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World Forum for Harmonization of Vehicle Regulations**Working Party on Automated/Autonomous and Connected Vehicles*****Fourth session**

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Item 8 (a) of the provisional agenda

UN Regulations Nos. 13, 13-H, 139 and 140:**Electronic Stability Control****Proposal for amendments to amendments to UN Regulation
No. 140 (Electronic Stability Control)****Submitted by the experts from the International Organization of Motor
Vehicle Manufacturers and the European Association of Automotive
Suppliers****

The text reproduced below was prepared by the experts from the International Organization of Motor Vehicle Manufacturers (OICA) and the European Association of Automotive Suppliers (CLEPA), proposing to amendments to UN Regulation No. 140 (Electronic Stability Control (ESC)). The modifications to the existing text of the Regulation are marked in bold for new, and strikethrough for deleted characters.

* Formerly: **Working Party on Brakes and Running Gear (GRRF)**.

** In accordance with the programme of work of the Inland Transport Committee for 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21/Add.1, Cluster 3), 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 9.9.4., amend to read:

“9.9.4. The steering amplitude of the final run in each series is the greater of 6.5 A or 270 degrees, provided the calculated magnitude of 6.5 A is less than or equal to 300 degrees. If any 0.5 A increment, up to 6.5 A, is greater than 300 degrees, the steering amplitude of the final run shall be 300 degrees.

If the above calculated steering amplitude of the final run is greater than the maximum operable steering wheel angle determined by design of the steering system, the final angle amplitude for the series test may be the maximum operable angle.”

II. Justification

Background

1. UN Regulation No. 140 (ESC) prescribes that the “Sine with Dwell” series test of vehicle directional stability performance shall be conducted with:

- (a) The initial steering wheel angle amplitude of 1.5A (as defined in paragraph 9.9.2.);
- (b) The steering wheel angle amplitude is increased by 0.5A from a test run to next run (paragraph 9.9.3.);
- (c) The final steering wheel angle amplitude of the greater of 6.5A or 270 degrees. If any 0.5 A increment, up to 6.5 A, is greater than 300 degrees, the steering amplitude of the final run shall be 300 degrees (paragraph 9.9.4.), where "A" is the steering wheel angle that produces a steady state lateral acceleration of 0.3 g for the test vehicle, which is determined from the “Slowly Increasing Steer” test (paragraph 9.6).

2. In these test conditions, the normalized angle “A” evacuates the influence of the steering gear ratio in relation to the steering wheel angle and vehicle behavior. The lower the steering gear ratio is (i.e. the quicker the steering characteristic is), the smaller the angle “A” and steering angle amplitude for each test run are, to provide constant steered wheel angle implying constant lateral movement of vehicle, regardless of the steering gear ratio, for reasonable testing of ESC.

3. However, the final steering wheel angle amplitude is fixed between 270 and 300 degrees, which are absolute values, not the normalized angles that exclude the influence of the steering gear ratio of each vehicle.

Concern for future steering systems

4. There might appear in the future some vehicles which have significantly low steering gear ratio (i.e. quick steering characteristics) and which may not be able to achieve the specified final absolute angle amplitude in the ESC test, then jeopardizing future beneficial improvement of steering equipment e.g. steering-by-wire system.

Justification of the proposal

5. The above proposal would be appropriate because:

(a) The original intention of the ESC regulation would not be prejudiced as UN GTR No. 8 (ESC), produced in parallel to the text of UN Regulation No. 140, mentions that the final steering wheel angle amplitude of 270 to 300 degrees was decided based on the investigation of an average driver’s ability to operate steering wheel as fast as possible under the specified “Sine with Dwell” condition (ECE/TRANS/180/Add.8, paragraphs 190 and 191 of the preamble). Thus, the decision was based on maximum achievable steering wheel input. Without prejudice to the above intention, the final steering wheel angle amplitude for the series of tests could be decided to be the maximum operable steering wheel angle of the steering system if the maximum operable angle is less than 270 degrees. It is because the maximum operable angle is equivalent to the maximum achievable steering input in this case.

(b) The ESC regulation is not intended to prescribe a maximum operable steering wheel angle. It would not be reasonable to judge that a vehicle equipped with low geared steering system (i.e. quick steering characteristics) is incompliant with the ESC regulation for the simple reason that the operable steering wheel angle is less than 270 degrees, even though it is adequately safe in practical use with technical development and complies with UN Regulation No. 79 steering requirements.

Note by the secretariat:

The authors of the document are highlighting the following paragraphs of UN Regulation No. 140, relevant for this proposal: paras. 5., 5.1., 7., 7.1., 7.2., 7.3., 7.3.1., 7.3.2., 9., 9.6., 9.6.1., 9.9., 9.9.1., 9.9.2., 9.9.3., 9.9.4. (also reproduced in informal document GRVA-02-23).
