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World Forum for Harmonization of Vehicle Regulations**Working Party on Lighting and Light-Signalling****Eighty-ninth session**

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Item 6 (a) of the provisional agenda

Installation UN Regulations:**UN Regulation No. 48 (Installation of Lighting and Light-Signalling Devices)****Proposal for a new supplement to UN Regulation No. 48****Submitted by the experts from the Task Force on Automated Vehicle Signalling Requirements*****Revision**

The text reproduced below was prepared by the experts from Germany and the Task Force on Automated Vehicle Signalling Requirements (TF AVSR). The modifications to the existing text of the UN Regulation are marked bold for new and strikethrough for deleted characters. The justification part is taken from document ECE/TRANS/WP.29/GRE/2022/14.

* In accordance with the programme of work of the Inland Transport Committee for 2023 as outlined in proposed programme budget for 2023 (A/77/6 (Sect. 20), table 20.6), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

Paragraph 2.3.8., amend to read:

"2.3.8. "Movable components" of the vehicle mean those body panels or other vehicle parts the position(s) of which can be changed by tilting, rotating or sliding without the use of tools. They do not include tiltable driver cabs of trucks."

[Add new paragraphs 2.3.12. to 2.3.12.12., to read:

"2.3.12. **Terms and definitions related to MDV, ADS vehicles and ADS**

2.3.12.1. "Automated Driving System (ADS)" means the hardware and software that are collectively capable of performing the entire DDT on a sustained basis regardless of whether it is limited to a specific operational design domain (ODD).

2.3.12.2. "Driving system control (DSC)" means the part of the ADS which controls the entire DDT; it may be operated by driver support features or ADS features.

2.3.12.3. "(ADS) feature" means an application of ADS hardware and software designed specifically for use within an ODD.

2.3.12.4. "(ADS) function" means an ADS hardware and software capability designed to perform a specific portion of the DDT.

2.3.12.5. "Manually Driven Vehicle (MDV)" means a vehicle controlled by a driver.

2.3.12.6. "Dual mode vehicle (DMV)" means a vehicle, which can be either controlled:

- by a driver, or
- by a DSC.

2.3.12.7. "ADS vehicle" means a vehicle equipped with an ADS, and permanently controlled by a DSC.

2.3.12.8. "Driver" means a human being who performs in real time part or all of the DDT.

2.3.12.9. "Dynamic Driving Task (DDT)" means the real-time operational and tactical functions required to operate the vehicle in on-road traffic.

2.3.12.10. The DDT is always performed in its entirety by the ADS in operation ("the entire DDT" as stated in the definition of an "Automated Driving System" under paragraph 3.1.) which means the whole of the tactical and operational functions necessary to operate the vehicle. These functions can be grouped into three interdependent categories: sensing and perception, planning and decision, and control.

2.3.12.10.1. Sensing and perception include:

- Monitoring the driving environment via object and event detection, recognition, and classification.
- Perceiving other vehicles and road users, the roadway and its fixtures, objects in the vehicle's driving environment and relevant environmental conditions.
- Sensing the ODD boundaries, if any, of the ADS feature.
- Positional awareness.

2.3.12.10.2. Planning and decision include:

- Predicting actions of other road users.
- Response preparation.

- **Manoeuvre planning.**

2.3.12.10.3. Control includes:

- **Object and event response execution.**
- **Lateral vehicle motion control.**
- **Longitudinal vehicle motion control.**
- **Indication of vehicle status and/or intended driving manoeuvres and, if required, enhancing conspicuity via lighting and signalling**

2.3.12.10.4. The DDT excludes strategic functions.

2.3.12.11. “Strategic function” means a capability to issue commands, instructions, or guidance for execution by an ADS.¹

2.3.12.12. “Operational Design Domain (ODD)” means the operating conditions under which an ADS feature is specifically designed to function.²

Paragraph 2.5.3., amend to read:

"2.5.3. "Direction-indicator lamp" means the lamp used to indicate to other road-users ~~that the driver intends~~ **intention** to change direction to the right or to the left. A direction-indicator lamp or lamps may also be used according to the provisions of UN Regulations Nos. 97, ~~or~~ 116, **162 or 163.**"

Paragraph 2.5.18., amend to read:

"2.5.18. "Exterior courtesy lamp" means a lamp used to provide supplementary illumination to assist the entry and exit of the vehicle ~~driver and passenger~~ or ~~in~~ loading operations;"

Paragraph 2.7.4.7., amend to read:

"2.7.4.7. "Adaptive main-beam" means a main-beam of the AFS that adapts its beam pattern to the presence of oncoming and preceding vehicles in order to improve the long-range **illumination visibility ahead of the vehicle** ~~for the driver~~ without causing discomfort, distraction or glare to other road users."

Paragraph 5.14.4., amend to read:

"5.14.4. It shall not be possible deliberately, from the driver's seat, **if fitted**, to stop the movement of switched ON lamps before they reach the position of use. If there is a danger of dazzling other road users by the movement of the lamps, they may light up only when they have reached their position of use."

Paragraph 5.26.4., amend to read:

"5.26.4. No sharp variation of intensity shall be observed during transition.

It may be possible ~~for the driver~~ to set the functions above to static luminous intensities."

Add a new paragraph 6.1.7.2.1. to read:

6.1.7.2.1. In the case that the vehicle is controlled by a [DSC], the control signals being produced by a sensor system which shall be capable, in addition to the Requirements in paragraph 6.1.7.2., of detecting and reacting to vulnerable road users such as, pedestrians, unlighted bicycles, horses, etc.

Paragraph 6.2.6.1.1., amend to read:

¹ Examples include setting the starting point, destination, route, and way points to be used by an ADS during a trip.

² [In this document, the ODD only refers to the vehicle's external environment condition. If all conditions are referred to, a different term can be defined.]

"6.2.6.1.1. The initial downward inclination of the cut-off of the dipped-beam to be set in the unladen vehicle state with one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**, shall be specified within an accuracy of 0.1 per cent by the manufacturer and indicated in a clearly legible and indelible manner on each vehicle close to either headlamp or the manufacturer's plate by the symbol shown in Annex 7."

Paragraph 6.2.7.7., amend to read:

"6.2.7.7. The driver **or the [DSC]** shall at all times be able to engage the automatic operation."

Paragraph 6.3.6.1.1., amend to read:

"6.3.6.1.1. In the case of class "B" front fog lamps the vertical inclination of the cut-off to be set in the unladen vehicle state with one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**, shall be -1.5 per cent or lower. ¹³"

Paragraph 6.3.6.1.2.1.1., amend to read:

"6.3.6.1.2.1.1. The vertical inclination of the cut-off to be set in the unladen vehicle state with one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**, shall be - 1.0 per cent or lower. "

Paragraph 6.3.6.1.2.2.2., amend to read:

"6.3.6.1.2.2.2. The initial downward inclination of the cut-off to be set in the unladen vehicle state with one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**, shall be specified within an accuracy of one decimal place by the manufacturer and indicated in a clearly legible and indelible manner on each vehicle close to either the front fog lamp or the manufacturer's plate or in combination with the indication referred to in paragraph 6.2.6.1.1. by the symbol shown in Annex 7 to this Regulation. The value of this indicated downward inclination shall be defined in accordance with paragraph 6.3.6.1.2.2.1. "

Paragraph 6.4.7.2., amend to read:

"6.4.7.2. Moreover, the electrical connections of the two optional devices mentioned in paragraph 6.4.2.2. shall be such that these devices cannot be switched ON unless the lamps referred to in paragraph 5.11. are switched ON.

The devices fitted on the side of the vehicle may be switched ON for slow manoeuvres in forward motion of the vehicle up to a maximum speed of 15 km/h, provided that the following conditions are fulfilled:

- (a) The devices shall be switched ON and OFF manually by a separate control **or may be switched ON and OFF automatically by a [DSC]**;
- (b) If so switched ON, they may remain ON after reverse gear is disengaged;
- (c) They shall be automatically switched OFF if the forward speed of the vehicle exceeds 15 km/h, regardless of the position of the separate control; in this case they shall remain switched OFF until deliberately being switched ON again."

Paragraph 6.5.7., amend to read:

"6.5.7. Electrical connections

Direction-indicator lamps shall switch ON independently of the other lamps. All direction-indicator lamps on one side of a vehicle shall be switched ON and OFF by means of one control and shall flash in phase. **In addition, in the case of an activated [DSC], it may be operated automatically.**

On M₁ and N₁ vehicles less than 6 m in length, with an arrangement complying with paragraph 6.5.5.2. above, the amber side-marker lamps, when mounted,

shall also flash at the same frequency (in phase) with the direction-indicator lamps. "

Paragraph 6.6.7.1. amend to read:

"6.6.7.1. The signal shall be operated by means of a separate manual control, enabling all the direction-indicator lamps to flash in phase. **In addition, in the case of an activated [DSC], it may be operated automatically.**"

Paragraph 6.20.7.2., amend to read:

"6.20.7.2. When the reversing lamp is switched ON, both cornering lamps may be switched ON simultaneously, independently from the steering **angle wheel position** or direction-indicator **activation position**.

If so switched ON, both cornering lamps shall be switched OFF either:

- (a) When the reversing lamp is switched OFF; or
- (b) When the forward speed of the vehicle exceeds 15 km/h."

Paragraph 6.22.6.1.1., amend to read:

"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~~ **front seat, nearest to the opposing traffic**, 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."

Add a new paragraph 6.22.7.1.2.1. to read:

6.22.7.1.2.1. In the case that the vehicle is controlled by a [DSC], the control signals being produced by a sensor system which shall be capable, in addition to the Requirements in paragraph 6.22.7.1.2., of detecting and reacting to vulnerable road users such as, pedestrians, unlighted bicycles , horses etc..

Paragraph 6.22.7.1.3., amend to read:

6.22.7.1.3. **With the exception of an active [DSC]**, it shall always be possible to switch the main-beam headlamps, adaptive or non-adaptive, ON and OFF manually and to manually switch OFF the automatic control.

Moreover, the switching OFF, of the main-beam headlamps and of their automatic control, shall be by means of a simple and immediate manual operation; the use of sub-menus is not allowed.

Paragraph 6.22.7.5., amend to read:

"6.22.7.5. In case a driving system is not active, the driver shall always be able to set the AFS to the neutral state and to return it to its automatic operation. A [DSC] shall always be able to set the AFS to neural state."

Paragraph 6.22.8.4., amend to read:

"6.22.8.4. A tell-tale to indicate that the driver **or the [DSC]** has set the system into a state according to paragraph 5.8. of UN Regulation No. 123 or paragraph 4.12. of UN Regulation No. 149 is optional."

Annex 1,

Add new items 9.31. and 9.32. to read:

- "9.31. [Driving system control (DSC)]:yes/no².....
 9.32. Dual mode vehicle (DMV): yes/no²
 9.33. Automated Driving System (ADS) vehicle: yes/no²....."

Annex 5,

Paragraph 2., amend to read:

- "2. Loading conditions for different types of vehicles :
- **For vehicles designed to travel without occupants the presence of any persons shall be ignored.**
 - **For vehicles designed to travel with occupants the following loading conditions shall be applied:"**

Paragraphs 2.1.1.1. to 2.4.2.2., amend to read:

- "2.1.1.1. One person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic;**
- 2.1.1.2. ~~The driver~~ **One person in the front seat, nearest to the opposing traffic**, plus one passenger in the front seat farthest from the **first person driver**;
- 2.1.1.3. ~~The driver~~ **One person in the front seat, nearest to the opposing traffic**, one passenger in the front seat farthest from the **first person driver**, all the seats farthest to the rear occupied;
- 2.1.1.4. All the seats occupied;
- 2.1.1.5. All the seats occupied, plus an evenly distributed load in the luggage boot, in order to obtain the permissible load on the rear axle or on the front axle if the boot is at the front. If the vehicle has a front and a rear boot, the additional load shall be appropriately distributed in order to obtain the permissible axle loads. However, if the maximum permissible laden mass is obtained before the permissible load on one of the axles, the loading of the boot(s) shall be limited to the figure which enables that mass to be reached;
- 2.1.1.6. ~~Driver~~ **One person in the front seat, nearest to the opposing traffic**, plus an evenly distributed load in the boot, in order to obtain the permissible load on the corresponding axle.
- However, if the maximum permissible laden mass is obtained before the permissible load on the axle, the loading of the boot(s) shall be limited to the figure which enables that mass to be reached.
- 2.1.2. In determining the above loading conditions, account shall be taken of any loading restrictions laid down by the manufacturer.
- 2.2. Vehicles in categories M₂ and M₃¹;
- The angle of the light beam from the dipped-beam headlamps shall be determined under the following loading conditions:
- 2.2.1. Vehicle unladen and one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic;**
- 2.2.2. Vehicles laden such that each axle carries its maximum technically permissible load or until the maximum permissible mass of the vehicle is attained by loading the front and rear axles proportionally to their maximum technically permissible loads, whichever occurs first.
- 2.3. Vehicles in category N with load surfaces:
- 2.3.1. The angle of the light beam from the dipped-beam headlamps shall be determined under the following loading conditions;
- 2.3.1.1. Vehicle unladen and one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic;**

- 2.3.1.2. ~~Driver~~ **One person in the front seat, nearest to the opposing traffic**, plus a load so distributed as to give the maximum technically permissible load on the rear axle or axles, or the maximum permissible mass of the vehicle, whichever occurs first, without exceeding a front axle load calculated as the sum of the front axle load of the unladen vehicle plus 25 per cent of the maximum permissible payload on the front axle. Conversely, the front axle is so considered when the load platform is at the front.
- 2.4. Vehicles in category N without a load surface:
- 2.4.1. Drawing vehicles for semi-trailers:
- 2.4.1.1. Unladen vehicle without a load on the coupling attachment and one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**;
- 2.4.1.2. One person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**: technically permissible load on the coupling attachment in the position of the attachment corresponding to the highest load on the rear axle.
- 2.4.2. Drawing vehicles for trailers:
- 2.4.2.1. Vehicle unladen and one person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**;
- 2.4.2.2. One person in the ~~driver's seat~~ **front seat, nearest to the opposing traffic**, all the other places in the driving cabin being occupied."

II. Justification

1. This proposal to amend UN Regulation No. 48 (Installation of lighting and light-signalling devices) is submitted by the expert from the Task Force AVSR with the aim to introduce vehicles with a driving system, which controls its operation or may be operated by driver support features or automated driving features or by an Automated Driving System (ADS). In particular, it is based on the discussions at the Task Force on Autonomous Vehicle Signalling Requirements (TF AVSR) online meeting on 27 July 2023.
2. At the first TF AVSR meeting on 15 June 2022 in Stockholm, two new definitions for the purpose of this Regulation were added for clarification. The "Driving system" is the description for the parts of the vehicle that enable automated or autonomous driving. The operational mode, regardless of whether the vehicle is operated manually or automatically is defined as the "Driving mode" and taken from the key definitions in the standard SAE-J3016. That can be specified, e.g. as an autonomous driving mode, in the meaning that it is currently required in this Regulation. These two definitions make it possible to define the lighting requirements without having to go into detail about the different levels of automated or autonomous driving.
3. At its eighty-eighth session in April 2023, the Working Party on Lighting and Light-Signalling (GRE) requested TF AVSR to find common definitions with the Working Party on Automated/Autonomous and Connected Vehicles (GRVA). The TF AVSR - GRVA discussions started, but until the latest TF AVSR meeting it has not been possible to reach a common position. Therefore, the definitions in conjunction with the automated vehicles are put into brackets in the proposed text. The discussion with GRVA and its Informal Working Group on Functional Requirements for Automated and Autonomous Vehicles (IWG FRAV) will be continuing meanwhile.
4. The requirements in 6.11.7.3.2. need only an amendment in case there is no driver's door. There is in general a need for a warning, at least an audible signal, additional to the mandatory tell-tale if the ignition is switched OFF or the ignition key is withdrawn and the driver's door is opened, because this is independent from the driving mode a relevant information for the driver and prevents from unintentional actions. In addition, in Annex 5 for the loading conditions a clarification for vehicles without occupants was introduced.

Background supporting information

5. On 2 December 2021, the Federal Motor Transport Authority (KBA) granted the world's first type approval in the field of automated driving for an Automated Lane Keeping System (ALKS) for a model of the manufacturer Mercedes-Benz.
6. The basis is UN Regulation No. 157, which defines internationally harmonised safety requirements for automated lane-keeping systems. This type approval for automated driving granted by KBA is an important first step on the road to automation, as Mr. Richard Damm, President of KBA said on the occasion of the granting. KBA sets national, European and international standards for road safety on the road to autonomous driving. This is the key point, because it requires consumer confidence in the safety of the new technologies. In order to create this trust, we have applied a strict standard, which we, as pioneers in this field, will also adhere to further down the road, Mr. Richard Damm continued.
7. The automatic lane-keeping system - ALKS - is classified as "Level 3" automation. This is an automated mode in which the driver does not have to constantly monitor the system. UN Regulation No. 157 still limits the use of ALKS in its current form on motorway-like roads up to a speed of 60 km/h. The use of ALKS on motorway-like roads is not permitted. Under this condition, the driver can perform non-driving activities with the ALKS function switched on. However, the driver must be prepared at all times to resume driving after being requested to do so.
8. The number of type approvals for automated and autonomous driving vehicles will increase rapidly. Without rapid adaptation of UN Regulation No. 48, the entire Regulation may become less relevant in the long run as alternative regulations are developed somewhere else.
9. One example for that is “ANNEXES to the Commission Delegated Regulation (EU) 2022/... amending Annexes I, II, IV and V to Regulation (EU) 2018/858 of the European Parliament and of the Council as regards the technical requirements for vehicles produced in unlimited series, vehicles produced in small series, *fully automated vehicles produced in small series* and special purpose vehicles, and as regards software updates” which was expected to come into force on 6 July 2022³.
10. This includes “Annex II, Part I, Appendix 1 to Regulation (EU) 2018/858, containing the requirements for EU type-approval of vehicles produced in small series is amended and complemented to take into account Regulation (EU) 2019/2144 and the delegated acts and implementing acts adopted pursuant to it. In addition, the requirements for the EU whole vehicle type-approval of fully automated vehicles produced in small series are set out in a new Table 2 to that Appendix.”
11. The above Table 2 contains the requirements as follows:
- “D15 Installation of light signalling, road illumination and retro-reflective devices Regulation (EU) 2019/2144 A (which refers in general to UN Regulation No. 48)*
- Definition of: X (for manual driving mode) // A (for fully automated driving mode)*
- Additional requirements: The requirements shall remain the same, but in case of malfunctioning, the information shall be sent to ADS and the remote intervention operator (if applicable).*
- The activation of the lights is managed by the ADS.*
- For bidirectional vehicles, requirements shall be met in both directions unless it is incompatible with the use in agreement with the type-approval authority.”*
12. Therefore, TF AVSR proposes to adapt UN Regulation No. 48 as soon as possible.

³ [https://eur-lex.europa.eu/legal-content/NL/TXT/?uri=PI_COM:Ares\(2022\)2077610](https://eur-lex.europa.eu/legal-content/NL/TXT/?uri=PI_COM:Ares(2022)2077610)