall be made at test voltage as specified in the relevant Annex (See Table 1)
- C1.4.** Filament lamps shall be measured preferably in the normal operating position.
- C1.5.** Before starting a test, the stabilization of the temperature of the filament lamp shall be obtained by operating at test voltage for 10 minutes.

**C2. Colour**

- C2.1.** Colour tests shall be made with a measuring system that determines CIE trichromatic co-ordinates of the received light with an accuracy of  $\pm 0.002$ .
- C2.2.** The trichromatic coordinates shall be measured with a colorimetric receiver integrating over a right circular cone subtending an angle of minimum  $5^{\circ}$  and maximum  $15^{\circ}$ , at the centre of the filament.
- C2.3. Measuring directions**  
(See the figure **C1**.)
  - C2.3.1.** Initially, the receiver shall be positioned perpendicular to the lamp 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 in bi-directional steps of about  $30^{\circ}$  until the area specified in paragraphs **C2.3.2** or **C2.3.3** 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.
  - C2.3.2.** For filament lamps used in headlamps, measurements shall be made in directions around the filament lamp with the centreline of the receiver aperture located within an angle  $\pm 30^{\circ}$ , from the plane perpendicular to the lamp axis with the origin in the centre of the filament. In case of filament lamps with two filaments, the centre of the driving-beam filament shall be taken.
  - C2.3.3.** For filament lamps used in light signalling devices, measurements shall be made randomly around the filament lamp with exception of the area claimed or covered by the cap of the filament lamp, including the immediate transition area. In case of filament lamps with two filaments, the centre of the major filament shall be taken.

Figure C1

FIGURE ILLUSTRATING THE POSITIONS OF COLOURIMETRIC RECEIVER



**Annex D (See Para 10.2)**  
**Test Procedure for life test.**

- D1** The lamps selected for life test shall burn throughout life in the normal burning position at specified test voltage given in the relevant tables D1/D2.  
 In case of double filament lamps separate LTQ's, as provided for, shall be used for life test on each filament.
- D2** **Ageing:** Shall be as per **9.2.1** of this standard.
- D3** **Test Voltage:**  
 Measurements shall be carried out at the test voltage specified in the relevant Annex (See Table 1). The voltage shall be a stable D.C. or A.C voltage with a frequency between 40Hz and 60Hz.  
 The test voltage is deemed to be stable when the momentary fluctuations do not exceed 1% and the deviation of the average over the test period does not exceed +0.1V of the specified value.
- D4** **Switching on and off during Life Test:**  
 Lamps on life test shall be switched off twice in 24 hours of operation for a period of not less than 15minutes, such period not being considered as part of the life of the lamp.
- D5** **Accidentally Broken Lamps:**  
 If one or more lamps break accidentally in handling during life test, the life results may be computed on the basis of results obtained on the remainder of LTQ, provided the number of later is not less than 9.
- D6** **Test Conditions:**  
 During the life test, it is preferable to maintain the room temperature at  $25 \pm 2.5^{\circ}\text{C}$ . If this is not possible, adequate care should be taken that during testing heat of one lamp does not disturb other lamps. This condition shall be deemed to be satisfied if a minimum distance of 250 mm is kept between lamps during testing.
- D7** **Duration of Life Test:**  
 For the purpose of computing average life of LTQ lamps operating beyond 125% of the specified life in life test shall be deemed to have a life equal to 125% of the specified life only.
- D8** **Measurements during Life Test (efficiency maintenance)**  
 Each lamp of the LTQ shall be tested for lumen with an integrating photometer at the test voltage at percentage indicated in Table D1/D2, of the specified life.  
 The life test may be interrupted for determination of the lumen maintenance.
- D9** **Number of Samples:** The LTQ shall be 10. The number of samples shall be as per para.13.1.12.
- D10.0** **Life Performance:**
- D10.1** The batch shall be considered as complying with life performance requirements, if:
- D10.2** The minimum average life of LTQ shall not be less than the minimum life specified in the relevant tables D1/D2.

**Note:** These figures are lower than the specified life in order to cover the statistical uncertainty involved in testing small samples.

**D10.3** The number of lamps of the LTQ having lives less than 60% of the specified life together with lamps having lumen maintenance at 50% of the specified life less than value specified in relevant table shall not exceed 4 in case of festoon, direction indicator of category 5 and rear position lamps and 2 in the case of other lamps.

**Table D1: Requirements for Double Filament Lamps.**

Category	Filament	Life requirements (h)		Lm%	Lm to be verified at % of LSP
		LSP*	LTQ		
R2	Driving	75	63	85	50 ± 5%
	Passing	150	126	85	50 ± 5%
S1	Driving	100	85	85	50 ± 5%
	Passing	100	85	85	50 ± 5%
S2	Driving	100	85	85	50 ± 5%
	Passing	100	85	85	50 ± 5%
H4	Driving	150	126	85	75 ± 5%
	Passing	300	252	85	75 ± 5%
HS1	Driving	150	126	85	75 ± 5%
	Passing	300	252	85	75 ± 5%
H13, H13A	Driving	150	126	85	75 ± 5%
	Passing	300	252	85	75 ± 5%
P21/5W	Main	100	85	85	50 ± 5%
	Auxiliary	1000	850	85	50 ± 5%
P21/4W	Main	100	85	85	50 ± 5%
	Auxiliary	1000	850	85	50 ± 5%
P27/7W	Main	100	85	85	50 ± 5%
	Auxiliary	1000	850	85	50 ± 5%
PY27/7W	Main	100	85	85	50 ± 5%
	Auxiliary	1000	850	85	50 ± 5%
W21/5W	Main	100	85	85	50 ± 5%
	Auxiliary	1000	850	85	50 ± 5%
R10/5W	Main	100	85	85	50 ± 5%
	Auxiliary	1000	850	85	50 ± 5%

\* LSP = Specified Life



**Table D2: Requirements for Single Filament Lamps.**

Category	Life requirements (h)		Lm %	Lm to be verified at % of LSP
	LSP	LTQ		
H1	300	252	85	$75 \pm 5\%$
H3	300	252	85	$75 \pm 5\%$
H7	300	252	85	$75 \pm 5\%$
H8, H8A	300	252	85	$75 \pm 5\%$
H9, H9A	300	252	85	$75 \pm 5\%$
H10	300	252	85	$75 \pm 5\%$
H11, H11A	300	252	85	$75 \pm 5\%$
H12	300	252	85	$75 \pm 5\%$
HB3 HB3A,	300	252	85	$75 \pm 5\%$

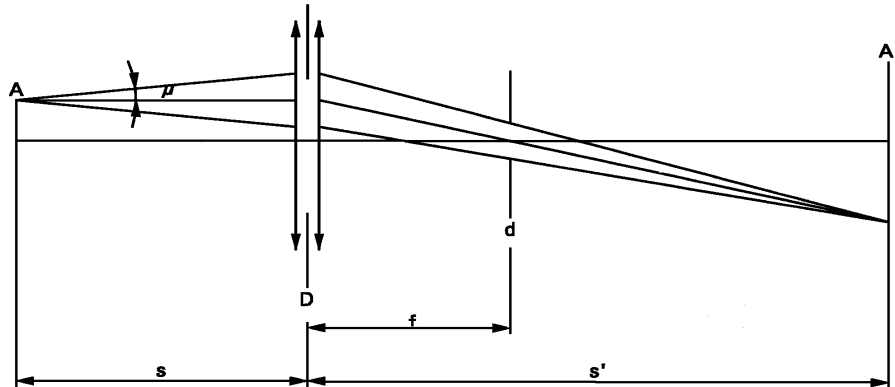
Table D2 Contd. : Requirements for Single filament lamps.

Category	Requirements		Lm %	Lm to be verified at % of LSP
	LSP	LTQ		
HB4, HB4A	300	252	85	75 ± 5%
HIR1, HIR2	300	252	85	75 ± 5%
HS2	300	252	85	75 ± 5%
S3	100	85	85	50 ± 5%
R5W	200	156	85	50 ± 5%
R10W	200	156	85	50 ± 5%
RY10W	200	156	85	50 ± 5%
P21W	100	85	85	50 ± 5%
PY21W	100	85	85	50 ± 5%
P27W	100	85	85	50 ± 5%
PS19W	100	85	85	50 ± 5%
PY19W	100	85	85	50 ± 5%
PSY19W	100	85	85	50 ± 5%
P24W	100	85	85	50 ± 5%
PS24W	100	85	85	50 ± 5%
PY24W	100	85	85	50 ± 5%
PSY24W	100	85	85	50 ± 5%
P19W	100	85	85	50 ± 5%
H27W/1	200	156	85	75 ± 5%
H27W/2	200	156	85	75 ± 5%
H21W	200	156	85	75 ± 5%
H6W	200	156	85	75 ± 5%
C5W	200	156	85	50 ± 5%
C10W	200	156	85	50 ± 5%
C21W	200	156	85	50 ± 5%
T1.4W	200	156	85	50 ± 5%
T4W	200	156	85	50 ± 5%
W3W	200	156	85	50 ± 5%
W2.3W	200	156	85	50 ± 5%
WY2.3W	200	156	85	50 ± 5%
W5W	200	156	85	50 ± 5%
WY5W	200	156	85	50 ± 5%
W16W	200	156	85	50 ± 5%
W21W	200	156	85	50 ± 5%
WY21W	200	156	85	50 ± 5%
WP21W	200	156	85	50 ± 5%
WPY21W	200	156	85	50 ± 5%
H14	300	252	85	75 ± 5%
F02	75	63	85	50 ± 5%

**Annex E (See Para 6.3.1)**  
**Optical Setup for the Measurement of the Position and Form of the Arc**  
**and of the Position of the Electrodes**

- E1** This method is an example of a measurement method; any method with equivalent measurement accuracy may be used.
- E2** The gas-discharge light source shall be positioned as shown in Figure 1 Annexes A51 and A52 for lamps D1S/D2S and D1R/D2R respectively

**Figure E1**



- E3** An optical system shall project a real image  $A'$  of the arc  $A$  with a magnification of preferably  $M = s'/s = 20$  on a screen. The optical system shall be aplanatic and achromatic. In the focus-length  $f$  of the optical system a diaphragm  $d$  shall cause a projection of the arc with nearly parallel observation directions. To get the angle of the half divergence not larger than  $\mu = 0.5^\circ$ , the diameter of the focus-diaphragm with respect to the focus-length of the optical system shall be not more than  $d = 2f \tan(\mu)$ .
- E4** The active diameter of the optical system shall be not more than:  
 $D = (1 + 1/M)d + c + (b_1 + b_2)/2$ . ( $c$ ,  $b_1$  and  $b_2$  are given in Annexes A51 & A52)
- E5** A scale on the screen shall enable to measure the position of the electrodes. The calibration of the arrangement advantageously can be done by using a separate projector with a parallel beam in connection with a gauge whose shadow is projected to the screen. The gauge shall show the reference axis and the plane parallel to the reference plane and at distance "e" mm from it ( $e = 27.1$  for D1S, D1R, D2S and D2R).
- E6** In the plane of the screen a receiver has to be mounted movable in a vertical direction on a line corresponding to the plane at "e" from the reference plane of the gas discharge light source.
- E7** The receiver shall have the relative spectral sensitivity of the human eye.
- E8** The size of the receiver shall be not more than  $0.2 M$  mm in the horizontal and not more than  $0.025 M$  mm in the vertical direction. ( $M =$  the magnification)
- E9** The range of measurable movement shall be such that the required measures of the arc bending  $r$  and arc diffusion  $s$  can be measured

**Annex F (See Para 0.4)  
Index of Old and New Reference Numbers for Auto Lamps.**

<b>As per this standard</b>		<b>Reference Number as per IS:1606-1979</b>
<b>Category</b>	<b>Reference Number</b>	
R2	12R2	HC12/1
	24R2	HC24/1
H4	12H4	HE12/1
	24H4	HE24/1
S1	6S1	HB6/2
	12S1	HB12/1
S2	12S2	HB12/2
P21W	6P21W	D6/1
	12P21W	D12/1
	24P21W	D24/1
P21/5W	6P21/5W	D6/2
	12P21/5W	D12/2
	24P21/5W	D24/2
R5W	6R5W	M6/5
	12R5W	M12/5
	24R5W	M24/3
R10W	6R10W	M6/6
	12R10W	M12/6
	24R10W	M24/4
C5W	6C5W	F6/2
	12C5W	F12/2
	24C5W	F24/1
C10W	6C10W 1	F6/3
	12C10W	F12/3
T4W	6T4W	M6/4
	12T4W	M12/4
	24T4W	M24/2
W5W	12W5W	W12/4
	24W5W	W24/3
R10/5W	12R10/5W	D12/3

**Annex G (See para 15)**  
**CONFORMITY OF PRODUCTION**

**G1.0 General:**

Filament lamps and gas-discharge light sources approved to this standard shall be so manufactured as to conform to the type approved by meeting the inscriptions and technical requirements set forth in this Standard. In order to verify that these requirements are met, suitable controls of the production shall be carried out

The conformity requirements shall be considered satisfied from a photometric ( including UV radiation for gas-discharge light sources), geometrical, visual and electrical standpoint if the specified tolerances for production filament lamps and gas-discharge light sources in the relevant data sheet of annex A are met.

**G2.0** The manufacturer shall in particular:**G2.1** Ensure existence of procedures for the effective control of the quality of products,**G2.2** Have access to the control equipment necessary for checking the conformity to each approved type,**G2.3** Ensure that data of test results are recorded and that related documents shall remain available for a period specified as per Quality Management System of the manufacturer. (See AIS 037)**G2.4.** Analyze the results of each type of test, applying criteria of Para **G3.4**, in order to verify and ensure the stability of the product characteristics making allowance for variation of an industrial production,**G2.5** Ensure that for each type of filament lamp or gas-discharge light source at least the tests prescribed in Para **G3.3** of this Standard are carried out,**G2.6** Ensure that any collecting of samples giving evidence of non-conformity with the type of test considered shall give rise to another sampling and another test. All the necessary steps shall be taken to re-establish the conformity of the corresponding production.**G2.7** The assessment shall in general cover series production filament lamps or gas-discharge 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**G3.0 Methods used in tests****G3.1.** Tests shall generally be carried out in accordance with the methods set out in this Standard.

The application of above para. requires regular calibration of test apparatus and its correlation with measurements made by test agency.

**G3.2 Nature of sampling**

Samples of filament lamps and gas-discharge light sources shall be selected at random from the production of a uniform batch. A uniform batch means a set of filament lamps or gas-discharge light sources of the same type, defined according to the production methods of the manufacturer.

**G3.3 Inspected and recorded characteristics**

The filament lamps and gas-discharge light sources shall be inspected and test results recorded following the grouping of characteristics as listed Table **G1**.

In case a filament lamp has more than one inner element (filament, shield) the grouping of characteristics (dimensions, watts, and lumens) applies to each element separately.

**G3.4 Criteria governing acceptability**

The manufacturer 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 of this Standard.

Compliance shall be assured if the level of acceptable non-compliance per grouping of characteristics given in Table **G1** is not exceeded. This means that the number of filament lamps not complying with the requirement for any grouping of characteristics of any filament lamp or gas-discharge light source type does not exceed the qualifying limits in the relevant tables **G2**, **G3** or **G4**

**Note:** Each individual filament lamp or gas-discharge light source requirement shall be considered as a characteristic.

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table **G2** 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.

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table **G3** 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.

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table **G4** given as a percentage of the results, assuming an acceptance probability of at least 0.95.

**Note:** Appropriate table, corresponding to the acceptance level of the manufacture shall be followed.

**Table G1**  
**a) Characteristics for Filament lamps**

<b>Grouping of characteristics</b>	<b>Grouping of test records between lamp types ( See G2.7)</b>	<b>Minimum 12 monthly sample per grouping ( See G2.7)</b>	<b>Acceptable level of non-compliance per grouping of characteristics (%)</b>
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 coloured bulbs of the same design	315	
External lamp 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 ( See G 3.3)	All lamps of one type	200	6.5
Initial readings, watts and lumens ( See G 3.3)	All lamps of one type	200	1
Note: "Minimum 12 monthly sample per grouping" means the minimum samples over the period of 12 consecutive calendar months immediately preceding the date of review.			

**b) Characteristics for Gas-discharge Light Sources**

<b>Grouping of characteristics</b>	<b>Grouping of test records between lamp types ( See G2.7)</b>	<b>Minimum 12 monthly sample per grouping ( See G2.7)</b>	<b>Acceptable level of non-compliance per grouping of characteristics (%)</b>
Marking, legibility and durability	All types with the same external dimensions	315	1
Bulb quality	All types with the same bulb	315	1
External dimensions (excluding cap)	All types of the same category	315	1
Position and dimensions of arc and stripes	All types of the same category	200	6.5
Starting, run-up and hot restrike	All types of the same category	200	1
Lamp voltage and wattage	All types of the same category	200	1
Luminous flux, colour and UV-radiation	All types of the same category	200	1
Note: "Minimum 12 monthly sample per grouping" means the minimum samples over the period of 12 consecutive calendar months immediately preceding the date of review.			

Table G2 - Qualifying limits for acceptance

Number of test results of each characteristics		Qualifying limits for acceptance
More than	Upto	
	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	1060	18
1061	1125	19
1126	1190	20
1191	1249	21

Table G3 Qualifying limits for acceptance

Number of lamps in records		Qualifying limit	Number of lamps in records		Qualifying limit	Number of lamps 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	1002	80
296	308	29	649	662	55	1003	1016	81
309	322	30	663	676	56	1017	1029	82
323	336	31	677	689	57	1030	1043	83
337	349	32	690	703	58	1044	1056	84
350	363	33	704	716	59	1057	1070	85
364	376	34	717	730	60	1071	1084	86
377	390	35	731	744	61	1085	1097	87
391	404	36	745	757	62	1098	1111	88
405	417	37	758	771	63	1112	1124	89
418	431	38	772	784	64	1125	1138	90
432	444	39	785	798	65	1139	1152	91
445	458	40	799	812	66	1153	1165	92
459	472	41	813	825	67	1166	1179	93
473	485	42	826	839	68	1180	1192	94
486	499	43	840	852	69	1193	1206	95
500	512	44	853	866	70	1207	1220	96
513	526	45	867	880	71	1221	1233	97
527	540	46	881	893	72	1234	1249	98



Table G4

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

**G4.0 Surveillance Checks:**

Test Agency which has granted type-approval may at any time verify the conformity control methods applicable to each production unit as per details given in AIS 037.

Note: Surveillance checks will become applicable only after the implementation date of AIS 037 for this standard is notified.

**G4.1.** In every inspection, the test books and production survey records shall be presented to the visiting inspector.

The normal frequency of inspection authorized by the competent authority shall be one every two years. In the case where negative results are recorded during one of these visits, the competent authority shall verify that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

**G4.2.** The representative of the Test Agency may take samples at random which will be tested on the facilities used by the manufacturer. The minimum number of samples may be determined according to the results of the manufacturer's own verification.

When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the above tests carried out, samples shall be selected for testing at the premises of testing agencies.

**G4.3 Requirements of Tests by Test Agency:**

If tests are carried out as per **G3.0** by the test agency, the following condition shall apply:

**G4.3.1** Compliance shall be decided according to the values in Table **G5**. For each grouping of characteristics filament lamps or gas-discharge light source shall be either accepted or rejected according to the values in table **G5**.

Note: This scheme in Table **G5** is designed to assess the compliance of filament lamps and gas-discharge light source 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.

**G4.3.2** The test by the Test Agency if required shall consist of tests on a sample of 125 lamps. The filament lamps and gas-discharge light source shall be inspected and test results recorded following the grouping of characteristics as listed in table **G1**.

**G4.3.3** If the number of non-conforming units is equal to or less than the values prescribed in column (2)/(4), of Sl.No.1 of Table **G5**, the production is deemed to comply.

If the number of non-conforming units is more than the values prescribed in column (3)/(5) of Sl.No.1 of Table **G5** the production is deemed not to comply.

If the number of non-conforming units is greater than column (2)/(4), and less than column (3)/(5) of Sl.No.1 of Table **G5**, an additional sample of size of 125, selected at random from a recent production run, shall be taken within two months, shall be subjected to test.

The results of these tests shall be clubbed together with the results of the earlier test and if the number of non-conforming units is equal to or less than the values prescribed in column (2)/(4) of Sl.No.2 of Table **G5**, the production is deemed to comply. Otherwise, the production is deemed not to comply

**Table G5**

	1 %		6.5 %	
	Accept	Reject	Accept	Reject
(1)	(2)	(3)	(4)	(5)
1. First sample size: 125	2	5	11	16
2. 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

**Annex : H**  
**(See Introduction)**  
**COMMITTEE COMPOSITION**  
**Automotive Industry Standards Committee**

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