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World Forum for Harmonization of Vehicle Regulations**Working Party on Passive Safety****Seventy-second session**

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Item 11 of the provisional agenda

UN Regulation No. 134 (Hydrogen and Fuel Cells Vehicles)**Proposal for Supplement 5 to the Original Version and Supplement 2 to the 01 Series of Amendments to UN Regulation No. 134 (Hydrogen and Fuel Cells Vehicles)****Submitted by the expert from France***

The text reproduced below was prepared by the expert from France to clarify the procedure and the characteristics of the measuring device used for the compliance test of the vehicle exhaust system. The modifications to the current text of the UN Regulation are marked in bold for new or strikethrough for deleted characters.

* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in the proposed programme budget for 2022 (A/76/6, part V, sect. 20, para. 20.76), 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

Annex 5,

Paragraphs 4.4. and 4.5., amend to read:

- "4.4. The exhaust hydrogen concentration is continuously measured during the following steps:
- (a) The power system is shut down;
 - (b) Upon completion of the shut-down process, the power system is immediately started;
 - (c) After **completion of the start-up process as defined by the manufacturer**~~a lapse of one minute~~, the power system is turned off and measurement continues until the power system shut-down procedure is completed.
- 4.5. The measurement device shall: ~~have a measurement response time of less than 300 milliseconds~~
- (a) **Have a measurement response-time ($t_0 - t_{90}$) of less than two seconds, where t_0 is the moment of hydrogen concentration switching, and t_{90} is the time when 90 per cent of the final indication is reached.**
 - (b) **Have a resolution time of less than 300 milliseconds (sampling rate of >3.33 Hz)."**

II. Justification

1. The proposal is meant to clarify the procedure and the characteristics of the measuring device used for the compliance test for the vehicle exhaust system. It is based on the ongoing work of UN GTR No. 13, Phase 2.
 2. Paragraph 4.4.: During the compliance test for the vehicle exhaust system, the exhaust hydrogen concentration is continuously measured during several steps. The power system is shut-down. The power system is immediately started upon completion of the shut-down process. After a lapse of one minute, the power system is turned off and measurement continues until the power system shut-down procedure is completed. However, the start-up process may last longer than one minute and may allow a "normal shutdown" not before one minute. Therefore, it would be more appropriate to turn off the system after completion of the start-up process. The text is clarified accordingly.
 3. Paragraph 4.5.: In the compliance test for vehicle exhaust system, the measurement device should have a measurement response time of less than 300 milliseconds. However, no hydrogen analyser is on the market with a response time of less than 300 milliseconds. The instrument which can be used for observing hydrogen emissions with an appropriate time resolution is a vacuum mass spectrometer. The pressure reduction from atmosphere to an appropriate vacuum level needs a respective length of a thin capillary which results in a travel time which is longer than 300 milliseconds. Therefore, the maximum measurement response time is updated to two seconds. Requirements on the resolution time of the measurement device were also added.
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