

Submitted by the expert from GTB

Informal document **GRE-87-30**
(87th GRE, 25-28 October 2022
agenda item 6 (a))

Revision of ECE/TRANS/WP.29/GRE/2022/21

This document was prepared by the experts from the International Automotive Lighting and Light-Signalling Expert Group (GTB) with the aim to extend to AFS passing-beam headlamps the possibility to project driver assistance symbols and patterns. The proposed modifications to the current text of the UN Regulation are marked in bold for new or strikethrough for deleted characters. **Additional changes to original proposal GRE/2022/21 are highlighted in yellow.**

I. Proposal

A. Proposal for a new Supplement to the 06, 07 and 08 series of amendments to UN Regulation No. 48

Paragraph 5.35., amend to read:

- “5.35. General provisions relating to Driver Assistance Projection
- The Driver Assistance Projection shall be constituted of patterns, symbols or both.
- 5.35.1. Symbols and patterns shall be related and limited only to warning/highlighting:
- (a) the presence of hazardous traffic situation
 - (b) the presence of other road users which require the driver’s attention
 - (c) to maintain the distances to surrounding road users and infrastructure
 - (d) to maintain the correct lane
- The patterns and symbols shall be explained in the owner's handbook.
- 5.35.2. The only symbols and patterns that may be used for the Driver Assistance Projection, and their associated underlying conditions, are listed in Annex 16.
- 5.35.3. Neither flashing nor transforming of driver assistance projections is permitted, unless expressly allowed for the use cases described under the conditions in Annex 16.**
- ~~5.35.3-4.~~ It shall be always possible to manually deactivate and reactivate the system which operates the Driver Assistant Projection.
- ~~5.35.4-5.~~ The projected symbols and patterns shall no longer be projected when their associated underlying conditions allowing them to be shown do not exist anymore.
- ~~5.35.5-6.~~ The projected symbols and patterns shall stop flashing when their associated underlying conditions allowing them to flash do not exist anymore.
- ~~5.35.6-7.~~ The Driver Assistance Projection shall be deactivated automatically in case of an electrically detectable failure of the system that affects the visual information **on the road given by the Driver Assistance Projection.**
- 5.35.8. The Driver Assistance Projection shall not interfere with information displayed by the Field of Vision Assistant as defined in UN Regulation No. 125.**
- 5.35.9. The Driver Assistance Projection shall not operate when the windshield wiper is switched ON and its continuous operation has occurred for a period of at least two minutes.**
- 5.35.10. The lateral distance from the outer edges of the Driver Assistance Projection with respect to the longitudinal median plane or to the trajectory of the centre of gravity of the vehicle shall not be more than 1,250 mm.**
- This shall be demonstrated by the manufacturer by calculation or by other means accepted by the Type Approval Authority.”**

Add a new paragraph 6.22.9.2. to read:

- “6.22.9.2. Lighting units for AFS passing beam and/or adaptive main beam may produce Driver Assistance Projection in order to warn the driver appropriately regarding special traffic situations or conditions.”**

Paragraph 6.22.9.2. (former), renumber and amend to read:

~~6.22.9.2.3.~~ Verification of compliance with AFS automatic operating requirements

6.22.9.2.3.1. 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
 - i) To the description required in paragraph 3.2.6. 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 paragraphs 6.22.7.4.1. through 6.22.7.4.5. above.
- (c) **Compliance of Driver Assistance Projection, if any, with the requirements according to paragraph 5.35. and its sub-paragraphs.**

6.22.9.2.3.2. To verify, whether, according to the paragraph 6.22.7.4., the AFS automatic operation of the passing-beam function, 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).

In addition, if Driver Assistance Projection is present, the technical service shall verify during the test drive that this feature does not cause any distraction.

6.22.9.2.3.3. The overall performance of the automatic control, **including Driver Assistance Projection if installed**, shall be demonstrated by the applicant by documentation or by other means accepted by the authority responsible for type approval. Furthermore, the manufacturer shall provide a documentation package which gives access to the design of "the 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 functions 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 basic reference for the verification process.

6.22.9.2.3.4. To verify, that the adaptation of the main-beam, including Driver Assistance Projection, does not cause any discomfort, distraction or glare, neither to the driver nor to oncoming and preceding vehicles, the technical service shall perform a test drive according to paragraph 2. in Annex 12. This shall include any situation relevant to the system control on the basis of the applicant's description. The performance of the adaptation of the main-beam shall be

documented and checked against the applicant’s description. Any obvious malfunctioning shall be contested (e.g. excessive angular movement or flicker).”

Paragraph 6.22.9.3.2. (former) and its sub-paragraphs, delete:

- ~~6.22.9.3.2. The adaptive main beam may produce the Driver Assistance Projection in order to warn the driver appropriately regarding special traffic situations or conditions.~~
- ~~6.22.9.3.2.1. The lateral distance from the outer edges of the Driver Assistance Projection with respect to the trajectory of the centre of gravity of the vehicle shall not be more than 1,250 mm. This shall be demonstrated by the manufacturer by calculation or by other means accepted by the Type Approval Authority.~~
- ~~6.22.9.3.2.2. Driver Assistance Projection shall not interfere with information displayed by the Field of Vision Assistant as defined in UN Regulation No. 125.~~
- ~~6.22.9.3.2.3. No Flashing flashing and/or transforming nor transforming of driver assistance projections is not permitted, unless expressly allowed for the use cases situations described under the conditions in Annex [16].~~
- ~~6.22.9.3.2.4. Driver Assistance Projection shall not operate when the windshield wiper is switched ON and its continuous operation has occurred for a period of at least two minutes.~~

Paragraphs 6.22.9.3., 6.22.9.3.1. and its subparagraphs (former), renumber to 6.22.9.4., 6.22.9.4.1. and its subparagraphs accordingly.

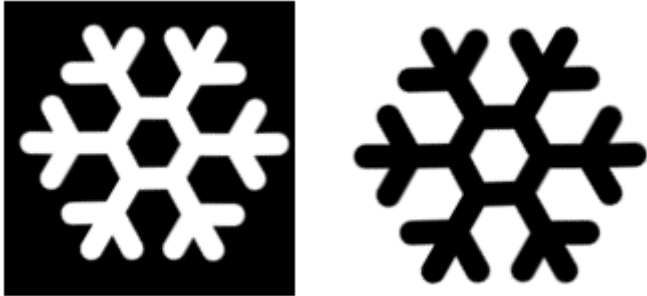
Annex 1, item 9.22., amend to read:


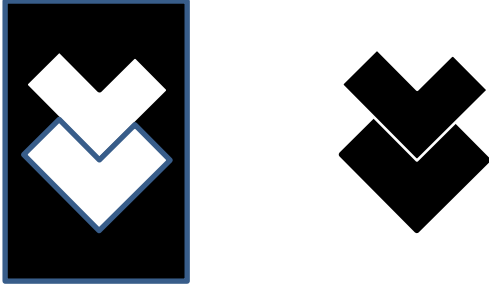
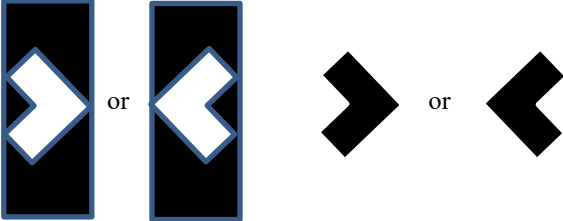
“9.22.	Adaptive front lighting system (AFS):	yes/no ²
9.22.1.	AFS passing-beam	yes/no²
9.22.1.1.	AFS passing-beam + Driver Assistance Projection	yes/no²
9.22.4.2.	AFS main-beam	yes/no ²
9.22.4.3.	AFS adaptive Mmain-beam (ADB)	yes/no ²
9.22.4.3.1.	AFS adaptive Mmain-beam (ADB) + Driver Assistance Projection	yes/no ² ”

Annex 16., amend to read:

“Annex 16

Symbols and patterns for the use as Driver Assistance Projections and Explanations of the Warnings/Highlights

Symbols and Pattern	Use case	Conditions and remarks
	Slippery road warning	<p>Shall not be activated when the vehicle speed is less than 50km/h.</p>

	<p>Risk of collision warning</p>	<p>Triggered when the relative speed is larger than 30 km/h and Risk of Collision Time is less than 1.4 s.</p> <p>Flashing at 4.0 hz +/- 1.0 hz allowed.</p> <p>Shall not be activated when the vehicle speed is less than 50km/h.</p>
	<p>Wrong way warning</p>	<p>Activated when the vehicle is entering a one-way road or a highway in opposite direction.</p> <p>Flashing at 4.0 hz +/- 1.0 hz allowed.</p>
	<p>Lane keeping assist warning</p>	<p>Activated if the vehicle unintentionally exits its lane.</p> <p>Shall not be activated when the vehicle speed is less than 50km/h.</p>

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B. Proposal for a new Supplement to the 01 series of amendments to UN Regulation No. 149

Add a new paragraph 5.3.2.10. to read:

“5.3.2.10. The Driver Assistance Projection according to UN Regulation No. 48, paragraph 5.35., may be produced by modifying the passing-beam light distribution within a zone limited by the following angles:

vertically: - 1.2° and below

horizontally: ± 25°

In this zone, the intensity of the projection shall not exceed $2.15 \cdot 10^5$ cd and shall not be less than the minimum intensities prescribed in Table 7.

5.3.2.10.1. The colour of the light emitted for Driver Assistance Projection shall be white.”

Paragraph 5.3.3.8. and its subparagraph, amend to read:

“5.3.3.8. The Driver Assistance Projection according to UN Regulation No. 48, paragraph ~~6.22.9.3.2.5.35.~~5.35., may be part of the driving-beam light distribution within a zone limited by the following angles:

vertically: - 1.2° and below

horizontally: ± 25°

The Driver Assistance Projection may be produced by modifying the beam pattern in the zone defined above, where the luminous intensity in any point of the entire driving beam shall not exceed the maximum value (I_{\max}) according to paragraph 5.1.4.2. and not be less than the minimum intensities prescribed in Table 13 Part B.

5.3.3.8.1. The colour of the light emitted for Driver Assistance Projection shall be white.”

II. Justification

A. General

1. This proposal is intended to allow Driver Assistance Projection on the road surface by using the AFS passing-beam, in addition to the current possibility to use the Adaptive Driving Beam (ADB), as requested by some Contracting Parties. It is adapted to the new 01 series of amendments to UN Regulation No. 149 (Road Illumination Devices) and to the latest series of amendments to UN Regulation No. 48 (Installation of Lighting of Light-Signalling Devices).

2. Furthermore, this proposal is part of the simplification process of lighting regulations, with more neutral technology requirements. This will give the opportunity to offer this feature to the drivers of a wider number of car segments.

3. Minor changes are proposed in the current regulatory provisions, while keeping a sufficient safety level for all traffic participants. The projection zone is the same as for driving-beam. The intensity values are limited to I_{\max} as prescribed for driving-beam. Increased luminous intensity needs to be obtained on the road, in order to reach sufficient contrast, especially for the streets in cities equipped with street lighting. Minimum intensities in the projection zone shall respect the requirements set for AFS passing-beam headlamps. In case of Driver Assistance Projection in the frame of an AFS passing-beam, the maximum luminous intensities values as defined in Table 7 do not apply.

4. Glare is limited, due to the fact that projections are activated in the very specific use cases defined in Annex 16 and only for a limited time. Furthermore, no projection is allowed in case of rain (paragraph 5.35.9.) and the area for projection in combination with the AFS passing-beams is exactly the same as for the ADB (vertically: -1.2° and below, horizontally: $\pm 25^\circ$). For vertical limit, the maximum angle of -1.2° is below the cut-off line for passing-beam headlamps, with sufficient margin.

5. The proposed maximum lateral distance from the outer edges of the Driver Assistance Projection on the road with respect to the longitudinal plane of the vehicle is based on the value proposed in document ECE/TRANS/WP.29/GRE/2021/18, adopted at the eighty-fifth session of the Working Party on Lighting and Light-Signalling (GRE), as amended by informal document GRE-85-33. An alternative is offered to measure the lateral distance from the outer edges of the driver assistance projections with respect to the trajectory of the centre of gravity of the vehicle.

6. Annex 16 is amended in order to take into account the concerns from some Contracting Parties about possible disturbance/distraction, particularly for vulnerable road users during the circulation in urban areas. For this purpose, it has been considered suitable to introduce a threshold based on vehicle speed. It is suggested reviewing this requirement in the future, when objective and applicable test conditions to evaluate the effective disturbance/distraction are available.

B. New Supplement to the 06, 07 and 08 series of amendments to UN Regulation No. 48

1. Paragraph 5.35., containing the general provisions relating to Driver Assistance Projection, is modified and reorganized:

- Paragraphs 5.35.3., 5.35.8. and 5.35.9. are transferred from existing paragraph 6.22.9.3.2. and its sub-paragraphs. The requirements remain the same.
- Paragraph 5.35.10. is taken from paragraph 6.22.9.3.2.1. and adapted for the evaluation of maximum lateral distance from the outer edges of the Driver Assistance Projection on the road. The proposed reference is the longitudinal plane of the vehicle, but it is still possible to evaluate this distance with respect to the trajectory of the centre of gravity. Only one method is accepted for the evaluation. Once it is chosen and submitted to Type Approval authorities, the reference cannot be modified during the projection of a pattern or a symbol.
- Paragraph 5.35.7. is modified in order to clarify the meaning of ‘visual information’, by explaining that it is restricted to the Driver Assistance Projection on the road. It will avoid any possible contradiction with other sources of visual information (e.g.: Field of View Assistance).

2. A new paragraph 6.22.9.2. is added in order to allow Driver Assistance Projection by use of AFS passing-beam, in addition to Adaptive Driving Beam (ADB). The wording is taken from the previous paragraph 6.22.9.3.2. for Driver Assistance Projection with ADB only (GRE/2021/18 as amended by GRE-85-33).

3. Modifications are brought to paragraph 6.22.9.2. (renumbered to paragraph 6.22.9.3.) to include verification of Driver Assistance Projection during the test of AFS automatic operating, especially concerning the possible distraction, to be checked during the test drive.

4. Paragraph 6.22.9.3. and its subparagraphs are renumbered to 6.22.9.4. accordingly.

5. Paragraph 6.22.9.3.2. and its sub-paragraphs are deleted, as they have been transferred to paragraph 5.35. “General provisions relating to Driver Assistance Projection”.

6. In Annex 1 (Communication form), item 9.22. is amended to integrate the use of AFS passing-beam for Driver Assistance Projection and to list all possible configurations.

7. In Annex 16 (Symbols and patterns for the use as Driver Assistance Projections and Explanations of the Warnings/Highlights), a threshold in the speed value is added in ‘Conditions and remarks’ column for three symbols: ‘Slippery road warning’, ‘Risk of collision warning’ and ‘Lane keeping assist warning’. However, ‘Wrong way warning’ symbol is not covered by this requirement, as it is considered important for safety, also in urban areas.

C. New Supplement to the 01 series of amendments to UN Regulation No. 149

1. A new paragraph 5.3.2.10. is added in 5.3.2. section concerning provisions concerning AFS passing-beam. It contains the technical requirements for producing the Driver Assistance Projection, inspired from the ones in the frame of Adaptive Driving Beam:

- Limited zone remains the same (vertically: - 1.2° and below, horizontally: ±25°)
- Allowed maximum is set to 2.15·10⁵ cd (I_{max} of driving-beam) to keep consistency with Driver Assistance Projection produced in the frame of ADB.
- Minimum luminous intensity values shall follow the requirements of Table 7 (Type approval photometric requirements for Classes C, V, E and W passing-beam) for the points inside the limited zone)

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- A new wording is proposed in order to simplify and clarify the requirements. It allows to eliminate a redundancy.
 - Paragraph 5.3.2.10.1. allows to clarify that the emitted colour for Driver Assistance Projection shall be white (same requirement as for the road projections with Adaptive Driving Beam).
2. Paragraph 5.3.3.8. is amended to make reference to para. 5.35., instead of para 6.22.9.3.2., and to make two editorial corrections. However, the wording of the paragraph was maintained like the one adopted at the eighty-fifth GRE session in October 2021 (document ECE/TRANS/WP.29/GRE/2021/18, as amended by informal document GRE-85-33).
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