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## Economic Commission for Europe

### Inland Transport Committee

### World Forum for Harmonization of Vehicle Regulations

#### 187th session

Geneva, 21-24 June 2022

Item 4.7.2. of the provisional agenda

#### 1958 Agreement:

Consideration of draft amendments to existing

UN Regulations submitted by GRPE

## **Proposal for Supplement 1 to the 07 series of amendments to UN Regulation No. 49 (Emissions of compression ignition and positive ignition (LPG and CNG) engines)**

### **Submitted by the Working Party on Pollution and Energy\***

The text reproduced below was adopted by the Working Party on Pollution and Energy (GRPE) at its eighty-fifth session (ECE/TRANS/WP.29/GRPE/85, para. 29). It is based on ECE/TRANS/WP.29/GRPE/2022/3 and GRPE-85-47 as reproduced by Annex IV to the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration at their June 2022 sessions.

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\* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in 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.

Throughout Annexes 2A, 2B, 2C and Appendix 2 to Annex 13 and their corresponding Table of Contents entries, replace “06 series” by “07 series”

Annex 2A, Addendum

Table 7, amend to read:

Test number	1	2	3	4	5	6	7
Measured engine speed (rpm)							
Measured fuel flow (g/h)							
Measured torque (Nm)							
Measured power (kW)							
Barometric pressure (kPa)							
Water vapour pressure (kPa)							
Intake air temperature (K)							
Power correction factor							
Corrected power (kW)							
Auxiliary power (kW) <sup>1</sup>							
Net power (kW)							
Net torque (Nm)							
Corrected specific fuel consumption (g/kWh)							

Annex 2B

Section II, amend to read:

“Section II

1. Additional information (where applicable): see Addendum
2. Technical Service responsible for carrying out the tests
3. Date of test report
4. Number of test report
5. Remarks (if any): see Addendum
6. Place
7. Date
8. Signature

Attachments: Information package.

Test report.”

Annex 2B

Final paragraph, amend to read:

"In the case of an extension to the type approval of a vehicle with a reference mass exceeding 2,380 kg but not exceeding 2,610 kg, the reporting of the CO<sub>2</sub> emissions (g/km) and fuel consumption (l/100 km) shall be included in accordance with Appendix 1 to Annex 12."

*Insert a new Addendum, to read:*

**"Addendum to type approval communication No ...  
concerning the type approval of a vehicle type with an  
approved engine with regard to the emission of pollutants  
emissions pursuant to Regulation No. 49, 07 series of  
amendments**

1. Additional information
  - 1.1. Particulars to be completed in relation to the type approval of a vehicle with an approved engine installed
    - 1.1.1. Make of engine (name of undertaking)
    - 1.1.2. Type and commercial description (mention any variants)
    - 1.1.3. Manufacturer's code as marked on the engine
    - 1.1.4. Category of vehicle
    - 1.1.5. Category of engine: Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol (ED95)/Ethanol (E85)/dual-fuel <sup>(1)</sup>
      - 1.1.5.1. Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B <sup>(1)</sup> <sup>(df)</sup>
    - 1.1.6. Name and address of manufacturer
    - 1.1.7. Name and address of manufacturer's authorised representative (if any)
  - 1.2. Vehicle
    - 1.2.1. Type approval number of the engine/engine family <sup>(1)</sup>
    - 1.2.2. Engine Control Unit (ECU) software calibration number
  - 1.3. Particulars to be completed in relation to the type approval of an engine/engine family <sup>(1)</sup> as a separate technical unit (conditions to be respected in the installation of the engine on a vehicle)
    - 1.3.1. Maximum and/or minimum intake depression
    - 1.3.2. Maximum allowable back pressure
    - 1.3.3. Exhaust system volume
    - 1.3.4. Restrictions of use (if any)
  - 1.4. Emission levels of the engine/parent engine <sup>(1)</sup>

Deterioration Factor (DF): calculated/fixed <sup>(1)</sup>

Specify the DF values and the emissions on the WHSC (if applicable) and WHTC tests in the table below.

In case of engines tested on different reference fuels, the tables shall be reproduced for each reference fuel tested.

In case of Type 1B and Type 2B dual-fuel engines, the tables shall be reproduced for each mode tested (dual-fuel and diesel modes).

    - 1.4.1. WHSC test

<sup>1</sup> Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable)

<sup>df</sup> Dual fuel engines

Table 4  
WHSC test

	<i>WHSC test (if applicable) *,**</i>						
DF Mult/add <sup>(1)</sup>	CO	THC	NHMC (‡)	NO <sub>x</sub>	PM Mass	NH <sub>3</sub>	PM Number
Emissions	CO (mg/kWh)	THC (mg/kWh)	NHMC (‡) (mg/kWh)	NO <sub>x</sub> (mg/kWh)	PM Mass (mg/kWh)	NH <sub>3</sub> ppm	PM Number (#/kWh)
Test result							
Calculated with DF							
CO <sub>2</sub> emissions (mass emission, g/kWh)							
Fuel consumption <sup>(d)</sup> (g/kWh)							

\* In the case of engines considered in paragraphs 4.6.3. and 4.6.6. of this Regulation, repeat the information for all fuels tested, when applicable.

\*\* In the case of dual-fuel engines of Type 1B, Type 2B, and type 3B, types as defined in Annex 15 to this Regulation, repeat the information in both dual-fuel and diesel mode.

‡ In the cases laid down in Table 1 of Annex 15 to this Regulation for dual-fuel engines, and for positive ignition engines

#### 1.4.2. WHTC Test

Table 5  
WHTC Test

	<i>WHTC test</i>							
DF Mult/add <sup>1</sup>	CO	THC	NMHC (‡)	CH <sub>4</sub> (‡)	NO <sub>x</sub>	PM Mass	NH <sub>3</sub>	PM Number
Emissions	CO (mg/kWh)	THC (mg/kWh)	NMHC (‡) (mg/kWh)	CH <sub>4</sub> (‡) (mg/kWh)	NO <sub>x</sub> (mg/kWh)	PM Mass (mg/kWh)	NH <sub>3</sub> ppm	PM Number
Cold start								
Hot start w/o regeneration								
Hot start with regeneration <sup>1</sup>								
k <sub>r,u</sub> (mult/add) <sup>1</sup>								
k <sub>r,d</sub> (mult/add) <sup>1</sup>								
Weighted test result								
Final test result with DF								
CO <sub>2</sub> emissions <sup>(d)</sup> (mass emission, g/kWh)								
Fuel consumption <sup>(d)</sup> (g/kWh)								

‡ In the cases laid down in Table 1 of Annex 15 to this Regulation for dual-fuel engines, and for positive ignition engines.

<sup>d</sup> When required by this Regulation.

## 1.4.3. Idle test

Table 6

**Idle test**

<i>Test</i>	<i>CO value</i> (%vol)	<i>Lambda</i> <sup>1</sup>	<i>Engine speed</i> (min <sup>-1</sup> )	<i>Engine oil temperature</i> (°C)
Low idle test		N/A		
High idle test				

## 1.4.4. PEMS demonstration test

Table 6a

**PEMS demonstration test**

Vehicle type (e.g. M <sub>3</sub> , N <sub>3</sub> and application e.g. rigid or articulated truck, city bus)						
Vehicle description (e.g. vehicle model, prototype)						
Pass Fail Results <sup>2</sup> :	CO	THC	NMHC	CH <sub>4</sub>	NO <sub>x</sub>	PM number
Work window conformity factor <sup>5</sup>						
CO <sub>2</sub> mass window conformity factor <sup>5</sup>						
Trip information:	Urban		Rural		Motorway	
Shares of time of the trip characterised by urban, rural and motorway operation as described in paragraph 4.5. of Annex 8						
Shares of time of the trip characterised by accelerating, decelerating, cruising and stop as described in paragraph 4.5.5. of Annex 8						
	Minimum			Maximum		
Work window average power (%)						
CO <sub>2</sub> mass window duration (s)						
Work window: percentage of valid windows						
CO <sub>2</sub> mass window: percentage of valid windows						
Fuel consumption consistency ratio						

<sup>5</sup> CF<sub>final</sub> needs to be stated, if applicable

## 1.5. Power measurement

## 1.5.1. Engine power measured on test bench

<sup>2</sup> Delete as appropriate.

Table 7  
**Engine power measured on test bench**

<i>Test number</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
Measured engine speed (rpm)							
Measured fuel flow (g/h)							
Measured torque (Nm)							
Measured power (kW)							
Barometric pressure (kPa)							
Water vapour pressure (kPa)							
Intake air temperature (K)							
Power correction factor							
Corrected power (kW)							
Auxiliary power (kW) <sup>1</sup>							
Net power (kW)							
Net torque (Nm)							
Corrected specific fuel consumption (g/kWh)							
1.5.2.	Additional data						
1.6.	Special provisions						
1.6.1.	Granting approvals for vehicles for export (see paragraph 13.4.1. of this Regulation)						
1.6.1.1.	Approvals granted for vehicles for export in line with paragraph 1.6.1.: Yes/No (²)						
1.6.1.2.	Provide a description of approvals granted in paragraph 1.6.1.1., including the series of amendments of this Regulation and the level of emission requirements to which this approval applies						
1.6.2.	Replacement engines for vehicles in use (see paragraph 13.4.2. of this Regulation)						
1.6.2.1.	Approvals granted for replacement engines for vehicles in use in line with paragraph 1.6.2.: Yes/No (²)						
1.6.2.2.	Provide a description of approvals for replacement engines for vehicles in use granted in paragraph 1.6.2.1. including the series of amendments of this Regulation and the level of emission requirements to which this approval applies						
1.7.	Alternative approvals (see Annex 9A, paragraph 2.4.)						
1.7.1.	Alternative approvals granted in line with paragraph 1.7.: Yes/No (²)						
1.7.2.	Provide a description of alternative approvals in line with paragraph 1.7.1. "						

*Annex 2C*

*Final paragraph*, amend to read:

"In the case of an extension to the type approval of a vehicle with a reference mass exceeding 2,380 kg but not exceeding 2,610 kg, the reporting of the CO<sub>2</sub>

emissions (g/km) and fuel consumption (l/100 km) shall be included in accordance with Appendix 1 to Annex 12. "

Addendum, Table 7, amend to read:

“

<i>Test number</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
Measured engine speed (rpm)							
Measured fuel flow (g/h)							
Measured torque (Nm)							
Measured power (kW)							
Barometric pressure (kPa)							
Water vapour pressure (kPa)							
Intake air temperature (K)							
Power correction factor							
Corrected power (kW)							
Auxiliary power (kW) <sup>1</sup>							
Net power (kW)							
Net torque (Nm)							
Corrected specific fuel consumption (g/kWh)							

“

Annex 3

Table 1, amend to read:

“

<i>Character</i>	<i>NO<sub>x</sub> OTL<sup>1</sup></i>	<i>PM OTL<sup>2</sup></i>	<i>CO OTL<sup>6</sup></i>	<i>IUPR<sup>13</sup></i>	<i>Reagent quality</i>	<i>Additional OBD monitors<sup>12</sup></i>	<i>Power threshold requirements<sup>14</sup></i>	<i>Cold start and PM number</i>	<i>Implementation dates: new types</i>	<i>Date when Contracting Parties may refuse type approval</i>
A <sup>9 10</sup> B <sup>10</sup>	Row "phase-in period" of Tables 1 and 2 of Annex 9A	Performance monitoring <sup>3</sup>	N/A	Phase-in <sup>7</sup>	Phase-in <sup>4</sup>	N/A	20%	N/A	27 January 2013	01 September 2015 <sup>9</sup> 31 December 2016 <sup>10</sup>
...										
E	Row "general requirements" of Tables 1 and 2 of Annex 9A	Row "general requirements" of Table 1 of Annex 9A	Row "general requirements" of Table 2 of Annex 9A	General <sup>8</sup>	General <sup>5</sup>	Yes	10%	Yes	7 January 2022 <sup>15</sup>	

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*Throughout the text and example approval marks, replace “06 series” or “06” with “07 series” or “07” as applicable*

*Annex 4, paragraph 9.3.2.1., amend to read:*

“9.3.2.1. Introduction

Paragraphs 9.3.2.2. to 9.3.2.7. describe the measurement...”

*Appendix 1 to Annex 12*

*Paragraphs A.1.2.1.2. and A.1.2.1.3., delete.*

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