

## Proposal for amendments to UN Regulation No. 140 Electronic Stability Control (ESC) Systems

The text below was prepared by the experts from the European Association of Automotive Suppliers (CLEPA) and the International Organization of Motor Vehicle Manufacturers (OICA) and is an amendment proposal to ECE/TRANS/WP.29/GRVA/2023/9. The modifications to the existing text of the Regulation are marked in **bold** for new or ~~struckthrough~~ for deleted characters.

### 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 shall be greater than 98 per cent of the maximum operable angle.

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**In case if that tyre saturation of the front tyres happens occurs before the above calculated magnitude angle, this angle may then the amplitude at which it occurs may be used as the final steering amplitude, but only if this angle is greater than or equal to 6.5 A.**

**Tyre saturation shall be considered to have occurred when all of the following parameters have reached their peak value (i.e. these parameters have not increased between two successive increments of 0.5 A):**

- **Peak lateral acceleration (see Paragraph 9.11.3)**
- **Second peak yaw rate (see Paragraph 9.11.8)**
- **Lateral displacement 1.07 seconds after BOS (see Paragraph 9.11.9)**

**It is not required for the peak values to occur in the same test run.”**

### II. Justification

1. Reaching fixed amplitude, i.e., fixed steering wheel angular speed due to given 0.7 Hz sine frequency, requires more torque with quick steering gear ratio systems than with slow steering gear ratio systems, and produces much more wheel steer.

2. The vehicle behaviour (yaw rate, lateral acceleration and thus trajectory) is similar for all amplitudes above approximately 7 to 8 A (i.e., more than 7 times the steering wheel angle corresponding to 0.3 g), because front tyres are “saturated”.

3. Front tyres saturation occurs when there is no increase of yaw rate, lateral acceleration or deviation of the trajectory.
  4. Above front tyres saturation, more steer of the front wheels doesn't provide more lateral force, so yaw rate and lateral acceleration don't increase. Continuing to increase steering wheel amplitude after front tyre saturation doesn't give more information.
  5. There might appear in the future some vehicles which have significantly low steering gear ratio (i.e., quick steering characteristics) and may need too much steering wheel torque to achieve the 270 degrees sine amplitude at 0.7 Hz (not reachable by conventional steering robots), then jeopardizing the easy approval of future beneficial steering equipment e.g. steer-by-wire (SBW) systems.
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