

**Ref.: Regulation No. 48
Draft Amendment on AFS**

6th GRE-AFS Informal meeting
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Proposal by GTB-AFS

Editorial note

The proposals are presented in a consolidated form together with the text of the R.48 Draft Amendments on AFS (basis WP 6-02);

Paragraphs with new or changed text (**bold** characters) are displayed in a box and being introduced by a brief note (in **blue 'arial' style characters**), indicating the purpose/ justification.

PROPOSED TEXT

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;"*

Insert new paragraphs 2.7.26. to 2.7.26.7., to read

- "2.7.26. ***"Adaptive front lighting system"** (AFS) means a lighting device, type-approved according to Regulation No. xxx providing two or more differing modes for automatic adaptation of the beam characteristics to varying conditions of use of the dipped-beam and, if it applies, the main-beam; such systems consist of the 'system control', one or more 'supply and operating device(s)', if any, and the 'installation units' of the right and of the left side of the vehicle;*
- 2.7.26.1. ***"Lighting unit"** means a light-emitting component designed to provide or contribute to one or more front lighting or light-signalling function(s) provided by the AFS;*
- 2.7.26.2. ***"Installation unit"** means an indivisible housing (lamp body) with one or more lighting unit(s) being contained;*

GTB-AFS: editorial issue

2.7.26.3. *"**Lighting mode**" or "**mode**" means a state of a front lighting function provided by the system, as specified by the manufacturer and intended for adaptation to specific vehicle and ambient conditions;*

2.7.26.4. *"**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;*

GTB-AFS: for clarification

2.7.26.5. *"**AFS control signal**" (**V-signal, E-signal, W-signal, T-signal**) means the input to control the system in accordance with the ~~relevant~~ paragraphs **6.20.7.4.2. through 6.20.7.4.5. of this Regulation;***

GTB-AFS, from wp 5-11: editorial issue

2.7.26.6. *"**Neutral state**" means the state of the AFS when **a defined mode of the class C** (~~basic~~) **passing beam or of the main beam, if any, is produced, being specified for initial adjustment of the AFS or parts of;***

Paragraph 2.9.1., amend to read:

"2.9.1. *"**Illuminating surface of a lighting device**" (paragraphs 2.7.9., 2.7.10., 2.7.18. and 2.7.20.) means the orthogonal projection of the full aperture of the reflector, or in the case of headlamps with an ellipsoidal reflector of the "projection lens" on a transverse plane. If the is taken into account.*

In the case of a dipped-beam headlamp 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 6.20.4. 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 11 of Regulation No. xxx;*

3.2.6.3. *the provisions being applied to adapt automatically the front lighting functions and modes according to paragraph 6.20.7.4. of this Regulation;*

GTB-AFS, as in wp 5-11: amendment with respect to practice

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 6.20.9.2. 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 6.20.5. 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:

... Adaptive Front Lighting Systems: white

Paragraph 5.16.1., amend to read:

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 5.24., to read:

"5.24. *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, including 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 sideways.

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 6.20.6.1. 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:

".....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 6.20. to 6.20.9.4., to read; (Note: final numbering to be actualized, e.g. 6.22...)

"6.20. 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.

6.20.1. Presence

Optional on motor vehicles. Prohibited on trailers.

6.20.2. Number

One.

6.20.3. Arrangement

No special requirements.

6.20.4. Position

GTB-AFS: editorial issue, relative to 2.7.26.6. amendment

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

6.20.4.1. *In width and height:*

for a given lighting function or mode the requirements indicated in the paragraphs 6.20.4.1.1. through 6.20.4.1.4. 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.

GTB-AFS, from wp 5-11: for clarification, relative to 6.20.4.1.4. amendment

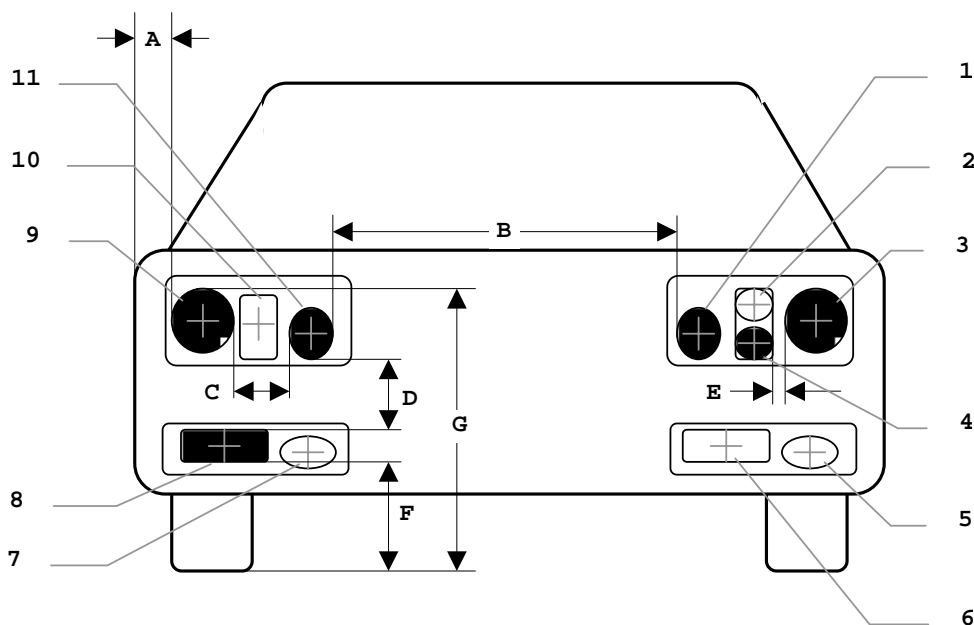
All dimensions refer to the nearest edge(s) of the apparent surface(s) of the lighting unit(s) [when measured] in the direction of the reference axis.

6.20.4.1.1. *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.

6.20.4.1.2. *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;*

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.4 and 8: two additional lighting units
- No.1 and 11: two symmetrically placed 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 ≤ 400
- B ≥ 600 or ≥ 400 if vehicle overall width <1300 mm, however
no requirement for category M1 and N1 vehicles
- C ≤ 200
- E ≤ 140

vertical dimensions in mm:

- D ≤ 400
- F ≥ 250
- G ≤ 1200

6.20.4.1.3.

GTB-AFS: same provision as for conventional passing beam headlamps

None of the additional lighting units described in paragraph 6.20.4.1.2. above shall be positioned lower than 250 mm (F in the figure) nor higher than 1200 mm (G in the figure) above the ground;

6.20.4.1.4. *Additionally, in width:*

GTB-AFS, from wp 5-11:

for each mode of the passing beam lighting ~~when measured in direction of the reference axis:~~

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,

GTB-AFS, (from wp 5-11): identical text as for conventional passing beam headlamps

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."

6.20.4.2. *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.

6.20.5. Geometric visibility

GTB-AFS, from wp 5-11: for clarification

*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."***

6.20.6. Orientation

Towards the front.

GTB-AFS: relative to 2.7.26.6. above

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:*

6.20.6.1.1. *The initial downward inclination of the basic passing beam in its neutral state 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.

6.20.6.1.2. *The downward inclination of the horizontal part of the "cut-off" of the basic passing beam in its neutral state 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;*

6.20.6.1.2.1. *in case the basic passing beam in its neutral state is generated by several beams from different lighting units, the provisions according to paragraph 6.20.6.1.2. above apply to each said beam's "cut-off" (if any), which is designed to project into the angular zone, as indicated under item 9.4.1. of the communication form conforming to the model in annex 1 to Regulation No. xxx.*

6.20.6.1.3. *passing beam levelling device*

The provisions of paragraph 6.2.6.2.2. above are not applicable.

6.20.6.2. *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.

6.20.6.3. *Measuring procedure:*

After adjustment of the initial setting of beam orientation, the vertical inclination of the passing beam or, when applicable, the downward inclinations of all the different lighting units that provide or contribute to the cut-off(s) according to paragraph 6.20.6.1.2.1. 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.

6.20.7. Electrical connections

6.20.7.1. *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.*

GTB-AFS, from wp 5-11: text to be deleted (covered by new paragraph 6.20.7.6. below)

~~(d) *Where, for the purpose of adjusting the beam orientation, the AFS cannot set itself automatically in the neutral state, means shall be provided to set the AFS to its neutral state.*~~

6.20.7.2. *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.*

GTB-AFS, from wp 5-11: text to be deleted (covered by new paragraph 6.20.7.6. below)

~~(d) *6.20.7.3. It shall always be possible for the driver to manually switch the AFS from any of the passing beam modes to the basic passing beam in its neutral state and to manually return it to automatic AFS operation.*~~

~~(e) *Where, for the purpose of adjusting the beam orientation according to paragraph 6.20.6. above, the AFS cannot set itself automatically in the neutral state, means shall be provided to set the AFS to its neutral state.*~~
~~6.20.7.3.1. Concerning the bending mode(s): the vehicle's steering wheel may be regarded to be the respective mean according to paragraph 6.20.7.3. above, provided that the reproducibility of the horizontal adjustment does not exceed [0.2 deg]; this shall be verified by the Technical Service responsible for the Type Approval tests.~~

GTB-AFS: editorial issue

6.20.7.3. *Switching ON and OFF the **main beam and the passing beam** may be automatic, however subject to the requirements for "Electrical connection" in paragraphs 5.11. and 5.12. of this Regulation.*

GTB-AFS: all AFS control shall be designed to be performed automatically; however, the possibility of intervention by the driver shall not be forbidden, except the manual activation of a class, and, except the activation of a bending mode.

6.20.7.4. *Automatic operation of the AFS lighting functions and modes*

*The changes ~~within and~~ between the provided 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.*

Means for the driver's intervention, if any, shall not allow for the activation of a passing beam class or a bending mode, irrespective of the provisions set out in paragraphs 6.20.7.6. and 6.20.7.5. of this Regulation.

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

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

6.20.7.4.2. *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 80 km/h;*
- (b) *roads equipped with a fixed road illumination, and the vehicle's speed not exceeding 80 km/h;*
- (c) *a road surface luminance of 1 cd/m² and/or a horizontal road illumination of 10 lx being exceeded continuously;*
- (d) *vehicle's speed not exceeding 50 km/h.*

GTB-AFS: provisions taking into account the different proposals discussed at the 5th GRE-AFS; however, with a proposal for a lower speed threshold value taking into account that speed limitation differs in different countries.

6.20.7.4.3. *The class E mode(s) of the passing beam shall not operate unless, **being** automatically detected (E-signal applies),*

- (a) *the vehicle's speed is not less than [70] km/h, and,*
- (b) *the road characteristics correspond to motorway conditions 8/. **This** shall be deemed to be satisfied if a continuous evaluation of one or more sets of information data is provided that can indicate motorway conditions, (e.g. the vehicle's speed being essentially steady together with steering parameters, or, the width and the course of the road lanes **being** indicated by means of optical detection, **or, the lateral separation to oncoming traffic exceeding the normal value being detected**).*

8/ *Such conditions can be found in Chapter I, Article 1 of the Convention on Road Traffic (Vienna Agreement, 1968)*

6.20.7.4.4. *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 system is switched ON and its continuous or automatically controlled operation has occurred for a period of at least two minutes*

6.20.7.4.5.

GTB-AFS: provisions based on the different proposals discussed at the 5th GRE-AFS

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 6.20.7.4.1. through 6.20.7.4.4. above) unless at least one of the following conditions is/are automatically detected:

- (a) ***one or more of external factors [parameters] which correspond to curvature of the road;***
- (b) ***continuous evaluation of one set of information which indicates the trajectory of the centre of gravity of the vehicle (e.g. the angle of lock of the steering).***

In addition the following provisions apply:

6.20.7.4.5.1. *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;*

6.20.7.4.5.2. *a horizontal movement of the asymmetric cut-off sideways 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 beam's 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.*

GTB-AFS: text to be deleted in view of the more general provisions of paragraph 6.20.9.4. below

~~6.20.7.5. *[Concerning the "traffic change function" according to the provisions of paragraph 5.8.2. of Regulation No.xxx, if any: where the AFS cannot set itself automatically into the corresponding correct state, means shall be provided which allow the driver to activate the "traffic change function"; these means shall be designed so, that it can be operated only when the vehicle is not in normal condition of use; the state being activated shall be indicated in clearly legible and indelible manner [with the letters "R/D" for the position for right hand traffic and the letters "L/G" for the position for left hand traffic].]*~~

GTB-AFS, from wp 5-11: re-placing the former 6.20.7.1 (d), 6.20.7.1 (d) and (e); relative to 2.7.26.6. above

6.20.7.6. *It shall be possible for the driver to set the AFS to the neutral state and to return it to its automatic operation. "*

^{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).*

6.20.8. *Tell-tale:*

GTB-AFS: provisions in line with general requirements regarding tell-tales.

6.20.8.1. *The provisions of paragraph 6.1.8. apply to an AFS which provides a main beam.*

6.20.8.2. *An operational tell-tale for the dipped beam is optional.*

6.20.8.3. *A tell-tale is mandatory which shall be operated:*

- *when a failure is detected with respect to the AFS control signals, and,*
- *when a failure signal is received in accordance with paragraph 5.9.1. of ECE Regulation No. xxx; this does not apply, if such failure is indicated by another tell-tale.*

6.20.9. *Other requirements*

GTB-AFS, from wp 5-13: provisions regarding cleaning device(s) for units, which are considered to be 'safety relevant'

6.20.9.1. *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 9.4. ~~±~~ of the communication form conforming to the model in annex 1 to Regulation No. xxx.*

GTB-AFS: provisions taking into account the different proposals discussed at the 5th GRE-AFS

6.20.9.2. *Verification of compliance with AFS automatic operating requirements*

6.20.9.2.1. *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 6.20.7.4.1. through 6.20.7.4.5. above.*

6.20.9.2.2. *To verify particular aspects of the compliance with the requirements according to paragraphs 6.20.7.4. above **the technical service may conduct practical tests and / or request the Applicant to submit test reports of their in-house testing.***

6.20.9.3. *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.

GTB-AFS: editorial issue

6.20.9.4. *Means for a 'traffic-change **function**' according to the provisions of paragraph 5.8.2. of Regulation No. xxx, if any, shall be explained in the owner's handbook."*

^{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 new item 9.22., to read:

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

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

Insert new item 10.4., to read:

"10.4. *Comments concerning AFS (according to paragraphs 3.2.6. and 6.20.7.4. of the Regulation):*"

Annex 6, insert 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.*"
