

Amendments to document ECE/TRANS/WP.29/GRRF/2015/2

This document is presented by the Chair of the Lane Keeping Assistance System (LKAS) adhoc group for improving the wording of the document ECE/TRANS/WP.29/GRRF/2015/2, and solving the pending questions with regard to the warning provision. The group was not able to achieve consensus on the application dates of the amendments (wording remaining in square brackets). The modifications to the existing text of the Regulation are marked in **bold** for new or ~~strike through~~ for deleted characters. The changes added to ECE/TRANS/WP.29/GRRF/2015/2 are indicated in *red* text.

I. Proposal

Insert a new paragraph 2.3.4.2.1., to read:

"2.3.4.2.1. **"Lane Keeping Assistance System (LKAS)" means a system which assists the driver in keeping the vehicle within the chosen lane, by influencing the lateral movement of the vehicle.**"

Paragraph 5.1.6.1., amend to read:

"5.1.6.1. Whenever the Automatically Commanded Steering function becomes operational, this shall be indicated to the driver and the control action shall be automatically disabled if the vehicle speed exceeds the set limit of 10 km/h by more than 20 per cent or the signals to be evaluated are no longer being received. Any termination of control shall produce a short but distinctive driver warning by a visual signal and either an acoustic signal or by imposing a ~~tactile~~ **haptic** warning signal on the steering control."

Insert new paragraphs 5.1.6.2. to 5.1.6.5., to read:

"5.1.6.2. ***If an LKAS is fitted on the vehicle, then the LKAS shall meet the requirements contained in paragraphs 5.1.6.3. to 5.1.6.6. of this Regulation.***

5.1.6.2.3. **The LKAS shall be designed so that excessive intervention of steering control (e.g. an excessive steering torque) is suppressed to ensure the steering operability by the driver and to avoid unexpected vehicle behaviour, during its operation.**

The end of the intervention shall be such that the LKAS reduces its directional control to zero in a progressive manner, to ensure easy and safe handling of the vehicle, as defined in paragraph 5.1.1. The directional control fade-out strategy shall be at the discretion of the vehicle manufacturer.

The steering control effort necessary to override the directional control provided by the LKAS shall not exceed the value specified in paragraph 6.2.4.2. for an intact steering equipment.

5.1.6.3.4. **When the LKAS is temporarily not available, for example due to inclement weather conditions, the system shall clearly inform the driver about the system status, except if the system is in the OFF mode, e.g. switched off. This exception does not affect the required warning in the case of a system malfunction.**

5.1.6.4.5. The vehicle may be equipped with a means for the driver to activate or deactivate the LKAS.

~~5.1.6.5.6. The LKAS shall provide a means of detecting that the driver is likely to be no longer in primary control of the vehicle (e.g. by sensing the driver's input on the steering wheel). This means of detection is required to work when the system is available (i.e. ready to intervene or intervening).~~

~~When the LKAS is available and has detected that the driver is likely to be no longer in primary control of the vehicle, [until the driver takes primary control again / encouraging the driver to take primary control again / to call the driver's attention], effective warnings shall be given simultaneously or in a cascade involving at least two means out of optical, acoustic and appropriate haptic.~~

~~When the LKAS is available (i.e. ready to intervene or intervening), it shall provide a means of detecting that the driver is in control of the vehicle. In the event that the LKAS has detected that the driver is likely to be no longer in control of the vehicle, distinctive warning shall be provided until the driver is detected to be in control of the vehicle again (e.g. via input on the steering wheel, brake pedal actuation) or until the LKAS is deactivated, either automatically or manually. When the LKAS is automatically deactivated, the system shall clearly inform the driver about the system status.~~

~~The LKAS warning shall be provided by at least two means out of optical, acoustic and haptic given simultaneously or in a cascade."~~

Insert a new paragraph 12., to read:

"12 Transitional provisions

12.1. As from the official date of entry into force of the 02 series of amendments, no Contracting Party applying this UN Regulation shall refuse to grant or refuse to accept UN type approvals under this UN Regulation as amended by the 02 series of amendments.

12.2. For vehicles of categories M_1 and N_1 , as from [1 September 2016/2017/2018/2019 (00/12/24/36 months)], Contracting Parties applying this UN Regulation shall grant UN type approvals only if the vehicle type to be approved meets the requirements of this UN Regulation as amended by the 02 series of amendments.

12.3. For vehicles of categories M_2 , M_3 , N_2 and N_3 , as from 1 September 2020 (48 months), Contracting Parties applying this UN Regulation shall grant UN type approvals only if the vehicle type to be approved meets the requirements of this UN Regulation as amended by the 02 series of amendments.

12.4. For vehicles of categories M_1 and N_1 , as from [1 September 2019/2021 (36/60 months)], Contracting Parties applying this Regulation shall not be obliged to accept, for the purpose of national or regional type approval, a vehicle type approved to the preceding (01) series of amendments to this Regulation.

12.5. For vehicles of categories M_2 , M_3 , N_2 and N_3 , As from [1 September 2021 (60 months)], Contracting Parties applying this Regulation shall not be obliged to accept, for the purpose of national or regional type approval, a

vehicle type approved to the preceding (01) series of amendments to this Regulation.

12.6 *Contracting Parties applying this UN Regulation shall not refuse to grant extensions of UN type approvals for existing types which have been granted according to the preceding series of amendments to this UN Regulation."*

II. Justification

1. The justification below explains the changes proposed to the official document ECE/TRANS/WP.29/GRRF/2015/2.

2. Paragraph 5.1.6.1: The word "tactile" is changed into "haptic" for consistency with the wording adopted for LKAS paragraph 5.1.6.6., and alignment with UN Regulation No. 130 on Lane Departure Warning System (LDWS).

3. Paragraph: 5.1.6.2.: The adhoc group confirmed that LKAS is an "if fitted" equipment, i.e. defined as optional to the manufacturer within UN Regulation No. 79. The proposed wording provides complete flexibility to the Contracting Parties signatory to this Regulation to mandate this system at national level at their best convenience.

4. The following paragraphs are re-numbered taking into account to the insertion of paragraph 5.1.6.2.

5. Paragraph 5.1.6.6. (Detection and warning strategies):

(a) The structure of paragraph 5.1.6.5. (Former) is improved to be simpler and crisper.

(b) The wording "*LKAS... shall provide a means of detecting that the driver is in control of the vehicle*" was preferred to the wording in the previous draft proposals on LKAS:

(i) The original wording from the LKAS Small Drafting Group in document GRRF-78-05 (i.e. "The system shall have at least 1 type of means to detect driver's attention e.g. by sensing the driver's hands on the steering wheel") was rejected by the group because no system is able to directly detect whether the driver is attentive or inattentive. Existing systems are able to monitor the driver's activity related to the driving tasks. Such detection may be performed via:

- a direct monitoring of the driver's input on the vehicle control(s) (e.g. input to steering wheel, brake pedal etc.),
- a monitoring of the effect of the driver's input on the vehicle path (e.g. analysing the position of the vehicle in the lane, as a result of the driver's action), or
- a combination of both ways.

In any case, these detection means only give an indication on whether the driver is attentive or not. Thus, requiring a means to detect "driver's attention" was considered not appropriate.

(ii) The proposal in the official document GRRF/2015/02 ("*LKAS shall provide a means of detecting that the driver is likely to be no longer in primary control of the vehicle (e.g. by sensing the driver's input on the steering wheel*") was modified by the group because this wording may

create misunderstandings. Indeed, some Park Assist Systems in current production have been approved as Automatically Commanded Steering Function (ACSF), which clearly means that a driver can drive “hands-off” while still being “in primary control of the vehicle”. Thus, the wording “driver in primary control of the vehicle” was considered not matching the intention of the LKAS requirement of paragraph 5.1.6.6.

- (c) The group then agreed on the wording “*LKAS shall provide a means of detecting that the driver is in control of the vehicle*”. This wording indeed avoids all issues listed above (related to “driver’s attention”, “in primary control” etc.), while not being design restrictive. Indeed, this wording is open to systems which may:
 - (i) monitor the driver’s input on the control(s);
 - (ii) monitor the effect of the driver’s input of the vehicle path;
 - (iii) monitor the driver’s attention (this is currently feasible to a limited extent but may be developed in the future).

6. The text provides an alternative for the termination of the warning:

- (a) When “*the driver is detected to be in control of the vehicle again*”;
- (b) When the LKAS “*is deactivated*”. The wording “deactivated” has been preferred to “switched OFF”, to be consistent with the terminology already used in paragraph 5.1.6.5.

7. Regarding the warning itself, the flexibility given for the warning is a must for the vehicle manufacturers for keeping the Human Machine Interface (HMI) consistent among the different functions of the vehicle, e.g. for avoiding Advanced Emergency Braking System (AEBS) or LDWS warnings being mixed up or interfering with LKAS warnings (AEBS and LDWS also require optical, acoustic and haptic warnings).

8. The new wording also specifies that the warning must be “distinctive”, for consistency with the existing text of paragraph 5.1.6.1. The group acknowledged the understanding that the warning must be “distinct” from e.g. the other ambient noises present in a vehicle in normal driving conditions. It was also clarified that the wording does not mean that the warning must be different to that of e.g. LDWS.

9. Transitional provisions:

- (a) The adhoc group did not reach consensus on application dates for vehicles of categories M_1/N_1 , while it achieved general agreement for the vehicles of categories $M_2/M_3/N_2/N_3$.
- (b) Industry found a lead time of 36 months necessary for M_1/N_1 new vehicle types, and 60 months for existing types, based on the following:
 - (i) The manufacturers need time to develop, validate and certify the hardware and software for existing production as well as for the products still under development. Systems like LKAS need millions of kms of testing in all conditions (winter, summer, urban, suburban, highway, etc.) to ensure robustness of the system.
 - (ii) The production of new requirements for an existing and evolving technology makes a hard impact to manufacturers having systems in development, because LKAS, as a safety system, could turn into a “danger” system, should the proper tests and validation work be

neglected due to lack of time. Manufacturers still developing LKAS would face constraints in terms of delay, extra-development costs, disturbance in the product and marketing plans, loss of competitiveness vs. manufacturers having already launched their systems on the market etc. in spite their system have positive impact on safety (and comfort).

- (iii) For example some "basic systems" only intervene shortly when the vehicle crosses the lane marking (the intervention is a haptic warning). Such systems prevent overreliance as they do not "encourage" a driver to drive "hands-off", they hardly comply with the requirements of paragraph 5.1.6.6., yet they do not create any safety issue.
 - (iv) LKAS, as safety system, could turn into a "danger" system, should the proper tests and validation work be neglected due to lack of time.
 - (v) The systems currently in production are approved to UN Regulation No. 79 thanks to its CEL annex. As no safety issue exist today there is no strong reason not to give to the industry sufficient time for implementation.
 - (vi) Market competition will drive the introduction of LKAS. It could be detrimental to the users' acceptance (e.g. generation of false alerts) if the introduction of this new technology requires conformance earlier than 36 months after it is regulated by the amended text. The users' defiance vis-à-vis a new safety-related technology could jeopardise the correct introduction of this technology.
- (c) Germany and the Netherlands propose 0 months for New Types (paragraph 12.2.) because the new requirements are at interpretation level and as far as they know, all the systems on the market fulfil the new requirements and transitional provisions would allow systems not fulfilling the new requirements. Those systems not fulfilling the new requirements are at a too low safety level.
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