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Item 4 of the provisional agenda

Simplification of lighting and light-signalling Regulation**Proposal for a collective amendment to Regulations Nos. 19,
98, 112, 113 and 123****Submitted by the expert from the International Automotive Lighting
and Light Signalling Expert Group (GTB)***

The text reproduced below was prepared by the expert from GTB to introduce provisions for standardised replaceable light-emitting diode (LED) light sources approved according to Regulation No. 128. The modifications to the existing text of the Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2014–2018 (ECE/TRANS/240, para. 105 and ECE/TRANS/2014/26, programme activity 02.4), 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.

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I. Proposal

A. Supplement 9 to the 04 series of amendments to Regulation No. 19 (Front fog lamps)

Table of contents, List of annexes, amend to read:

"12 ~~Requirements in the use of LED module(s)~~ **Requirements for LED modules and front fog lamps including LED and/or LED light sources**"

Text of the Regulation, Introduction, amend to read:

" ...

The introduction of the Class "F3" provides for requirements that are amended to be similar to those of a headlamp as follows:

- (a) The photometric values are specified as luminous intensities using the angular coordinate system;
- (b) Light sources can be selected according to the provisions of Regulation No. 37 (~~incandescent filament lamps light sources~~)¹, and Regulation No. 99 (Gas-discharge light sources) **and Regulation No. 128 (Light Emitting Diode (LED) light sources)**. Light Emitting Diode (LED) modules may also be used.

" ..."

Paragraph 1.4.5., amend to read:

"1.4.5. The category of ~~filament lamp(s)~~ **light sources** used, as listed in Regulation No. 37, Regulation No. 99, **Regulation No. 128** and/or the LED module specific identification code(s) (if applicable).

A change of the thermal grade of the LED light source(s) does not constitute a change of type;"

Paragraph 1.6., amend to read:

"1.6. References made in this Regulation to standard (étalon) light sources and to Regulations Nos. 37 and 99 shall refer to Regulations Nos. 37 and 99 and their series of amendments in force at the time of application for type approval.

References made in this Regulation to standard (étalon) LED light source(s) and to Regulation No. 128, including the thermal grade of the LED light source(s), shall refer to Regulation No. 128 and its series of amendments in force at the time of application for type approval."

Paragraph 2.3.1., amend to read:

"2.3.1. A brief technical specification including the category of filament ~~lamp~~-**light source** used as listed in Regulation No. 37 and its series of amendments in

¹ Note by the secretariat: Draft Supplement 45 to the 03 series of amendments to Regulation No. 37 (ECE/TRANS/WP.29/GRE/2016/2), which is being submitted to the November 2016 session of WP.29, will modify the title of Regulation No. 37.

force at the time of application for type approval, even if the filament ~~lamp~~
light source cannot be replaced;"

Paragraph 2.4.1., amend to read:

"2.4.1. A brief technical specification including the category of the light source(s) used; this (these) light source category(ies) shall be listed in Regulation No. 37, ~~or~~ Regulation No. 99 **or Regulation No. 128** and their series of amendments in force at the time of application for type approval, even if the light source cannot be replaced. **In case of LED light source(s) used the minimum applicable thermal grade of the LED light source(s) shall be specified.**"

Paragraph 4.2.2.3.1., amend to read:

"4.2.2.3.1. On units meeting the requirements of this Regulation which are so designed that the filament(s) **or LED light source(s)** of one function shall not be lit simultaneously with that of any function with which it may be reciprocally incorporated, an oblique stroke (/) shall be placed behind the symbol in the approval mark of such function."

Paragraph 4.2.2.3.3., amend to read:

"4.2.2.3.3. On units meeting the requirements of Annex 5 to this Regulation only when supplied with a voltage of 6 V or 12 V, a symbol consisting of the number 24 crossed out by an oblique cross (x) shall be placed near the ~~filament lamp~~
light source holder(s)."

Paragraph 5.4., to be deleted and the subsequent paragraphs to be renumbered and amended to read:

- "5.54 In the case of the use of replaceable light sources:
- (a) The light source's holder shall conform to the characteristics given in IEC Publication No. 60061. The holder data sheet relevant to the category of light sources used applies, **in case of replaceable LED light source taking into account the minimum thermal grade of the LED light source indicated in the communication form of Annex 1;**
 - (b) The light source shall fit easily into the front fog lamp;
 - (c) The design of the device shall be such that the light source(s) can be fixed in no other position but the correct one.
- 5.65. In the case of Class B, the front fog lamp shall be equipped with one filament ~~lamp~~**light source** approved according to Regulation No. 37 even if the filament ~~lamp~~**light source** cannot be replaced. Any Regulation No. 37 filament ~~lamp~~**light source** may be used provided that;
- (a) Its objective luminous flux does not exceed 2,000 lumens, and
 - (b) No restriction on the use is made in Regulation No. 37 and its series of amendments in force at the time of application for type approval.
- 5.65.1. Even if this filament ~~lamp~~**light source** cannot be replaced it shall comply with the requirements in paragraph 5.5. above.
- 5.76. In the case of Class F3, irrespective of whether the light sources can be replaced or not, they shall be:
- 5.76.1. One or more light sources approved according to:

5.76.1.1. Regulation No. 37 and its series of amendments in force at the time of application for type approval, provided that no restriction on their use is made,

5.76.1.2. Or, Regulation No. 99 and its series of amendments in force at the time of application for type approval,"

Insert a new paragraph 5.6.1.3., to read:

"5.6.1.3. Or, Regulation No. 128 and its series of amendments in force at the time of application for type approval, provided that no restriction on their use is made. The front fog lamp shall comply with the requirements specified in Annex 12 to this Regulation. The compliance with the requirements shall be tested."

Paragraph 5.7.2., renumber as paragraph 5.6.2.

"5.76.2. And/or, one or more LED modules where the requirements of Annex 12 to this Regulation shall apply; compliance with these requirements shall be tested."

Paragraph 5.8., renumber as paragraph 5.7 and amend the subsequent paragraphs to read:

"5.87. In the case of LED module it shall be checked that:

5.87.1. The design of the LED module(s) shall be such that they can be fitted in no position other than the correct one.

5.87.2. Non-identical light source modules, if any, shall be non-interchangeable within the same lamp housing.

5.87.3. The LED module(s) shall be tamperproof.

5.98. In case of front fog lamps with light source(s) having a total objective luminous flux that exceeds 2,000 lumens, a reference shall be made in item 10. of the communication form of Annex 1.

5.409. If the lens of the front fog lamp is made of plastic materials, tests shall be done according to the requirements of Annex 6.

5.409.1. The UV resistance of light transmitting components located inside the front fog lamp and made of plastic material shall be tested according to Annex 6, paragraph 2.7.

5.409.2. The test in paragraph 5.409.1. is not necessary if **only** low-UV type light sources as specified in Regulation No. 99 **or Regulation No. 128** in Annex 12 to this Regulation are used, or if provisions are taken, to shield the relevant lamp components from UV radiation, e.g. by glass filters.

5.410. The front fog lamp and its ballast system of light source control gear shall not generate radiated or power line disturbances, which cause a malfunction of other electric/electronic systems of the vehicle:⁵

5.421. Front fog lamps, designed to operate permanently with an additional system to control the intensity of the light emitted, or which are reciprocally incorporated with another function, using a common light source, and designed to operate permanently with an additional system to control the intensity of the light emitted, are permitted.

5.4312. In the case of Class F3 the sharpness and linearity of the cut-off shall be tested according to the requirements of Annex 9."

Paragraphs 6.3.1. to 6.3.2., amend to read:

- "6.3.1. A colourless standard (étalon) filament ~~lamp~~ **light source** as specified in Regulation No. 37, of the category specified by the manufacturer, which may be supplied by the manufacturer or applicant, shall be used.
- 6.3.1.1. During the testing of the front fog lamp the power supply for this filament ~~lamp~~ **light source** shall be regulated so as to obtain the reference luminous flux at 13.2 V as indicated in the relevant data sheet of Regulation No. 37.
- 6.3.1.2. During the testing of a front fog lamp where the filament ~~lamp~~ **light source** cannot be replaced, the voltage at the terminals of the front fog lamp shall be regulated at 13.2 V.
- 6.3.2. The front fog lamp shall be deemed satisfactory if the photometric requirements are met with at least one standard filament ~~lamp~~ **light source.**"

Paragraph 6.4.1.1.1., amend to read:

- "6.4.1.1.1. The front fog lamp shall comply with the requirements of paragraph 6.4.3. of this Regulation with at least one complete set of appropriate standard (étalon) ~~lamps~~ **light sources**, which may be supplied by the manufacturer or applicant.

In the case of filament ~~lamps~~ **light sources** operating directly under vehicle voltage system conditions:

The front fog lamp shall be checked by means of colourless standard (etalon) filament ~~lamps~~ **light sources** as specified in Regulation No. 37.

During the testing of the front fog lamp, the power supply to the filament ~~lamp(s)~~ **light source(s)** shall be regulated so as to obtain the reference luminous flux at 13.2 V as indicated on the relevant data sheet of Regulation No. 37."

Paragraph 6.4.1.2., amend to read:

- "6.4.1.2. In the case of a **replaceable** gas-discharge light source:"

Insert a new paragraph 6.4.1.3. and renumber the subsequent paragraphs accordingly, to read:

- "**6.4.1.3. In the case of replaceable LED light sources:**

- 6.4.1.3.1. The front fog lamp shall comply with the requirements of paragraph 6.4.3. of this Regulation with at least one complete set of appropriate standard (étalon) light sources, which may be supplied by the manufacturer or applicant.**

In the case of LED light sources operating directly under vehicle voltage system conditions:

The front fog lamp shall be checked by means of standard (etalon) light sources as specified in Regulation No. 128.

All photometric and colorimetric measurements shall be made while the lamp is supplied with the voltage of 13.2 V or 28.0 V; the luminous intensity values measured shall be corrected. The correction factor is the ratio between the objective luminous flux and the value of the luminous flux found at the voltage applied. In the case of more than one LED light source, the mean value of the correction factors shall be applied, while each individual correction factor shall not deviate more than 5 per cent

from this mean value. LED light source(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

- 6.4.1.34. In the case of non-replaceable light sources:
All measurements on front fog lamps equipped with non-replaceable light sources shall be made at 6.3 V, 13.2 V or 28.0 V or at other vehicle voltage as specified by the applicant. The test laboratory may require from the applicant the special power supply needed to supply the light sources. The test voltages shall be applied to the input terminals of the lamp.
- 6.4.1.45. In the case of LED modules:
All measurements on front fog lamps equipped with LED module(s) shall be made at 6.3 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. LED modules operated by an electronic light source control gear shall be measured with the input voltage as specified by the applicant or with a supply and operating device which replace this control gear for the photometric test. The relevant input parameters (e.g. duty cycle, frequency, pulse shape, peak voltage) shall be specified and stated in the communication form, item 10.6., in Annex 1 to this Regulation."
- 6.4.1.56. Compliance with the requirements of paragraph 5.8.1. shall be verified at least with respect to the values in lines 3 and 4 of the table of paragraph 6.4.3."

Annex 1,

Item 10.2., amend to read:

"10.2. Number and category(ies) of filament ~~lamp~~ and gas-discharge light source(s):"

Insert a new item 10.3. and renumber the subsequent items accordingly, to read:

- "10.3. Number, category(ies) and minimum applicable thermal grade of LED light source(s):**
- 10.34. LED module(s): yes/no² and for each LED module a statement whether it is replaceable or not: yes/no²
- 10.45. Light generator: yes/no²
- 10.56. LED module or light generator specific identification code:
- 10.67. Application of electronic light source control gear:³ yes/no²
Supply to the light source:
Specification of the light source control gear:
Input voltage:⁴
In the case of an electronic light source control gear not being part of the lamp:
Output signal specification:
- 10.78. Colour of light emitted: white/selective yellow²
- 10.89. Luminous flux of the light source (see paragraph 5.9.) greater than 2,000 lumens: ... yes/no²

10.910. Luminous intensity is variable: ... yes/no²

10.1011. The determination of the cut-off gradient (if measured) was carried out at
.....10 m / 25 m² "

Annex 2,

Paragraph 1.1., amend to read:

"1.1. When testing photometric performances of any front fog lamp chosen at random and equipped with a standard filament ~~lamp~~ **light source**, no measured value may deviate unfavourably by more than 20 per cent from the value prescribed in this Regulation."

Paragraph 2.1., amend to read:

"2.1. **For LED light source(s) the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux as specified in Regulation No. 128; accordingly the measured intensities may be corrected by 20 per cent in the favourable direction.**

When testing the photometric performances of any front fog lamp chosen at random according to paragraph 6.4. of this Regulation, no measured value of the luminous intensity may deviate unfavourably by more than 20 per cent."

Paragraph 2.2., to be deleted and the subsequent paragraphs to be renumbered and amended to read:

"2.32. For the measured values in the table according to paragraph 6.4.3. of this Regulation the respective maximum deviations may be:

Designated lines or zones	Vertical position* above h + below h -	Horizontal position* left of v: - right of v: +	Luminous intensity candela		To comply
			Equivalent 20 per cent	Equivalent 30 per cent	
Point 1, 2**	+60°	±45°	115 max	130 max	All points
Point 3, 4**	+40°	±30°			
Point 5, 6**	+30°	±60°			
Point 7, 10**	+20°	±40°			
Point 8, 9**	+20°	±15°			
Line 1**	+8°	-26° to +26°	160 max	170 max	All line
Line 2**	+4°	-26° to +26°	180 max	195 max	All line
Line 3	+2°	-26° to +26°	295 max	320 max	All line
Line 4	+1°	-26° to +26°	435 max	470 max	All line
Line 5	0°	-10° to +10°	585 max	630 max	All line
Line 6***	-2.5°	from 5° inwards to 10° outwards	2,160 min	1,890 min	All line
Line 8 L and R***	-1.5° to -3.5°	-22° and +22°	880 min	770 min	One or more points

Designated lines or zones	Vertical position* above h + below h -	Horizontal position* left of v: - right of v: +	Luminous intensity candela		To comply
			Equivalent 20 per cent	Equivalent 30 per cent	
Line 9 L and R***	-1.5° to -4.5°	-35° and +35°	360 min	315 min	One or more points
Zone D	-1.5° to -3.5 °	-10° to +10°	14,400 max	15,600 max	Whole zone

* The co-ordinates are specified in degrees for an angular web with a vertical polar axis.

** See paragraph 6.4.3.4. of this Regulation.

*** See paragraph 6.4.3.2. of this Regulation.

2.43. For the periodic records, the photometric measurements for verification of conformity shall at least yield data for the points 8 and 9, and the lines 1, 5, 6, 8 and 9 as specified in paragraph 6.4.3. of this Regulation."

Annex 5,

Introductory part, amend to read:

"Once the photometric values have been measured according to the prescriptions of this Regulation, in the point of maximum illumination in zone D (E_{max}) and in the point HV, a complete front fog lamp sample shall be tested for stability of photometric performance in operation. "Complete front fog lamp" is the complete lamp itself including those surrounding body parts and lamps, which could influence its thermal dissipation.

The tests shall be carried out:

- (a) In a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$, the test sample being mounted on a base representing the correct installation on the vehicle;
- (b) In case of replaceable light sources: using mass production filament light sources, which have been aged for at least one hour, or mass production gas-discharge light sources, which have been aged for at least 15 hours, **or mass production LED light sources** or mass production LED modules which ~~has~~**have** been aged for at least 48 hours and cooled down to ambient temperature before starting the tests as specified in this Regulation. The LED modules supplied by the applicant shall be used.

The measuring equipment shall be equivalent to that used during ~~headlamp~~**front fog lamp** type-approval tests.

The test sample shall be operated without being dismantled from or readjusted in relation to its test fixture. The light sources used shall be a-light sources of the category(ies) specified for that front fog lamp. **Moreover, in case of LED light sources, the thermal grade of the LED light source(s) shall be the same or higher as the one indicated in the Communication form in Annex 1.**

..."

Paragraph 1.1., amend to read:

"1.1. Clean front fog lamp

The front fog lamp shall be operated for 12 hours as described in paragraphs 1.1.1. **and 1.1.2.** and checked as prescribed in paragraph 1.1.23. below."

Paragraph 1.1.1.2., amend to read:

"1.1.1.2. In the case of more than one lighting function (e.g. a headlamp with one or more driving-beams and/or a front fog lamp): the headlamp shall be subjected to the following cycle until the prescribed time is reached:

- (a) 15 minutes, front fog lamp lit;
- (b) 5 minutes, all ~~filaments~~ **light source(s)** lit.

If the applicant declares that only one lighting function is to be used at a time (e.g. only the passing-beam lit or only the driving-beam(s) lit or only the front fog lamp lit¹), the test shall be carried out in accordance with this condition, successively activating the front fog lamp half of the time and one of the other lighting functions for half the time specified in paragraph 1.1. above."

Paragraph 1.1.2., amend to read:

"1.1.2. Test voltage

The voltage shall be applied to the terminals of the test sample as follows:

- (a) In case of replaceable filament **or LED** light source(s) operated directly under vehicle voltage system conditions: The test shall be performed at 6.3 V, 13.2 V or 28.0 V as applicable except if the applicant specifies that the test sample may be used at a different voltage. In this case, the test shall be carried out with the filament **or LED** light source(s) operated at the highest voltage that can be used;
- (b) ..."

Paragraph 1.2., amend to read:

"1.2. Dirty front fog lamp

The front fog lamp, having been tested as specified in paragraph 1.1. above shall be operated for one hour as described in paragraphs 1.1.1. **and 1.1.2.** Following preparation, as prescribed in paragraph 1.2.1. below, it shall be checked as prescribed in paragraph 1.1.3. above."

Annex 12,

The Title, amend to read:

~~"Requirements in case of use of LED modules(s) or of light generators~~
Requirements for LED modules and front fog lamps including LED modules and/or LED light sources"

Paragraph 1.4.1., amend to read:

"1.4.1. After removal and replacement of the module the photometric requirements of the ~~headlamp~~ **front fog lamp** shall still be met;"

Paragraph 3.1.3.1., amend to read:

"3.1.3.1. All samples shall be tested under the conditions as specified in paragraph 6.4.1.45. of this Regulation."

Insert a new paragraph 3.1.3.3. to read:

"3.1.3.3. LED light source operating conditions:

All samples shall be tested under the conditions as specified in paragraphs 6.4.1.3. of this Regulation."

**B. Supplement 8 to the 01 series of amendments to Regulation No. 98
(Headlamps with gas-discharge light sources)**

Table of contents, List of annexes, amend to read:

"11 Requirements for LED modules and headlamps including LED modules **and/or LED light sources**"

Paragraph 1.6., amend to read:

"1.6. References made in this Regulation to standard (étalon) filament ~~lamp~~ **light source(s)**, gas-discharge light source(s) **and LED light source(s), including the thermal grade of the LED light source(s)** shall refer to Regulations Nos. 37, 99 **and 128** respectively, and to their series of amendments in force at the time of application for type approval"

Paragraph 2.1.5., amend to read:

"2.1.5. Which light sources are energized when the various beam combinations are used **and, in case of a light source category with more than one objective luminous flux value, which objective luminous flux value is used;**"

Paragraph 2.1.6., amend to read:

"2.1.6. The category of light source(s) as listed in Regulations Nos. 37, ~~or 99~~ **or 128** and their series of amendments in force at the time of application for type approval and, in case of a light source category with more than one objective luminous flux value, which objective luminous flux value is used for passing beam and for driving beam."

Insert a new paragraph 2.2.5.2.4., to read:

"2.2.5.2.4. If LED light sources are being applied as specified in Regulation No. 128."

Part B, title, footnote 5, amend to read:

⁵ **Technical requirement for filament light sources: see Regulation No. 37.**
Technical requirements for gas-discharge light sources: see Regulation No. 99.
Technical requirement for LED light sources: see Regulation No. 128."

Insert a new paragraph 5.8.3., to read:

"5.8.3. In the case that one or more (additional) LED light sources are used in the gas-discharge headlamp, these LED light sources shall be approved according to Regulation No. 128 and its series of amendments in force at the time of application for type approval, provided that no restriction on the use is made in Regulation No. 128 and its series of amendments in force at the time of application for type approval."

Paragraph 5.8.3., renumber as paragraph 5.8.4.:

"5.8.34. The design of the device shall be such that the light source(s) can be fixed in no other position but the correct one."

Paragraph 5.8.4., renumber as paragraph 5.8.5. and amend to read:

"5.8.45. The ~~lamp~~ **light source** holder shall conform to the dimensional characteristics as given on the data sheet of IEC Publication 60061, relevant to the category of light source(s) used. The light source(s) shall fit easily into the headlamp."

Paragraph 5.12., amend to read:

"5.12. The headlamp (if equipped with LED modules **and/or LED light sources**) and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 11 of this Regulation. The compliance with the requirements shall be tested."

Paragraphs 6.2.4. to 6.2.4.2., amend to read:

"6.2.4. Only one gas-discharge light source is permitted for each passing beam headlamp. ~~A maximum of two~~ **Additional light sources** are permitted as follows:"

6.2.4.1. One additional light source according to Regulation No. 37 or one or more additional **LED light sources or one or more additional** LED module(s) may be used inside the passing beam headlamp to contribute to bend lighting.

6.2.4.2. One additional **filament** light source according to Regulation No. 37, and/or one or more LED module(s) inside the passing beam headlamp, may be used for the purposes of generating infrared radiation. It/they shall only be activated at the same time as the gas discharge light source. In the event that the gas-discharge light source fails, this additional light source ~~and/or~~ LED module(s) shall be automatically switched off.

The test voltage for the measurement with this/**these** additional light source(s) and/or LED module(s) shall be the same as in paragraph 6.2.4.4."

Paragraph 6.2.4.4.2., amend to read:

"6.2.4.4.2. In the case of a filament light source according to Regulation No. 37:

The lamp shall be measured by means of an uncoloured standard (étalon) filament ~~lamp~~ **light source** designed for a rated voltage of 12 V. During the checking, the voltage at the terminals of the filament ~~lamp~~ **light source** shall be regulated so as to obtain the reference luminous flux at 13.2 V as indicated at the relevant data sheet of Regulation No. 37."

Insert a new paragraph 6.2.4.4.3., to read:

"**6.2.4.4.3. In the case of a (set of) LED light source(s) according to Regulation No. 128:**

The lamp shall be measured by means of a (set of) standard (étalon) LED light source. During the checking, the voltage at the terminals of the LED light source(s) shall be regulated to 13.2 V.

For the measurements, the flux of this LED light source may differ from the objective luminous flux at 13.2 V specified in Regulation No. 128. In this case, the luminous intensity values shall be corrected accordingly by

the individual factor of the standard (étalon) LED light source ($F = \Phi_{obj.} / \Phi(Voltage)$).

In the case of more than one LED light source, the mean value of the correction factors shall be applied, while each individual correction factor shall not deviate more than 5 per cent from this mean value.

LED light source(s) operated by an electronic light source control gear, shall be measured as specified by the applicant."

Paragraph 6.2.4.4.3., renumber as paragraph 6.2.4.4.4.:

"6.2.4.4.34. In the case of LED module(s):

The lamp shall be measured at 6.3 V, 13.2 V or 28.0V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant."

Paragraph 6.2.6.1.3., amend to read:

"6.2.6.1.3. Means of one additional filament light source or **one or more LED light sources** or one or more LED module(s) without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with this/these light source(s) or LED module(s) activated."

Paragraph 6.3.2., amend to read:

"6.3.2. It is possible to use several light sources for the driving beam, these light sources being listed in Regulation No. 37 (in this case the filament ~~lamp~~ **light source** shall be operated at their reference luminous flux), in Regulation No. 99, **in Regulation No. 128** and/or they can be LED module(s). Where more than one light source is used to provide the driving beam, these light sources shall be operated simultaneously whilst determining the maximum value of luminous intensity (I_M).

It is also possible that a part of the driving beam produced by one of these light sources will be used exclusively for short time signals (flash to pass) as declared by the applicant. This shall be indicated in the relevant drawing and a remark shall be made in the communication form."

Annex 1, item 9.4., amend to read:

"9.4. Category (or categories) of **gas-discharge and filament and/or LED** light source(s),⁴ **and the minimum applicable thermal grade of the LED light source:**"

Annex 1, footnote 4, to be deleted.

Annex 4, introductory part, amend to read:

"Test on complete headlamps

Once the photometric values have been measured according to the prescriptions of this Regulation, in the point for I_{max} for driving beam and in points HV, 50 R and B 50 L for passing beam (or HV, 50 L, B 50 R for headlamps designed for left-hand traffic) a complete headlamp sample shall be tested for stability of photometric performance in operation. "Complete headlamp" shall be understood to mean the complete lamp itself including ballast(s) and those surrounding body parts and lamps which could influence its thermal dissipation.

The tests shall be carried out:

- (a) In a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$, the test sample being mounted on a base representing the correct installation on the vehicle;
- (b) In case of replaceable light sources: using mass production filament light sources, which have been aged for at least one hour, or mass production gas-discharge light sources, which have been aged for at least 15 hours or mass production **LED light sources or mass production LED modules** which have been aged for at least 48 hours and cooled down to ambient temperature before starting the tests as specified in this Regulation. The LED modules supplied by the applicant shall be used.

The measuring equipment shall be equivalent to that used during headlamp type-approval tests.

The test sample shall be operated without being dismantled from or readjusted in relation to its test fixture. The light source(s) used shall be a light source(s) of the category specified for that headlamp. **Moreover, in case of an LED light source(s), the thermal grade of the LED light source(s) shall be the same or higher as the one indicated in the Communication form in Annex 1.**

..."

Annex 4, paragraph 1.1.1.2., sub-paragraph (e), amend to read:

- "(e) LED module(s) **and LED light sources** shall be measured at 6.75 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. LED module(s) **and LED light source(s)** operated by an electronic light source control gear shall be measured as specified by the applicant."

Annex 7, third indent in the right column, amend to read:

"None of the ~~filament lamps~~ **light sources** and/or LED module(s) which the headlamp contains is designed for a 24 volts network system."

Annex 11,

Title, amend to read:

"Requirements for LED modules and headlamps including LED modules **and/or LED light sources**"

Paragraph 1., amend to read:

"1. General specifications **for LED modules**"

Paragraph 2., amend to read:

"2. Manufacture **of LED modules**"

Insert a new paragraph 3.2.2., to read:

3.2.2. LED light source operating conditions

All samples shall be tested under the conditions as specified in paragraphs 6.2.4.4. of this Regulation."

Paragraph 3.2.2. (former), renumber as 3.2.3.

C. Supplement 7 to the 01 series of amendments to Regulation No. 112 (Headlamps emitting an asymmetrical passing-beam):

Title, amend to read:

"Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing-beam or a driving-beam or both and equipped with filament ~~lamps~~ **light sources, light-emitting diode (LED) light sources** and/or light-emitting diode (LED) modules"

Table of contents, List of annexes, amend to read:

"10 Requirements for LED modules and headlamps including LED modules **and/or LED light sources**"

Paragraph 1.3.6, amend to read:

"1.3.6. The category of filament ~~lamp~~ **light source used, the category of LED light source(s)** used and/ or the LED module specific identification code(s);
A change of the thermal grade of the LED light source(s) does not constitute a change of type."

Paragraph 1.6., amend to read:

"1.6. References made in this Regulation to standard (étalon) filament ~~lamp(s)~~ **light source(s)** and to Regulation No. 37 shall refer to Regulation No. 37 and its series of amendments in force at the time of application for type approval.
References made in this Regulation to standard (étalon) LED light source(s) and to Regulation No. 128, including the thermal grade of the LED light source(s), shall refer to Regulation No. 128 and its series of amendments in force at the time of application for type approval."

Paragraph 2.1.5., replace to read:

"2.1.5. **The light source(s) used, being:**
2.1.5.1. **the category of the filament light source(s), as listed in Regulation No. 37 and its series of amendments in force at the time of application for type approval; and/or**
2.1.5.2. **the category of the LED light source(s), as listed in Regulation No. 128 and its series of amendments in force at the time of application for type approval, including the minimum applicable thermal grade of the LED light source(s); and/or**
2.1.5.3. **the LED module(s) specific identification code(s), as indicated in paragraph 3.5. and its subparagraphs.**"

Paragraph 3.3., amend to read:

"3.3. Headlamps equipped with passing-beam designed to satisfy the requirements both of right-hand and of left-hand traffic shall bear markings indicating the two settings of the optical unit or LED module on the vehicle or of the filament ~~lamp~~ **light source or LED light source(s)** on the reflector; these markings shall consist of the letters "R/D" for the position for right-hand traffic and the letters "L/G" for the position for left-hand traffic."

Paragraph 4.2.2.2., amend to read:

"4.2.2.2. On headlamps designed to meet the requirements of both traffic systems by means of an appropriate adjustment of the setting of the optical unit or the filament ~~lamp~~ **light source or the LED light source(s)** or LED module(s), a horizontal arrow with a head on each end, the heads pointing respectively to the left and to the right;"

Paragraph 4.2.3.1., amend to read:

"4.2.3.1. On headlamps meeting the requirements of this Regulation which are so designed that the filament or **LED light source(s) or** LED module(s) producing the principal passing-beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the symbol indicating the headlamp producing the passing-beam in the approval mark."

Paragraph 4.2.3.2., amend to read:

"4.2.3.2. On headlamps equipped with filament ~~lamps~~ **light sources and/or LED light sources** and meeting the requirements of Annex 4 to this Regulation only when supplied with a voltage of 6 V or 12 V, a symbol consisting of the number 24 crossed out by an oblique cross (x), shall be placed near the ~~filament lamp~~ **light source holder(s)**."

Part B, title, footnote 5, amend to read:

"⁵ Technical requirements for filament ~~lamps~~ **light sources**: see Regulation No. 37.
Technical requirements for LED light sources: see Regulation No. 128."

Paragraph 5.2.1., amend to read:

"5.2.1. Headlamps shall be fitted with a device enabling them to be so adjusted on the vehicles as to comply with the rules applicable to them. Such a device need not be fitted on units in which the reflector and the diffusing lens cannot be separated, provided the use of such units is confined to vehicles on which the headlamp setting can be adjusted by other means.

Where a headlamp providing a principal passing-beam and a headlamp providing a driving-beam, each equipped with its own filament ~~lamp~~ **light source or LED light source(s)** or LED module(s), the adjusting device shall enable the principal passing-beam and the driving-beam to be adjusted individually."

Paragraph 5.3.1., amend to read:

"5.3.1. Filament ~~lamp(s)~~ **light source(s)** approved according to Regulation No. 37. Any filament ~~lamp~~ **light source** covered by Regulation No. 37 may be used, provided that no restriction on the use is made in Regulation No. 37 and its series of amendments in force at the time of application for type approval."

Paragraph 5.3.1.1., amend to read:

"5.3.1.1. The design of the device shall be such that the filament ~~lamp~~ **light source** can be fixed in no other position but the correct one;⁶"

Paragraph 5.3.1.1., footnote 6, amend to read:

"⁶ A headlamp is regarded as satisfying the requirements of this paragraph if the filament ~~lamp~~ **light source** can be easily fitted into the headlamp and the positioning lugs can be correctly fitted into their slots even in darkness."

Paragraph 5.3.1.2., amend to read:

"5.3.1.2. The filament ~~lamp~~ **light source** holder shall conform to the characteristics given in IEC Publication 60061. The holder data sheet relevant to the category of filament ~~lamp~~ **light source** used, applies."

Insert a new paragraph 5.3.2., to read:

"5.3.2. And/or LED light source(s) approved according to Regulation No. 128. Any LED light source covered by Regulation No. 128 may be used, provided that no restriction on the use is made in Regulation No. 128 and its series of amendments in force at the time of application for type approval.

5.3.2.1. The design of the device shall be such that the LED light source(s) can be fixed in no other position but the correct one⁷;

5.3.2.2. The LED light source holder(s) shall conform to the characteristics given in IEC Publication 60061. The holder data sheet(s) relevant to the category of LED light source(s) used, apply, taking into account the minimum thermal grade of the LED light source indicated in the communication form of Annex 1.

5.3.2.3. If applicable, a means of controlling the voltage at the terminals of the device, within the limits as defined in Regulation No. 48, may, for convenience, be located within the body of the headlamp. However, for the purposes of type approval of the passing and/ or driving beam according to the provisions of this Regulation, such means of voltage control shall not be considered to be part of the headlamp and shall be disconnected during the testing to verify performance according to the requirements of this Regulation.

5.3.2.4. The headlamp shall comply with the requirements specified in Annex 10 to this Regulation. The compliance with the requirements shall be tested.

5.3.2.5. The total objective luminous flux of all LED light source(s) and LED modules producing the principal passing-beam and measured as described in paragraph 5. of Annex 10 shall be equal or greater than 1,000 lumens."

Paragraph 5.3.2.1. (new), insert a new footnote 7, to read:

"⁷ A headlamp is regarded as satisfying the requirements of this paragraph if the LED light source can be easily fitted into the headlamp and the positioning features can be correctly fitted into their slots even in darkness."

Paragraph 5.3.2. (former) and its subparagraphs, renumber and amend to read:

"5.3.23. And/or LED module(s):

5.3.23.1. Electronic light source control gear(s) associated with the operation of LED module(s), if applicable, shall be considered to be part of the headlamp; they may be part of the LED module(s);

5.3.23.2. The headlamp, if equipped with LED modules, and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 10 to this Regulation. The compliance with the requirements shall be tested.

- 5.3.23.3. The total objective luminous flux of all **LED light source(s) and** LED modules producing the principal passing-beam and measured as described in paragraph 5. of Annex 10 shall be equal or greater than 1,000 lumens.
- 5.3.23.4. In the case of a replaceable LED module the removal and replacement of this LED module, as described in Annex 10, paragraph 1.4.1. shall be demonstrated to the satisfaction of the Technical Service."

Paragraph 5.4., amend to read:

- "5.4. Headlamps designed to satisfy the requirements both of right hand and of left hand traffic may be adapted for traffic on a given side of the road either by an appropriate initial setting when fitted on the vehicle or by selective setting by the user. Such initial or selective setting may consist, for example, of fixing either the optical unit at a given angle on the vehicle or the filament ~~lamp~~ **light source or LED light source(s)** or LED module(s) producing the principal passing-beam at a given angle/position in relation to the optical unit. In all cases, only two different and clearly distinct settings, one for right hand and one for left-hand traffic, shall be possible, and the design shall preclude inadvertent shifting from one setting to the other or setting in an intermediate position. Where two different setting positions are provided for the filament ~~lamp~~ **light source or LED light source(s)** or LED module(s) producing the principal passing-beam, the components for attaching the filament ~~lamp~~ **light source or LED light source(s)** or LED module(s) producing the principal passing-beam to the reflector must be so designed and made that, in each of its two settings, this filament ~~lamp~~ **light source or LED light source(s)** or LED module(s) will be held in position with the precision required for headlamps designed for traffic on only one side of the road. Conformity with the requirements of this paragraph shall be verified by visual inspection and, where necessary, by a test fitting."

Paragraph 5.9., amend to read:

- "5.9. In case of a passing-beam headlamp incorporating a **filament light source or LED light source(s)** or LED module(s) producing the principal passing-beam and having a total objective luminous flux which exceeds 2,000 lumens, a reference shall be made in item 9. of the communication form in Annex 1. The objective luminous flux of LED modules shall be measured as described in paragraph 5. of Annex 10."

Paragraph 5.10., amend to read:

- "5.10. The definitions in paragraphs 2.7.1.1.3. and 2.7.1.1.7. in Regulation No. 48 allow the use of LED modules, which may contain holders for other light sources. Notwithstanding this provision a mixture of ~~LED²(s)~~ **LED light sources or LED module(s) with and** other light sources for the principal dipped beam or the contributor to the bend lighting or each driving-beam, as specified by this Regulation is not allowed."

Paragraph 6.1.1., amend to read:

- "6.1.1. Headlamps shall be so made that they give adequate illumination without dazzle when emitting the passing-beam, and good illumination when emitting the driving-beam. Bend lighting may be produced by activating one additional filament light source, **one or more LED light source(s)** or one or more LED module(s) being part of the passing-beam headlamp."

Paragraph 6.1.3. and its subparagraphs, amend to read:

"6.1.3. ~~Apart from LED module(s),~~ **In case of filament light source** the headlamps shall be checked by means of an uncoloured standard (étalon) filament ~~lamp~~ **light source** designed for a rated voltage of 12 V.

6.1.3.1. During the checking of the headlamp, the voltage at the terminals of the filament ~~lamp~~ **light source** shall be regulated as to obtain the reference luminous flux at 13.2 V as indicated for each filament ~~lamp~~ **light source** at the relevant data sheet of Regulation No. 37.

However, if a filament ~~lamp~~ **light source** of category H9 or H9B is used for the principal passing-beam, the applicant may choose the reference luminous flux at 12.2 V or 13.2 V as indicated in the relevant data sheet of Regulation No. 37 and a reference stating which voltage was chosen for type approval shall be made in item 9 in the communication form of Annex 1.

6.1.3.2. In order to protect the standard (étalon) filament ~~lamp~~ **light source** during the process of photometric measurement it is permissible to carry out the measurements at a luminous flux that differs from the reference luminous flux at 13.2 V. If the Technical Service chooses to carry out measurements in such a manner, the luminous intensity shall be corrected by multiplying the measured value by the individual factor F_{lamp} of the standard (étalon) filament ~~lamp~~ **light source** in order to verify the compliance with the photometric requirements where:

$$F_{\text{lamp}} = \Phi_{\text{reference}} / \Phi_{\text{test}}$$

$\Phi_{\text{reference}}$ is the reference luminous flux at 13,2 V as specified in the relevant data sheet of Regulation No. 37

Φ_{test} is the actual luminous flux used for the measurement.

However, where the reference luminous flux of 12.2 V as specified in the data sheet for the category H9 or H9B is chosen, this procedure is not permitted.

6.1.3.3. The headlamp shall be considered acceptable if it meets the requirements of paragraph 6. with at least one standard (étalon) filament ~~lamp~~ **light source**, which may be submitted with the headlamp."

Insert a new paragraph 6.1.4., to read:

"6.1.4. **In case of LED light source(s) the headlamps shall be checked by means of standard (étalon) LED light source(s).**

6.1.4.1. **All photometric and colorimetric measurements shall be made while the lamp is supplied with the voltage of 13.2 V or 28.0 V; the luminous intensity values measured shall be corrected. The correction factor is the ratio between the objective luminous flux and the value of the luminous flux found at the voltage applied. In the case of more than one LED light source, the mean value of the correction factors shall be applied, while each individual correction factor shall not deviate more than 5 per cent from this mean value. LED light source(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.**

6.1.4.2. **The headlamp shall be considered acceptable if it meets the requirements of paragraph 6. with at least one (set of) standard (étalon) LED light source(s), which may be submitted with the headlamp."**

Paragraph 6.1.4., renumber as paragraph 6.1.5.

Paragraph 6.1.5., renumber as paragraph 6.1.6. and amend to read:

"6.1.56. In the case of headlamps equipped with **LED light sources**, LED modules and filament ~~lamps~~ **light sources**, the part of the headlamp with filament ~~lamp(s)~~ **light source(s)** shall be tested according to paragraph 6.1.3., **the part of the headlamp with LED light source(s) shall be tested according to paragraph 6.1.4.** and the part of the headlamp with LED module(s) shall be ~~evaluated~~ **tested** according to the provisions of paragraph 6.1.45. and then added to the previous result(s) ~~obtained from the filament lamp(s) tested.~~"

Paragraph 6.2.4., amend to read:

"6.2.4. The passing-beam shall meet the luminous intensities at the test points referred to in the tables below and in Annex 3 Figure B (or mirrored about the VV line for left-hand traffic):

<i>Headlamps for RH Traffic**</i>							<i>Class A Headlamp</i>		<i>Class B Headlamp</i>	
<i>Test point designation</i>		<i>Test point angular coordinates - Degrees</i>					<i>Required luminous intensity cd</i>		<i>Required luminous intensity cd</i>	
							<i>Max</i>	<i>Min</i>	<i>Max</i>	<i>Min</i>
B 50 L		0.57U, 3.43L					350		350	
BR		1.0 U, 2.5R					1,750		1,750	
75 R		0.57D, 1.15R						5,100		10,100
75 L		0.57D, 3.43L					10,600		10,600	
50 L		0.86D, 3.43L					13,200***		13,200***	
50 R		0.86D, 1.72R						5,100		10,100
50 V		0.86D, 0								5,100
25 L		1.72D, 9.0L						1,250		1,700
25 R		1.72D, 9.0R						1,250		1,700
Any point in zone III (bounded by the following coordinates in degrees)							625		625	
8 L	8 L	8 R	8 R	6 R	1.5 R	V-V				
1 U	4 U	4 U	2 U	1.5 U	1.5 U	H-H				
Any point in zone IV (0.86D to 1.72D, 5.15 L to 5.15 R)								1,700		2,500
Any point in zone I (1.72D to 4D, 9 L to 9 R)							17,600		< 2I*	

Note: In the table:

Letter L means that the point is located on the left of VV line.

Letter R means that the point is located on the right of VV line.

Letter U means the point is located above HH line

Letter D means the point or segment is located below HH line

* Actual measured value at points 50R / 50L respectively

** For left-hand traffic, the letter R shall be replaced by letter L and vice versa.

*** In case where a headlamp in which **LED light sources and/or** LED modules are producing a passing-beam in conjunction with an electronic light source control gear, the measured value shall not be more than 18,500 cd.

<i>Headlamps for RH Traffic**</i>		
<i>Test point</i>	<i>Angular coordinates Degrees</i>	<i>Required luminous intensity- cd Min</i>
1	4U, 8L	Points 1+2+3 190
2	4U, 0	
3	4U, 8R	
4	2U, 4L	Points 4+5+6 375
5	2U, 0	
6	2U, 4R	
7	0, 8L	65
8	0, 4L	125

Paragraph 6.2.6., amend to read:

"6.2.6. Headlamps designed to meet the requirements of both right-hand and left-hand traffic ~~must~~**shall**, in each of the two setting positions of the optical unit or LED module(s) producing the principal passing-beam or of the filament ~~lamp~~ **light source or LED light source(s)**, meet the requirements set forth above for the corresponding direction of traffic."

Paragraph 6.2.7., amend to read:

"6.2.7. The requirements in paragraph 6.2.4. above shall also apply to headlamps designed to provide bend lighting and/or that include ~~the~~ additional light source(s) or LED module(s) referred to in paragraph 6.2.8.2. In the case of a headlamp designed to provide bend lighting its alignment may be changed, provided that the axis of the beam is not displaced vertically by more than 0.2°."

Paragraph 6.2.7.1.3., amend to read:

"6.2.7.1.3. Means of one additional filament light source **or one or more additional LED light source(s)** or one or more LED module(s) without moving horizontally the kink of the elbow of the cut-off, measurements shall be carried out with ~~this~~ **these** light source(s) or LED module(s) activated."

Paragraph 6.2.8. and its subparagraphs, amend to read:

"6.2.8. Only one filament light source or **one or more LED light source(s)** or one or more LED module(s) are permitted for the principal passing-beam. Additional light sources or LED modules are permitted only as follows (see Annex 10):

6.2.8.1. One additional **filament** light source according to Regulation No. 37 **or one or more additional LED light source(s) according to Regulation No. 128** or one or more additional LED module(s) may be used inside the passing-beam headlamp to contribute to bend lighting;

6.2.8.2. One additional **filament** light source according to Regulation No. 37 **or one or more additional LED light source(s) according to Regulation No. 128** ~~and~~ or one or more **additional** LED module(s), inside the passing-beam headlamp, may be used for the purposes of generating infrared radiation. It/they shall only be activated at the same time as the principal light source(s)

or LED module(s). In the event that **(one of)** the principal light source(s) or (one of) the principal LED module(s) fails, this additional light source(s) and/or LED module(s) shall be automatically switched off;

6.2.8.3. In the event of failure of an additional filament light source, **one or more additional LED light source(s)** or one or more additional LED module(s), the headlamp shall continue to fulfil the requirements of the passing-beam."

Paragraph 6.3.2., amend to read:

"6.3.2. Irrespective of the type of light source (LED module(s), **LED light source(s)** or filament light source(s)) used to produce the principal passing-beam, several light sources:

- (a) Either filament light sources listed in Regulation No. 37; or
- (b) LED module(s) **and/or LED light source(s) listed in Regulation No. 128** may be used for each individual driving-beam."

Annex 1, item 9., amend to read:

"9. Brief description:

Category as described by the relevant marking:³

.....

Number and category(s) of filament ~~lamp(s)~~ **light source(s)**:

.....

Number, category(s) and minimum applicable thermal grade of LED light source(s):

Reference luminous flux used for the principal passing-beam (lm):.....

Principal passing-beam operated at approximately (V):

Measures according to paragraph 5.8. of this Regulation:

Number and specific identification code(s) of LED module(s) and for each LED module a statement whether it is replaceable or not: yes/no²

Number and specific identification code(s) of electronic light source control gear(s)..

.....

Total objective luminous flux as described in paragraph 5.9. exceeds 2,000 lumens: yes/no/does not apply²

The adjustment of the cut-off has been determined at: 10 m/25 m/does not apply²

The determination of the minimum sharpness of the "cut-off" has been carried out at: 10 m/25 m/does not apply² "

Annex 2, figure 4b and subsequent text, amend to read:

"Figure 4b



The headlamp bearing the above approval mark meets the requirements of this Regulation in respect of both the passing-beam and the driving-beam and is designed:

Figure 3: Class A for left hand traffic only.

Figures 4a and 4b: Class B for both traffic systems by means of an appropriate adjustment of the setting of the optical unit or the filament ~~lamp~~ **light source or the LED light source(s)** on the vehicle."

Annex 4,

Introductory part, amend to read:

"Tests on complete headlamps

Once the photometric values have been measured according to the prescriptions of this Regulation, in the point for I_{\max} for driving-beam and in points HV, 50 R, B 50 L for passing-beam (or HV, 50 L, B 50 R for headlamps designed for left-hand traffic) a complete headlamp sample shall be tested for stability of photometric performance in operation. "Complete headlamp" shall be understood to mean the complete lamp itself including those surrounding body parts and lamps which could influence its thermal dissipation.

The tests shall be carried out:

- (a) In a dry and still atmosphere at an ambient temperature of $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$, the test sample being mounted on a base representing the correct installation on the vehicle;
- (b) In case of replaceable light sources: using mass production filament light sources, which have been aged for at least one hour, or mass production gas-discharge light sources, which have been aged for at least 15 hours or mass production **LED light sources and LED modules** which have been aged for at least 48 hours and cooled down to ambient temperature before starting the tests as specified in this Regulation. The LED modules supplied by the applicant shall be used.

The measuring equipment shall be equivalent to that used during headlamp type approval tests.

The test sample shall be operated without being dismantled from or readjusted in relation to its test fixture. The light sources used shall be ~~a~~ light sources of the ~~category~~ **categories** specified for that headlamp. **Moreover, in case of an LED light source(s), the thermal grade of the LED light source(s) shall be the same or higher as the one indicated in the Communication form in Annex 1.**"

Paragraph 1.1.1.1., amend to read:

- "1.1.1.1. (a) In the case where only one lighting function (driving or passing-beam or front fog lamp) is to be approved, the corresponding filament, **LED light source(s)** and/or LED module(s) is (are) lit for the prescribed time;²
- (b) In the case of a headlamp with a passing-beam and one or more driving-beams or in the case of a headlamp with a passing-beam and a front fog lamp:

- (i) The headlamp shall be subjected to the following cycle until the time specified is reached:
- 15 minutes, principal passing-beam filament, **principal passing-beam LED light source(s)** or principal passing-beam LED module(s) lit;
- 5 minutes, all filaments, **LED light source(s)** and/or LED module(s) lit.
- (ii) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the driving-beam(s) lit³ at a time, the test shall be carried out in accordance with this condition, activating² successively the passing-beam half of the time and the driving-beam(s) (simultaneously) for half the time specified in paragraph 1.1. above.
- (c) In the case of a headlamp with a front fog lamp and one or more driving-beams:
- (i) The headlamp shall be subjected to the following cycle until the time specified is reached:
- 15 minutes, front fog lamp lit;
- 5 minutes, all filaments, **LED light source(s)** and/or ~~all~~ LED module(s) lit.
- (ii) If the applicant declares that the headlamp is to be used with only the front fog lamp lit or only the driving-beam(s) lit³ at a time, the test shall be carried out in accordance with this condition, activating² successively the front fog lamp half of the time and the driving-beam(s) (simultaneously) for half the time specified in paragraph 1.1. above.
- (d) In the case of a headlamp with a passing-beam, one or more driving-beams and a front fog lamp:
- (i) The headlamp shall be subjected to the following cycle until the time specified is reached:
- 15 minutes, principal passing-beam filament, **principal passing-beam LED light source(s)** or principal passing-beam LED module(s) lit;
- 5 minutes, all filaments, **LED light source(s)** and/or ~~all~~ LED module(s) lit.
- (ii) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the driving-beam(s)³ lit at a time, the test shall be carried out in accordance with this condition, activating² successively the principal passing-beam half of the time and the driving-beam(s) for half the time specified in paragraph 1.1. above, while the front fog lamp is subjected to a cycle of 15 minutes off and 5 minutes lit for half of the time and during the operation of the driving-beam;
- (iii) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the front fog lamp³ lit at a time, the test shall be carried out in accordance with this

condition, activating² successively the principal passing-beam half of the time and the front fog lamp for half of the time specified in paragraph 1.1. above, while the driving-beam(s) is(are) subjected to a cycle of 15 minutes off and 5 minutes lit for half of the time and during the operation of the principal passing-beam;

- (iv) If the applicant declares that the headlamp is to be used with only the passing-beam lit or only the driving-beam(s)³ lit or only the front fog lamp³ lit at a time, the test shall be carried out in accordance with this condition, activating² successively the principal passing-beam one third of the time, the driving-beam(s) one third of the time and the front fog lamp for one third of the time specified in paragraph 1.1. above.
- (e) In the case of a passing-beam designed to provide bend lighting with the addition of a filament light source, **one or more LED light source(s)** and/or one or more LED module(s), this **(these)** light source(s) and/or LED module(s) shall be switched on for one minute, and switched off for nine minutes during the activation of the passing-beam only (see Annex 4 – Appendix 1)."

Paragraph 1.1.1.1., footnote 3, amend to read:

"³ Should two or more lamp filaments, **LED light source(s)** and/or LED module(s) be simultaneously lit when headlamp flashing is used, this shall not be considered as being normal use of the filaments, **LED light source(s)** and/or LED module(s)."

Paragraph 1.1.1.2., amend to read:

"1.1.1.2. Test voltage

The voltage shall be applied to the terminals of the test sample as follows:

- (a) In case of replaceable filament light source(s) operated directly under vehicle voltage system conditions:

The test shall be performed at 6.3 V, 13.2 V or 28.0 V as applicable except if the applicant specifies that the test sample may be used at a different voltage. In this case, the test shall be carried out with the filament light source operated at the highest voltage that can be used.
- (b) In case of replaceable gas discharge light source(s): The test voltage for the electronic light source control-gear is 13.2 ± 0.1 volts for 12 V vehicle voltage system, or otherwise specified in the application for approval.
- (c) In the case of non-replaceable light source operated directly under vehicle voltage system conditions: All measurements on lighting units equipped with non-replaceable light sources (filament light sources and/ or others) shall be made at 6.3 V, 13.2 V or 28.0 V or at other voltages according to the vehicle voltage system as specified by the applicant respectively.
- (d) In the case of light sources, replaceable or non-replaceable, being operated independently from vehicle supply voltage and fully controlled by the system, or, in the case of light sources supplied by a supply and operating device, the test voltages as specified above shall be applied to the input terminals of that device. The test laboratory

may require from the manufacturer the supply and operating device or a special power supply needed to supply the light source(s).

- (e) **LED light source(s) and LED module(s)** shall be measured at 6.75 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. **LED light source(s) and LED module(s)** operated by an electronic light source control gear, shall be measured as specified by the applicant.
- (f) Where signaling lamps are grouped, combined or reciprocally incorporated into the test sample and operating at voltages other than the nominal rated voltages of 6 V, 12 V or 24 V respectively, the voltage shall be adjusted as declared by the manufacturer for the correct photometric functioning of that lamp."

Paragraph 2.1., amend to read:

"2.1. Test

The test shall be carried out in a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$.

Either using ~~Using~~ a mass production filament lamp **light source or LED light source(s) and/or** the LED module(s) as submitted with the headlamp, which has (have) been aged for at least one hour, the headlamp shall be operated on the principal passing-beam without being dismantled from or readjusted in relation to its test fixture. (For the purpose of this test, the voltage shall be adjusted as specified in paragraph 1.1.1.2.). The position of the cut-off line in its horizontal part (between vv and the vertical line passing through point B 50 L for right-hand traffic or B 50 R for left-hand traffic) shall be verified 3 minutes (r_3) and 60 minutes (r_{60}) respectively after operation.

The measurement of the variation in the cut-off line position as described above shall be carried out by any method giving acceptable accuracy and reproducible results."

Annex 4, Appendix 1, amend to read:

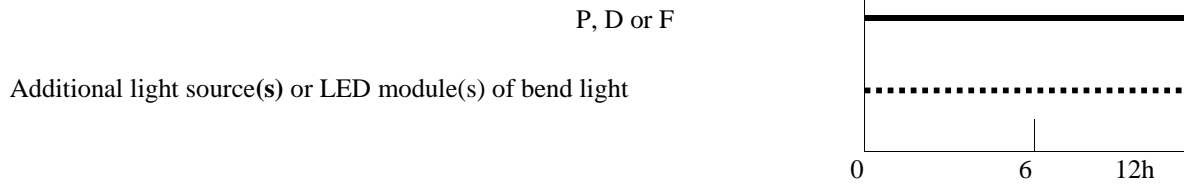
"Annex 4 - Appendix 1

Overview of operational periods concerning test for stability of photometric performance

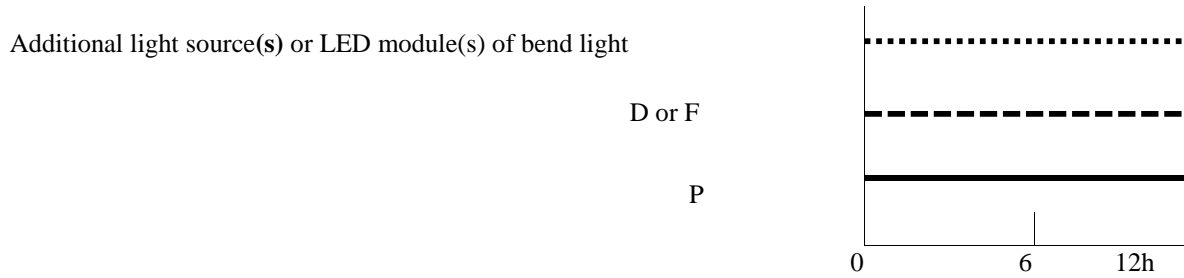
Abbreviations:	P: passing-beam lamp
	D: driving-beam lamp (D ₁ + D ₂ means two driving-beams)
	F: front fog lamp
— — — —	means a cycle of 15 minutes off and 5 minutes lit
.....	means a cycle of 9 minutes off and 1 minute lit

All following grouped headlamps and front fog lamps together with the added marking symbols are given as examples and are not exhaustive.

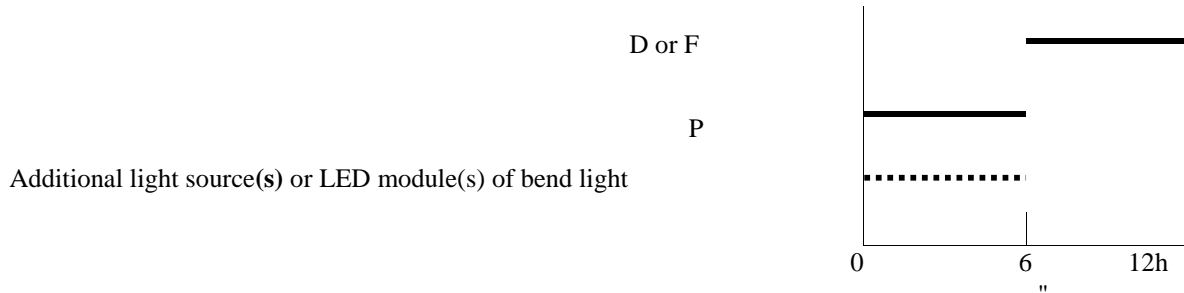
1. P or D or F (HC or HR or B)



2. P+F (HC B) or P+D (HCR)



3. P+F (HC/B) or HC/B or P+D (HC/R)



Annex 5,

Paragraph 1.2., amend to read:

"1.2. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard (étalon) filament lamp light source, a (set of) standard (étalon) LED light source(s), a (set of) serial production LED light source(s) and/or LED module(s), as present in the lamp:

For LED light source(s) the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux as specified in Regulation No. 128; accordingly the measured intensities may be corrected by 10 per cent in case of the use of standard (étalon) light source(s) and by 20 per cent in the case of the use of serial production light source(s) in the favourable direction:"

Paragraph 1.2.2.2., amend to read:

"1.2.2.2. And if, for the driving-beam, HV being situated within the isolux $0.75 I_{max}$ a tolerance of +20 per cent for maximum values and -20 per cent for minimum

values is observed for the photometric values at any measuring point specified in paragraph ~~6.3.2~~ **6.3.3** of this Regulation."

Paragraph 1.2.4., amend to read:

"1.2.4. If in the case of a lamp equipped with a replaceable filament light source **and/or replaceable LED light source(s)** the results of the tests described above do not meet the requirements, tests shall be repeated using another standard (étalon) filament ~~lamp~~ **light source and/or another (set of standard (étalon) LED light source(s)).**"

Annex 6, paragraph 2.1.2.1., amend to read:

"2.1.2.1. Method

Photometric measurements shall be carried out on the samples before and after the test.

These measurements shall be made using (a) standard (étalon) ~~lamp~~ **light source(s)** and/or LED module(s), as present in the headlamp, at the following points:

B 50 L and 50 R for the passing-beam (B 50 R and 50 L in the case of headlamps intended for left-hand traffic);

I_{\max} for the driving-beam."

Annex 7,

Paragraph 1.2., amend to read:

"1.2. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with a standard filament ~~lamp~~ **light source, a (set of) standard LED light source(s), a (set of) serial production LED light source(s)** and/or LED module(s) present in the headlamp:

For LED light source(s) the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux as specified in Regulation No. 128; accordingly the measured intensities may be corrected by 10 per cent in case of the use of standard (étalon) light source(s) and by 20 per cent in the case of the use of serial production light source(s) in the favourable direction:"

Paragraph 1.2.2.2., amend to read:

"1.2.2.2. And if, for the driving-beam, HV being situated within the isolux $0.75 I_{\max}$, a tolerance of +20 per cent for maximum values and -20 per cent for minimum values is observed for the photometric values at any measuring point specified in paragraph ~~6.3.2~~ **6.3.3** of this Regulation. The reference mark is disregarded."

Paragraph 1.2.4., amend to read:

"1.2.4. If the results of the tests described above do not meet the requirements, tests shall be repeated using another standard filament ~~lamp~~ **light source, another (set of) standard LED light source(s)** and/or LED module(s) present in the headlamp."

Title of Annex 10, amend to read:

"Requirements for LED modules and headlamps including LED modules **and/or LED light sources**"

Annex 10,

Paragraph 1., amend to read:

"1. General specifications **for LED modules**"

Paragraph 2., amend to read:

"2. Manufacture **of LED modules**"

Paragraph 3.2.1., amend to read:

"3.2.1. LED module operating conditions

All samples shall be tested under the conditions as specified in paragraphs ~~6.1.4. and 6.1.5.~~ **6.1.5. and 6.1.6.** of this Regulation. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer."

Insert a new paragraph 3.2.2. and renumber the subsequent paragraph accordingly, to read:

"3.2.2. **LED light source operating conditions**

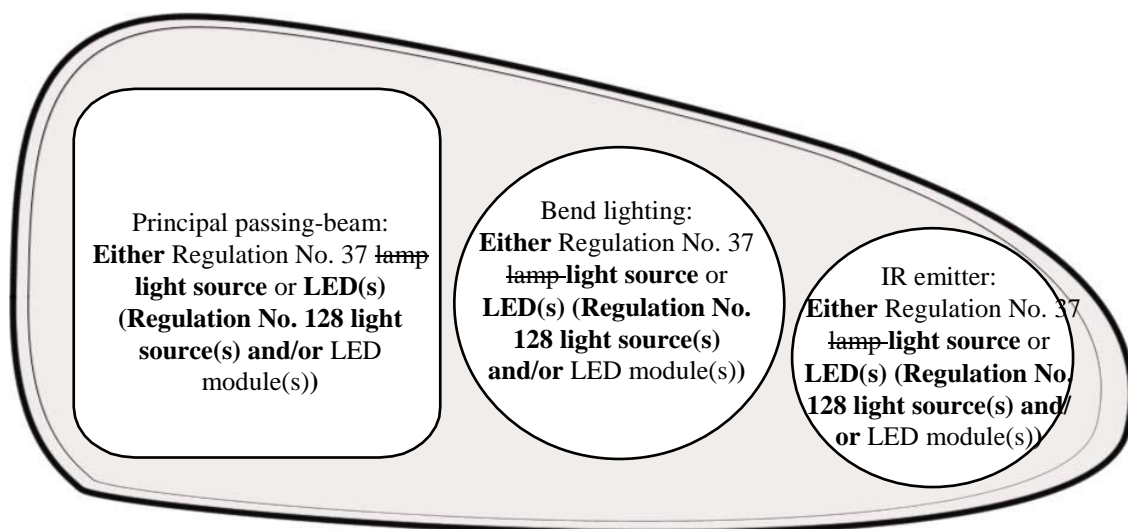
All samples shall be tested under the conditions as specified in paragraphs 6.1.4. and 6.1.6. of this Regulation.

3.2.23. Ambient temperature

For the measurement of electrical and photometric characteristics, the headlamp shall be operated in a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$."

Annex 11, figure, amend to read:

"



"

D. Supplement 7 to the 01 series of amendments to Regulation No. 113 (Headlamps emitting a symmetrical passing-beam)

Title, amend to read:

"Uniform provisions concerning the approval of motor vehicle headlamps emitting a symmetrical passing beam or a driving beam or both and equipped with filament **light sources**, gas-discharge light sources, **light-emitting diode (LED) light sources and/or LED modules**"

Table of contents, List of annexes, amend to read:

"12 Requirements for LED modules and headlamps including LED modules **and/or LED light sources**"

Paragraph 1.3.5., replace the existing text to read:

"1.3.5. The category of filament light source(s) used, the category of gas-discharge light source used, the category of LED light source(s) used and/or the light source module specific identification code(s);

A change of the thermal grade of the LED light source(s) does not constitute a change of type."

Paragraph 1.7., amend to read:

"1.7. References made in this Regulation to standard (étalon) filament ~~lamp(s)~~ **light source(s)** and to Regulation No. 37 shall refer to Regulation No. 37 and its series of amendments in force at the time of application for type approval."

Insert a new paragraph 1.9, to read:

"1.9. References made in this Regulation to standard (étalon) LED light source(s) and to Regulation No. 128, including the thermal grade of the LED light source(s), shall refer to Regulation No. 128 and its series of amendments in force at the time of application for type approval."

Paragraphs 1.9. and 1.10. (former), renumber as 1.10. and 1.11., respectively.

Paragraph 2.1.3., amend to read:

"2.1.3. The category of the ~~filament lamp(s)~~ **filament light source(s)** used, as listed in Regulation No. 37 and its series of amendments in force at the time of application for type approval, if any."

Insert a new paragraph 2.1.5., to read:

"2.1.5. The category of the LED light source(s), as listed in Regulation No. 128 and its series of amendments in force at the time of application for type approval, including the minimum applicable thermal grade of the LED light source(s), if any."

Paragraphs 2.1.5. and 2.1.6. (former), renumber as 2.1.6. and 2.1.7., respectively.

Paragraph 2.2.2.1., amend to read:

"2.2.2.1. For ~~gas discharge lamps~~ **gas-discharge light sources**, the make and type of the ballast(s) in the case that the ballast(s) is (are) not integrated with the light source(s);"

Paragraph 3.3., amend to read:

"3.3. On the back of the headlamp the indication of the category of filament ~~lamp(s)~~ **light source(s)** or **LED light source(s)** or gas-discharge light source used."

Paragraph 3.10.2., amend to read:

"3.10.2. In the case of filament light source, the category(s) of filament ~~lamp(s)~~ **light source(s)**, and/or

In the case of LED light source, the category(s) of LED light source(s), and/or

In the case of LED module(s), the rated voltage and rated wattage and the specific identification code(s) of the LED module(s)."

Paragraph 4.2.3.1., amend to read:

"4.2.3.1. on headlamps meeting the requirements of this Regulation which are so designed that the filament ~~lamp~~ **light source(s)**, **LED light source(s)**, gas-discharge light source or LED module(s) producing the passing beam shall not be lit simultaneously with that of any other lighting function with which it may be reciprocally incorporated: an oblique stroke (/) shall be placed behind the passing lamp symbol in the approval mark."

Part B, title, footnote 7, amend to read:

"⁷ Technical requirements for filament ~~lamp~~-**light sources**: see Regulation No. 37. Technical requirements for gas-discharge light sources: see Regulation No. 99. **Technical requirements for LED light sources: see Regulation No. 128.**"

Paragraph 5.2.1. second indent, amend to read:

"5.2.1.

Where a headlamp providing a passing beam and a headlamp providing a driving beam, each equipped with its own filament ~~lamp(s)~~ **light source(s)**, gas-discharge light source, **LED light source(s)** or LED module(s), are assembled to form a composite unit the adjusting device shall enable each optical system individually to be duly adjusted."

Paragraph 5.3.1., amend to read:

"5.3.1. Headlamps shall be equipped with filament ~~lamp(s)~~ **light source(s)** approved according to Regulation No. 37 **and/or with LED light source(s) approved according to Regulation No. 128** and/or, with (an) LED module(s).

In the case of the use of additional light source(s) and/or additional lighting unit(s) to provide bend lighting, ~~only~~ categories of filament ~~lamps~~ **light sources** covered by Regulation No. 37, provided that no restriction on the use for bending light is made in Regulation No. 37 and its series of amendments in force at the time of application for type approval, **and/or categories of LED light sources covered by Regulation No. 128, provided that no restriction on the use for bending light is made in Regulation No. 128 and its series of amendments in force at the time of application for type approval**, and/or LED modules(s) shall be used."

Paragraph 5.3.2., amend to read:

"5.3.2. It is possible to use two filament light sources for the principal passing-beam and several filament light sources for the driving-beam.

Any Regulation No. 37 filament ~~lamp~~ **light source** may be used, provided that:

- (a) No restriction on the use is made in Regulation No. 37 and its series of amendments in force at the time of application for type approval;
- (b) For Classes A and B, its reference luminous flux at 13.2V for principal dipped-beam does not exceed 900 lm;
- (c) For Classes C and D, its reference luminous flux at 13.2V for principal dipped-beam does not exceed 2,000 lm.

The design of the device shall be such that the filament ~~lamp~~ **light source** can be fixed in no other position but the correct one⁸.

The filament ~~lamp~~ **light source** holder shall conform to the characteristics given in IEC Publication 60061. The holder data sheet relevant to the category of filament ~~lamp~~ **light source** used, applies."

Insert new paragraphs 5.3.3., 5.3.3.1. and 5.3.3.2., to read:

"5.3.3. It is possible to use several LED light sources for the principal passing-beam and for the driving-beam.

Any Regulation No. 128 LED light source may be used, provided that:

- (a) **No restriction on the use is made in Regulation No. 128 and its series of amendments in force at the time of application for type approval;**
- (b) **Its total objective luminous flux at 13.2V for principal dipped-beam does not exceed 2,000 lm;**

The design of the device shall be such that the LED light source(s) can be fixed in no other position but the correct one.⁸

The LED light source holder(s) shall conform to the characteristics given in IEC Publication 60061. The holder data sheet(s) relevant to the category(ies) of LED light source(s) used, apply, taking into account the minimum thermal grade of the LED light source indicated in the communication form of Annex 1.

5.3.3.1. The total objective luminous flux of all LED light sources and LED module(s) producing the principal passing-beam and measured as described in paragraph 5. of Annex 12 shall be within the following minimum and maximum limits:

	<i>Headlamps Class A</i>	<i>Headlamps Class B</i>	<i>Headlamps Class C</i>	<i>Headlamps Class D</i>
Principal passing-beam minimum	150 lumens	350 lumens	500 lumens	1,000 lumens
Principal passing-beam maximum	900 lumens	1,000 lumens	2,000 lumens	2,000 lumens

5.3.3.2. The headlamp shall comply with the relevant requirements specified in Annex 12 of this Regulation. The compliance with the requirements shall be tested."

Paragraphs 5.3.3. to 6.3.3.4. (former), renumber and amend to read:

- 5.3.34. For lamps equipped with (an) LED module(s):
- 5.3.34.1. The electronic light source control gear(s), if applicable, shall be considered as being part of the headlamp; they may also be part of the LED module(s);
- 5.3.34.2. The headlamp and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 12 of this Regulation. The compliance with the requirements shall be tested.
- 5.3.34.3. The total objective luminous flux of all **LED light sources and LED modules** producing the principal passing-beam ~~shall be and~~ measured as described in paragraph 5. of Annex 12 **shall be within the**. The following minimum and maximum limits ~~shall apply~~:

		<i>Headlamps Class A</i>	<i>Headlamps Class B</i>	<i>Headlamps Class C</i>	<i>Headlamps Class D</i>
Principal passing-beam minimum		150 lumens	350 lumens	500 lumens	1,000 lumens
Principal passing-beam maximum		900 lumens	1,000 lumens	2,000 lumens	2,000 lumens

- 5.3.3 4.4. In the case of a replaceable LED module, the removal and replacement of this LED module, as described in Annex 12, paragraph 1.4.1., shall be demonstrated to the satisfaction of the Technical Service."

Paragraph 5.4.1., amend to read:

- "5.4.1. The headlamp shall be equipped with (a) gas-discharge light source(s) approved according to Regulation No. 99 **and/or with LED light source(s) approved according to Regulation No. 128** and/or (an) LED module(s).

In the case of the use of additional light source(s) and/or additional lighting unit(s) to provide bend lighting, ~~only~~ categories of filament ~~lamps~~ **light sources** covered by Regulation No. 37, provided that no restriction on the use for bending light is made in Regulation No. 37 and its series of amendments in force at the time of application for type, **and/or categories of LED light sources covered by Regulation No. 128, provided that no restriction on the use for bending light is made in Regulation No. 128 and its series of amendments in force at the time of application for type approval**, and/or LED modules(s) shall be used."

Insert new paragraphs 5.4.3., 5.4.3.1. and 5.4.3.2., to read:

- "5.4.3. **In the case of LED light sources the holder(s) shall conform to the characteristics given in IEC Publication 60061. The holder data sheet(s) relevant to the category(ies) of LED light source(s) used, apply, taking into account the minimum thermal grade of the LED light source indicated in the communication form of Annex 1.**

- 5.4.3.1. **The total objective luminous flux of all LED light sources and LED module(s) producing the principal passing beam and measured as described in paragraph 5. of Annex 12 shall be equal or greater than the following limit:**

	<i>Headlamps Class E</i>
Principal passing-beam minimum	2,000 lumen

5.4.3.2. The headlamp shall comply with the relevant requirements specified in Annex 12 to this Regulation. The compliance with the requirements shall be tested."

Paragraphs 5.4.3.to 5.4.3.3. (former), renumber and amend to read:

"5.4.3 4. In the case of (an) LED module(s) the following requirements apply:

5.4.34.1. The electronic light source control gear(s), if applicable, shall be considered as being part of the headlamp; they may also be part of the LED module(s);

5.4.34.2. The headlamp and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 12 to this Regulation. The compliance with the requirements shall be tested.

5.4.34.3. The total objective luminous flux of all **LED light sources and** LED modules producing the principal passing beam ~~shall be~~ **and** measured as described in paragraph 5. of Annex 12 **shall be equal or greater than** ~~the~~The following ~~minimum~~ limit ~~shall apply~~:

	<i>Headlamps Class E</i>
Principal passing-beam minimum	2,000 lumen

Paragraph 5.9., amend to read:

"5.9. The definitions in paragraphs 2.7.1.1.3. and 2.7.1.1.7. in Regulation No. 48 allow the use of LED module(s), which may contain holders for other light sources. Notwithstanding this provision a mixture of **LED light source(s) or** LED module(s) ~~and with~~ filament light sources for the passing beam or each driving beam, as specified by this Regulation is not allowed."

Paragraph 6.1.3.1., amend to read:

"6.1.3.1. ~~Apart from (an) LED module(s),~~ **In case of filament light source,** the headlamps shall be checked by means of an uncoloured standard (étalon) filament ~~lamp light source~~ **light source** designed for a rated voltage of 12 V. During the checking of the headlamp, the voltage at the terminals of the filament ~~lamp light source~~ **light source** shall be regulated so as to obtain the reference luminous flux at 13.2 V as indicated at the relevant data sheet of Regulation No. 37.

In order to protect the standard (étalon) filament ~~lamp light source~~ during the process of photometric measurement it is permissible to carry out the measurements at a luminous flux that differs from the reference luminous flux at 13.2 V. If the test laboratory chooses to carry out measurements in such a manner the luminous intensity shall be corrected by multiplying the measured value by the individual factor F_{lamp} of the standard (étalon) filament ~~lamp light source~~ in order to verify the compliance with the photometric requirements where:

$$F_{lamp} = \Phi_{reference} / \Phi_{test}$$

$\Phi_{reference}$ is the reference luminous flux at 13,2 V as specified in the relevant data sheet of Regulation No. 37

Φ_{test} is the actual luminous flux used for the measurement

Depending on the number of filament light sources for which the headlamp is designed, it shall be considered acceptable if it meets the requirements of paragraph 6 with the same number of standard (étalon) light source(s), which may be submitted with the headlamp."

Paragraph 6.1.3.2., replace to read:

"6.1.3.2. In case of LED light source(s) the headlamps shall be checked by means of standard (étalon) LED light source(s).

All photometric and colorimetric measurements shall be made while the lamp is supplied with the voltage of 13.2 V or 28.0 V; the luminous intensity values measured shall be corrected. The correction factor is the ratio between the objective luminous flux and the value of the luminous flux found at the voltage applied. In the case of more than one LED light source, the mean value of the correction factors shall be applied, while each individual correction factor shall not deviate more than 5 per cent from this mean value. LED light source(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

Depending on the number of LED light sources for which the headlamp is designed, it shall be considered acceptable if it meets the requirements of paragraph 6. with the same number of standard (étalon) LED light sources, which may be submitted with the headlamp."

Insert a new paragraph 6.1.5., to read:

"6.1.5. For Class E with (a) LED light source(s) according to Regulation No. 128

The headlamps shall be checked by means of standard (étalon) LED light source(s).

All photometric and colorimetric measurements shall be made while the lamp is supplied with the voltage of 13.2 V or 28.0 V; the luminous intensity values measured shall be corrected. The correction factor is the ratio between the objective luminous flux and the value of the luminous flux found at the voltage applied. In the case of more than one LED light source, the mean value of the correction factors shall be applied, while each individual correction factor shall not deviate more than 5 per cent from this mean value. LED light source(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

Depending on the number of LED light sources for which the headlamp is designed, it shall be considered acceptable if it meets the requirements of paragraph 6. with the same number of standard (étalon) LED light sources, which may be submitted with the headlamp."

Paragraphs 6.1.5., 6.1.5.1. and 6.1.6. (former), renumber and amend to read:

"6.1.56. For Class E with (an) LED module(s)

6.1.56.1. LED module(s) shall be measured at 6.3 V or 13.2 V respectively, if not otherwise specified within this Regulation. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

6.1.67. In the case of headlamp systems having additional light source(s) and/or additional lighting unit(s) used to produce bend lighting, the additional light source(s) shall be measured according to the paragraphs 6.1.3., 6.1.4., 6.1.5. and 6.1.56."

Paragraph 6.2.5.3., at the very end delete:

"6.2.5.3.
~~Other general text:
 UN ECE type approval at reference luminous flux according to Regulation No. 37.
 Nominal aim for photometry:
 Vertical: 1 per cent D (0.57°D) Horizontal: 0°
 Allowed tolerances for photometry:
 Vertical: 0.3°D to 0.8°D Horizontal: ± 0.5°D L R"~~

Paragraph 6.2.7., amend to read:

"6.2.7. Either one or two filament light sources (Classes A, B, C, D) or one gas discharge light source (Class E) **or one or more LED light source(s) (Classes A, B, C, D, E)** or one or more LED module(s) (Classes C, D, E) are permitted for the principal passing beam."

Paragraph 6.3.2., amend to read:

"6.3.2. Irrespective of the type of light source (LED module(s) or filament light source(s) or gas discharge light source **or LED light source(s)**) used to produce the passing beam, several light sources either:

- (a) ~~One or more~~ filament light sources listed in Regulation No. 37 (Classes A, B, C, D);
- or
- (b) Gas discharge light sources listed in Regulation No. 99 (Class E); or
- (c) **LED light sources listed in Regulation No. 128 (Class B, C, D, E);**
or
- (e d) LED module(s) (Classes C, D, E) may be used for each individual driving beam."

Annex 1, item 9., amend to read:

"9. Brief description:
 Category as described by the relevant marking:³
 Number and category(ies) of filament ~~lamp(s)~~ **light source(s)**, if any:
 Number and category(ies) of gas-discharge light source, if any:
Number, category(ies) and minimum applicable thermal grade of LED light source(s):

 Number and specific identification code(s) of LED modules and for each LED module statement whether it is replaceable or not: (yes/no)²
 Number and specific identification code(s) of electronic light source control gear(s), if any:

 ..."

*Annex 4,**Introductory part, amend to read:*

"Once the photometric values have been measured according to the prescriptions of this Regulation, in the point for I_{\max} for driving-beam and in points 0.50U/1.5L and 0.50U/1.5R, 50R, 50L for Class B passing-beam and in points 0.86D-3.5R, 0.86D-3.5L, 0.50U-1.5L and 0.50U-1.5R for Classes C, D and E, for passing-beam a complete headlamp sample shall be tested for stability of photometric performance in operation. "Complete headlamp" shall be understood to mean the complete lamp itself, including those surrounding body parts, filament ~~lamps~~ **light sources**, gas discharge light sources, **LED light source(s)** or LED module(s) which could influence its thermal dissipation.

The tests shall be carried out:

- (a) In a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$, the test sample being mounted on a base representing the correct installation on the vehicle;
- (b) In case of replaceable light sources: using mass production filament light sources, which have been aged for at least one hour, or mass production gas-discharge light sources, which have been aged for at least 15 hours or mass production **LED light sources and LED modules** which have been aged for at least 48 hours and cooled down to ambient temperature before starting the tests as specified in this Regulation. The LED modules supplied by the applicant shall be used.

The measuring equipment shall be equivalent to that used during headlamp type-approval tests.

The test sample shall be operated without being dismantled from or readjusted in relation to its test fixture. The light sources used shall be ~~a~~-light sources of the ~~category~~ **categories** specified for that headlamp. **Moreover, in case of an LED light source(s), the thermal grade of the LED light source(s) shall be the same or higher as the one indicated in the Communication form in Annex 1."**

Paragraph 1.1.1.2. sub-paragraph (a), amend to read:

- "(a) In case of replaceable filament light source(s) operated directly under vehicle voltage system conditions: the test shall be performed at 6.3 V, 13.2 V or 28.0 V as applicable except if the applicant specifies that the test sample may be used at a different voltage. In this case, the test shall be carried out with the ~~filament~~ light source operated at the highest voltage that can be used. "

Paragraph 1.1.1.2. sub-paragraph (e), amend to read:

- "(e) **LED light source(s) and LED module(s)** shall be measured at 6.75 V, 13.2 V or 28.0 V respectively, if not otherwise specified within this Regulation. **LED light source(s) and LED module(s)** operated by an electronic light source control gear, shall be measured as specified by the applicant."

Paragraph 2.1., amend to read:

"2.1. Test

The test shall be carried out in a dry and still atmosphere at an ambient temperature of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

Using a mass production filament ~~lamp(s)~~ **light source** which has been aged for at least one hour or a mass production gas-discharge light source which has been aged for at least 15 hours or ~~the~~ **LED light source(s) and/or** LED module(s) as submitted with the headlamps, which has (have) been aged for at least 48 hours, the headlamp shall be operated on passing beam without being dismantled from or readjusted in relation to its test fixture. (For the purpose of this test, the voltage shall be adjusted as specified in paragraph 1.1.1.2.). The position of the "cut-off" line in its horizontal part (between the vertical lines passing through point 50 L and 50 R for Class B headlamp, 3.5 L and 3.5 R for Classes C, D and E headlamp) shall be verified 3 minutes (t_3) and 60 minutes (t_{60}) respectively after operation.

The measurement of the variation in the "cut-off" line position as described above shall be carried out by any method giving acceptable accuracy and reproducible results."

Annex 5,

Paragraph 1.2.1., amend to read:

"1.2.1. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with standard filament ~~lamp(s)~~ **light source(s), standard LED light source(s), serial production LED light source(s)** and/or (a) LED module(s), as present in the lamp.

For LED light source(s) the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux as specified in Regulation No. 128; accordingly the measured intensities may be corrected by 10 per cent in case of the use of standard (étalon) light source(s) and by 20 per cent in the case of the use of serial production light source(s) in the favourable direction. "

Paragraph 1.2.4., amend to read:

"1.2.4. If, in the case of a lamp equipped with a replaceable filament light source(s) according to Regulation No. 37 **and/or replaceable LED light source(s) according to Regulation No. 128**, the results of the tests described above do not meet the requirements, tests shall be repeated using another (**set of**) standard ~~filament lamp(s)~~ **light source(s).**"

Paragraph 1.3.1., amend to read:

"1.3.1. For Class E headlamps measured at $13.2\text{ V} \pm 0.1\text{ V}$, or as otherwise specified, and equipped with:

(a) A removable standard gas-discharge light source according to Regulation No. 99. In this case the luminous flux of this gas-discharge light source may differ from the reference luminous flux specified in Regulation No. 99 and the illuminances shall be corrected accordingly;

or

(b) A serial production gas-discharge light source and a serial ballast. In this case the luminous flux of this light source may deviate from the nominal luminous flux due to light source and ballast tolerances as specified in Regulation No. 99 and accordingly the measured illuminances may be corrected by 20 per cent in the favourable direction;

or

(c) **A replaceable standard LED light source(s) according to Regulation No. 128. In this case the luminous flux of this (these) LED light source(s) may differ deviate from the objective luminous flux specified in Regulation No. 128 and accordingly the measured intensities may be corrected by 10 per cent in the favourable direction;**

or

(d) **A serial production LED light source(s) according to Regulation No. 128. In this case the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux specified in Regulation No. 128 and accordingly the measured intensities may be corrected by 20 per cent in the favourable direction;**

or

(ee) LED modules as present in the lamp;

The conformity of mass-produced headlamps, chosen at random and equipped with a ~~Gas-Discharge lamp~~ **gas-discharge light source, LED light source(s)** and / or LED module(s) present in the headlamp, with respect to photometric performance shall not be contested provided that"

Paragraph 1.3.5., amend to read:

"1.3.5. If the results of the tests described above do not meet the requirements, tests on the headlamp shall be repeated using another standard gas-discharge light source, gas-discharge light source and/or ballast, **standard LED light source** or LED module and electronic light source control gear, whichever is applicable according to paragraph 1.3.1. above."

Annex 6, paragraph 2.1.2.1., amend to read:

"2.1.2.1. Method

Photometric measurements shall be carried out on the samples before and after the test.

These measurements shall be made using (a) standard (étalon) ~~lamp~~ **light source(s)**, a standard gas-discharge light source or (an) LED module(s) as present in the headlamp, at the following points:

B 50, 50L and 50R for Class B headlamp, 0.86D/3.5R, 0.86D/3.5L, 0.50U/1.5L and 1.5R for Classes C, D and E headlamp for the passing beam or a passing/driving lamp;

I_{max} , for the driving beam of a driving lamp or a passing/driving lamp;"

Annex 7,

Paragraph 1.2.1., amend to read:

- "1.2.1. With respect to photometric performances, the conformity of mass-produced headlamps shall not be contested if, when testing photometric performances of any headlamp chosen at random and equipped with standard filament lamp(s) **light source(s), standard LED light source(s), serial production LED light source(s)** and/or (an) LED module(s) as present in the headlamp.

For LED light source(s) the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux as specified in Regulation No. 128; accordingly the measured intensities may be corrected by 10 per cent in case of the use of standard (étalon) light source(s) and by 20 per cent in the case of the use of serial production light source(s) in the favourable direction. "

Paragraph 1.2.4., amend to read:

- "1.2.4. If the results of the tests described above do not meet the requirements, tests shall be repeated using (an) other standard ~~filament lamp(s)~~ **light source(s).**"

Paragraph 1.3.1., amend to read:

- "1.3.1. For Class E headlamps measured at $13.2\text{ V} \pm 0.1\text{ V}$, or as otherwise specified, and equipped with:
- (a) A removable standard gas-discharge light source according to Regulation No. 99. In this case the luminous flux of this gas-discharge light source may differ from the reference luminous flux specified in Regulation No. 99 and the illuminances shall be corrected accordingly;

or

 - (b) A serial production gas-discharge light source and a serial ballast. In this case the luminous flux of this light source may deviate from the nominal luminous flux due to light source and ballast tolerances as specified in Regulation No. 99 and accordingly the measured illuminances may be corrected by 20 per cent in the favourable direction;

or

 - (c) **A replaceable standard LED light source(s) according to Regulation No. 128. In this case the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux specified in Regulation No. 128 and accordingly the measured intensities may be corrected by 10 per cent accordingly in the favourable direction;**

or

 - (d) **A serial production LED light source(s) according to Regulation No. 128. In this case the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux specified in Regulation No. 128 and accordingly the measured intensities may be corrected by 20 per cent in the favourable direction;**

or

(ee) LED modules as present in the lamp;

The conformity of mass-produced headlamps, chosen at random and equipped with a ~~Gas Discharge lamp~~ **gas-discharge light source, LED light source(s)** and / or LED module(s) present in the headlamp, with respect to photometric performance shall not be contested provided that"

Paragraph 1.3.5., amend to read:

"1.3.5. If the results of the tests described above do not meet the requirements, tests on the headlamp shall be repeated using another standard gas-discharge light source, a gas-discharge light source and/or ballast, **standard LED light source** or (an) LED module(s) and electronic light source control gear(s), whatever is applicable according to paragraph 1.3.1. above."

Annex 11, last indent in the right column, amend to read:

"None of the filament ~~lamps~~ **light sources or LED light sources** which the headlamp contains is designed for a 24 Volts network system"

Annex 12,

The Title, amend to read:

"Requirements for LED modules and headlamps including LED modules **and/or LED light sources**"

Paragraph 1, amend to read:

"1. General specifications **for LED modules**"

Paragraph 2, amend to read:

"2. Manufacture **of LED modules**"

Paragraph 3.2.1, amend to read:

"3.2.1. LED module operating conditions

All samples shall be tested under the conditions as specified in paragraph ~~6.1.3.~~ **6.1.3.3., respectively 6.1.6., and 6.1.7.** of this Regulation. If not specified differently in this annex LED modules shall be tested inside the headlamp as submitted by the manufacturer."

Insert a new paragraph 3.2.2, to read:

"**3.2.2. LED light source operating conditions**

All samples shall be tested under the conditions as specified in paragraphs 6.1.3.2., respectively 6.1.5., and 6.1.7. of this Regulation."

Paragraph 3.2.2. (former), renumber as 3.2.3.

E. Supplement 8 to the 01 series of amendments to Regulation No. 123 (Adaptive front-lighting systems (AFS))

Table of contents, List of annexes, amend to read:

"11 Requirements for LED modules and adaptive front-lighting (AFS) including LED modules **and/or LED light sources**"

Paragraph 1.21., amend to read:

"1.21. References made in this Regulation to standard (étalon) filament **lamp light source(s) and**, gas-discharge light source(s) **and LED light source(s), including the thermal grade of the LED light source(s)**, shall refer to Regulations Nos. 37, **and 99 and 128** respectively, and to their series of amendments in force at the time of application for type approval."

Paragraph 2.1.4., replace to read:

"**2.1.4. The light source(s) used, being:**

2.1.4.1. The category of replaceable and/or non-replaceable filament light source(s), as listed in Regulation No. 37 and its series of amendments in force at the time of application for type approval; and/or

2.1.4.2. The category of the gas discharge light source(s), as listed in Regulation No. 99 and its series of amendments in force at the time of application for type approval; and/or

2.1.4.3 The category of replaceable and/or non-replaceable LED light source(s), as listed in Regulation No. 128 and its series of amendments in force at the time of application for type approval; and/or

2.1.4.4. The LED module(s) specific identification code(s) as indicated in paragraph 3.5 and its subparagraphs;"

Paragraph 5.3.1.1., amend to read:

"5.3.1.1. **Filament** light source(s) that are approved according to Regulation No. 37 and ~~their~~ **its** series of amendments in force at the time of application for type approval and for which no restriction on the use is made;"

Paragraph 5.3.1.2., amend to read:

"5.3.1.2. **Gas discharge** light source(s) that are approved according to Regulation No. 99 **and its series of amendments in force at the time of application for type approval;**"

Insert a new paragraph 5.3.1.3., to read:

"**5.3.1.3. LED light source(s) that are approved according to Regulation No. 128 and its series of amendments in force at the time of application for type approval;**"

Paragraph 5.3.1.3. (former), renumber to 5.3.1.4.

Paragraph 5.3.2.1., amend to read:

"5.3.2.1. The **lamp light source** holder shall conform to the characteristics given on the data sheet of IEC Publication No. 60061, as referred to in the relevant light source Regulation."

Paragraph 5.3.2.2., amend to read:

"5.3.2.2. The design of the device shall be such that the **filament lamp light source** can be fixed in no other position but the correct one."

Paragraph 5.12., amend to read:

"5.12. The AFS, if equipped with **LED light sources and/or** LED modules, and the LED module(s) themselves shall comply with the relevant requirements specified in Annex 11 of this Regulation. The compliance with the requirements shall be tested."

Paragraph 5.14., amend to read:

"5.14. In the case of the basic passing beam in the neutral state being produced exclusively by **LED light sources and/or** LED modules, the total objective luminous flux of these **LED light sources and/or** LED modules shall be equal or greater than 1,000 lumen per side, when measured as described in paragraph 5. of Annex 11"

Annex 1, item 9.2., amend to read:

"9.2. Number and category(ies) of replaceable **filament, gas discharge and LED light source(s), and the minimum applicable thermal grade of the LED light source(s):**"

Annex 4,

Introductory part, amend to read:

"Tests on complete systems

Once the photometric values have been measured according to the prescriptions of this Regulation, in the point of E_{max} for driving-beam and in points HV, 50V and B50L (or R), whichever applies for passing-beam, a complete system sample shall be tested for stability of photometric performance in operation.

For the purpose of this annex:

- (a) "*Complete system*" shall be understood to mean the complete right and left side of a system itself including electronic light source control-gear(s) and/or supply and operating device(s) and those surrounding body parts and **lamps light sources** which could influence its thermal dissipation. Each installation unit of the system and /or LED module, if any, of the complete system may be tested separately;
- (b) "*Test sample*" in the following text means correspondingly either the "complete system" or the installation unit under test;
- (c) The expression "*light source*" shall be understood to comprise also any single filament of a filament **lamp light source, LED light sources**, LED modules or light emitting parts of a **LED light source or** LED module.

The tests shall be carried out:

- (a) In a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$, the test sample being mounted on a base representing the correct installation on the vehicle;

- (b) In case of replaceable light sources: using a mass production filament light source, which has been aged for at least one hour, or a mass production gas-discharge light source, which has been aged for at least 15 hours or a mass production LED module which has been aged for at least 48 hours **or a mass production LED light source which has been aged for at least 48 hours** and cooled down to ambient temperature before starting the tests as specified in this Regulation. The LED modules supplied by the applicant shall be used;
- (c) In the case of a system providing an adaptation of the driving-beam, the driving-beam shall be in the maximum condition if activated.

The measuring equipment shall be equivalent to that used during type approval tests of the test samples of the system. The system or part(s) thereof shall, prior to the subsequent tests, be set to the neutral state.

The test sample shall be operated on passing beam without being dismantled from or readjusted in relation to its test fixture. The light source used shall be a light source of the category specified for that headlamp. **Moreover, in case of an LED light source(s), the thermal grade of the LED light source(s) shall be the same or higher as the one indicated in the Communication form in Annex 1."**

Paragraph 1.1.1.2., sub-paragraph (a), amend to read:

- "(a) In case of replaceable filament light source(s) **and/or replaceable LED light source(s)**, operated directly under vehicle voltage system conditions:

The test shall be performed at 6.3 V, 13.2 V or 28.0 V as applicable, except if the applicant specifies that the test sample may be used at a different voltage. In this case, the test shall be carried out with the ~~filament~~ light source whose wattage is the highest that can be used."

Paragraph 1.1.1.2., sub-paragraph (c), amend to read:

- "(c) In the case of non-replaceable light source operated directly under vehicle **voltage** system conditions:

All measurements on lighting units equipped with non-replaceable light sources (filament light sources **and/or LED light sources** and/or others) shall be made at 6.3 V, 13.2 V or 28.0 V or at other voltages according to the vehicle voltage system as specified by the applicant respectively."

Annex 9,

Paragraph 2.1., amend to read:

- "2.1. In the case of replaceable filament ~~lamps~~ **light sources** operated directly under vehicle voltage system conditions:

The system or parts thereof shall be checked by means of an uncoloured standard (étalon) filament ~~lamp-light~~ **source(s)** designed for a rated voltage of 12 V. During checking of the system or part of, the voltage at the terminals of the filament ~~lamp-light~~ **source(s)** shall be regulated so as to obtain the reference luminous flux 13.2 volts as indicated at the relevant data sheet of Regulation No. 37.

For the measurements, the flux of this filament **lamp light source** may differ from the reference luminous flux at 13.2 V specified in Regulation No. 37. In this case, the luminous intensity shall be corrected accordingly by the individual factor of the standard (étalon) filament **lamp light source** ($F = \Phi_{obj.} / \Phi(Voltage)$).

The system or parts thereof shall be considered acceptable if the requirements of paragraph 6. of this Regulation are met with at least one standard (étalon) filament **lamp light source**, which may be submitted with the system."

Paragraph 2.3., amend to read:

"2.3. In the case of a non-replaceable light source operating directly under vehicle voltage system conditions:

All measurements on lamps equipped with non-replaceable light sources (filament **lamps light sources** and other) shall be made at 6.3 V, 13.2 V or 28.0 V, or at a voltage as specified by the applicant with respect to any other vehicle voltage system."

Insert a new paragraph 2.6. to read:

2.6. In the case of a (set of) replaceable LED light source(s):

2.6.1. With respect to type approval the following applies:

The system or parts thereof shall be checked by means of a (set of) white standard (étalon) LED light source(s). During checking of the system or parts thereof, the voltage at the terminals of the LED light source(s) shall be 13.2 volts.

For the measurements, the flux of this (these) LED light source(s) may differ from the objective luminous flux at 13.2 V specified in Regulation No. 128. In this case, the luminous intensity shall be corrected accordingly by the individual factor of the standard (étalon) LED light source ($F = \Phi_{obj.} / \Phi(Voltage)$).

In the case of more than one LED light source, the mean value of the correction factors shall be applied, while each individual correction factor shall not deviate more than 5 per cent from this mean value.

The system or parts thereof shall be considered acceptable if the requirements of paragraph 6. of this Regulation are met with at least a (set of) standard (étalon) LED light source, which may be submitted with the system.

2.6.2. With respect to Conformity of Production (CoP) the following applies:

The system or parts thereof shall be checked by means of a (set of) white standard (étalon) LED light source(s) or a (set of) serial production LED light source(s) During checking of the system or parts thereof, the voltage at the terminals of the LED light source(s) shall be 13.2 volts.

(a) In case of the usage of a (set of) white standard (étalon) LED light source(s) the luminous flux of this (these) LED light source(s) may deviate from the objective luminous flux specified in Regulation No. 128 and accordingly the measured intensities may be corrected by 10 per cent in the favourable direction;

(b) In case of the usage of a (set of) serial production LED light source(s) the luminous flux of this (these) LED light source(s) may

deviate from the objective luminous flux specified in Regulation No. 128 and accordingly the measured intensities may be corrected by 20 per cent in the favourable direction;

The system or parts thereof shall be considered acceptable if the CoP requirements of Annex 5 and Annex 7 of this Regulation are met with at least a (set of) standard (étalon) LED light source or with a (set of) serial production LED light source(s), corrected as applicable."

Annex 11,

Title, amend to read:

"Requirements for LED modules and adaptative front-lighting (AFS) including LED modules **and/or LED light sources**"

Paragraph 1., amend to read:

"1. General specifications **for LED modules**"

Paragraph 2., amend to read:

"2. Manufacture **of LED modules**"

Paragraph 3., amend to read:

"3. Test conditions **for LED modules and LED light sources**"

Paragraphs 3.2.1. to 3.3., amend to read:

"3.2.1. LED module **and/or LED light source** operating conditions

All samples shall be tested under the conditions as specified in paragraph 2.5 of Annex 9 to this Regulation. If not specified differently in this annex, LED modules shall be tested inside the AFS as submitted by the manufacturer."

"3.2.2. Ambient temperature

For the measurement of electrical and photometric characteristics, the AFS **including LED modules and/or LED light source** shall be operated in a dry and still atmosphere at an ambient temperature of $23\text{ °C} \pm 5\text{ °C}$."

"3.3. Ageing

Upon the request of the applicant the LED module **and/or LED light source** shall be operated for 15 h and cooled down to ambient temperature before starting the tests as specified in this Regulation."

Paragraph 4.1.1., first line, amend to read:

"4.1.1. Red content **of LED modules**"

Paragraph 4.2., first line, amend to read:

"4.2. UV-radiation **of LED modules**"

Paragraph 4.3., first line, amend to read:

"4.3. Temperature stability **of AFS using LED module(s) and/or LED light source(s)**"

II. Justification

1. This collective amendment extends the usage of LED light sources of Regulation No. 128 to the Regulations for front lighting, namely Regulations Nos. 19, 98, 112, 113 and 123. This intention was outlined by the expert from GTB during the seventy-fifth session of GRE (Informal document GRE-75-14).

2. It is proposed to allow for the use of regulated replaceable LED light sources according to Regulation No. 128 in all applications where the use of LED modules is already allowed by the current Regulations. Several editorial and technical changes are introduced as follows.

Editorial changes

3. In several places the term "LED module(s)" is replaced by "LED module(s) and/or LED light source(s)", following the philosophy that Regulation No. 128 LED light sources are allowed in all functions where LED modules are allowed today.

4. In several places a reference to LED light sources and Regulation No. 128 is inserted.

5. In several places "filament lamp" is replaced by "filament light source" (comment: this change is not related to Regulation No. 128 but is implemented in this step to align with the recent changes to Regulation No. 37).

Changes related to mixing of light sources

6. The use of more than one Regulation No. 128 LED light source per function is allowed (comment: the use of more than one LED module is already allowed)

7. Mixing of LED modules and Regulation No. 128 LED light sources in the same function is allowed.

8. No "hybrid" solutions, e.g. mixing of filament light source technology and LED light source technology is not allowed in the same function (comment: also today mixing of filament light source and LED modules is not allowed, but in Regulation No. 123 mixing of technologies is already allowed).

Changes related to "Thermal Grades"

9. The Thermal Grade is a characteristic of the Regulation No. 128 LED light sources for forward lighting to ensure safe replaceability.

10. "Thermal Grade" means that the technical parameters of a Regulation No. 128 LED light source (e.g. luminous flux) are specified up to the temperature limit of the thermal grade.

11. Due to the thermal behaviour of LED technology it is necessary to define a thermal interface for replaceable Regulation No. 128 LED light sources in addition to the electrical, mechanical and optical interfaces known from Regulation No. 37 and Regulation No. 99.

12. Thermal Grade testing is defined in Regulation No. 128 paragraph 3.10 (see GRE-76-xx, the informal to show the Regulation No. 128 changes in the pipeline) and is only performed at LED light source level.

13. The minimum applicable Thermal Grade of the Regulation No. 128 LED light source must be specified and mentioned in the communication form for the headlamp type approval.

14. Incorrect insertion of Regulation No. 128 LED light sources is prevented by mechanical keying. Downward compatibility is ensured, i.e. a high Thermal Grade light

source (e.g. 105°C) can be inserted in a lower Thermal Grade headlamp (e.g. 85°C); however not vice-versa.

Changes related to the "luminous flux limits for the light source" for principle passing beam

15. The luminous flux limits for the light sources (e.g. minimum 1,000 lm for Regulation No. 112 principal passing beam) apply to the total luminous flux value of all LEDs (LED modules and Regulation No. 128 LED light sources) added together.

Changes related to the type-approval testing

16. For type approval of the headlamp an etalon (standard) Regulation No. 128 LED light source is used, and the luminous flux is corrected to the objective value (comment: the use of etalon light source for type approval is the same like for filament and high-intensity discharge (HID) light sources today).

17. If more than one Regulation No. 128 LED light source is used in the same function, then a mean value of the correction factors is applied, and each individual correction factor shall not deviate by more than 5% from the mean value (comment: the same procedure is used in Regulation No. 7, Annex 4, paragraph 3.2. for multiple light-source testing).

Changes related to the Conformity of Production (COP) testing

18. Etalon or serial (mass) production Regulation No. 128 LED light source(s) are allowed for COP testing (comment: the same procedure is foreseen in Regulation No. 98, Annex 8, paragraph 1.2.).

19. In case of etalon light source(s), a correction of intensity values up to 10 per cent is allowed.

20. In case of serial production light source(s), a correction of intensity values up to 20 per cent is allowed (comment: the same procedure is foreseen in Regulation No. 98, Annex 8, paragraph 1.2.).
