



Economic and Social Council

Distr.: General
31 August 2016

Original: English

Economic Commission for Europe

Inland Transport Committee

World Forum for Harmonization of Vehicle Regulations

170th session

Geneva, 15-18 November 2016

Item 4.6.2 of the provisional agenda

**1958 Agreement – Consideration of draft amendments
to existing Regulations submitted by GRE**

Proposal for Supplement 45 to the 03 series of amendments to Regulation No. 37 (Filament lamps)

Submitted by the Working Party on Lighting and Light-Signalling*

The text reproduced below was adopted by the Working Party on Lighting and Light-Signalling (GRE) at its seventy-fifth session (ECE/TRANS/WP.29/GRE/75, para. 8). It is based on ECE/TRANS/WP.29/GRE/2016/2 not amended. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee AC.1 for consideration at their November 2016 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2016–2017 (ECE/TRANS/254, para. 159 and ECE/TRANS/2016/28/Add.1, cluster 3.1), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

Supplement 45 to the 03 series of amendments to Regulation No. 37 (Filament lamps)

Regulation No. 37, amend to read:

"Regulation No. 37

Uniform provisions concerning the approval of filament light sources for use in approved lamps of power-driven vehicles and of their trailers

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1. Scope

This Regulation applies to filament light sources shown in Annex 1 and intended for use in approved lamps of power-driven vehicles and of their trailers.

2. Administrative provisions

2.1. Definitions

2.1.1. Definition of "*category*"

The term "*category*" is used in this Regulation to describe different basic design of standardised filament light sources. Each category has a specific designation, as for example: "H4", "P21W", "T4W", "PY21W" or "RR10W".

2.1.2. Definition of "*type*"

Filament light sources of different¹ "*types*" are filament light sources within the same category which differ in such essential respects as:

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

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

2.1.2.3. Rated voltage;

2.1.2.4. Halogen.

2.2. Application for approval

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

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

2.2.2.1. Drawings in triplicate, sufficiently detailed to permit identification of the type;

2.2.2.2. A brief technical description; this shall include the shape of the filament if the relevant light source sheet specifies that a straight or V-shaped filament is allowed;

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

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

¹ A selective-yellow bulb or an additional selective-yellow outer bulb, solely intended to change the colour but not the other characteristics of a filament light source emitting white light, does not constitute a change of type of the filament light source.

- 2.2.3.1. A declaration by the manufacturer that the type submitted is identical (except in the trade name or mark) with and has been produced by the same manufacturer as, the type already approved, the latter being identified by its approval code;
- 2.2.3.2. Two samples bearing the new trade name or mark.
- 2.2.4. The Type Approval Authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.
- 2.3. Inscriptions
 - 2.3.1. Filament light sources submitted for approval shall bear on the cap or bulb²:
 - 2.3.1.1. The trade name or mark of the applicant;
 - 2.3.1.2. The rated voltage. However, for filament light sources for which only a 12 V type is standardised and the maximum allowed bulb diameter of which does not exceed 7.5 mm, the rated voltage need not be marked;
 - 2.3.1.3. The international designation of the relevant category. The wattage character "W" of this designation need not be marked when the maximum allowed bulb diameter of the filament light source type does not exceed 7.5 mm;
 - 2.3.1.4. The rated wattage (in the sequence, high wattage/low wattage filament for dual-filament light sources); this need not be indicated separately if it is part of the international designation of the relevant filament light source category;
 - 2.3.1.5. A space of sufficient size to accommodate the approval mark.
 - 2.3.2. The space mentioned in paragraph 2.3.1.5. above shall be indicated in the drawings accompanying the application for approval.
 - 2.3.3. Halogen filament light sources meeting the requirements of paragraph 3.7. below shall be marked with a "U".
 - 2.3.4. Inscriptions other than those covered by paragraphs 2.3.1. and 2.4.3. may be affixed, on the condition that they do not adversely affect the luminous characteristics.
- 2.4. Approval
 - 2.4.1. If all samples of a type of filament light source which are submitted in pursuance of paragraphs 2.2.2.3. or 2.2.3.2. above meet the requirements of this Regulation, approval shall be granted.
 - 2.4.2. An approval code shall be assigned to each type approved. Its first character (at present 2, corresponding to the 02 series of amendments which entered into force on 27 October 1983 and to the 03 series of amendments (not requiring changes in the approval number), which entered into force on 1 June 1984) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. This will be followed by an identification code comprising not more than three characters. Only the Arabic numerals and capital letters listed in footnote ³ shall be used. The same Contracting Party may not assign the same code to another type of filament light source. Notice

² In the latter case, the luminous characteristics shall not be adversely affected.

³ 0 1 2 3 4 5 6 7 8 9

A B C D E F G H J K L M N P R S T U V W X Y Z

of approval or of extension or refusal or withdrawal of approval or production definitively discontinued of a type of filament light source pursuant to this Regulation shall be communicated to the Parties of the Agreement which apply this Regulation by means of a form conforming to the model in Annex 2 to this Regulation and of a drawing, supplied by the applicant for approval in a format not exceeding A4 (210 x 297 mm) and on a scale of at least 2:1. If the applicant so desires, the same approval code may be assigned to the filament light source emitting white light and to the filament light source emitting selective-yellow light (see para. 2.1.2.3.).

- 2.4.3. To every filament light source conforming to a type approved under this Regulation there shall be affixed in the space referred to in paragraph 2.3.1.5., in addition to the inscriptions required under paragraph 2.3.1., an international approval mark consisting of:
 - 2.4.3.1. A truncated circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval⁴;
 - 2.4.3.2. The approval code, placed close to the truncated circle.
- 2.4.4. If the applicant has obtained the same approval code for several trade names or marks, one or more of them will suffice to meet the requirements of paragraph 2.3.1.1.
- 2.4.5. The marks and inscriptions specified in paragraphs 2.3.1. and 2.4.3. shall be clearly legible and be indelible.
- 2.4.6. Annex 3 to this Regulation gives an example of arrangement of the approval mark.

3. Technical requirements

- 3.1. Definitions

The definitions given in Resolution [R.E.4]⁵ or its subsequent revisions, applicable at the time of application for type approval shall apply.
- 3.2. General specifications
 - 3.2.1. Each sample submitted shall conform to the relevant specifications of this Regulation.
 - 3.2.2. Filament light sources shall be so designed as to be and to remain in good working order when in normal use. They shall moreover exhibit no fault in design or manufacture.
 - 3.2.3. The filament(s) shall be the only element(s) of the filament light source that generate and emit light when energised.
- 3.3. Manufacture
 - 3.3.1. Filament light source bulbs shall exhibit no scores or spots which might impair their efficiency and their optical performance.

⁴ The distinguish numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to Consolidated Resolution on the Construction of Vehicles (R.E.3), document TRANS/WP.29/78/Rev.4.

⁵ Note by the secretariat: Draft Resolution on the common specification of light source categories (R.E.4) is submitted to WP.29 as document ECE/TRANS/WP.29/2016/111.

- 3.3.2. Filament light sources shall be equipped with standard caps complying with the cap data sheets of IEC Publication 60061, as specified on the individual data sheets of Annex 1.
- 3.3.3. The cap shall be strong and firmly secured to the bulb.
- 3.3.4. To ascertain whether filament light sources conform to the requirements of paragraphs 3.3.1. to 3.3.3. above, a visual inspection, a dimension check and, where necessary, a trial fitting shall be carried out.
- 3.4. Tests
- 3.4.1. Filament light sources shall first be aged at their test voltage for approximately one hour. For dual-filament light sources, each filament shall be aged separately. In the case of filament light sources, for which more than one test voltage is specified, the highest test voltage value shall be used for ageing.
- 3.4.2. In the case of a filament light source having a coated bulb, after the ageing period corresponding to paragraph 3.4.1., the surface of the bulb shall be lightly wiped with a cotton cloth soaked in a mixture of 70 vol. per cent of n-heptane and 30 vol. per cent of toluol. After about five minutes, the surface shall be inspected visually. It shall not show any apparent changes.
- 3.4.3. The position and dimensions of the filament shall be measured with the filament light sources being supplied with current at from 90 per cent to 100 per cent of the test voltage. In the case of filament light sources, for which more than one test voltage is specified, the highest test voltage value shall be used for measurement of the position and dimensions of the filament.
- 3.4.4. Unless otherwise specified, electrical and photometric measurements shall be carried out at the test voltage(s).
- 3.4.5. Electrical measurements shall be carried out with instruments of at least class 0.2.
- 3.4.6. In the case where the selective-yellow colour is allowed, the luminous flux of the filament light source with the selective-yellow outer bulb shall be at least 85 per cent of the specified luminous flux of the relevant filament light source emitting white light.
- 3.5. Filament position and dimensions
- 3.5.1. The geometric shapes of the filament shall in principle be as specified on the filament light source data sheets of Annex 1.
- 3.5.2. For line filaments the correct position and shape shall be checked as specified in the relevant data sheets.
- 3.5.3. If the filament is shown on the filament light source data sheet in at least one view as a point, the position of the luminous centre shall be determined in conformity with Annex 4.
- 3.5.4. The length of a line filament shall be determined by its ends, defined — unless otherwise specified on the relevant data sheet — as the apices of the first and the last filament turn as seen in projection perpendicular to the reference axis of the filament light source. Such an apex shall comply with the requirement that the angle formed by the legs shall not exceed 90°. In the case of coiled-coil filaments the apices of the secondary turns shall be taken

into account. Apices outside the point of connection to the current lead-in legs shall be disregarded for the determination of the filament length.

- 3.5.4.1. For axial filaments the extreme position of the apices considered shall be determined by rotating the filament light source about its reference axis. The length shall then be measured in a direction parallel to the reference axis.
- 3.5.4.2. For transverse filaments the filament axis shall be placed perpendicular to the direction of projection. The length shall be measured in a direction perpendicular to the reference axis.
- 3.6. Colour
- 3.6.1. The colour of the light emitted by the filament light source shall be white unless otherwise specified on the relevant data sheet.
- 3.6.2. The definitions of the colour of the light emitted, given in Regulation No. 48 and its series of amendments in force at the time of application for type approval, shall apply to this Regulation.
- 3.6.3. The colour of the light emitted shall be measured by the method specified in Annex 5. Each measured value shall lie within the required tolerance area⁶. Moreover, in the case of filament light sources emitting white light, the measured values shall not deviate more than 0.020 unit in the x and/or y direction from a point of choice on the Planckian locus (CIE 015:2004, 3rd edition). Filament light sources for use in light signalling devices shall meet the requirements as specified in paragraph 2.4.2. of IEC Publication 60809, Edition 3.
- 3.7. UV radiation

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

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

$$k_m \cdot \int_{\lambda = 380nm} Ee(\lambda) \cdot V(\lambda) \cdot d\lambda$$

$$k2 = \frac{\int_{\lambda = 250nm}^{315nm} Ee(\lambda) \cdot d\lambda}{780nm} \leq 2 \cdot 10^{-6} W / lm$$

$$k_m \cdot \int_{\lambda = 380nm} Ee(\lambda) \cdot V(\lambda) \cdot d\lambda$$

⁶ For conformity of production purposes of amber and red colour only, at least 80 per cent of the measuring results shall lie within the required tolerance area.

Where:

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

$V(\lambda)$ (1) is the spectral luminous efficiency;

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

λ (nm) is the wave length.

This value shall be calculated using intervals of five nanometres.

3.8. Observation concerning selective-yellow colour

An approval of a filament light source type under this Regulation may be granted, pursuant to paragraph 3.6. above, for a filament light source emitting white light as well as selective-yellow light; Article 3 of the Agreement to which this Regulation is annexed shall not prevent the Contracting Parties from prohibiting, on vehicles registered by them, filament light sources emitting either white or selective-yellow light.

3.9. Check on optical quality

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

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

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

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

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

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

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

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

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

- 3.9.5.1. It satisfies the pertinent conditions of approval;
- 3.9.5.2. It has an effective diameter of not less than 160 mm;
- 3.9.5.3. With a standard filament light source it produces at the various points and in the various zones specified for the headlamp type concerned, illumination equal to:
 - 3.9.5.3.1. Not more than 90 per cent of the maximum limits;
 - 3.9.5.3.2. Not less than 120 per cent of the minimum limits prescribed for the headlamp type concerned.
- 3.10. Standard filament light sources

Additional requirements for standard (étalon) filament light sources are given on the relevant data sheets of Annex 1.

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

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

4. Conformity of production

- 4.1. Filament light sources approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the inscriptions and technical requirements set forth in paragraph 3. above and Annexes 1, 3 and 4 to this Regulation.
- 4.2. In order to verify that the requirements of paragraph 4.1. are met, suitable controls of the production shall be carried out.
- 4.3. The holder of the approval shall in particular:
 - 4.3.1. Ensure existence of procedures for the effective control of the quality of products;
 - 4.3.2. Have access to the control equipment necessary for checking the conformity to each approved type;
 - 4.3.3. Ensure that data of test results are recorded and that related documents shall remain available for a period to be determined in accordance with the-Type Approval Authority,
 - 4.3.4. Analyse the results of each type of test, applying criteria of Annex 7, in order to verify and ensure the stability of the product characteristics making allowance for variation of an industrial production;
 - 4.3.5. Ensure that for each type of filament light source, at least the tests prescribed in Annex 6 to this Regulation are carried out;
 - 4.3.6. 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.

- 4.4. The Type Approval Authority which has granted type-approval may at any time verify the conformity control methods applicable to each production unit.
- 4.4.1. In every inspection, the test books and production survey records shall be presented to the visiting inspector.
- 4.4.2. The inspector may take samples at random which will be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own verification.
- 4.4.3. When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the tests carried out in application of paragraph 4.4.2. above, the inspector shall select samples, to be sent to the Technical Service which has conducted the type approval tests.
- 4.4.4. The Type Approval Authority may carry out any tests prescribed in this Regulation. Where the Type Approval Authority decides to carry out spot checks, criteria of Annexes 8 and 9 to this Regulation shall be applied.
- 4.4.5. The normal frequency of inspection authorised by the Type Approval Authority shall be one every two years. In the case where negative results are recorded during one of these visits, the Type Approval Authority shall ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

5. Penalties for non-conformity of production

- 5.1. The approval granted in respect of a filament light source pursuant to this Regulation may be withdrawn if the requirements are not met or if a filament light source bearing the approval mark does not conform to the type approved.
- 5.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of a communication form conforming to the model in Annex 2 to this Regulation.

6. Production definitively discontinued

If the holder of the approval completely ceases to manufacture a type of filament light source approved in accordance with this Regulation, he shall so inform the Type Approval Authority which has granted the approval. Upon receiving the relevant communication, that Type Approval Authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in Annex 2 to this Regulation.

7. Names and addresses of the Technical Services responsible for conducting approval tests and of Type Approval Authorities

The Parties to the 1958 Agreement which apply this Regulation shall communicate to the United Nations secretariat the names and addresses of the Technical Services responsible for conducting approval tests and of the Type Approval Authorities which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, or production definitively discontinued issued in other countries, are to be sent.

8. Transitional provisions

- 8.1. Approvals granted under the preceding series of amendments shall remain valid, except that for conformity of production, current production filament light sources shall comply with the requirements of the latest series of amendments starting 12 months from the date of application of this amendment.⁷
- 8.2. The correspondence between the former designations and the new ones is indicated in the following table:

<i>Old designations</i>	<i>New designations in the 03 series of amendments</i>
P25-1	P21W
P25-2	P21/5W
R19/5	R5W
R19/10	R10W
C11	C5W
C15	C21W
T8/4	T4W
W10/5	W5W
W10/3	W3W

⁷ The amended text of this paragraph was introduced by Supplement 14 to the 03 series of amendments. This supplement entered into force on 3 September 1997 and it also introduced in the text of the Regulation new paragraphs 2.3.3. and 3.7. and in Annex 1 new sheets HIR1 and PY27/7W.

Annex 1

Sheets* for filament light sources

The sheets of the relevant filament light source category and the group in which this category is listed with restrictions on the use of this category shall apply as incorporated in Resolution [R.E.4] or its subsequent revisions, applicable at the time of application for type approval of the filament light source.

* From [date] onwards, the sheets for filament light sources, the list and groups of filament light source categories with their restrictions on the use and their sheet numbers are incorporated in Resolution [R.E.4] (ECE/TRANS/WP.29/2016/111)

Annex 2

Communication

(Maximum format: A4 (210 x 297 mm))



issued by:

Name of administration

.....

- Concerning:²
- Approval granted
 - Approval extended
 - Approval refused
 - Approval withdrawn
 - Production definitively discontinued

of a type of filament light source pursuant to Regulation No. 37

Approval No. Extension No.

1. Trade name or mark of the device:
2. Manufacturer's name for the type of device:
3. Manufacturer's name and address:
4. If applicable, name and address of manufacturer's representative:

5. Submitted for approval on:
6. Technical Service responsible for conducting approval tests:

7. Date of report issued by that Service:
8. Number of report issued by that Service:
9. Concise description:
 Category of filament light source:
 Rated voltage:
 Rated wattage:

¹ Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation).

² Strike out what does not apply.

Colour of the light emitted: White/selective-yellow/amber/red²

Colour coating on glass bulb: yes/no²

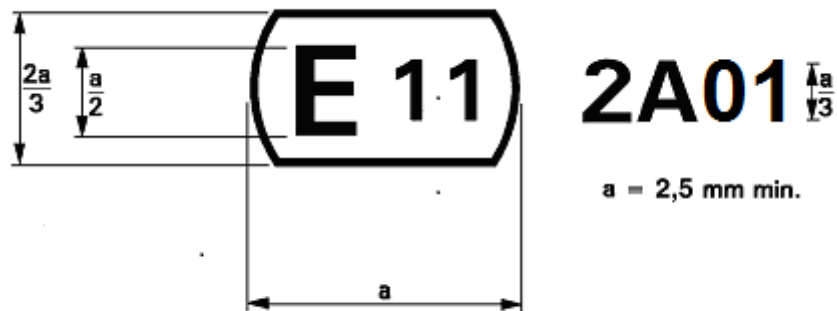
Halogen filament light source: yes/no²

10. Position of the approval mark:
11. Reason(s) for extension (if applicable):
12. Approval granted/refused/extended/withdrawn:²
13. Place:.....
14. Date:.....
15. Signature:
16. The following documents, bearing the approval mark shown above, are available on request:

Annex 3

Example of the arrangement of the approval mark

(See paragraph 2.4.3)



The above approval mark affixed to a filament light source indicates that the light source has been approved in the United Kingdom (E 11) under the approval code A01.

The first character of the approval code indicates that the approval was granted in accordance with the requirements of Regulation No 37 as amended by the 02 and 03* series of amendments.

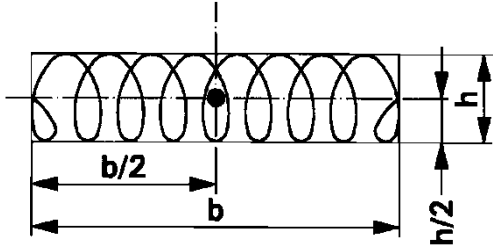
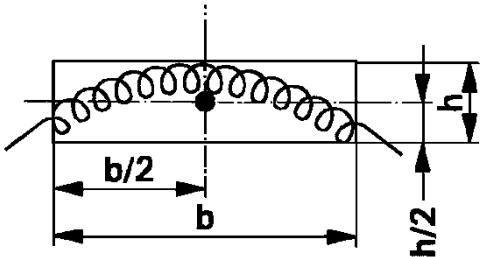
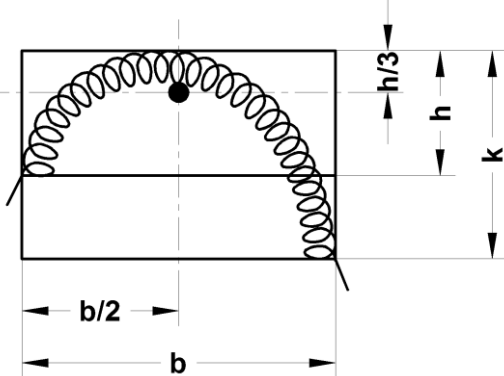
* Not requiring changes in the approval number.

Annex 4

Luminous centre and shapes of filaments

Unless otherwise stated on the filament light source data sheets, this annex is applicable to the determination of the luminous centre of different filament shapes.

The position of the luminous centre depends upon the filament shape.

No.	Filament shapes	Observations
1		<p>With $b > 1.5 h$, the deviation of the filament axis with respect to a plane normal to the reference axis shall not exceed 15°</p>
2		<p>Only applicable to filaments which can be inscribed in a rectangle of $b > 3h$.</p>
3		<p>Applicable to filaments which can be inscribed in a rectangle of $b \leq 3h$, whereby, however, $k < 2h$.</p>

The side lines of the circumscribed rectangles in Nos. 2 and 3 are parallel and perpendicular, respectively, to the reference axis.

The luminous centre is the intersection of the dash-dot lines.

The drawings are intended only to demonstrate the essential dimensions.

Annex 5

Checking the colour of filament light sources

1. General
 - 1.1. Measurements shall be made on finished light sources. Filament light sources with secondary (outer) bulb acting as colour filter shall be handled as filament light source with primary bulb.
 - 1.2. Tests shall be made at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$.
 - 1.3. Tests shall be made at test voltage(s) as specified in the relevant filament light source data sheet.
 - 1.4. Filament light sources shall be measured preferably in the normal operating position. In case of dual filament light sources the high wattage (major or driving beam) filament shall be operated only.
 - 1.5. Before starting a test, the stabilisation of the temperature of the filament light source shall be obtained by operating at test voltage for 10 minutes. In the case of filament light sources, for which more than one test voltage is specified, the relevant test voltage value shall be used for achieving stabilization.
2. Colour
 - 2.1. Colour tests shall be made with a measuring system that determines CIE trichromatic co-ordinates of the received light with an accuracy of ± 0.002 .
 - 2.2. The trichromatic coordinates shall be measured with a colourimetric receiver integrating over a right circular cone subtending an angle of minimum 5° and maximum 15° , at the centre of the filament.
 - 2.3. Measuring directions (see the figure below).
 - 2.3.1. Initially, the receiver shall be positioned perpendicular to the filament light source axis and to the filament axis (or plane in case of a curved filament). After measurement the receiver shall be moved around the filament light source in bi-directional steps of about 30° until the area specified in paragraphs 2.3.2. or 2.3.3. is covered. In each position a measurement shall be made. However, no measurement shall be made when:
 - (a) The centreline of the receiver coincides with the filament axis; or
 - (b) The line of sight between the receiver and the filament is blocked by opaque (non-transmitting) parts of the light source, such as lead wires or a second filament, if any.
 - 2.3.2. For filament light sources used in headlamps, measurements shall be made in directions around the filament light source with the centreline of the receiver aperture located within an angle $\pm 30^\circ$, from the plane perpendicular to the filament light source axis with the origin in the centre of the filament. In case of filament light sources with two filaments, the centre of the driving beam filament shall be taken.

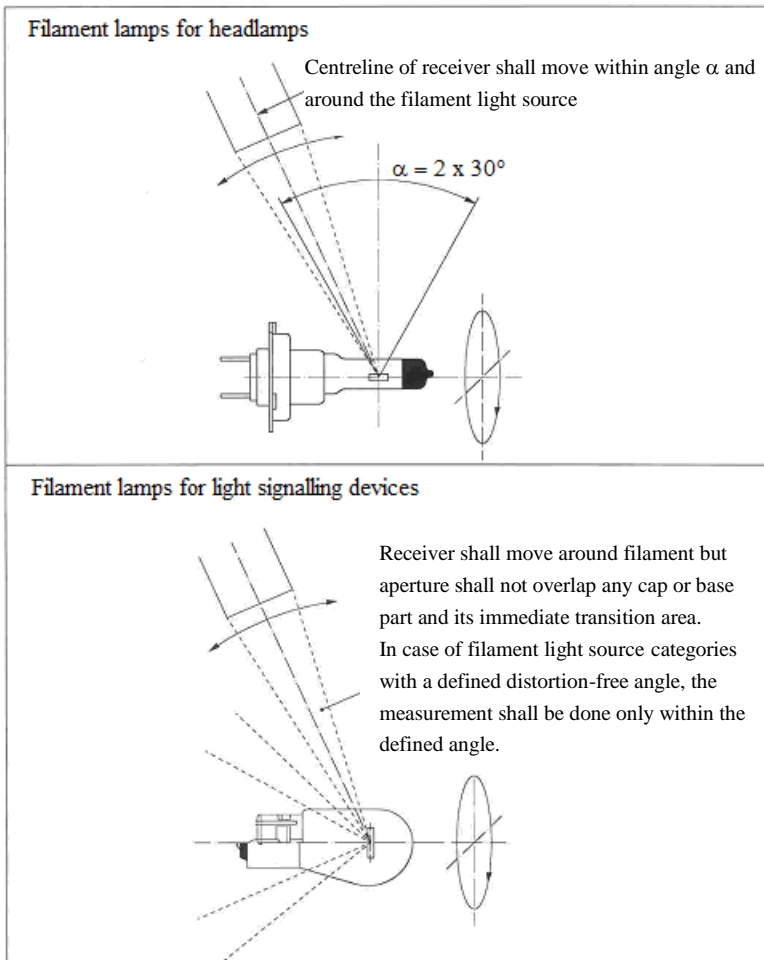
2.3.3. For filament light sources used in light signalling devices, measurements shall be made in directions around the filament light source with exception of:

- (a) The area claimed or covered by the cap of the filament light source; and
- (b) The immediate transition area along the cap.

In case of filament light sources with two filaments, the centre of the major filament shall be taken.

In case of filament light source categories with a defined distortion-free angle, the measurement shall be done only within the defined angle.

Figure illustrating the positions of colourimetric receiver



Annex 6

Minimum requirements for quality control procedures by the manufacturer

1. General

The conformity requirements shall be considered satisfied from a photometric, geometrical, visual and electrical standpoint if the specified tolerances for production filament light sources in the relevant data sheet of Annex 1 and the relevant data sheet for the caps are met.
2. Minimum requirements for verification of conformity by the manufacturer

For each type of filament light source the manufacturer or the holder of the approval mark shall carry out tests, in accordance with the provisions of this Regulation, at appropriate intervals.

 - 2.1. Nature of tests

Tests of conformity of these specifications shall cover their photometric, geometrical and optical characteristics.
 - 2.2. Methods used in tests
 - 2.2.1. Tests shall generally be carried out in accordance with the methods set out in this Regulation.
 - 2.2.2. The application of paragraph 2.2.1. requires regular calibration of test apparatus and its correlation with measurements made by a Type Approval Authority.
 - 2.3. Nature of sampling

Samples of filament light sources shall be selected at random from the production of a uniform batch. A uniform batch means a set of filament light sources of the same type, defined according to the production methods of the manufacturer.
 - 2.4. Inspected and recorded characteristics

The filament light sources shall be inspected and test results recorded following the grouping of characteristics as listed in Annex 7, Table 1.
 - 2.5. Criteria governing acceptability

The manufacturer or the holder of approval is responsible for carrying out a statistical study of the test results in order to meet the specifications laid down for verification of conformity of production in paragraph 4.1. of this Regulation.

Compliance shall be assured if the level of acceptable non-compliance per grouping of characteristics given in Table 1 of Annex 7 is not exceeded. This means that the number of filament light sources not complying with the requirement for any grouping of characteristics of any filament light source type does not exceed the qualifying limits in the relevant Tables 2, 3 or 4 of Annex 7.

Note: Each individual filament light source requirement shall be considered as a characteristic.

Annex 7

Sampling and compliance levels for manufacturer test records

Table 1
Characteristics

<i>Grouping of characteristics</i>	<i>Grouping* of test records between filament light source types</i>	<i>Minimum 12 monthly sample per grouping*</i>	<i>Acceptable level of non-compliance per grouping of characteristics (%)</i>
Marking, legibility and durability	All types with the same external dimensions	315	1
Bulb quality	All types with the same bulb	315	1
Colour of the bulb	All types (emitting red and amber light) of the same category and colour technology	20	1
External filament light source dimensions (excluding cap/base)	All types of the same category	200	1
Dimensions of caps and bases	All types of the same category	200	6.5
Dimensions related to internal elements**	All filament light sources of one type	200	6.5
Initial readings, watts and lumens**	All filament light sources of one type	200	1
Colour endurance test	All filament light sources (emitting red, amber and white light) of one colour coating technology	20***	1

* The assessment shall in general cover series production filament light sources from individual factories. A manufacturer may group together records concerning the same type from several factories, provided these operate under the same quality system and quality management.

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

*** Representative distribution over categories of filament light sources using the same colour coating technology and finishing, and that comprises filament light sources of the smallest and the largest diameter of the outer bulb, each at the highest rated wattage.

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table 2 as maximum number of non-compliance. The limits are based on an acceptable level of 1 per cent of non-compliance, assuming an acceptance probability of at least 0.95.

Table 2*

<i>Number of test results of each characteristics</i>	<i>Qualifying limits for acceptance</i>
20	0
21 - 50	1
51 - 80	2
81 - 125	3
126 - 200	5
201 - 260	6
261 - 315	7
316 - 370	8
371 - 435	9
436 - 500	10
501 - 570	11
571 - 645	12
646 - 720	13
721 - 800	14
801 - 860	15
861 - 920	16
921 - 990	17
991 - 1,060	18
1,061 - 1,125	19
1,126 - 1,190	20
1,191 - 1,249	21

* In accordance with ISO 2859-1:1999 "Sampling procedures for inspection by attributes - Part 1: Sampling schemes indexed by acceptance quality limit (AQL) for lot-by-lot inspection" including Technical Corrigendum 1:2001.

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table 3 given as maximum number of non-compliance. The limits are based on an acceptable level of 6.5 per cent of non-compliance, assuming an acceptance probability of at least 0.95.

Table 3

<i>Number of filament light sources in records</i>	<i>Qualifying limit</i>	<i>Number of filament light sources in records</i>	<i>Qualifying limit</i>	<i>Number of filament light sources in records</i>	<i>Qualifying limit</i>
- 200	21	541 - 553	47	894 - 907	73
201 - 213	22	554 - 567	48	908 - 920	74
214 - 227	23	568 - 580	49	921 - 934	75
228 - 240	24	581 - 594	50	935 - 948	76
241 - 254	25	595 - 608	51	949 - 961	77
255 - 268	26	609 - 621	52	962 - 975	78
269 - 281	27	622 - 635	53	976 - 988	79
282 - 295	28	636 - 648	54	989 - 1,002	80
296 - 308	29	649 - 662	55	1,003 - 1,016	81
309 - 322	30	663 - 676	56	1,017 - 1,029	82
323 - 336	31	677 - 689	57	1,030 - 1,043	83
337 - 349	32	690 - 703	58	1,044 - 1,056	84
350 - 363	33	704 - 716	59	1,057 - 1,070	85
364 - 376	34	717 - 730	60	1,071 - 1,084	86
377 - 390	35	731 - 744	61	1,085 - 1,097	87
391 - 404	36	745 - 757	62	1,098 - 1,111	88
405 - 417	37	758 - 771	63	1,112 - 1,124	89
418 - 431	38	772 - 784	64	1,125 - 1,138	90
432 - 444	39	785 - 798	65	1,139 - 1,152	91
445 - 458	40	799 - 812	66	1,153 - 1,165	92
459 - 472	41	813 - 825	67	1,166 - 1,179	93
473 - 485	42	826 - 839	68	1,180 - 1,192	94
486 - 499	43	840 - 852	69	1,193 - 1,206	95
500 - 512	44	853 - 866	70	1,207 - 1,220	96
513 - 526	45	867 - 880	71	1,221 - 1,233	97
527 - 540	46	881 - 893	72	1,234 - 1,249	98

Qualifying limits for acceptance based on different numbers of test results for each grouping of characteristics are listed in Table 4 given as a percentage of the results, assuming an acceptance probability of at least 0.95.

Table 4

<i>Number of test results of each characteristic</i>	<i>Qualifying limits shown as a percentage of results. Acceptable level of 1% of non-compliance</i>	<i>Qualifying limits shown as a percentage of results. Acceptable level of 6.5% of non-compliance</i>
1,250	1.68	7.91
2,000	1.52	7.61
4,000	1.37	7.29
6,000	1.30	7.15
8,000	1.26	7.06
10,000	1.23	7.00
20,000	1.16	6.85
40,000	1.12	6.75
80,000	1.09	6.68
100,000	1.08	6.65
1,000,000	1.02	6.55

Annex 8

Minimum requirements for spot checks by the Type Approval Authority

1. General
The conformity requirements shall be considered satisfied from a photometric, geometrical, visual and electrical standpoint if the specified tolerances for production filament light sources in the relevant data sheet of Annex 1 and the relevant data sheet for the caps are met.
2. The conformity of mass-produced filament light sources shall not be contested if the results are in agreement with Annex 9 to this Regulation.
3. Conformity shall be contested and the manufacturer requested to make the production meet the requirements if the results are not in agreement with Annex 9 to this Regulation.
4. If paragraph 3 of this annex is applied, a further sample of 250 filament light sources, selected at random from a recent production run, shall be taken within two months.

Annex 9

Compliance approved by spot check

Compliance approved or disapproved shall be decided according to the values in Table 1. For each grouping of characteristics filament light sources shall be either accepted or rejected according to the values in Table 1.*

Table 1

	1 %**		6.5 %**	
	<i>Accept</i>	<i>Reject</i>	<i>Accept</i>	<i>Reject</i>
First sample size: 125	2	5	11	16
If the number of non-conforming units is greater than 2 (11) and less than 5 (16) take a second sample size of 125 and assess the 250	6	7	26	27

* The proposed scheme is designed to assess the compliance of filament light sources to an acceptance level of non-compliance of 1 per cent and 6.5 per cent respectively and is based on the Double Sampling Plan for Normal Inspection in IEC Publication 60410: Sampling Plans and Procedures for Inspection by Attributes.

** The filament light sources shall be inspected and test results recorded following the grouping of characteristics as listed in Annex 7, Table 1.