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6-9 March 2001, agenda item 4.2.3.)

PROPOSAL FOR DRAFT SUPPLEMENT 21 TO THE 03 SERIES OF AMENDMENTS  
TO REGULATION No. 37

(Filament lamps)

Transmitted by the Working Party on Lighting and Light-Signalling (GRE)

Note: The text reproduced below was adopted by GRE at its forty-fifth session, and is transmitted for consideration to WP.29 and to AC.1. It is based on documents TRANS/WP.29/GRE/2000/20, as corrected, and TRANS/WP.29/GRE/2000/21, part (a) only (TRANS/WP.29/GRE/45, para. [...]).

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<http://www.unece.org/trans/main/welcwp29.htm>

List of contents, annexes.

Annex 1, add at the end of the list new sheets, to read:

“.....

Sheets WP21W (only for signalling lamps)”

Annex 1,

sheets P21W/1 and P21W/2, replace by the new sheets P21W/1 and P21W/2;

sheets P21/5W/1 to P21/5W/3, replace by the new sheets P21/5W/1 to P21/5W/3;

sheet R10W/1, replace by the new sheet R10W/1;

sheet PY21W/1, replace by the new sheet PY21W/1;

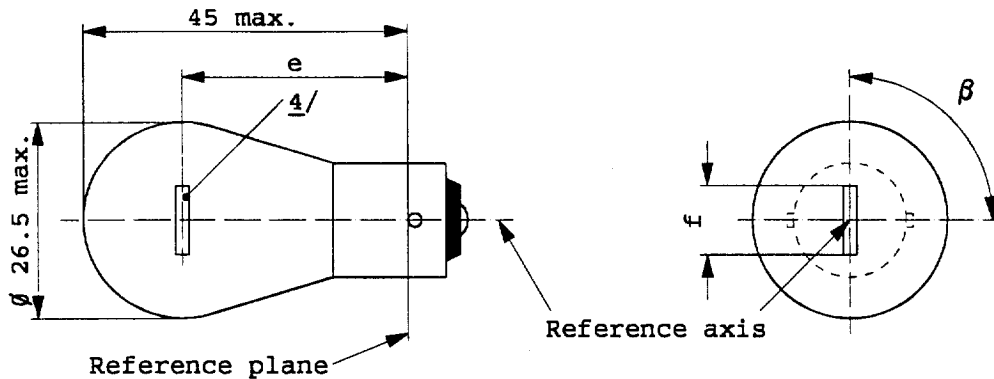
sheets H8/1 to H8/4, replace by the new sheets H8/1 to H8/4;

sheets H9/1 to H9/4, replace by the new sheets H9/1 to H9/4;

sheets H11/1 to H11/4, replace by the new sheets H11/1 to H11/4;

add the new sheets WP21W/1 and WP21W/2;

reading as follows:



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 <u>1/</u> deviation	6, 12 V			<u>3/</u>	0.3 max
	24V			1.5	
β		75°	90°	105°	90° ± 5°
Cap: BA 15s in accordance with IEC Publ. 61 (sheet 7004-11A-9) <u>2/</u>					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	6	12	24	12
	Watts	21			21
Test voltage	Volts	6.75	13.5	28.0	
Objective values	Watts	27.6 max.	26.5 max.	29.7 max.	26.5 max. at 13.5 V
	Luminous flux lm	460 ± 15%			
Reference luminous flux: 460 lm at approx. 13.5 V					

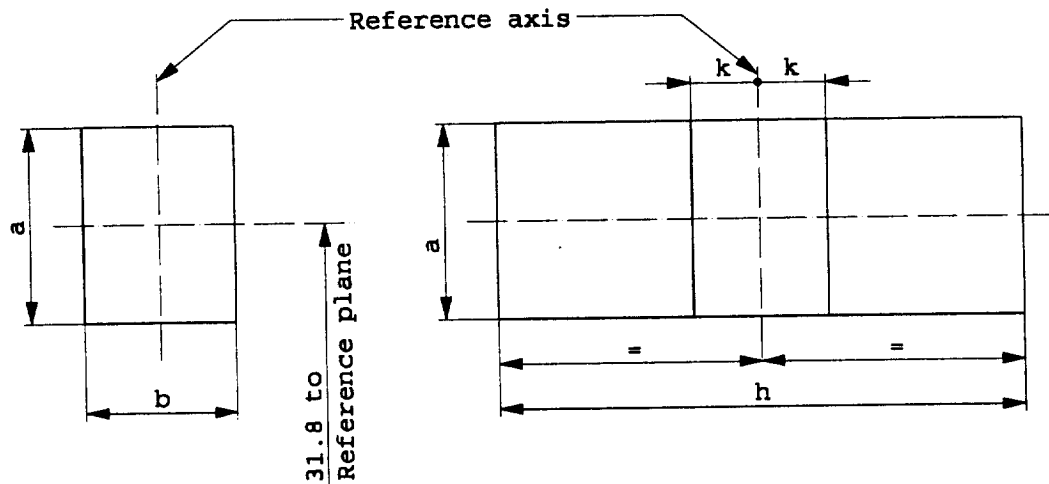
- 1/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the pins.
- 2/ Filament lamps with cap BA 15d may be used for special purposes; they have the same dimensions.
- 3/ To be checked by means of a box system, sheet P21W/2.
- 4/ In this view the filament of the 24 V type may be straight or V-shaped. This shall be indicated in the application of approval. If it is straight, the screen projection requirements, sheet P21W/2, apply. If it is V-shaped, the filament ends shall be at the same distance within ± 3 mm from the reference plane

Screen projection requirements.

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and the reference plane and has an axis perpendicular, within  $\pm 15^\circ$ , to the plane through the centre line of the pins (P21W) or reference pin (PY21W) and the reference axis, whether a filament lamp complies with the requirements.

Side elevation

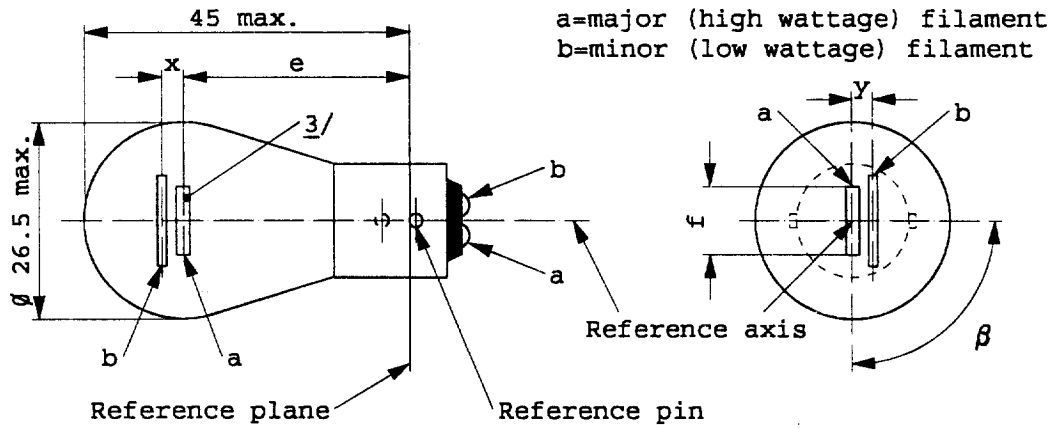
Front elevation



Reference	a	b	h	k
Dimension	3.5	3.0	9.0	1.0

Test procedures and requirements.

1. The filament 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.
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.
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:
  - 3.1 The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.
  - 3.2 The centre of the filament shall not be offset by more than distance "k" from the reference axis.



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			
Lateral <u>2/</u> deviation	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: BAY 15d in accordance with IEC Publ. 61 (sheet 7004-11B-7)								
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS								
Rated values	Volts	6		12		24		12
	Watts	21	5	21	5	21	5	21/5
Test voltage	Volts	6.75		13.5		28.0		
Objective values	Watts	27.6 max.	6.6 max.	26.5 max.	6.6 max.	29.7 max.	11 max.	26.5/6.6 max. at 13.5 V
	Luminous flux lm	440	35	440	35	440	40	
	±%	15	20	15	20	15	20	
Reference luminous flux: 440 and 35 lm at approx. 13.5 V								

For the notes see sheet P21/5W/2.

**Notes**

- 1/ These dimensions shall be checked by means of a "box-system". See sheets P21/5/2 and P21/5W/3. "x" and "y" refer to the major (high-wattage) filament, not to the reference axis.
- 2/ Maximum lateral deviation of the major (high wattage) filament centre from two mutually perpendicular planes both containing the reference axis and one containing the axis of the reference pin.
- 3/ In this view the filaments of the 24 V type may be straight or V-shaped. This shall be indicated in the application of approval. If the filaments are straight, the screen projection requirements apply. If they are V-shaped, the ends of each filament shall be at the same distance within  $\pm 3$  mm from the reference plane.

**Screen projection requirements.**

This test is used to determine, by checking whether:

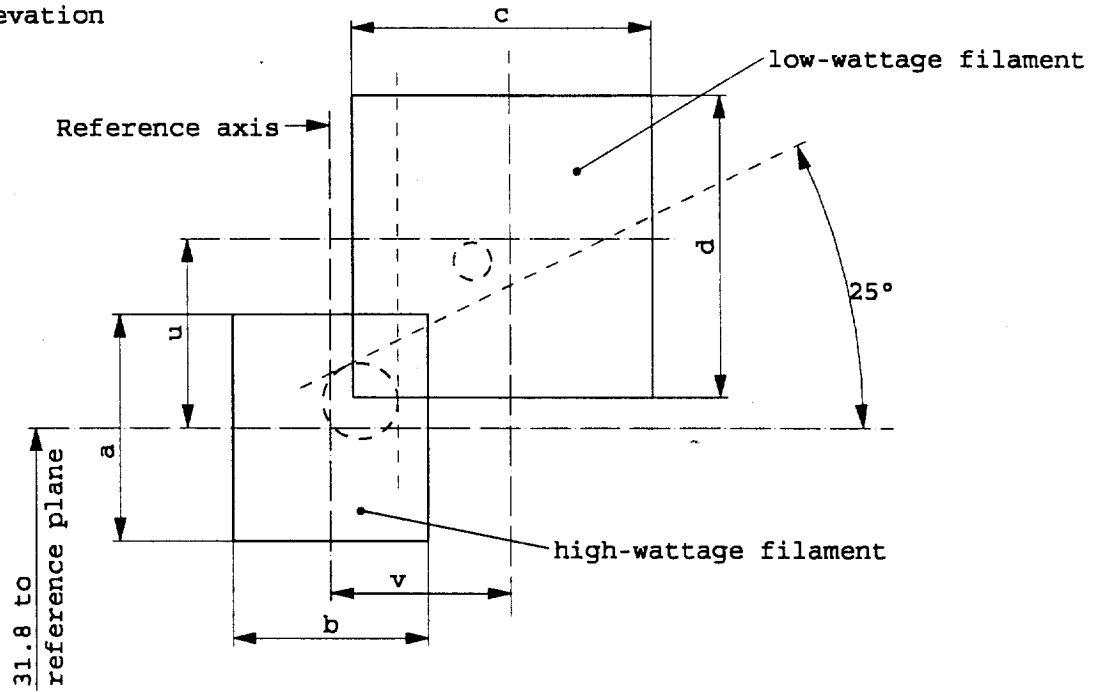
- (a) the major (high wattage) filament is correctly positioned relative to the reference axis and reference plane and has an axis perpendicular, within  $\pm 15^\circ$ , to the plane through the centres of the pins and the reference axis; and whether
  - (b) the minor (low wattage) filament is correctly positioned relative to the major (high wattage) filament,
- whether a filament lamp complies with the requirements.

Test procedure and requirements.

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.
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:
  - 2.1 the projection of the major filament shall lie entirely within a rectangle of height "a" and width "b", having its centre at the theoretical position of the centre of the filament;
  - 2.2 the projection of the minor filament shall lie entirely:
    - 2.2.1. within a rectangle of width "c" and height "d" having its centre at a distance "v" to the right of and at a distance "u" above the theoretical position of the centre of the major filament;
    - 2.2.2. above a straight line tangential to the upper edge of the projection of the major filament and rising from left to right at an angle of  $25^\circ$ .
    - 2.2.3. to the right of the projection of the major filament.
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:
  - 3.1 the projection of the major filament shall lie entirely within a rectangle of height "a" and width "h", centred on the theoretical position of the centre of the filament;
  - 3.2 the centre of the major filament shall not be offset by more than distance "k" from the reference axis;
  - 3.3 the centre of the minor filament shall not be offset from the reference axis by more than  $\pm 2$ mm ( $\pm 0.4$  mm for standard filament lamps).

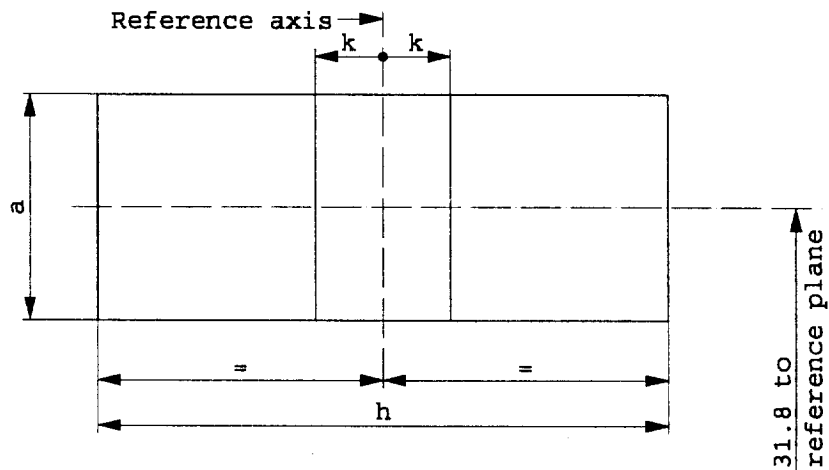
Dimensions in mm

Side elevation

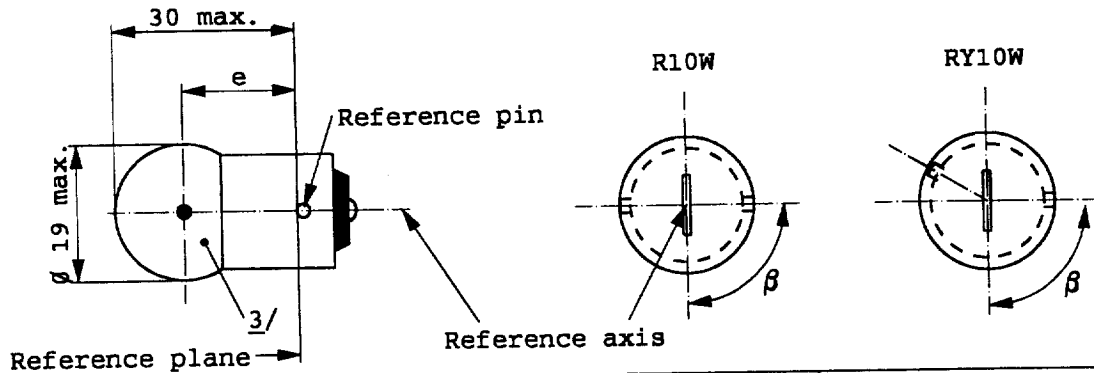


Reference	a	b	c	d	u	v
Dimensions	3.5	3.0	4.8		2.8	

Front elevation



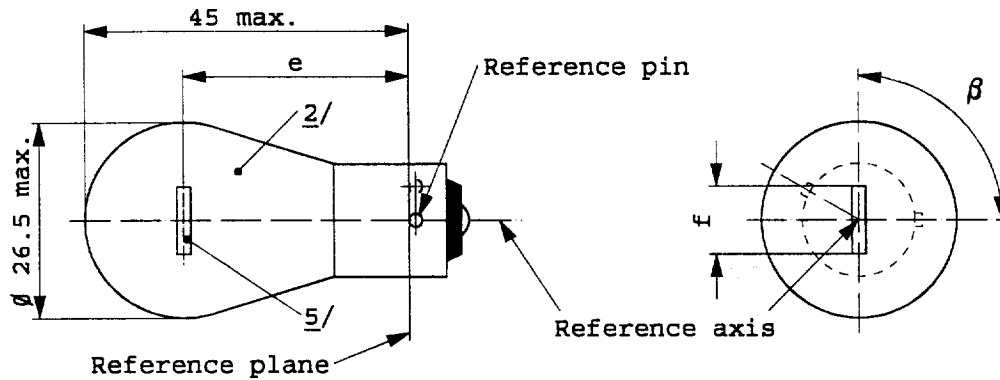
Reference	a	h	k
Dimensions	3.5	9.0	1.0



DIMENSIONS in mm	Filament lamps of normal production			Standard filament lamp	
	min.	nom.	max.		
e	17.5	19.0	20.5	19.0 ± 0.3	
Lateral deviation <sup>2/</sup>			1.5	0.3 max	
$\beta$	60°	90°	120°	90° ± 5°	
Cap R10W: BA 15s in accordance with IEC Publ. 61 (sheet 7004-11A-9) <sup>1/</sup> RY10W: BAU 15s (sheet 7004-19-1)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	6	12	24	12
	Watts	10			10
Test voltage	Volts	6.75	13.5	28.0	
Objective values	Watts	11 max		14 max.	11 max. at 13.5 V
	Luminous flux lm R10W	125 ± 20%			
	flux lm RY10W	75 ± 20%			
Reference luminous flux: Clear bulb: 125 lm at approx. 13.5 V Amber bulb: 75					

- 1/ Filament lamps R10W 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 the reference pin
- 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.

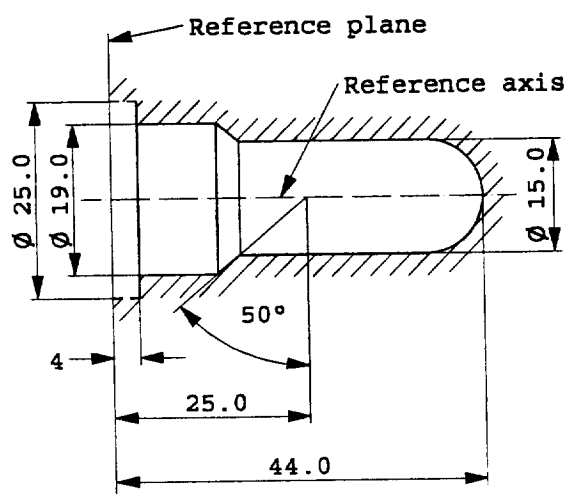
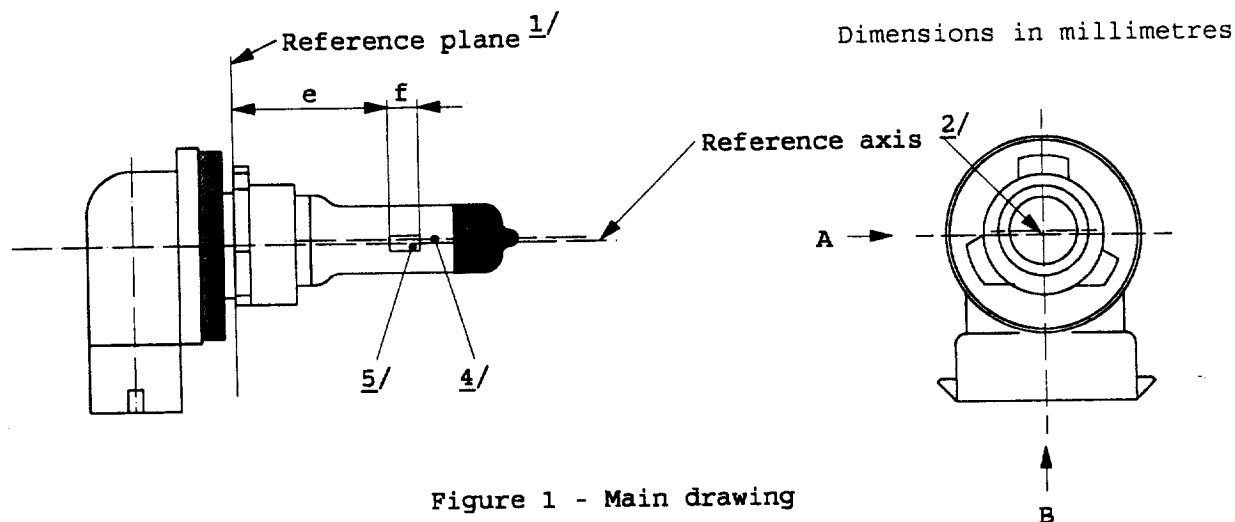




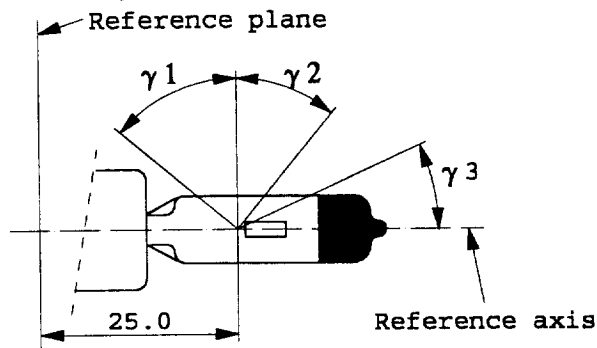
DIMENSIONS in mm		Filament lamps of normal production			Standard filament lamp
		min.	nom.	max.	4/
e	12 V		31.8 3/		31.8 ± 0.3
	24 V	30.8	31.8	32.8	
f	12 V			7.0	7.0 +0/-2
Lateral 1/ deviation	12 V			3/	0.3 max.
	24V			1.5	
β		75°	90°	105°	90° ± 5°
Cap: BAU 15s in accordance with IEC Publ. 61 (sheet 7004-19-1)					
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS					
Rated values	Volts	12	24	12	
	Watts	21			21
Test voltage	Volts	13.5	28.0		
Objective values	Watts	26.5 max.	29.7 max.	26.5 max. at 13.5 V	
	Luminous flux lm	280 ± 20%			
Reference luminous flux: Clear bulb: 460 lm at approx. 13.5 V Amber bulb: 280					

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

The drawings are intended only to illustrate the essential dimensions of the filament lamp.



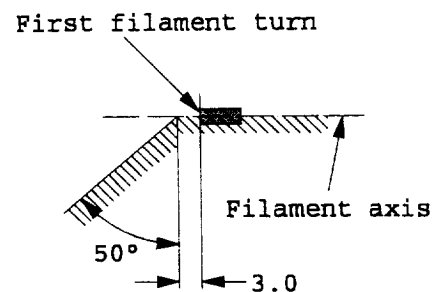
- 1/ The reference plane is the plane formed by the underside of the beveled lead-in flange of the cap.
- 2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.
- 3/ Glass bulb and supports shall not exceed the envelope as indicated in figure 2. The envelope is concentric to the reference axis.
- 4/ The bulb shall be colourless or yellow.
- 5/ Notes concerning the filament diameter.
  - No actual diameter restrictions apply but the objective for future developments is to have  $d_{max.} = 1.2 \text{ mm}$
  - For the same manufacturer, the design diameter of standard (étalon) 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/

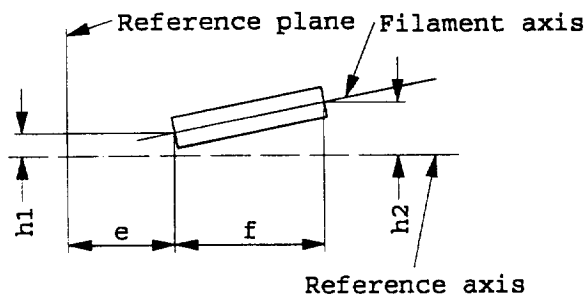
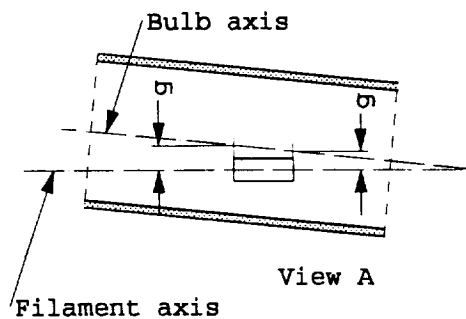


Figure 5

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



View A

Figure 6

Bulb eccentricity 10/

- 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, sheet H8/1). No metal parts other than filament turns shall be located in the shaded area as seen in figure 4.
- 9/ The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in figure 1 on sheet H8/1.  
The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.
- 10/ Offset of filament in relation to bulb axis measured in two planes parallel to the reference plane where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.

Dimensions in mm	Filament lamps of normal production		Standard filament lamp
	12 V		12 V
e <u>11/</u>	25.0	<u>12/</u>	25.0 ± 0.1
f <u>11/</u>	3.7		3.7 ± 0.1
g	0.5 min.		u.c.
h1	0	<u>12/</u>	0 ± 0.1
h2	0	<u>12/</u>	0 ± 0.15
γ1	50° min.		50° min.
γ2	40° min.		40° min.
γ3	30° min.		30° min.
Cap H8: PGJ19-1 in accordance with IEC 61 (sheet 7004-110-2) H8A: PGJX19-1			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Volts	12	12
	Watts	35	35
Test voltage	Volts	13.2	
Objective values	Watts	max 43	max 43 at 13.2 V
	Luminous flux lm	800	
	±%	15	
Reference luminous flux for headlamp testing: 600 lm at approx. 12V			

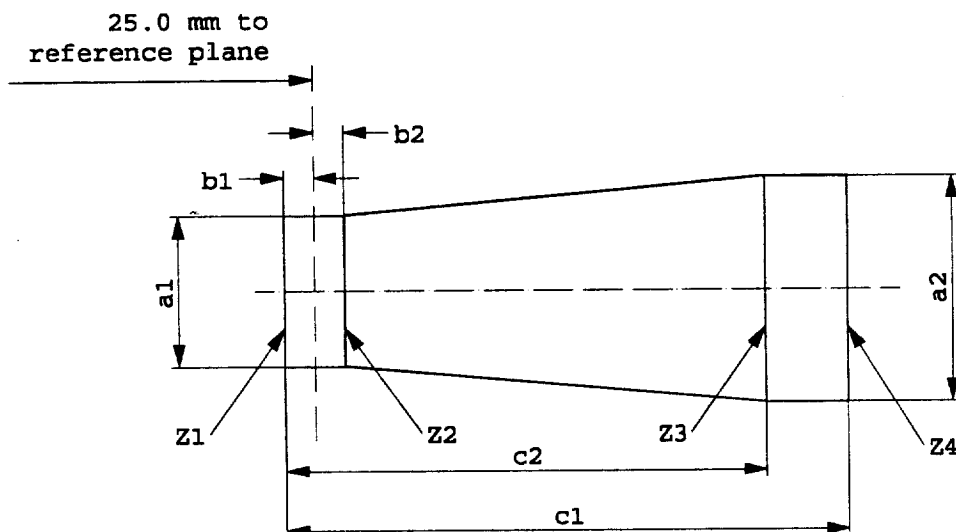
11/ The end of the filaments are defined as the points where, when the viewing direction is direction A as shown in figure 1, sheet H8/1, the projection of the outside of the end turns crosses the filament axis.

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

Screen projection requirements

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

Dimensions in mm



	a1	a2	b1	b2	c1	c2
12 V	$d + 0.5$	$d + 0.7$	0.25		4.6	3.5

d = diameter of filament

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

The filament shall lie entirely within the limits shown.

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

The drawings are intended only to illustrate the essential dimensions of the filament lamp.

Dimensions in millimetres

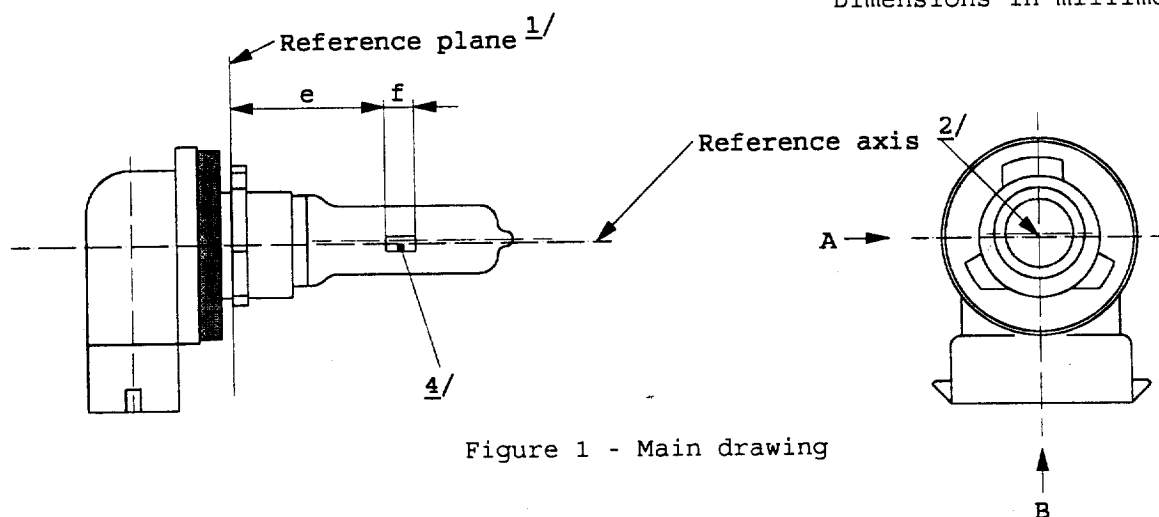


Figure 1 - Main drawing

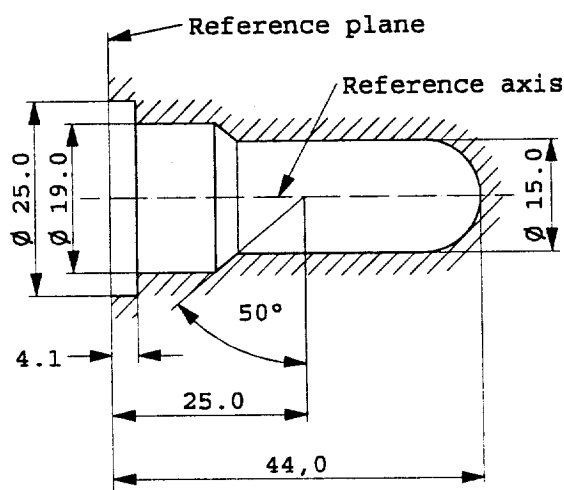
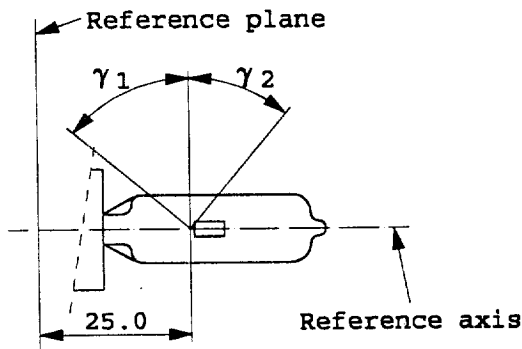


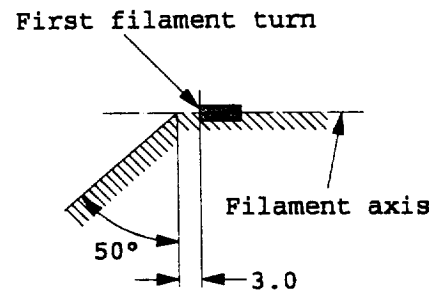
Figure 2 - Maximum lamp outline 3/

- 1/ The reference plane is the plane formed by the underside of the beveled lead-in flange of the cap.
- 2/ The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.
- 3/ Glass bulb and supports shall not exceed the envelope as indicated in figure 2. The envelope is concentric to the reference axis.
- 4/ Notes concerning the filament diameter.
  - No actual diameter restrictions apply but the objective for future developments is to have  $d_{max.} = 1.4$  mm
  - For the same manufacturer, the design diameter of standard (étalon) filament lamp and filament lamp of normal production shall be the same.



View B

Figure 3 - Distortion free area <sup>5/</sup>



View A

Figure 4 - Metal free zone <sup>6/</sup>

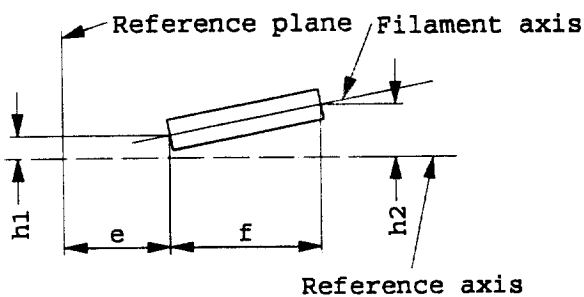
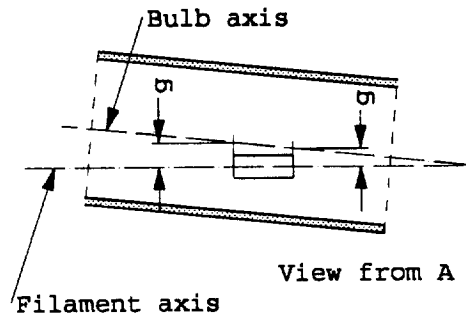


Figure 5 - Offset of filament axis <sup>7/</sup>  
(for standard filament lamps only)



View from A

Figure 6 - Bulb eccentricity <sup>8/</sup>

- <sup>5/</sup> 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  $\gamma_2$
- <sup>6/</sup> 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, sheet H9/1).  
No metal parts other than filament turns shall be located in the shaded area as seen in figure 4.
- <sup>7/</sup> The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in figure 1 on sheet H9/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.
- <sup>8/</sup> Offset of bulb 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.

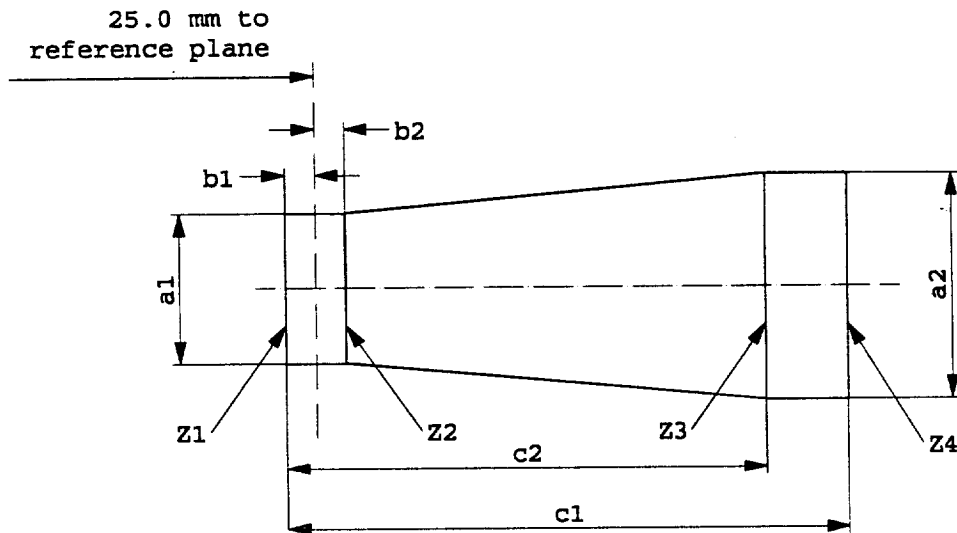
Dimensions in mm		Tolerances	
		Filament lamps of normal production	Standard filament lamp
e	<u>9/ 10/</u> 25	<u>11/</u>	± 0.10
f	<u>9/ 10/</u> 4.8	<u>11/</u>	± 0.10
g	<u>9/</u> 0.70	± 0.5	± 0.30
h1	0	<u>11/</u>	± 0.10 <u>12/</u>
h2	0	<u>12/</u>	± 0.15 <u>12/</u>
$\gamma_1$	50° min.	-	-
$\gamma_2$	40° min.	-	-
Cap H9: PGJ19-5 in accordance with IEC 61 (sheet 7004-110-2) H9A: PGJX19-5			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS			
Rated values	Volts	12	12
	Watts	65	65
Test voltage	Volts	13.2	13.2
Objective values	Watts	73 max.	73 max.
	Luminous flux lm	2100	
	± %	10	
Reference luminous flux for headlamp testing: 1500 lm at approx. 12V			

- 9/ The viewing direction is direction A as shown in figure 1 on sheet H9/1.
- 10/ The ends of the filament are defined as the points where, when the viewing direction as defined in note 9/ above, the projection of the outside of the end turns crosses the filament axis.
- 11/ To be checked by means of a "box-system". Sheet H9/4.
- 12/ The eccentricity is measured only in viewing directions A and B as shown in figure 1 on sheet H9/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.



Screen projection requirements

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



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

d = diameter of filament

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

The filament shall lie entirely within the limits shown.

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

The drawings are intended only to illustrate the essential dimensions of the filament lamp.

Dimensions in millimetres

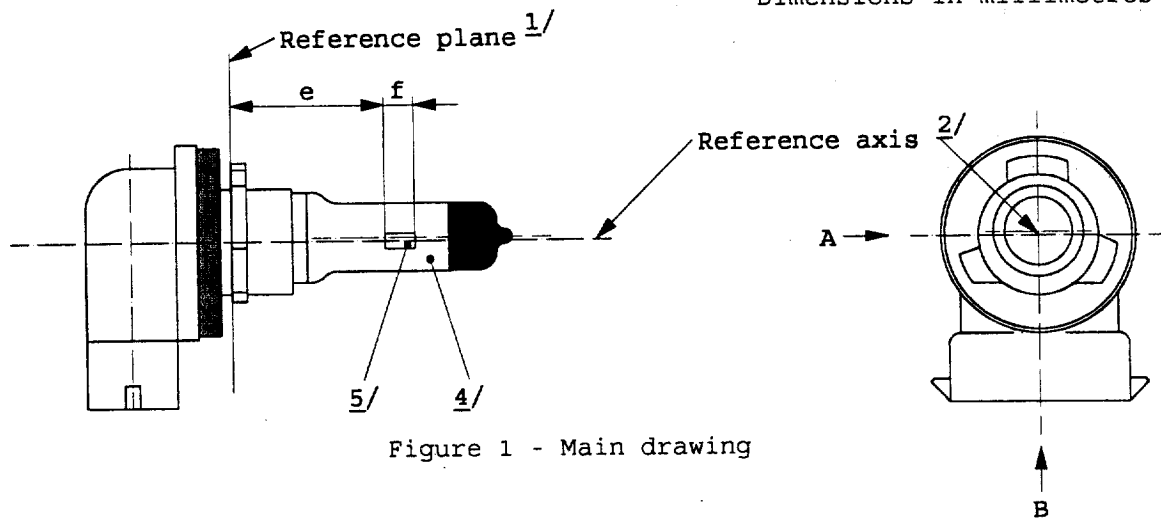


Figure 1 - Main drawing

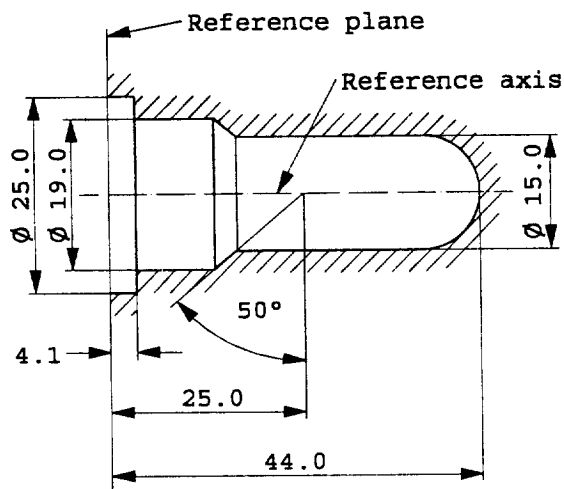
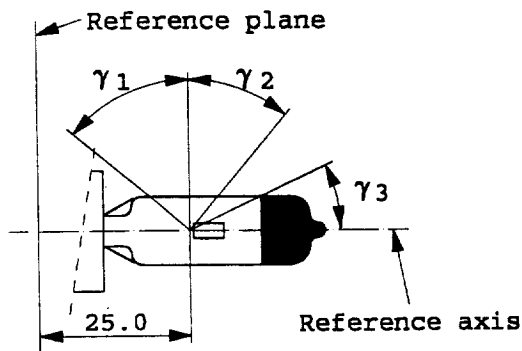


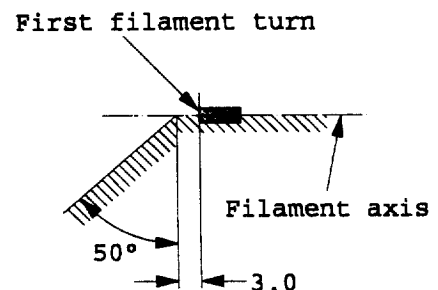
Figure 2 - Maximum lamp outline <sup>3/</sup>

- <sup>1/</sup> The reference plane is the plane formed by the underside of the beveled lead-in flange of the cap.
- <sup>2/</sup> The reference axis is perpendicular to the reference plane and passing through the centre of the 19 mm cap diameter.
- <sup>3/</sup> Glass bulb and supports shall not exceed the envelope as indicated in figure 2. The envelope is concentric to the reference axis.
- <sup>4/</sup> The bulb shall be colourless or yellow.
- <sup>5/</sup> Notes concerning the filament diameter.
  - No actual diameter restrictions apply but the objective for future developments is to have  $d_{max.} = 1.4$  mm
  - For the same manufacturer, the design diameter of standard (étalon) filament lamp and filament lamp of normal production shall be the same.



View B

Figure 3 - Distortion free area <sup>6/</sup> and black top <sup>7/</sup>



View A

Figure 4 - Metal free zone <sup>8/</sup>

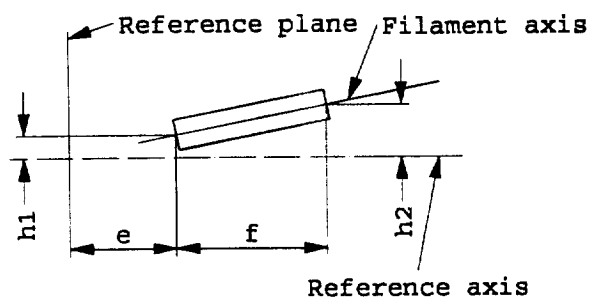


Figure 5 - Offset of filament axis <sup>9/</sup>  
(for standard filament lamps only)

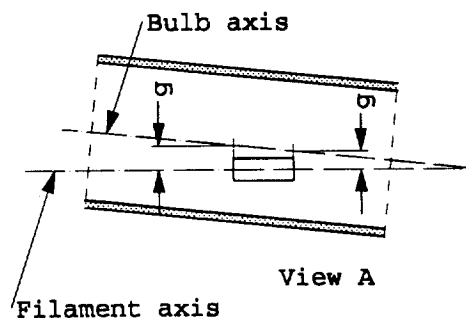


Figure 6 - Bulb eccentricity <sup>10/</sup>

- <sup>6/</sup> 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  $\gamma_2$
- <sup>7/</sup> 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
- <sup>8/</sup> 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, sheet H11/1).  
No metal parts other than filament turns shall be located in the shaded area as seen in figure 4.
- <sup>9/</sup> The offset of the filament with respect to the reference axis is measured only in viewing directions A and B as shown in figure 1 on sheet H11/1. The points to be measured are those where the projection of the outside of the end turns nearest to or furthest from the reference plane crosses the filament axis.
- <sup>10/</sup> Eccentricity of bulb 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.

Dimensions in mm	Filament lamp 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.		u.c.	
h1	0	<u>12/</u>	0 ± 0.1	
h2	0	<u>12/</u>	0 ± 0.15	
γ1	50° min.		50° min.	
γ2	40° min.		40° min.	
γ3	30° min.		30° min.	
Cap	H11: PGJ19-2 H11A: PGJX19-2 in accordance with IEC 61 (sheet 7004-110-2)			
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	12	24	12
	Watts	55	70	55
Test voltage	Volts	13.2	28.0	13.2
Objective values	Watts	62 max.	80 max.	62 max.
	Luminous flux lm	1350	1600	
	±%	10	10	
Reference luminous flux for headlamp testing: 1000 lm at approx. 12V				

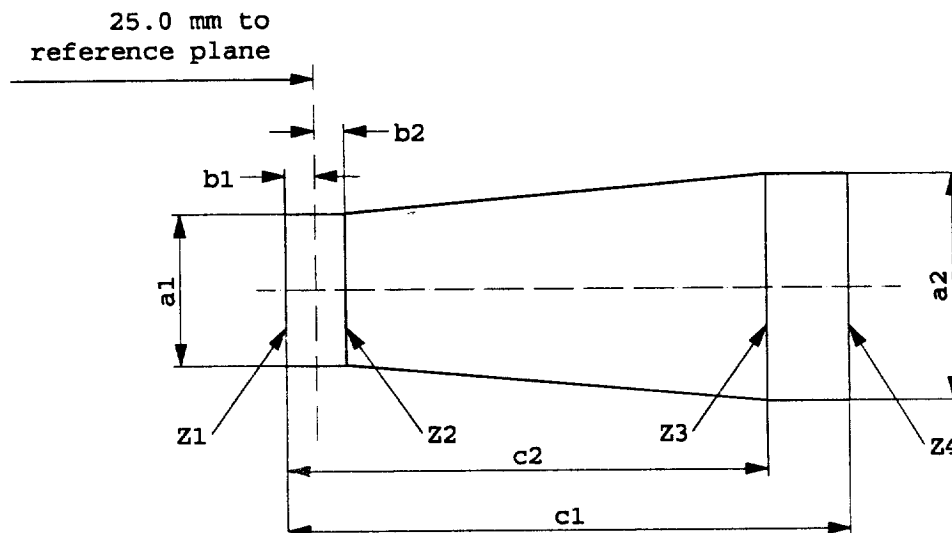
11/ The ends of the filament are defined as the points where, when the viewing direction is View A as shown in figure 1, sheet H11/1. the projection of the outside of the end turns crosses the filament axis.

12/ To be checked by means of a "Box system", sheet H11/4.

Screen projection requirements

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

Dimensions in millimetres



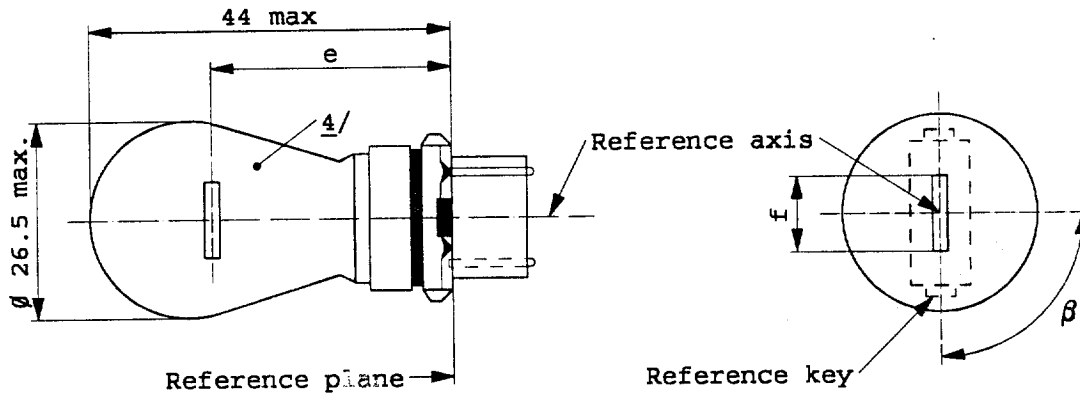
	a1	a2	b1	b2	c1	c2
12 V	$d + 0.3$	$d + 0.5$	0.2		5	4.0
24 V	$d + 0.6$	$d + 1.0$	0.25		6.3	4.6

$d$  = diameter of filament

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

The filament shall lie entirely within the limits shown.

The ends of the filament as defined on sheet H11/3, note 11/ shall lie between lines  $Z_1$  and  $Z_2$  and between lines  $Z_3$  and  $Z_4$ .



DIMENSIONS in mm	Filament lamps of normal production			Standard filament lamp
	min.	nom.	max.	
e		27.9 <u>3/</u>		27.9 ± 0.3
f	5.5	6.0	7.0	6.0 ± 0.5
Lateral deviation <u>2/</u>			<u>3/</u>	0.0 ± 0.4
$\beta$	75° <u>3/</u>	90°	105° <u>3/</u>	90° ± 5°
Cap WP21W: WY2.5x16d in accordance with IEC Publ.61 (sheet 7004-104B-1) WPY21W: WZ2.5x16d (sheet 7004-104C-1)				
ELECTRICAL AND PHOTOMETRIC CHARACTERISTICS				
Rated values	Volts	12		12
	Watts	21		21
Test voltage	Volts	13.5		
Objective values	Watts		26.5 max	26.5 max. at 13.5 V
	Luminous flux 1m	WP21W	460 ± 15%	
		WPY21W	280 ± 20%	
Reference luminous flux: Clear bulb: 460 lm at approx. 13.5 V Amber bulb: 280				

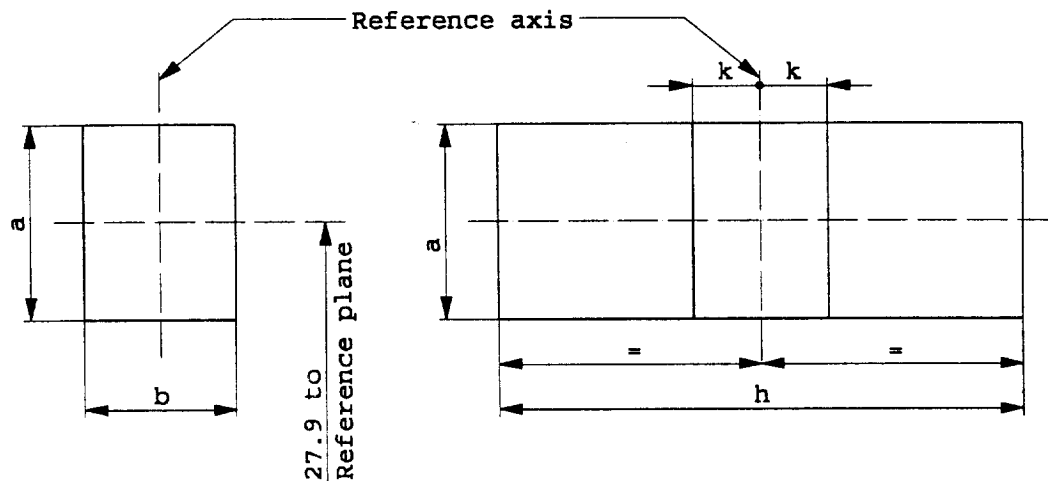
- 1/ The reference axis is defined with respect to the reference keys and is perpendicular to the reference plane.
- 2/ Maximum lateral deviation of filament centre from two mutually perpendicular planes both containing the reference axis and one containing axis through the reference keys.
- 3/ To be checked by means of the box system, sheet WP21W/2
- 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 WP21W and white or amber for category WPY21W. 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.

Screen projection requirements

This test is used to determine, by checking whether the filament is correctly positioned relative to the reference axis and the 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.

Side elevation

Front elevation



Reference	a	b	h	k
Dimension	3.5	3.0	9.0	1.0

Test procedures and requirements.

1. The filament 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.
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.
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:
  - 3.1 The projection of the filament shall lie entirely within a rectangle of height "a" and width "h", having its centre at the theoretical position of the centre of the filament.
  - 3.2 The centre of the filament shall not be offset by more than distance "k" from the reference axis.