

**Economic and Social Council**Distr.: General
26 October 2018

Original: English

Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Pollution and Energy****Seventy-eighth session**

Geneva, 8-11 January 2019

Item 3(a) of the provisional agenda

Light vehicles: UN Regulations Nos. 68 (Measurement of the maximum speed, including electric vehicles), 83 (Emissions of M₁ and N₁ vehicles), 101 (CO₂ emissions/fuel consumption) and 103 (Replacement pollution control devices)**Proposal for a new Supplement to the 06 and 07 series of amendments to UN Regulation No. 83 (Emissions of M1 and N1 vehicles)****Submitted by the expert from the International Organization of Motor Vehicle Manufacturers***

The text reproduced below was prepared by the expert from the International Organization of Motor Vehicle Manufacturers (OICA) to clarify the relationship between approval levels, reference fuels and PN limits for PI vehicles and to modify the calculation formulae for determination of evaporative emissions in accordance with changes already agreed in UN GTR No. 19. The modifications to the current text of the 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 2018–2019 (ECE/TRANS/274, para. 123 and ECE/TRANS/2018/21 and Add.1, Cluster 3), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

GE.18-17904(E)



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I. Proposal

Amend footnote 7 to Table A in paragraph 5.2., to read:

- "⁷ Upon the choice of the manufacturer vehicles with positive and compression ignition engines may be tested with either E5 or E10 and either B5 or B7 fuels, respectively. **This decision shall be reflected where applicable in the approval character as described in Table A3/1**~~However: not later than sixteen months after the dates set out in point 12.2.1., new type approvals shall only be performed with E10 and B7 fuels; not later than as from dates set out in point 12.2.4., all new vehicles shall be approved with E10 and B7 fuels.~~ "

Amend footnote 2 to Table 1 in paragraph 5.3.1.4. to read:

- "² ~~Until three years after the dates specified in paragraphs 12.2.1. and 12.2.2. of this Regulation for new type approvals and new vehicles respectively, a~~ A particulate number emission limit of 6.0×10^{12} #/km shall apply to PI direct injection vehicles upon the choice of the manufacturer. **This decision shall be reflected where applicable in the approval character as described in Table A3/1**"

Amend the key to Annex 3, Table A3/1, to read:

"Emissions standard key

- A Emission requirements according to the limits in Table 1 of paragraph 5.3.1.4. of this Regulation, ~~but allowing~~ **complying with** the preliminary values for particulate numbers for PI vehicles as detailed in footnote 2 to that table **any using any applicable reference fuel;**
- B Emission requirements according to the limits in Table 1 of paragraph 5.3.1.4. of this Regulation, ~~including~~ **complying with** the ~~final~~ particulate number standards for PI vehicles **in the table without reference to footnote 2** and use of E10 and B7 reference fuel (where applicable). "

Amend Annex 7, paragraph 4.2.1., to read:

- "4.2.1. Variable-volume enclosure

The variable-volume enclosure expands and contracts in response to the temperature change of the air mass in the enclosure. Two potential means of accommodating the internal volume changes are movable panel(s), or a bellows design, in which an impermeable bag or bags inside the enclosure expand(s) and contract(s) in response to internal pressure changes by exchanging air from outside the enclosure. Any design for volume accommodation shall maintain the integrity of the enclosure as specified in Appendix 1 to this annex over the specified temperature range.

Any method of volume accommodation shall limit the differential between the enclosure internal pressure and the barometric pressure to a maximum value of ± 5 ~~kPa~~ **hPa**.

The enclosure shall be capable of latching to a fixed volume. A variable volume enclosure shall be capable of accommodating a +7 per cent change from its "nominal volume" (see paragraph 2.1.1. of Appendix 1 to this annex.), taking into account temperature and barometric pressure variation during testing. "

Amend Annex 7, paragraph 4.6.2., to read:

- "4.6.2. The accuracy of the pressure recording system shall be within ± 0.3 kPa and the pressure shall be capable of being resolved to ± 0.2 have resolution of **0.025** kPa. "

Delete Annex 7, paragraphs 4.9. and 4.9.1.:

~~"4.9. Additional equipment~~

~~4.9.1. The absolute humidity in the test area shall be measurable to within ± 5 per cent. "~~

Amend Annex 7, paragraph 6.1. to be a title, renumber the existing text of paragraph 6.1. as 6.1.1. and add paragraph 6.1.2., to read:

"6.1. **Calculation of evaporative test results**

6.1.1. The evaporative emission tests described in paragraph 5. of this annex allow the hydrocarbon emissions from the diurnal and hot soak phases to be calculated. Evaporative losses from each of these phases is calculated using the initial and final hydrocarbon concentrations, temperatures and pressures in the enclosure, together with the net enclosure volume. The formula below is used:

$$M_{HC} = k \cdot V \cdot 10^{-4} \left(\frac{C_{HC,f} \cdot P_f}{T_f} - \frac{C_{HC,i} \cdot P_i}{T_i} \right) + M_{HC,out} - M_{HC,i}$$

Where:

- M_{HC} = hydrocarbon mass in grams,
 $M_{HC,out}$ = mass of hydrocarbon exiting the enclosure, in the case of fixed volume enclosures for diurnal emission testing (grams),
 $M_{HC,i}$ = mass of hydrocarbon entering the enclosure, in the case of fixed volume enclosures for diurnal emission testing (grams),
 C_{HC} = measured hydrocarbon concentration in the enclosure (ppm volume in C1 equivalent),
 V = net enclosure volume in cubic metres corrected for the volume of the vehicle, with the windows and the luggage compartment open. If the volume of the vehicle is not determined a volume of 1.42 m³ is subtracted,
 T = ambient chamber temperature, in K,
 P = barometric pressure in kPa,
 H/C = hydrogen to carbon ratio,
 k = $1.2 \cdot (12 + H/C)$;

Where:

- i = is the initial reading,
 f = is the final reading,
 H/C = is taken to be 2.33 for diurnal test losses,
 H/C = is taken to be 2.20 for hot soak losses.

- 6.1.2.** As an alternative to the equation in paragraph 6.1.1. of this Annex, for variable volume enclosures the following equation may be used at the choice of the manufacturer:

$$M_{HC} = k \times V \times \frac{P_i}{T_i} (C_{HCf} - C_{HCi})$$

where:

- M_{HC} = hydrocarbon mass in grams,
 C_{HC} = measured hydrocarbon concentration in the enclosure (ppm volume in C_1 equivalent),
 V = net enclosure volume in cubic metres corrected for the volume of the vehicle, with the windows and the luggage compartment open. If the volume of the vehicle is not determined a volume of 1.42 m³ is subtracted;
 T_i = initial ambient chamber temperature, in K,
 P_i = initial barometric pressure in kPa,
 H/C = hydrogen to carbon ratio,
 H/C = is taken to be 2.33 for diurnal test losses;
 H/C = is taken to be 2.20 for hot soak losses;
 k = is $1.2 \times 10^{-4} \times (12 + H/C)$, in (g × K/(m³ × kPa));"

Amend Annex 7, Appendix 1, paragraph 2.4. to be a title, renumber the existing text of paragraph 2.4. as 2.4.1. and add paragraph 2.4.2., to read:

"2.4. Calculations of evaporative test results

- 2.4.1.** The calculation of net hydrocarbon mass change within the enclosure is used to determine the chamber's hydrocarbon background and leak rate. Initial and final readings of hydrocarbon concentration, temperature and barometric pressure are used in the following formula to calculate the mass change.

$$M_{HC} = k \cdot V \cdot 10^{-4} \left(\frac{C_{HC,f} \cdot P_f}{T_f} - \frac{C_{HC,i} \cdot P_i}{T_i} \right) + M_{HC,out} - M_{HC,i}$$

Where:

- M_{HC} = hydrocarbon mass in grams,
 $M_{HC,out}$ = mass of hydrocarbon exiting the enclosure, in the case of fixed volume enclosures for diurnal emission testing (grams),
 $M_{HC,i}$ = mass of hydrocarbon entering the enclosure when a fixed volume enclosure is used for diurnal emissions (grams),
 C_{HC} = hydrocarbon concentration in the enclosure (ppm carbon (Note : ppm carbon = ppm propane x 3)),
 V = enclosure volume in cubic metres,
 T = ambient temperature in the enclosure, (K),
 P = barometric pressure, (kPa),
 k = 17.6

Where:

- i = is the initial reading,
f = is the final reading,

2.4.2. As an alternative to the equation in paragraph 2.4.1. of this Annex, for variable volume enclosures the following equation may be used at the choice of the manufacturer:

$$M_{HC} = k \times V \times \frac{P_i}{T_i} (C_{HCf} - C_{HCi})$$

where:

- M_{HC} = hydrocarbon mass in grams,**
 C_{HC} = measured hydrocarbon concentration in the enclosure (ppm volume in C_1 equivalent),
 V = net enclosure volume in cubic metres,
 T_i = initial ambient chamber temperature, in K,
 P_i = initial barometric pressure in kPa,
 k = is 17.6"

II. Justification

1. The footnotes to the table of test requirements and the table of emissions limits are causing inflexibility in the recognition of some of the approval levels in the series of amendments 07.
2. These footnotes were introduced correctly to protect the EU from having to accept vehicle approvals which were not compliant with local legislation.
3. However:
 - (a) The EU is currently not subject to mutual recognition in UN Regulation No. 83 due to the WLTP transitional provisions
 - (b) This working paper, if adopted at GRPE 78 in January 2019 would proceed to WP.29 in June of 2019 and would not enter into force before September 1st 2019, after which time the approval codes being amended will no longer be valid for first registration of vehicles in the EU.
4. During the development of UN GTR No. 19, an alternative formula for the calculation of hydrocarbons has been introduced which may be used for variable volume SHED facilities at the choice of the manufacturer.
5. The introduction of these changes in UN Regulation No. 83 will prevent the need for additional text in UN GTR No. 19 as the references remain the same but are completed.
6. Further minor amendments and corrections which were noted during the drafting of UN GTR No. 19 have been included in the interest of consistency.