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Addendum 18: United Nations Global Technical Regulation No. 18

United Nations Global Technical Regulation on On-Board Diagnostic (ODB) systems for L-category vehicles

(Established in the Global Registry on 11 November 2020)

Amendment 1 – Appendix 1

Proposal and report pursuant to Article 6, paragraph 6.2.7. of the Agreement

- Revised authorization to develop amendments to UN Global Technical Regulation No. 2 and to develop new UN Global Technical Regulations and UN Regulations in the area of Environmental and Propulsion unit Performance Requirements (EPPR) for light vehicles (ECE/TRANS/WP.29/AC.3/36/Rev.1).
- Technical Report on the development of Amendment 1 to UN Global Technical Regulation (UN GTR) No. 18 (On-Board Diagnostic (OBD) systems for L-category vehicles) (ECE/TRANS/WP.29/2020/130), adopted by AC.3 at its fifty-ninth session (ECE/TRANS/WP.29/1155, paras. 142-143).



UNITED NATIONS



Revised authorization to develop amendments to UN Global Technical Regulation No. 2 and to develop new UN Global Technical Regulations and UN Regulations in the area of Environmental and Propulsion unit Performance Requirements (EPPR) for light vehicles

I. Objectives

1. The objective of this proposal is to significantly extend the time for the working group to continue working on the mandate (ECE/TRANS/WP29/AC.3/36) given by the World Forum for Harmonization of Vehicle Regulations (WP.29) to establish amendments to UN Global Technical Regulation (UN GTR) No. 2 (Worldwide harmonized Motorcycle emissions Certification/test procedure (WMTC)) with respect to Environmental and Propulsion unit Performance Requirements (EPPR), currently only applicable for two-wheel motorcycles in the framework of the 1998 Global Agreement. If the scope and the purpose of UN GTR No. 2 is not considered to be appropriate it will be proposed to amend the scope and purpose or develop new UN GTRs making reference to the relevant parts of UN GTR No. 2.
2. The objective is to develop requirements and/or test procedures under the 1998 Agreement, and create synergies with the 1958 Agreement UN Regulations. Where possible, develop common requirements in the form of one or more UN Regulations and one or more UN GTRs as well as associated amendments and/or supplements;
3. To exchange information on current and future regulatory requirements in the area of environmental and propulsion unit performance requirements for "category 3 vehicles" or "L-category vehicles";
4. To minimize the differences between these regulatory requirements, with a view towards facilitating the development of light vehicles to comply with such internationally harmonised requirements;
5. Assessing the coherency with other regulatory requirements and groups, such as those regarding Worldwide harmonized Light vehicles Test Procedure (WLTP), Electric Vehicles and the Environment (EVE) and Vehicle Propulsion System Definitions (VPSD);
6. To build further on the output of the group after finalising its first mandate (January 2013 – January 2016). The group managed to work on a number of priority items and the goal of this next stage of work is to continue working in order to further progress in harmonising EPPR for light vehicles.

II. Introduction

7. The proposal for setting up an Informal Working Group (IWG) regarding EPPR for light vehicles operating under the Working Party on Pollution and Energy (GRPE) came at the initiative of the European Union, represented by the European Commission, DG GROW. The intention of setting up the group was announced at the GRPE meetings in January and June 2012 and at the WP.29 plenary session in June 2012. A mandate to start the activities in the EPPR informal group was endorsed by WP.29 at its November 2012 session. The group had its first meeting in January 2013.
8. The working group is established under both the 1958 and 1998 Agreements to create the basis for the possible development of UN Regulations and UN GTRs in the area of EPPR. All global partners are invited to join the group and share experiences regarding setting relevant regulatory requirements as well as from the market.
9. The group aims replicating the successful approach of the UN GTR No 2 subgroup operating under GRPE, which facilitated an exchange of information among participants when each party had domestic regulatory requirements for an emission laboratory test cycle to measure exhaust gas emissions from a motorcycle after cold start. In 2011 a unique event took

place in which Contracting Parties endorsed Amendment 2 to UN GTR No. 2 putting forward global exhaust gas emission limit values for type I emissions test for motorcycles (WMTC). Building on this success the process of international collaboration should continue to further harmonise requirements in the area of EPPR for the whole range of light vehicles.

10. The group will furthermore review technical progress of current and near future powertrain technology, including e.g. electrified powertrains and different fuel types and develop appropriate requirements for such technical progress.

11. The IWG started to work under its first mandate on harmonized test procedures for two-wheeled vehicles equipped with conventional combustion engine technology but the objectives also includes three-wheeled vehicles and other propulsion types in the next stage of work. It was decided that the scope of discussions does not cover light four-wheeled vehicles on emission related GTRs under the 1998 Agreement in EPPR IWG. The scope of discussions for the UN Regulations under the 1958 Agreement was not discussed yet and this may be discussed under GRPE or WP.29. Regarding the three-wheeled vehicles, it is necessary to recognize the situation of present regulation in each country and then to consider the appropriate regulation. Nevertheless three-wheeled vehicles are regarded to be in the scope of work of the group. For the five considered GTRs and corresponding five UN Regulations draft proposals as well several amendments to deal with different levels of stringency were submitted to the group, but owing to time constraints three priority subjects were identified and selected for the first stage of work:

(a) A draft GTR on test types III (crankcase emissions) and test type IV (evaporative emissions);

(b) A draft GTR with regard to on-board diagnostics, UN stage 1;

(c) Entire revision of GTR No 2 to dedicate separate sections to test types I (tailpipe emission after cold start), II (idle / free acceleration emissions) and VII (energy efficiency) and update the GTR for technical progress.

12. In this second stage the group is going to discuss the remaining draft proposals and to attempt to finalise the tasks identified in the base mandate.

13. For the remaining subjects in this second stage, the group will continue to first develop requirements for 2-wheeled vehicles (motorcycles and mopeds; categories 3-1, L-1 and 3-3 and L3) with conventional combustion engine technology. Progressively other vehicles categories and other propulsion unit types will be considered to be included.

III. Areas of work in the working group

14. The main activities of the group are proposed to be focussing on revising or establishing the following environmental performance verification test types:

Type I Tailpipe emissions test after cold start;

Type II Tailpipe emissions test at (increased) idle / free acceleration test;

Type III Emission test of crankcase gases, including appropriate test procedures, if deemed necessary;

Type IV Evaporative emissions test;

Type V Durability testing of pollution control devices;

(Type VI) (Cold ambient emissions. This test type is considered out of scope)

Type VII Measurement of energy efficiency (CO₂ emissions, fuel consumption, electric energy consumption and electric range determination);

Type VIII Environmental on-board diagnostic verification tests.

15. In addition the group should assess and develop functional aspects of On-Board Diagnostic (OBD) systems.

16. In addition the group should assess and develop propulsion unit performance requirements for conventional vehicles equipped with combustion engines only as well as for advanced concepts such as electric and hybrid electric powertrains. Unified rules and test procedures to measure power and torque for this wide range of propulsion technologies fitted on light vehicles as well as unified measurement of maximum design vehicle speed and/or power for restricted light vehicles should be developed and agreed upon.

17. For both environmental and propulsion unit performance requirements all possible fuels should be taken into consideration: petrol, petrol-ethanol mixtures, diesel, biodiesel but also gaseous fuels such as compressed natural gas, liquified petroleum gas, hydrogen and their blends.

18. In addition it should be assessed whether “light vehicle” classification can be further optimised and refined. After an initial assessment by the EPPR IWG, to clarify whether there are needs of these issues or not for the purpose of environmental requirements, the result should be reported to WP.29.

IV. Existing regulations and directives

19. A stocktake of the regional regulations and directives applicable to L-category vehicles as well as UN Regulations Nos. 40, 47, 68, 83, 85, 101, UN GTR No. 2 and the work in progress regarding WLTP has been a first step on which the group based its work. Further consultation of developing regional/country specific legislation will be done to ensure coherence and meeting the needs of the Contracting Parties to the 1958 and 1998 Agreements.

V. Timeline

20. The plan is based on the draft roadmap and will regularly be reviewed and updated to reflect the latest situation on progress and the feasibility of the timeline.

(a) 9-12 June 2015: GRPE (71st session) official meeting of the informal working group. Presentation of roadmap and related programme management items to GRPE submitted for adoption;

(b) 10-13 November 2015: World Forum for Harmonization of Vehicle Regulations (167th session of WP.29), adoption of GRPE decision regarding the roadmap and related programme management items;

(c) 2016-2020: meetings of the working group, regularly reporting to GRPE and the Administrative Committees;

(d) Jan 2020: presentation of a final report as an informal document at GRPE;

(e) 2020: possible adoption of UN Regulation(s) and Global Technical Regulation(s), with respective amendments.

Technical Report on the development of Amendment 1 to UN Global Technical Regulation (UN GTR) No. 18 (On-Board Diagnostic (OBD) systems for L-category vehicles)

I. Mandate

1. Amendment 1 to the UN GTR No. 18 was developed by the Informal Working Group (IWG) on Environmental and Propulsion Performance Requirements of L-category vehicles (EPPR). The Executive Committee (AC.3) of the 1998 Agreement adopted the authorisation to develop amendments to UN GTR No. 18 at its 45th session (12 November 2015) (ECE/TRANS/WP.29/AC.3/36/Rev.1).

II. Objectives

2. This UN GTR establishes harmonized functional requirements for OBD and a procedure to test and verify the environmental OBD functions (test type VIII).
3. The scope includes two- and three-wheeled vehicles of category 3¹ equipped with conventional combustion engine technology, while the objectives also include other propulsion types in the next stage of work.
4. The scope of discussions does not cover light four-wheeled vehicles on emission related UN GTRs.

III. Meetings held by the Informal Working Group (IWG)

5. The proposed text of Amendment 1 to UN GTR No. 18 addressing the points listed in section II above was discussed at length and agreed upon by all participants in numerous IWG meetings and of an ad-hoc OBD2 Correspondence Group (OBD2CG). These meetings took the format of either face-to-face or audio/web meetings.

IV. Technical references in the development of the UN GTR

6. For the development of the UN GTR, the following legislation and technical standards contain relevant applications of requirements for motorcycles and other vehicles in the scope of this UN GTR or transferable provisions for passenger cars:
 - (a) UN (1958 Agreement, light-duty legislation): Chapter 11 of Regulation No. 83;
 - (b) UN (1998 Agreement, heavy-duty legislation): UN GTR No. 5;
 - (c) UN Mutual Resolution No. 2 (M.R.2);
 - (d) EU: Annex XII to Regulation (EU) No. 44/2014 (Delegated Act on Vehicle Construction Requirements supplementing Regulation (EU) No. 168/2013) with respect to functional OBD requirements, Annex VIII of Regulation (EU) No. 134/2014 (Delegated Act on Environmental and Propulsion Unit Performance Supplementing Regulation (EU) No. 168/2013) and Article 21 of Regulation (EU) No. 168/2013;
 - (e) Japan: Safety Regulations for Road Vehicles, Article 31, Attachment 115;
 - (f) The United States of America (light-duty legislation): US CFR, Title 40, Part 86, Subpart S;

¹ Source: SR1_TRANS-WP29-1045e (S.R.1) about vehicle categories, masses and dimensions: §2.1. "Category 3 vehicle" means a power driven vehicle with 2 or 3 wheels designed and constructed for the carriage of persons and/or goods.

(g) Standards:

(i) International: ISO 2575, ISO 9141-2, ISO 14229-3, ISO 14229-4, ISO 14230-4, ISO 15031-4, ISO 15031-5, ISO 15031-6, ISO 15765-4, ISO 20828, ISO 22901-2;

(ii) USA: SAE J1850.

V. Main resolutions agreed by the IWG

The following summary indicates the main resolutions agreed by the IWG and explanations for such decisions.

7. Purpose; This UN GTR establishes harmonized functional requirements for OBD and a procedure to test and verify the environmental OBD functions (test type VIII). The functional requirements and test procedures were developed so that they would be able to provide an internationally harmonized set of functional OBD requirements with respect to the "infra-structure" on-board of a vehicle in the scope of this UN GTR, which determines hardware and software design in a technology-neutral way and that considers technical feasibility and cost-effectiveness.

8. Applicability; The Informal Working Group followed its agreed terms of reference and prepared Amendment 1 to UN GTR No. 18 for two- and three-wheeled vehicles of category 3² under the 1998 Agreement. The IWG will, in due time, prepare an equivalent UN Regulation for L-category vehicles in its scope under the 1958 Agreement.

9. Fuels; Only petrol and diesel were considered. As was the case for UN GTR No. 2, Contracting Parties were of the opinion that, being alternate fuels not used for two-wheeled vehicles in a large scale, adding alternate fuels to the scope of this UN GTR would increase the work load of the IWG considering the timeline assigned for the formulation of this amendments to UN GTR No. 18. Therefore, it was agreed to take up the addition of alternate fuels in further revisions within the scope of this GTR.

10. Definitions; The definitions used in this GTR are taken from the draft common definitions incorporated in S.R.1, as well as from the work of the UN Vehicle Propulsion System Definitions (VPSD) group operating under GRPE with the goal to harmonise high level powertrain definitions and from other international and regional legislation.

11. Technical background.

11.1. The European Commission (EC) launched an EPPR study for L-category vehicles in January 2012³ with the objective to develop proposals to update UN GTR No. 2 for technical progress and to develop proposals for UN GTRs and Regulations with respect to harmonized EPPR legislation not yet covered at the international level for two- and three-wheeled vehicles, e.g. crankcase and evaporative emission test requirements, on-board diagnostic requirements, propulsion unit performance requirements, etc. The output of this comprehensive study was submitted for the review and comments to the IWG on EPPR. The objective was to identify concerns and to provide ready base-proposals for further enhancements by the IWG on EPPR. This would accommodate the needs at the international level to assess a vehicle with respect to on-board diagnostics based on scientific evidence, being objective and developed in a globally accepted way.

11.2. A further study on behalf of the EC (Effect study of the environmental step Euro 5 for L-category vehicles⁴) indicated that the introduction of catalytic converter monitoring via OBD provided a cost beneficial (CBA) procedure to control possible tampering with the exhaust system of the vehicle specially for positive ignition engines systems (namely reducing the possibility of catalyst removal) in Europe.

² ECE/TRANS/WP.29/1045, as amended by Amends. 1 and 2 (Special Resolution No. 1).

³ Document reference EPPR-07- 07

⁴ doi:10.2873/397876. The report provided technical support and a cost-benefit analysis for assessing the individual measures within the Euro 5 package. It also served as technical background for the Report that according to paragraph 5 of Article 23 of Regulation (EU) No 168/2013, the European Commission needed to present to the European Parliament and the Council.

11.3. IMMA provided a study on countries from other regions of the world related to OBD and in particular, on the tampering rate of L-category vehicles (OBD2CG-17-01 (IMMA)). This study indicated that, in those regions, the CBA for the introduction of catalytic monitoring via OBD was negative.

12. Catalytic converter monitoring; The EC could not accept that the OBD would not continuously monitor the catalytic converter deterioration, as it was also one of the main means to fight against exhaust system tampering. Tampering prevention was very high on the EC agenda. Other Contracting Parties were also in agreement that anti-tampering of the exhaust system is a must and therefore, although not wanting to require a catalytic converter monitoring via OBD, they would like to see wordings that allow for other approaches. After several reiterations, a common proposal by Japan and the EC was agreed upon by introducing catalytic converter monitoring via OBD as a Contracting Party option. The Contracting Parties were also granted the possibility to exempt catalyst monitoring for certain vehicle classes only. Prescriptions in 5.3.4. also allow the Contracting Party to impose alternative methods for controlling the tampering with the exhaust system (catalytic converter). However, it is understood that a Contracting Party may only choose to prescribe other (alternative) conditions that the exhaust system needs to satisfy (paragraph 5.3.4.2) if paragraph 5.3.4.1 is not satisfied by the manufacturer. The following alternative methods were discussed and agreed as recommendation among the CPs:

12.1. Installation/use of exhaust systems where the silencer is detachable from the exhaust header pipe by fasteners capable of sustaining exhaust emissions below the NMHC and NO_x OBD thresholds provided in paragraph 5.5.1. measured at the location of fastening for the duration of the vehicle's useful life.

12.2. Installation/use of exhaust systems where the silencer is integrated into the exhaust header pipe with no fasteners and requires a special tool for detaching the exhaust system from the engine. Equivalent clauses were not introduced for compression-ignition engines, since the market for diesel category 3 vehicles is very limited and therefore special emphasis was not put on those engines.

13. Continuous vehicle operation at idle.

13.1. Paragraph 4.5.1. (c) in Annex 1 to Amendment 1 to UN GTR No. 18 fails to clarify how to handle vehicles equipped with start-stop function that cannot keep continuous operation at idle. The clarification is made in EC EURO 5 regulation in the part that regulation addresses hybrid vehicles. Unfortunately, although Amendment 1 to UN GTR No. 18 is based on the EC EURO 5 regulation, it does not address at this stage hybrid vehicles. Therefore paragraph 4.5.1. (c) needs to be understood as:

13.2. "the idle operation includes the idle-stop situation, since both conditions (accelerator pedal release and vehicle speed <1.6 km/h) are fulfilled even with an unfired engine."

13.3. This will also be in line with the light vehicle regulation where cars (which already have In-Use-Performance Ratio (IUPR) in place) use idle stop as included in idle time.
