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**PROPOSAL FOR DRAFT SUPPLEMENT 13 TO THE 02 SERIES OF
AMENDMENTS TO REGULATION No. 48**

(Installation of lighting and light-signalling devices)

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

Note: The text reproduced below was adopted by GRE at its fifty-third session, and is transmitted for consideration to WP.29 and to AC.1 (TRANS/WP.29/GRE/53, paras. 64 and 65). It is based on document TRANS/WP.29/GRE/2004/28, as amended by TRANS/WP.29/GRE/53, para. 64 (TRANS/WP.29/GRE/2004/28/Rev.1).

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Insert new paragraphs 2.6.1. and 2.6.2., to read:

- "2.6.1. "Lighting function" means the light emitted by a device to illuminate the road and objects in the direction of vehicle movement;
- 2.6.2. "Light-signalling function" means the light emitted or reflected by a device to give to other road users visual information on the presence, identification and/or the change of movement of the vehicle;"

Paragraph 2.7.1.1.2., amend to read:

- "2.7.1.1.2. "Non-replaceable light source" means a light source which can only be replaced by replacement of the device to which this light source is fixed;
- in case of a light source module: a light source which can only be replaced by replacement of the light source module to which this light source is fixed;
 - in case of adaptive front-lighting systems (AFS): a light source which can only be replaced by replacement of the lighting unit to which this light source is fixed;"

Insert new paragraphs 2.7.28. to 2.7.28.6., to read:

- "2.7.28. "Adaptive front lighting system" (or "AFS") means a lighting device type-approved according to Regulation No. xxx, providing beams with differing characteristics for automatic adaptation to varying conditions of use of the dipped-beam (passing beam) and, if it applies, the main-beam (driving-beam);
- 2.7.28.1. "Lighting unit" means a light-emitting component designed to provide or contribute to one or more front lighting function(s) provided by the AFS;
- 2.7.28.2. "Installation unit" means an indivisible housing (lamp body) which contains one or more lighting unit(s);
- 2.7.28.3. "Lighting mode" or "mode" means a state of a front lighting function provided by the AFS, as specified by the manufacturer and intended for adaptation to specific vehicle and ambient conditions;
- 2.7.28.4. "System control" means that part(s) of the AFS receiving the AFS control signals from the vehicle and controlling the operation of the lighting units automatically;
- 2.7.28.5. "AFS control signal" (V, E, W, T) means the input to the AFS in accordance with the paragraph 6.22.7.4. of this Regulation;
- 2.7.28.6. "Neutral state" means the state of the AFS when a defined mode of the class C passing beam ("basic passing beam") or of the main beam, if any, is produced, and no AFS control signal applies."

Paragraph 2.9.1., amend to read (inserting a new sub-paragraph at the end):

"2.9.1.
..... to one another, the mean adjustment should be used.

In case an AFS is installed:

where a lighting function is produced by two or more simultaneously operated lighting units on a given side of the vehicle, the individual illuminating surfaces, taken together, constitute the illuminating surface to be considered (for example, in the figure of paragraph 6.22.4. below, the individual illuminating surfaces of the lighting units 8, 9 and 11, regarded together and taking into account their respective location, constitute the illuminating surface to be considered for the right hand side of the vehicle)."

Insert new paragraphs 3.2.6. to 3.2.6.7., to read:

- "3.2.6. where an AFS is fitted on the vehicle, the applicant shall submit a detailed description providing the following information:
- 3.2.6.1. the lighting functions and modes for which the AFS has been approved;
 - 3.2.6.2. the related AFS control signals and their technical characteristics as defined according to Annex 10 of Regulation No. xxx;
 - 3.2.6.3. the provisions being applied to adapt automatically the front lighting functions and modes according to paragraph 6.22.7.4. of this Regulation;
 - 3.2.6.4. special instruction, if any, for the inspection of the light sources and the visual observation of the beam;
 - 3.2.6.5. the documents according to paragraph 6.22.9.2. of this Regulation;
 - 3.2.6.6. the lamps that are grouped or combined with or reciprocally incorporated in the AFS;
 - 3.2.6.7. lighting units which are designed to comply with the requirements of paragraph 6.22.5. of this Regulation."

Paragraph 5.4., amend to read:

- "5.4. In the absence of specific instructions, the height and orientation of the lamps shall be verified with the vehicle unladen and placed on a flat, horizontal surface, in the condition defined in paragraphs 2.24., 2.24.1. and 2.24.2. and, in the case where an AFS is installed, with the system in its neutral state."

Paragraph 5.15., amend to read (inserting a new entry at the end):

"5.15.
adaptive front-lighting systems (AFS): white."

Paragraph 5.16.1., amend to read:

"5.16.1. The number of lamps mounted on the vehicle shall be equal to the number indicated in the individual specifications of this Regulation."

Insert new paragraph 5.25., to read:

"5.25. Where an AFS is fitted, it shall be considered equivalent to a pair of dipped-beam headlamps and, if it provides main-beam function(s), it shall be considered equivalent to a pair of main-beam headlamps."

Paragraph 6.3.6., amend to read (inserting two new sub-paragraphs):

"6.3.6. Orientation

Towards the front.

They must be directed forward without causing undue dazzle or discomfort to oncoming drivers and other road users.

6.3.6.1. Horizontal orientation

The horizontal alignment of the front fog lamps must not vary according to the angle of lock of the steering.

When a beam from a front fog lamp is activated as part of another lighting function provided by an AFS, the axis of this beam may be automatically moved side-wards.

6.3.6.2. Vertical orientation

When a beam from a front fog lamp is activated as part of a dipped beam provided by an AFS, it has to comply with the requirements of paragraph 6.22.6.1. of this Regulation."

Paragraph 6.3.7., amend to read:

"6.3.7. Electrical connections

It must be possible to switch the front fog lamps ON and OFF independently of the main-beam headlamps, the dipped-beam headlamps or any combination of main- and dipped-beam headlamps, unless the front fog lamps are used as part of another lighting function in an AFS; however, the switching ON of the front fog

lamps function shall have the priority over the function for which the front fog lamps are used as a part."

Paragraph 6.5.3., amend to read (inserting a new sub-paragraph at the end):

"6.5.3. on all vehicles in categories O₂ O₃ and O₄.

Where an AFS is fitted, the distance to be considered for the choice of the category is the distance between the front direction indicator lamp and the closest lighting unit in its closest position contributing to or performing a passing beam mode."

Paragraph 6.9.9., amend to read:

"6.9.9. Other requirements

In case an AFS providing a bending mode is installed, the front position lamp may be swivelled together with a lighting unit to which it is reciprocally incorporated."

Insert new paragraphs 6.22. to 6.22.9.4., to read:

"6.22. ADAPTIVE FRONT LIGHTING SYSTEM (AFS)

Where not otherwise specified below, the requirements for main-beam headlamps (paragraph 6.1.) and for dipped-beam headlamps (paragraph 6.2.) of this Regulation apply to the relevant part of the AFS.

6.22.1. Presence

Optional on motor vehicles. Prohibited on trailers.

6.22.2. Number

One.

6.22.3. Arrangement

No special requirements.

6.22.4. Position

The AFS shall, prior to the subsequent test procedures, be set to the neutral state;

6.22.4.1. In width and height:

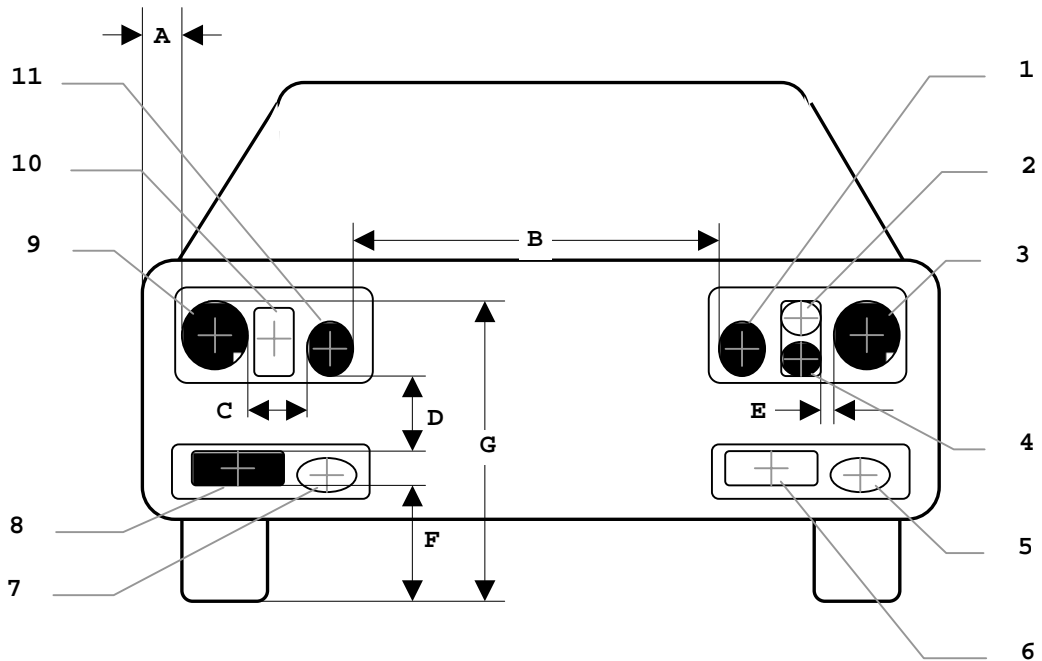
for a given lighting function or mode the requirements indicated in the paragraphs 6.22.4.1.1. through 6.22.4.1.4. below shall be fulfilled by those

lighting units which are energized simultaneously for that lighting function or mode of a function, according to the applicant's description.

All dimensions refer to the nearest edge of the apparent surface(s) observed in the direction of the reference axis, of the lighting unit(s).

- 6.22.4.1.1. Two symmetrically placed lighting units shall be positioned at a height in compliance with the requirements of the relevant paragraphs 6.1.4. and 6.2.4., where "Two symmetrically placed lighting units" shall be understood to be two lighting units, one on each side of the vehicle, positioned such that the (geometric) centres of gravity of their apparent surfaces are at the same height and at the same distance from the vehicle's longitudinal median plane within a tolerance of 50 mm, each; their light emitting surfaces, illuminating surfaces, and light outputs, however, may differ.
- 6.22.4.1.2. Additional lighting units, if any, on either side of the vehicle shall be positioned at a distance not exceeding 140 mm ^{7/} in horizontal direction (E in the figure) and 400 mm in vertical direction above or below (D in the figure) from the nearest lighting unit;
- 6.22.4.1.3. None of the additional lighting units described in paragraph 6.22.4.1.2. above shall be positioned lower than 250 mm (F in the figure) nor higher than indicated in paragraph 6.2.4.2. of this Regulation (G in the figure) above the ground;
- 6.22.4.1.4. Additionally, in width:
- for each mode of the passing beam lighting:
the outer edge of the apparent surface of at least one lighting unit on each side of the vehicle shall not be more than 400 mm from the extreme outer edge of the vehicle (A in the figure); and,
the inner edges of the apparent surfaces in the direction of the reference axes shall be not less than 600 mm apart. This does not apply, however, for M₁ and N₁ category vehicles; for all other categories of motor vehicles this distance may be reduced to 400 mm where the overall width of the vehicle is less than 1300 mm.

^{7/} In case of additional "two symmetrically placed lighting units" the horizontal distance may be 200 mm (C in the figure).



Lighting units being simultaneously energized for a given lighting mode:

- No. 3 and 9: (two symmetrically placed lighting units)
- No. 1 and 11: (two symmetrically placed lighting units)
- No. 4 and 8: (two additional lighting units)

Lighting units not being energized for said lighting mode:

- No. 2 and 10: (two symmetrically placed lighting units)
- No. 5: (additional lighting unit)
- No. 6 and 7: (two symmetrically placed lighting units)

horizontal dimensions in mm:

- $A \leq 400$
- $B \geq 600$, or, ≥ 400 if vehicle overall width < 1300 mm, however
no requirement for category M1 and N1 vehicles
- $C \leq 200$
- $E \leq 140$

vertical dimensions in mm:

- $D \leq 400$
- $F \geq 250$
- $G \leq 1200$

Apparent surfaces of lighting units 1 through 11 of an AFS (example)

6.22.4.2. In length:

all lighting units of an AFS shall be mounted at the front. This requirement is deemed to be satisfied if the light emitted does not cause discomfort to the driver either directly, or indirectly through the rear-view mirrors and/or other reflecting surfaces of the vehicle.

6.22.5. Geometric visibility

On each side of the vehicle, for each lighting function and mode provided: the angles of geometric visibility prescribed for the respective lighting functions according to paragraphs 6.1.5. and 6.2.5. of this Regulation, shall be met by at least one of the lighting units that are simultaneously energized to perform said function and mode(s), according to the description of the applicant. Individual lighting units may be used to comply with the requirements for different angles.

6.22.6. Orientation

Towards the front.

The AFS shall, prior to the subsequent test procedures, be set to the neutral state, emitting the basic passing beam.

6.20.6.1. Vertical orientation:

6.22.6.1.1. The initial downward inclination of the cut-off of the basic passing beam to be set in the unladen vehicle state with one person in the driver's seat shall be specified with a precision of 0.1 per cent by the manufacturer and indicated in clearly legible and indelible manner on each vehicle, close to either the front lighting system or the manufacturer's plate, by the symbol shown in Annex 7.

Where differing initial downward inclinations are specified by the manufacturer for different lighting units that provide or contribute to the cut-off of the basic passing beam, these values of downward inclination shall be specified with a precision of 0.1 per cent by the manufacturer and indicated in clearly legible and indelible manner on each vehicle, close to either the relevant lighting units or on the manufacturers plate, in such a way that all the lighting units concerned can be unambiguously identified.

6.22.6.1.2. The downward inclination of the horizontal part of the "cut-off" of the basic passing beam shall remain between the limits indicated in paragraph 6.2.6.1.2. of this Regulation under all the static loading conditions of the vehicle of Annex 5 of this Regulation; and the initial aiming shall be within the specified values.

6.22.6.1.2.1. in case the passing beam is generated by several beams from different lighting units, the provisions according to paragraph 6.22.6.1.2. above apply to each said beam's "cut-off" (if any), which is designed to project into the angular zone, as

indicated under item 9.4. of the communication form conforming to the model in Annex 1 to Regulation No. xxx.

6.22.6.2. Headlamp levelling device

6.22.6.2.1. In the case where a headlamp levelling device is necessary to satisfy the requirements of paragraph 6.22.6.1.2., the device shall be automatic.

6.22.6.2.2. In the event of a failure of this device, the passing beam shall not assume a position in which the dip is less than it was at the time when the failure of the device occurred.

6.22.6.3. Horizontal orientation:

For each lighting unit the kink of the elbow of the cut-off line, if any, when projected on the screen, shall coincide with the vertical line through the reference axis of said lighting unit. A tolerance of 0.5 degrees to that side which is the side of the traffic direction shall be allowed. Other lighting units shall be adjusted according to the applicant's specification, as defined according to Annex 10 of Regulation No. xxx.

6.22.6.4. Measuring procedure:

After adjustment of the initial setting of beam orientation, the vertical inclination of the passing beam or, when applicable, the vertical inclinations of all the different lighting units that provide or contribute to the cut-off(s) according to paragraph 6.22.6.1.2.1. above of the basic passing beam, shall be verified for all loading conditions of the vehicle in accordance with the specifications in paragraphs 6.2.6.3.1. and 6.2.6.3.2. of this Regulation.

6.22.7. Electrical connections

6.22.7.1. Main beam lighting (if provided by the AFS)

- (a) The lighting units for the main-beam may be activated either simultaneously or in pairs. For changing over from the dipped-beam to the main-beam at least one pair of lighting units for the main-beam shall be activated. For changing over from the main-beam to the dipped-beam all lighting units for the main-beam shall be de-activated simultaneously.
- (b) The dipped-beams may remain switched on at the same time as the main-beams.
- (c) Where four concealable lighting units are fitted their raised position must prevent the simultaneous operation of any additional headlamps fitted, if these are intended to provide light signals consisting of intermittent illumination at short intervals (see paragraph 5.12.) in daylight.

6.22.7.2. Passing beam lighting

- (a) The control for changing over to the dipped-beam must switch off all main-beam headlamps or de-activate all AFS lighting units for the main-beam simultaneously.
- (b) The dipped-beam may remain switched on at the same time as the main-beams.
- (c) In the case of lighting units for the dipped-beam being equipped with gas discharge light sources, the gas-discharge light sources shall remain switched on during the main-beam operation.

6.22.7.3. Switching ON and OFF the passing beam may be automatic, however subject to the requirements for "Electrical connection" in paragraph 5.12. of this Regulation.

6.22.7.4. Automatic operation of the AFS

The changes within and between the provided classes and their modes of the AFS lighting functions as specified below, shall be performed automatically and such that no discomfort, neither for the driver nor for other road users, is caused.

The following conditions apply for the activation of the classes and their modes of the passing beam and, where applicable, of the main-beam.

6.22.7.4.1. The class C mode(s) of the passing beam shall be activated if no mode of another passing beam class is activated.

6.22.7.4.2. The class V mode(s) of the passing beam shall not operate unless one or more of the following conditions is/are automatically detected (V-signal applies):

- (a) roads in built-up areas and the vehicle's speed not exceeding 60 km/h;
- (b) roads equipped with a fixed road illumination, and the vehicle's speed not exceeding 60 km/h;
- (c) a road surface luminance of 1 cd/m² and/or a horizontal road illumination of 10 lx being exceeded continuously;
- (d) the vehicle's speed not exceeding 50 km/h.

6.22.7.4.3. The class E mode(s) of the passing beam shall not operate unless the vehicle's speed exceeds 70 km/h and one or more of the following conditions is/are automatically detected.

- (a) The road characteristics correspond to motorway conditions 8/ and/or the vehicle's speed exceeds 110 km/h (E-signal applies).
- (b) In case of a class E mode of the passing beam which, according to the system's approval documents /communication sheet, complies with a 'data set' of Table 6 of Annex 3 of Regulation No. xxx, only.

8/ Traffic directions being separated by means of road construction, or, a corresponding lateral distance of opposing traffic is identified. This implies a reduction of undue glare from vehicles headlamps in opposing traffic.

Data set E1: the vehicle's speed exceeds 100 km/h (E1-signal applies);
Data set E2: the vehicle's speed exceeds 90 km/h (E2-signal applies);
Data set E3: the vehicle's speed exceeds 80 km/h (E3-signal applies).

- 6.22.7.4.4. The class W-mode(s) of the passing beam shall not operate unless the front fog lamps, if any, are switched OFF and one or more of the following conditions is/are automatically detected (W-signal applies):
- (a) the wetness of the road has been detected automatically;
 - (b) the windshield wiper is switched ON and its continuous or automatically controlled operation has occurred for a period of at least two minutes.
- 6.22.7.4.5. A mode of a class C, V, E, or W passing beam shall not be modified to become a bending mode of said class (T-signal applies in combination with the signal of said passing beam class according to paragraphs 6.22.7.4.1. through 6.22.7.4.4. above) unless at least one of the following characteristics (or equivalent indications) are evaluated:
- (a) the angle of lock of the steering;
 - (b) the trajectory of the centre of gravity of the vehicle.

In addition the following provisions apply:

- (i) a horizontal movement of the asymmetric cut-off side-wards from the longitudinal axis of the vehicle, if any, is allowed only when the vehicle is in forward motion ^{9/} and shall be such that the longitudinal vertical plane through the kink of the elbow of the cut-off does not intersect the line of the trajectory of the centre of gravity of the vehicle at distances from the front of the vehicle which are larger than 100 times the mounting height of the respective lighting unit;
 - (ii) one or more lighting units may be additionally energized only when the horizontal radius of curvature of the trajectory of the centre of gravity of the vehicle is 500 m or less.
- 6.22.7.6. It shall always be possible for the driver to set the AFS to the neutral state and to return it to its automatic operation.
- 6.22.8. Tell-tale:
- 6.22.8.1. The provisions of paragraphs 6.1.8. (for the main-beam headlamp) and 6.2.8. (for the dipped-beam headlamp) of this Regulation apply to the respective parts of an AFS.
- 6.22.8.2. A visual failure tell-tale for AFS is mandatory. It shall be non-flashing. It shall be activated whenever a failure is detected with respect to the AFS control signals or when a failure signal is received in accordance with paragraph 5.9. of

^{9/} This provision does not apply for passing beam lighting when bend lighting is produced for a right turn in right hand traffic (left turn in left-hand traffic).

Regulation No. xxx. It shall remain activated while the failure is present. It may be cancelled temporarily, but shall be repeated whenever the device which starts and stops the engine is switched on and off.

6.22.8.3. A tell-tale to indicate that the driver has set the system into a state according to paragraph 5.8. of Regulation No. xxx is optional.

6.22.9. Other requirements

6.22.9.1. An AFS shall be permitted only in conjunction with the installation of headlamp cleaning device(s) according to Regulation No. 45 10/ for at least those lighting units, which are indicated under item 9.3. of the communication form conforming to the model in Annex 1 to Regulation No. xxx, and which contribute to the class C (basic) passing beam.

6.22.9.2. Verification of compliance with AFS automatic operating requirements

6.22.9.2.1. The applicant shall demonstrate with a concise description or other means acceptable to the Authority responsible for type approval:

- (a) the correspondence of the AFS control signals
 - to the description required in paragraph 3.2.6. of this Regulation and
 - to the respective AFS control signals specified in the AFS type approval documents, and,
- (b) compliance with the automatic operating requirements according to paragraphs 6.22.7.4.1. through 6.22.7.4.5. above.

6.22.9.2.2. To verify particular aspects of the compliance with the requirements according to paragraph 6.22.7.4. above the technical service may conduct tests and / or request the applicant to submit test reports of their in-house testing.

6.22.9.3. The aggregate maximum intensity of the lighting units that can be energized simultaneously to provide the main-beam lighting or its modes, if any, shall not exceed 225 000 cd, which corresponds to a reference value of 75.

This maximum intensity shall be obtained by adding together the individual reference marks indicated on the several installation units that are simultaneously used to provide the main-beam.

6.22.9.4. The means according to the provisions of paragraph 5.8. of Regulation No. xxx, which allow the vehicle to be used temporarily in a territory with the opposite direction of driving than that for which approval is sought, shall be explained in detail in the owner's manual."

10/ Contracting Parties to the respective Regulations can still prohibit the use of mechanical cleaning systems when headlamps with plastic lenses, marked 'PL', are installed.

Annex 1,

Insert a new item 9.22., to read:

"9.22. Adaptive front lighting system (AFS):yes/no 2/"

Items 9.22. to 9.24 (former), renumber as items 9.23. to 9.25.

Insert a new item 10.4., to read:

"10.4. Comments concerning AFS (according to paragraphs 3.2.6. and 6.22.7.4. of the Regulation): "

Annex 6, insert a new paragraph 5.1.1., to read:

"5.1.1. Where an AFS is fitted, the measurements shall be carried out with the AFS in its neutral state."
