

## Proposal for amendments to GRE/2023/17

This informal document is aimed at superseding working document GRE72023/17, following the discussion at the 89<sup>th</sup> GRE session. Modifications to the original proposal are indicated in **blue** text.

### I. Proposal

#### A. Proposal for a supplement to **the 03 and 04 series to UN Regulation No. 53**

*Add new paragraphs 2.23. and 2.24. and their subparagraphs to read:*

- 2.23.** “*Adaptive front lighting system*” (or “AFS”) means a lighting device type-approved according to UN Regulation No. 149, providing beams with differing characteristics for automatic adaptation to varying conditions of use of the dipped-beam (passing-beam).
- 2.23.1.** “*AFS control signal*” (V, E, W) means the input to the AFS in accordance with the paragraph 6.18.6.3. of this Regulation.
- 2.24.** Definitions with regard to AFS:
- 2.24.1.** “*Class*” of a passing-beam (C, V, E or W) means the designation of a passing beam, identified by particular provisions according to UN Regulation No. 53 (for explanation only - the provisions of the passing-beam classes are dedicated to the conditions as follows: C for the basic passing-beam, V for use in lit areas such as towns, E for use on roads such as motorways, W for use in adverse conditions such as wet road);
- 2.24.2.** “*Functional unit*” means a part of a lighting unit providing a specific light distribution which may be used for different modes or classes.”

*Add new paragraphs 3.2.8. to 3.2.8.7. to read:*

- 3.2.8.** Where an AFS is fitted on the vehicle, the applicant shall submit a detailed description providing the following information:
- 3.2.8.1.** The lighting functions and modes for which the AFS has been approved;
- 3.2.8.2.** The related AFS control signals and their technical characteristics as defined according to annex 14 to UN Regulation No. 149.
- 3.2.8.3.** The provision being applied to adapt automatically the front lighting functions and modes according to paragraph 6.18.6.3. of this Regulation;
- 3.2.8.4.** Special instruction, if any, for the inspection of the light source and the visual observation of the beam;
- 3.2.8.5.** The documents according to paragraph 6.18.8.1. of this Regulation;
- 3.2.8.6.** The lamps that are grouped or combined with or reciprocally incorporated in the AFS;
- 3.2.8.7.** Lighting units which are designed to comply with the requirements of paragraph 6.18.5. of this Regulation.”

*Paragraph 5.4., amend to read:*

- 5.4.** In the absence of specific instructions, the height and orientation of the lamp shall be verified with the vehicle unladen and placed on a flat horizontal surface, its median longitudinal plane being vertical and the handlebars being in the position corresponding to the straight ahead movement. The tyre

pressure shall be those prescribed by the manufacturer for the particular conditions of loading required in this Regulation.

In the case where an ADB **or an AFS** is installed, with the system in its ADB **or AFS** neutral state.”

*Paragraph 5.13., amend to read:*

"5.13. Colours of the lights

...

**Adaptive front lighting system (AFS): white”**

*Insert a new paragraph 5.15.9. to read:*

**“5.15.9. Adaptive front lighting system (AFS) (paragraph 6.18.)”**

*Insert a new paragraph 5.24. to read:*

**“5.24. Where an AFS is fitted, it shall be considered equivalent to the dipped-beam headlamp(s).”**

*Add new paragraphs 6.18. to 6.18.8.1.3. to read:*

**“6.18. Adaptive front lighting system (AFS)**

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

**6.18.1. Presence**

**Optional**

**6.18.2. Number**

**One.**

**6.18.3. Arrangement**

**No special requirements**

**6.18.4. Position**

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

**6.18.4.1. In width and height:**

**6.18.4.1.1. An independent AFS installation unit may be installed above, below or to one side of another front lamp: if these lamps are one above the other the reference centre of the AFS installation unit shall be located within the median longitudinal plane of the vehicle; if these lamps are side by side their reference centre shall be symmetrical in relation to the median longitudinal plane of the vehicle.**

**6.18.4.1.2. An AFS installation unit that is reciprocally incorporated with another front lamp, shall be fitted in such a way that its reference centre lies within the median longitudinal plane of the vehicle. However, when the vehicle is also fitted with an independent driving beam headlamp, or a driving-beam headlamp that is reciprocally incorporated with a front position lamp alongside the AFS installation unit, their reference centre shall be symmetrical in relation to the median longitudinal plane of the vehicle.**

**6.18.4.1.3. Two AFS installation units, of which either one or both are reciprocally incorporated with another front lamp shall be installed in such a way that their reference centres are symmetrical in relation to the median longitudinal plane of the vehicle.**

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**6.18.4.1.4.** If installed, additional lighting unit(s) which provide bend lighting, type approved as part of the AFS according to UN Regulation No. 149, shall be installed under the following conditions:

In the case of (a) pair(s) of additional lighting units, they shall be installed so that their reference centre(s) are symmetrical in relation to the median longitudinal plane of the vehicle.

In the case of a single additional lighting unit, its reference centre shall be coincident with the median longitudinal plane of the vehicle.

**6.18.4.1.5.** Height: a minimum of 500 mm and a maximum of 1,200 mm above the ground.

**6.18.4.1.6.** In length: at the front of the vehicle. This requirement is regarded as satisfied if the light emitted does not cause discomfort to the driver either directly or indirectly by means of the rear-view mirrors and/or reflective surfaces of the vehicle.

**6.18.4.1.7.** In the case of two AFS installation units: the distance separating the illuminating surfaces of two AFS installation units must not exceed 200 mm.

**6.18.5.** Geometric visibility

For each lighting function and mode provided:

The angles of geometric visibility prescribed for the respective lighting functions according to paragraph 6.2.4. of this Regulation, shall be met by at least one lighting unit that is 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.

**6.18.5.1.** Vertical orientation:

the vertical inclination of the headlamp shall be set according the procedure described in the paragraphs 6.2.5.1. through 6.2.5.4. of this Regulation.

**6.18.5.2.** Headlamp levelling system

**6.18.5.2.1.** In the case where a headlamp levelling device is necessary to satisfy the requirements of paragraph 6.18.5.1., the device shall be automatic.

**6.18.5.2.2.** 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.

**6.18.5.2.3** Measuring procedure:

After adjustment of the initial setting of beam orientation, the vertical inclination of the passing-beam or, when applicable, the vertical inclination of all different lighting units that provide or contribute to the cut-off(s) of the basic passing-beam according to paragraph 6.18.5.1. above, shall be verified for all loading conditions of the vehicle in accordance with the specifications in paragraphs 6.2.5.1. to 6.2.5.4. of this regulation.

**6.18.5.3.** An HIAS may be installed for the AFS. In this case the requirements as specified in paragraph 6.2.5.5. and 6.2.5.6. of this Regulation shall be fulfilled.

**6.18.5.4.** Additional lighting unit(s) may be activated in conjunction with the AFS. In this case the requirement as specified in paragraph 6.2.5.7. and 6.2.5.8. of this Regulation shall be fulfilled.

**6.18.6.** Electrical connections

**6.18.6.1.** Passing-beam lighting:

- (a) The control for changing over to the dipped-beam shall switch OFF all main-beam headlamps 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 discharge light sources, the gas discharge light sources shall remain switched ON during the main-beam operation.
- 6.18.6.2.** The dipped-beam headlamps switching ON and OFF shall fulfil the requirements for “Electrical connection” in paragraph 5.10. and 6.2.6. of this Regulation.
- 6.18.6.3.** 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 without causing discomfort, distraction or glare, neither for the driver nor for the other road users.
- The following conditions apply for the activation of the classes and their modes of the passing-beam and, where applicable, of the main-beam and/or the adaptation of the main-beam.
- 6.18.6.3.1.** The class C mode(s) of the passing-beam shall be activated if no mode of another passing-beam class is activated.
- 6.18.6.3.2.** 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 illumination, and the vehicle’s speed not exceeding 60 km/h;
  - (c) A road surface illumination of 1 cd/m<sup>2</sup> and/or a horizontal road illumination of 10 lx being exceeded continuously;
  - (d) The vehicle’s speed not exceeding 50 km/h.
- 6.18.6.3.3.** The class E mode(s) of the passing-beam shall not operate unless the vehicle’s speed exceed 60 km/h and one or more of the following conditions is /are automatically detected:
- (a) The road characteristics correspond to motorway conditions <sup>(1)</sup> 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 UN Regulation No. 149, Table 12 only.
- 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).

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<sup>1</sup> Traffic direction 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 headlamp in opposing traffic.

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- 6.18.6.3.4.** The class W-mode(s) of the passing-beam shall not operate unless the front fog lamp, if any, are switched OFF and the wetness of the road has been automatically detected (W-signal applies).
- 6.18.6.4.** It shall always be possible for the driver to set the AFS to the neutral state and to return it to its automatic operation.
- 6.18.7.** Tell-tale:
- 6.18.7.1.** The provision of paragraphs 6.2.7. (for the dipped-beam headlamp) of this Regulation apply to the respective parts of an AFS.
- 6.18.7.2.** 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 4.13. of UN Regulation No. 149. It shall remain activated while the failure is present. It may be cancelled temporarily but shall be repeated whenever the device which starts and stop the propulsion system is switched ON and OFF.
- 6.18.8.** Other requirements
- 6.18.8.1.** Verification of compliance with AFS automatic operation requirements
- 6.18.8.1.1.** The applicant shall demonstrate with *a concise description* or other means acceptable to the Type Approval Authority:
- (a) The correspondence of the AFS control signals
    - (i) To the description required in paragraph 3.2.8. of this Regulation; and
    - (ii) To the respective AFS control signals specified in the AFS type approval documents; and
  - (b) Compliance with the automatic operating requirements according to paragraph 6.18.6.3.1. through 6.18.6.3.4. above.
- 6.18.8.1.2.** To verify, whether, according to the paragraph 6.18.6.3., the AFS automatic operation of the passing-beam functions does not cause any discomfort, the technical service shall perform a test drive which comprises any situation relevant to the system control on the basis of the applicants description; it shall be notified whether all modes are activated, performing and de-activated according to the applicant's description; obvious malfunctioning, if any, shall be contested (e.g. excessive angular movement or flicker).
- 6.18.8.1.3.** The overall performance of the automatic control shall be demonstrated by the applicant by documentation or by other means acceptable by the Type Approval Authority. Furthermore, the manufacturer shall provide a documentation package which gives access to the design of "safety concept" of the system. This "safety concept" is a description of the measures designed into the system, for example within the electronic units, so as to address system integrity and thereby ensure safe operation even in the event of mechanical or electrical failure which could cause any discomfort, distraction or glare, either to the driver or to oncoming and preceding vehicles. This description shall also give a simple explanation of all the control functions of the "system" and the methods employed to achieve the objectives, including a statement of the mechanism(s) by which control is exercised.

A list of all input and sensed variables shall be provided and the working range of these shall be defined. The possibility of a fall-back to the basic passing-beam (class C) function shall be a part of the safety concept.

The function of the system and the safety concept, as laid down by the manufacturer, shall be explained. The documentation shall be brief, yet

**provide evidence that the design and development has had the benefit of expertise from all the system fields which are involved.**

**For periodic technical inspections, the documentation shall describe how the current operational status of the “system” can be checked.**

**For Type Approval purposes this documentation shall be taken as the basis reference for the verification process.”**

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## B. Proposal for a supplement to the 01 series to UN Regulation No. 149

*Paragraph 1., amend to read:*

### “1. Scope

This Regulation applies to the following road illumination devices (lamps):

- Headlamps emitting a driving-beam and/or an asymmetrical passing-beam for vehicles of categories L, M, N and T
- Adaptive front-lighting systems (AFS) for vehicles of categories M ~~and, N~~ **and L<sub>3</sub>**
- **Adaptive Driving-Beam (ADB) for vehicles of category L<sub>3</sub>**
- Headlamps emitting a driving-beam and/or a symmetrical passing-beam for vehicles of categories L and T
- Front fog lamps for vehicles of categories L<sub>3</sub>, L<sub>4</sub>, L<sub>5</sub>, L<sub>7</sub>, M, N and T
- Cornering lamps for vehicles of categories M, N and T.”

*Paragraph 3.1.2.2.2., amend to read:*

“3.1.2.2.2. In the case of an AFS, it shall specify:

- (a) The lighting function(s) and their modes to be provided by the system;
- (b) The lighting units contributing to each of them and the signals with the technical characteristics relevant to their operation;
- (c) Which categories of the bending mode requirements apply, if any;
- (d) Which additional data set(s) of Class E passing-beam provisions according to Table 12, if any;
- (e) Which set(s) of Class W passing-beam provisions according to paragraph 5.3.2., if any;
- (f) Which lighting units provide or contribute to one or more passing-beam cut-off(s),
- (g) The indication(s) according to the provision of paragraph 5.3.5.1. with respect to paragraph 6.22. of UN Regulation No. 48 **or paragraph 6.18. of UN Regulation No. 53;**
- (h) Which lighting units are designed to provide the minimum passing-beam illumination according to paragraph 5.3.2.8.1.;
- (i) Mounting and operation requirements for the test purposes;
- (j) Any other relevant information;
- (k) In the case of light source module(s) this shall include, for each module:
  - (i) A brief technical specification of the light source module(s);
  - (ii) A drawing with dimensions and the basic electrical and photometric values and the objective luminous flux and for each light source module a statement whether it is replaceable or not;

- (iii) In case of electronic light source control gear, information on the electrical interface for approval testing;
- (l) Any other front-lighting or front light signalling function(s), provided by any lamp(s) being grouped, combined or reciprocally incorporated to the lighting units of the system, for which approval is sought; sufficient information for identification of the respective lamp(s) and indication of the Regulation(s), according to which they are intended to be (separately) approved;”

Paragraph 3.2.4., amend to read:

“3.2.4. If approval is sought for an AFS which is not intended to be included as part of the approval of a vehicle type according to UN Regulation No. 48 or if approval is sought for an ADB **or** AFS for vehicles of category L3 which is not intended to be included as part of the approval of a vehicle type according to UN Regulation No. 53,”

Paragraph 3.2.4.1., amend to read:

“3.2.4.1. The applicant shall submit sufficient documentation to prove the capability of the system to comply with the provisions of paragraph 6.22. of the UN Regulation No. 48 or paragraph 6.16. **and 6.18.** of UN Regulation No. 53 when correctly installed, and”

Paragraph 3.2.5., Table 1, amend to read:

Table 1

**List of symbols/combinations**

<i>Lamp (function)</i>	<i>Symbol</i>	<i>Symbol if device is part of a matched pair</i>
Driving-beam headlamp of Class A	R	YR
Passing-beam headlamp of Class V (asymmetrical)	V	YV
Driving-beam headlamp of Class B	HR	YHR
Passing-beam headlamp of Class C (asymmetrical)	C	YC
Auxiliary Driving-Beam of Class RA	RA	-
Adaptive Front lighting System (Class AFS-C): basic passing-beam	XC <sup>3</sup>	-
Adaptive Front lighting System (Class AFS-E): motorway passing-beam	XCE <sup>2, 3</sup>	-
Adaptive Front lighting System (Class AFS-V): town passing-beam	XCV <sup>3, 4</sup>	-
Adaptive Front lighting System (Class AFS-W): adverse weather passing-beam	XCW <sup>3, 4</sup>	-
<b>Adaptive Front lighting System for vehicle of category L3 (Class AFS-C): basic passing-beam</b>	<b>MXC<sup>3</sup></b>	
<b>Adaptive Front lighting System for vehicle of category L3 (Class AFS-E): motorway passing-beam</b>	<b>MXCE<sup>3, 4</sup></b>	
<b>Adaptive Front lighting System for vehicle of category L3 (Class AFS-V): town passing-beam</b>	<b>MXCV<sup>3, 4</sup></b>	

<sup>2</sup> In the case of a single installation unit the symbol "XC" **or** "MXC" is marked only once.

<sup>3</sup> In the case of more installation units each providing one or more AFS function(s) each unit is marked with the symbol "X" **or** "MX" followed by the identification symbol(s) of the specific AFS function(s) provided.



<i>Lamp (function)</i>	<i>Symbol</i>	<i>Symbol if device is part of a matched pair</i>
<b>Adaptive Front lighting System for vehicle of category L<sub>3</sub> (Class AFS-W): adverse weather passing-beam</b>	<b>MXCW<sup>3,4</sup></b>	
Adaptive Front lighting System (Class AFS-R): driving-beam	XR <sup>3</sup>	-
Passing-beam headlamp of Class AS (symmetrical)	C-AS	YC-AS
Passing-beam headlamp of Class BS (symmetrical)	C-BS	YC-BS
Passing-beam headlamp of Class CS (symmetrical)	WC-CS	YC-CS*
Passing-beam headlamp of Class DS (symmetrical)	WC-DS	YC-DS*
Driving-beam headlamp of Class BS	R-BS	YR-BS*
Secondary driving-beam headlamp of Class CS	WR-CS	YR-CS*
Secondary driving-beam headlamp of Class DS	WR-DS	YR-DS*
Adaptive driving-beam for vehicles of category L <sub>3</sub>	ADB	YADB
Front fog lamp of Class F3	F3	YF3
Cornering lamp of Class K	K	-

\* The symbol “W” is not indicated because deemed unnecessary for these classes as part of a matched pair

*Paragraph 4.5.3.6.*, amend to read:

“4.5.3.6. In case of an AFS incorporating light sources and/or light source modules producing the basic passing-beam and having a total objective luminous flux of the lighting units as indicated under item 9.2.3.(a) of the communication form which exceeds  $2.00 \cdot 10^3$  lumen per side, **a reference shall be made in the communication form in Annex 1. This information is not necessary in case the AFS is intended for a vehicle of category L<sub>3</sub>.**”

*Paragraph 5.3.2.1.*, amend to read:

“5.3.2.1. For each side of the system (vehicle) **or in the case of AFS for vehicles of category L<sub>3</sub> for the system** the passing-beam in its neutral state shall produce from at least one lighting unit a “cut-off” as defined in Annex 5 or,”

*Paragraph 5.3.2.2.*, amend to read:

“5.3.2.2. The system or part(s) thereof shall be aimed according to the requirements of Annex 5 paragraph 3.2. including the allowed specific tolerances of paragraph 4 so that the position of the cut-off complies with the requirements indicated in Table 8. **For AFS for vehicles of category L<sub>3</sub> the system or part(s) thereof shall be aimed according to the requirements of Annex 5 paragraph 3.3.**

If, however, the vertical adjustment cannot be performed repeatedly to the required position within the allowed tolerances, the instrument method of Annex 6, paragraph 2. shall be applied to the test compliance with the required minimum quality of the asymmetric “cut-off” line **or of the symmetric “cut-off” line for AFS for vehicles of category L<sub>3</sub>** and to perform the beam vertical adjustment.”

*Paragraph 5.3.2.4.*, amend to read:

“5.3.2.4. When emitting a specified mode of the passing-beam, the system shall meet the requirements in the respective section (C, V, E, W) of part A of the Table 7 (photometric values) and in Table 8 ( $I_{\max}$  and “cut-off” positions), as well as paragraph 2.1. (asymmetric “cut-off” definition) of Annex 5. **For AFS for vehicles of category L<sub>3</sub>, when emitting a specified mode of the passing-**

**beam, the system shall meet the requirements for passing-beam of Class DS specified in paragraph 5.4. of this Regulation.”**

*Annex 1,*

*Paragraph 9.2.9., insert a new footnote 6 to read:*

**“6 for AFS for vehicle of category L<sub>3</sub> the information through 9.2.9.2. to 9.2.10.5. are not necessary.”**

*Footnotes 6 to 8, renumber as 7 to 9 accordingly.*

*Annex 14, footnote 2 (d), amend to read:*

**“(d) Signal status when the respective conditions according to paragraph 6.22.7.4. of UN Regulation No. 48 or 6.18.6.3. of UN Regulation No. 53 are fulfilled.”**

*Annex 14, footnote 5, amend to read:*

**“5 Relevant to provisions of paragraph 6.22.6.1.2. of UN Regulation No. 48 or 6.18.5.1. of UN Regulation No. 53.”**

## **II. Justification**

1. This proposal to amend UN Regulation No. 53 (Installation of lighting and light-signalling devices for L<sub>3</sub> vehicles) and to amend UN Regulation No.149 (Road illumination devices) is submitted by the expert from Germany with the aim to introduce adaptive front-lighting systems (AFS) for motorcycles.
2. Motorbikes are disproportionately involved in accidents in relation to their share of the vehicle population and mileage. Especially at night, the risk of accidents is many times higher than for passenger cars. Since a while, requirements of adaptive front lighting system for M and N category vehicles are implemented. The introduction of this system has led to a safety increase for these vehicles. According to UN Regulation No. 53 it is not possible to change the light intensity in close field, near middle, left and right field illumination as allowed by UN Regulation No. 48. This means that in many driving condition (depending on speed and leaning angle) the road illumination is limited. In this respect, it seems appropriate to allow modern headlamp technologies for motorbikes as well. The same safety increase as for M and N category could be taken also for L<sub>3</sub> category vehicles.
3. A motorcycle AFS means a lighting device providing beams with differing characteristics/light modes for automatic adaptation to varying conditions of use of the dipped-beam (passing-beam). The light modes are automatically controlled depending on the vehicle speed.
4. The sensible transfer of the UN Regulations for AFS to motorbikes of class L<sub>3</sub> enables innovative headlamps with an adjustable light distribution to improve active safety. This contributes to better road illumination at night and increases road safety for motorbikes.
5. Therefore, Germany proposes to adopt these proposals as soon as possible.