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Item 4.12.3 of the provisional agenda

1958 Agreement:

**Consideration of proposals for new UN Regulations submitted
by the Working Parties subsidiary to the World Forum**

Proposal for amendments to ECE/TRANS/WP.29/2020/78

Submitted by the representatives of the European Commission and Japan*

The text reproduced below, supplementing the proposal for the 01 series of amendments to a new UN Regulation on uniform provisions concerning the approval of light duty passenger and commercial vehicles with regards to criteria emissions, emissions of carbon dioxide and fuel consumption and/or the measurement of electric energy consumption and electric range (WLTP), was drafted after the eightieth session of Working Party on Pollution and Energy (GRPE). It corrects errors and clarifies provisions from ECE/TRANS/WP.29/2020/78. GRPE would review this document during its June 2020 session. This document is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and its Administrative Committee for the 1958 Agreement (AC.1) for consideration and vote at their June 2020 sessions.

* In accordance with the programme of work of the Inland Transport Committee for 2020 as outlined in proposed programme budget for 2020 (A/74/6 (part V sect. 20) para 20.37), 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.



Paragraph 3.5.1., amend to read:

"3.5.1. "Criteria emissions" means those emission compounds for which limits are set in this Regulation."

Paragraph 3.10.8., amend to read:

"3.10.8. An "OBD driving cycle" consists of key-on, a driving mode where a malfunction would be detected if present, and key-off."

Paragraph 3.10.17., amend to read:

"3.10.17. Reserved"

Paragraph 4.3.1., amend to read:

"4.3.1. For the purposes of paragraph 4.1.2.(e), the Type Approval Authority that grants the approval shall make the information referred to in that point available to other Type Approval Authorities upon request."

Paragraphs 5.2.1. and 5.2.2., amend to read:

"5.2.1. The type approval number shall consist of four sections. Each section shall be separated by the '*' character.

Section 1: The capital letter 'E' followed by the distinguishing number of the Contracting Party which has granted the type approval¹.

Section 2: The number [of this UN Regulation,] followed by the letter 'R', successively followed by:

(a) Two digits (with leading zeros as applicable) indicating the series of amendments incorporating the technical provisions of the UN Regulation applied to the approval (00 for the UN Regulation in its original form);

(b) A slash (/) and two digits (with leading zeros as applicable) indicating the number of supplement to the series of amendments applied to the approval (00 for the series of amendments in its original form);

(c) A slash (/) and two character(s) indicating the implementing stage/level (e.g. 1A, 1B).

Section 3: A four-digit sequential number (with leading zeros as applicable). The sequence shall start from 0001.

Section 4: A two-digit sequential number (with leading zeros if applicable) to denote the extension. The sequence shall start from 00.

All digits shall be Arabic digits.

5.2.2. Example of an Approval Number to this Regulation:

E11*[XXX]R01/00/02*0123*01

The first extension of the Approval numbered 0123, issued by the United Kingdom to Series of Amendments 01, Supplement 00, which is a Level 2 Approval."

Paragraph 8.1.3., amend to read:

"8.1.3. CoP family

The manufacturer is allowed to split the CoP family into smaller CoP families.

¹ The distinguishing numbers of the Contracting Parties to the 1958 Agreement are reproduced in Annex 3 to the Consolidated Resolution on the Construction of Vehicles (R.E.3), document ECE/TRANS/WP.29/78/Rev.6 – Annex 3, www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html.

If the vehicle production takes place in different production facilities, different CoP families shall be created for each facility. An interpolation family can be represented in one or more CoP families.

The manufacturer may request ..."

Appendix 1

Paragraph 2.2., amend to read:

"2.2. During this test, the CO₂ mass emission after 4 phases $M_{CO_2,c,6}$ shall be determined according to step 6 of Table A7/1 of Annex B7.

During this test, the fuel efficiency after 3 phases $FE_{c,5}$ shall be determined according to step 5 of Table A7/1 of Annex B7."

Paragraph 2.3.1., amend to read:

"2.3.1. CO₂ mass emission values for CoP / Fuel efficiency values for CoP

In the case the interpolation method is not applied, the CO₂ mass emission value after 4 phases $M_{CO_2,c,7}$ according to step 7 of Table A7/1 of Annex B7 shall be used for verifying the conformity of production.

In the case the interpolation method is applied, the CO₂ mass emission value after 4 phases $M_{CO_2,c,ind}$ for the individual vehicle according to step 10 of Table A7/1 of Annex B7 shall be used for verifying the conformity of production.

In the case the interpolation method is not applied, the fuel efficiency value after 3 phases $FE_{c,8}$ according to step 8 of Table A7/1 of Annex B7 shall be used for verifying the conformity of production.

In the case the interpolation method is applied, the fuel efficiency value after 3 phases $FE_{c,ind}$ for the individual vehicle according to step 10 of Table A7/1 of Annex B7 shall be used for verifying the conformity of production."

Paragraph 3.2., amend to read:

"3.2. During this test, the CO₂ mass emission after 4 phases $M_{CO_2,CS,c,6}$ of the NOVC-HEV shall be determined according to step 6 of Table A8/5 of Annex B8.

During this test, the fuel efficiency after 2 phases $FE_{CS,c,4c}$ of the NOVC-HEV shall be determined according to step 4c of Table A8/5 of Annex B8."

Paragraph 3.3.1., amend to read:

"3.3.1. CO₂ mass emission values for CoP / Fuel efficiency values for CoP

In the case the interpolation method is not applied, the charge-sustaining CO₂ mass emission value after 4 phases $M_{CO_2,CS,c,7}$ according to step 7 of Table A8/5 of Annex B8 shall be used for verifying the conformity of production.

In the case the interpolation method is applied, the charge-sustaining CO₂ mass emission value after 4 phases $M_{CO_2,CS,c,ind}$ for the individual vehicle according to step 9 of Table A8/5 of Annex B8 shall be used for verifying the conformity of production.

In the case the interpolation method is not applied, the charge-sustaining fuel efficiency value after 3 phases $FE_{CS,c,1}$ according to step 2 of Table A8/6 of Annex B8 shall be used for verifying the conformity of production.

In the case the interpolation method is applied, the charge-sustaining fuel efficiency value after 3 phases $FE_{CS,c,ind}$ for the individual vehicle according to step 3 of Table A8/6 of Annex B8 shall be used for verifying the conformity of production."

Paragraph 5., amend to read:

"5. Verification of CoP on CO₂ mass emissions / fuel efficiency and electric consumption of OVC-HEVs"

Paragraph 5.2.2., amend to read:

"5.2.2. During this test, the charge-sustaining CO₂ mass emission after 4 phases $M_{CO_2,CS,c,6}$ shall be determined according to step 6 of Table A8/5 of Annex B8.

During this test, the charge-sustaining fuel efficiency after 3 phases $FE_{CS,c,4c}$ shall be determined according to step 4c of Table A8/5 of Annex B8."

Paragraph 5.2.3.1., amend to read:

"5.2.3.1. Charge-Sustaining CO₂ mass emission / fuel efficiency values for CoP

In the case the interpolation method is not applied, the charge-sustaining CO₂ mass emission value after 4 phases $M_{CO_2,CS,c,7}$ according to step 7 of Table A8/5 of Annex B8 shall be used for verifying the conformity of production.

In the case the interpolation method is applied, the charge-sustaining CO₂ mass emission value after 4 phases $M_{CO_2,CS,c,ind}$ for the individual vehicle according to step 9 of Table A8/5 of Annex B8 shall be used for verifying the conformity of production.

In the case that the interpolation method is not applied, the charge-sustaining fuel efficiency value after 3 phases $FE_{CS,c}$ according to step 2 of Table A8/6 of Annex B8 shall be used for verifying the conformity of production.

In the case the interpolation method is applied, the charge-sustaining fuel efficiency value after 4 phases $FE_{CS,c,ind}$ for the individual vehicle according to step 3 of Table A8/6 of Annex B8 shall be used for verifying the conformity of production."

Appendix 3

Paragraph 1., amend to read:

"1. Description of test procedure for the determination of the run-in factors

"

Paragraph 1.1., amend to read:

"1.1. The run-in test procedure shall be conducted by the manufacturer, who shall not make any adjustments to the test vehicles that have an impact on the criteria emissions, CO₂ emissions, fuel efficiency and electric energy consumption. The hardware and relevant ECU calibration of the test vehicle shall conform to the type approval vehicle. All the relevant hardware that has an impact on the criteria emissions, CO₂ emissions, fuel efficiency and electric energy consumption shall have had no operation prior to the run-in test procedure."

Paragraph 1.9., amend to read:

"1.9. For the determination of the run-in factor for CO₂ emissions of the 4 phase WLTP test, the coefficients C_{RI} and C_{const} in the following equation shall be calculated by a least squares regression analysis to four significant digits on all valid tests before and after the run-in:

$$M_{CO_2,i} = -C_{RI} \cdot \ln(D_i - D_s) + C_{const}$$

where:

$M_{CO_2,i}$ is the measured CO₂ mass emission for test i, g/km

C_{RI} is the slope of the logarithmic regression line

C_{const} is the constant value of the logarithmic regression line

In the case that multiple vehicles have been tested, the C_{RI} shall be calculated for each vehicle, and the resulting values shall be averaged. The manufacturer

will provide statistical evidence to the responsible authority that the fit is sufficiently statistically justified.

- 1.9.1. Based on the deviation of the measurements from the fit, the slope C_{RI} should be corrected downward with the standard deviation of the errors in the fit:

$$\sigma_{fit} = \sqrt{\frac{\sum(M_{CO_2,i} - M_{CO_2,i-fit})^2}{N-2}}$$

where:

$M_{CO_2,i-fit}$ is the result of the applying the equation for each of the distances D_i .

The slope C_{RI} shall be corrected for the uncertainty in the fit by:

$$C_{RI} \rightarrow C_{RI} - \sigma_{fit}$$

Paragraphs 1.10. to 1.13., amend to read:

- "1.10. The run-in factor $RI_{CO_2}(j)$ for CO₂ emissions after 4 phases of CoP test vehicle j shall be determined by the following equation:

$$RI_{CO_2}(j) = 1 - C_{RI} \cdot \left(\frac{\ln(D_k) - \ln(D_j)}{M_{CO_2,j}} \right)$$

where:

D_k is the average distance of the valid tests after the run-in, km

D_j is the system odometer setting of the CoP test vehicle, km

$M_{CO_2,j}$ is the mass CO₂ emission measured on the CoP test vehicle, g/km

In the case that D_j is lower than the minimum D_i , D_j shall be replaced by the minimum D_i ."

- 1.11. For the determination of the run-in factor for all applicable criteria emissions after 4 phases, the coefficients $C_{RI,c}$ and $C_{const,c}$ shall be calculated with a least squares regression analysis to four significant digits on all valid tests before and after the run-in:

$$M_{C,i} = C_{RI,c} \cdot (D_i - D_s) + C_{const,c}$$

where:

$M_{C,i}$ is the measured mass criteria emission component C

$C_{RI,c}$ is the slope of the linear regression line, g/km²

$C_{const,c}$ is the constant value of the linear regression line, g/km

The manufacturer will provide statistical evidence to the responsible authority that the fit is sufficiently statistically justified and the uncertainty margin based on the variation in the data should be taken into account to avoid an overestimation of the run-in effect.

- 1.12. The run-in factor $RI_C(j)$ for criteria emission component C after 4 phases of CoP test vehicle j shall be determined by the following equation:

$$RI_C(j) = 1 + C_{RI,C} \cdot \left(\frac{D_k - D_j}{M_{C,j}} \right)$$

where:

D_k is the average distance of the valid tests after the run-in, km

D_j is the system odometer setting of the CoP test vehicle, km

$M_{C,j}$ is the mass emission of component C on the CoP test vehicle, g/km

In the case that D_j is lower than the minimum D_i , D_j shall be replaced by the minimum D_i .

- 1.13. The run-in factor $RI_{EC}(j)$ for electric energy consumption after 4 phases shall be determined according to the procedure specified in paragraphs 1.9., 1.9.1. and 1.10. of this appendix, where CO_2 in the formulae is replaced by EC.

For fuel efficiency and electric energy consumption from the first 3 phases of a WLTP test

The run-in factor $RI_{FE}(j)$ for fuel efficiency and the run-in factor $RI_{EC}(j)$ for electric energy consumption shall be determined according to the procedure specified in paragraphs 1.9. and 1.10. of this appendix, where CO_2 in the formulae is replaced by FE and EC respectively."

Paragraph 2., insert to read:

- "2. Prior to the application of the derived run-in factor, the manufacturer shall provide the following information to the responsible authority.
- (a) Evidence of the derived run-in factor including the existence of statistical significance regarding the fit of the slope
 - (b) An explanation of the validation method to be used after the start of production, e.g. by measuring the run-in factor from selected vehicle(s) from the plant and then evaluating whether the run-in factor is appropriate or not."

Annexes Part A, front page, amend to read:

"Annexes Part A

The Type Approval requirements and documentation included in Annexes Part A are common to the series of amendments which includes Levels 1A / 1B and the series of amendments which includes Level 2 of this Regulation. This means that certain elements may not be required, or be required twice, for the level of approval being sought. In such an instance the element may be omitted or repeated, respectively."

Annex A1, paragraph 3.2.18.1., amend to read:

"

3.2.18.1.	Type approval number according to UN Regulation No. 134 (if applicable):
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"

Annex A1, paragraph 3.3.9.5., amend to read:

"

3.3.9.5.	Theoretical duration of a complete charge:
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"

Annex A1, Appendix 1, first page, amend to read:

"...

General notes:

If there are several options (references), the one tested should be described in the test report

If there are not, a single reference to the information document at the start of the test report may be sufficient.

Every Technical Service is free to include some additional information.

Test results may/shall be repeated to handle 3-phase and 4-phase WLTP.

Characters are included ..."

Annex B2, paragraph 3.4., amend to read:

"3.4. Calculation of available power

For each engine speed value n_k of the full load power curve as specified in paragraph 2 (h) of this annex the available power, $P_{\text{available}_k}$, shall be calculated using the following equation:

$$P_{\text{available}_k} = P_{\text{wot}}(n_k) \times (1 - (SM + ASM))$$

where:

P_{wot} is the power available at n_k at full load condition from the full load power curve;

SM is ..."

Annex B3

Table A3/6., amend the table caption to read:

"Table A3/6

Gasoline/petrol (E10H)"

Table A3/17., amend the table caption to read:

"Table A3/17

Diesel (B5H)"

Annex B6

Table A6/1., amend to read:

"

Table A6/1
Applicable rules for a manufacturer’s declared values (total cycle values)^(a) (as applicable)

Vehicle type		For 4 phase WLTP test only <i>M_{CO2}</i> ^(b) (g/km)	For 4 phase WLTP test <i>FC</i> (kg/100 km)	For 3 phase WLTP- <i>FE</i> (km/l or km/kg)	<i>Electric energy consumption</i> ^(c) (Wh/km)	<i>All electric range / Pure Electric Range</i> ^(c) (km)
Vehicles tested according to Annex B6 (pure ICE)		<i>M_{CO2}</i> Paragraph 3. of Annex B7.	<i>FC</i> Paragraph 1.4. of Annex B7.	<i>FE</i> Paragraph 1.4. of Annex B7.	-	-
NOVC-FCHV		-	<i>FC_{cs}</i> Paragraph 4.2.1.2.1. of Annex B8.	<i>FE_{cs}</i> Paragraph 4.2.1.2.1. of Annex B8.	-	-
NOVC-HEV		<i>M_{CO2,CS}</i> Paragraph 4.1.1. of Annex B8.	-	<i>FE_{cs}</i> Paragraph 4.1.1.1. of Annex B8.	-	-
OVC-HEV	CD	<i>M_{CO2,CD}</i> Paragraph 4.1.2. of Annex B8.	-	<i>FE_{CD}</i> Paragraph 4.6.1. of Annex B8.	For 4 phase WLTP test: <i>EC_{AC,CD}</i> Paragraph 4.3.1. of Annex B8. For 3 phase WLTP -: <i>EC</i> Paragraph 4.6.2. of Annex B8	<i>AER</i> Paragraph 4.4.1.1. of Annex B8.
	CS	<i>M_{CO2,CS}</i> Paragraph 4.1.1. of Annex B8.	-	<i>FE_{cs}</i> Paragraph 4.1.1.1. of Annex B8.	-	-
PEV		-	-	-	<i>EC_{WLTC}</i> Paragraph 4.3.4.2. of Annex B8.	<i>PER_{WLTC}</i> Paragraph 4.4.2. of Annex B8.

^(a) The declared value shall be the value to which the necessary corrections, as applicable, are applied

^(b) Rounding to 2 places of decimal according to paragraph 6.1.8. of this Regulation

^(c) Rounding to one place of decimal according to paragraph 6.1.8. of this Regulation"

Table A6/2., amend two table header rows to read:

"

For pure ICE vehicles, NOVC-HEVs and OVC-HEVs charge-sustaining Type 1 test.

	<i>Test</i>	<i>Judgement parameter</i>	<i>Criteria emission</i>	For 4 phase WLTP test: <i>M_{CO2}</i>	For 3 phase WLTP: <i>FE</i>
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...

For NOVC-FCHVs

	<i>Test</i>	<i>Judgement parameter</i>	For 4 phase WLTP test: <i>FC_{CS}</i> (upper value)	For 3 phase WLTP -: <i>FE_{CS}</i> (lower value)
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"

Paragraph 2.6.8.3.1.4., amend to read:

"2.6.8.3.1.4. Tolerance (4)

IWR	in the range of – 2.0 to + 4.0 per cent
RMSSE	manufacturer declared criteria but shall not be greater than 1.3 km/h

2.6.8.3.1.5. IWR and RMSSE drive trace indices shall be calculated in accordance with the requirements of paragraph 7. of Annex B7."

Annex B6, Appendix 2

Table A6.App2/1., amend to read:

"Table A6.App2/1

Energy content of fuel (as applicable)

Fuel	Petrol (E10H)	Ethanol (E85)	Diesel (B5H)	LPG	CNG
Heat value	8.64 kWh/l	6.41 kWh/l	9.80 kWh/l	12.86 x ρ kWh/l	11.39 MJ/m ³

ρ = test fuel density at 15°C (kg/l)"

Table A6.App2/3., amend to read:

"Table A6.App2/3

Willans factors (as applicable)

			<i>Naturally aspirated</i>	<i>Pressure-charged</i>
Positive ignition	Petrol (E10H)	l/MJ	0.0756	0.0803
		gCO ₂ /MJ	174	184
	CNG (G20)	m ³ /MJ	0.0719	0.0764
		gCO ₂ /MJ	129	137
	LPG	l/MJ	0.0950	0.101
		gCO ₂ /MJ	155	164
	E85	l/MJ	0.102	0.108
		gCO ₂ /MJ	169	179
Compression ignition	Diesel (B5H)	l/MJ	0.0611	0.0611
		gCO ₂ /MJ	161	161

Annex B7

Table A7/1., Steps 2 and 3, amend to read:

"

2	Output step 1	$M_{i,p,1}$, g/km; $M_{CO2,p,1}$, g/km.	Calculation of combined cycle values: $M_{i,c,2} = \frac{\sum_p M_{i,p,1} \times d_p}{\sum_p d_p}$ $M_{CO2,c,2} = \frac{\sum_p M_{CO2,p,1} \times d_p}{\sum_p d_p}$ where: $M_{i/CO2,c,2}$ are the emission results over the total cycle; d_p are the driven distances of the cycle phases, p.	$M_{i,c,2}$, g/km; $M_{CO2,c,2}$, g/km.
3	Output step 1 Output step 2	$M_{CO2,p,1}$, g/km; $M_{CO2,c,2}$, g/km.	RCB correction Appendix 2 to Annex B6.	$M_{CO2,p,3}$, g/km; $M_{CO2,c,3}$, g/km.

Table A7/1., amend the table caption to read:

"Table A7/1

Procedure for calculating final test results (FE applicable for the 3-phase WLTP only)

Table A7/1 shall be performed separately for results after 4 phases and for results after 3 phases."

Table A7/1. Steps 4c to 8, amend to read:

"

4c	Output step 4a	$M_{i,c,4a}$, g/km; $M_{CO2,c,4a}$, g/km.	In the case these values are used for the purpose of conformity of production, the criteria emission values and CO ₂ mass emission values shall be multiplied with the run-in factor determined according to paragraph 8.2.4. of this Regulation: $M_{i,c,4c} = RI_c(j) \times M_{i,c,4a}$ $M_{CO2,c,4c} = RI_{CO2}(j) \times M_{CO2,c,4a}$ In the case these values are not used for the purpose of conformity of production: $M_{i,c,4c} = M_{i,c,4a}$ $M_{CO2,c,4c} = M_{CO2,c,4a}$	$M_{i,c,4c}$; $M_{CO2,c,4c}$
			Calculate fuel efficiency ($FE_{c,4c_temp}$) according to paragraph 6. of Annex B6. In the case this value is used for the purpose of conformity of production, the fuel efficiency value shall be multiplied with the run in factor determined according to paragraph 8.2.4. of this Regulation: $FE_{c,4c} = RI_{FE}(j) \times FE_{c,4c_temp}$ In the case these values are not used for the purpose of conformity of production: $FE_{c,4c} = FE_{c,4c_temp}$	$FE_{c,4c}$, km/l;
5 Result of a single test.	Output step 4b and 4c	$M_{CO2,c,4c}$, g/km; $M_{CO2,p,4}$, g/km.	For results after 4 phases: ATCT correction of $M_{CO2,c,4c}$ and $M_{CO2,p,4}$ in accordance with paragraph 3.8.2. of Annex B6a. For results after 3 phases:	$M_{CO2,c,5}$, g/km; $M_{CO2,p,5}$, g/km.

			$M_{CO_2,c,5} = M_{CO_2,c,4c}$ $M_{CO_2,p,5} = M_{CO_2,p,4}$	
		$M_{i,c,4c}$, g/km; $FE_{c,4c}$, km/l;	<p>Apply deterioration factors calculated in accordance with Annex C4 to the criteria emissions values.</p> <p>In the case these values are used for the purpose of conformity of production, the further steps (6 to 10) are not required and the output of this step is the final result.</p>	$M_{i,c,5}$, g/km; $FE_{c,5}$, km/l;
6	For results after 4 phases Output step 5	For every test: $M_{i,c,5}$, g/km; $M_{CO_2,c,5}$, g/km; $M_{CO_2,p,5}$, g/km.	Averaging of tests and declared value. Paragraphs 1.2. to 1.2.3. inclusive of Annex B6.	$M_{i,c,6}$, g/km; $M_{CO_2,c,6}$, g/km; $M_{CO_2,p,6}$, g/km. $M_{CO_2,c,declared}$, g/km.
	For results after 3 phases Output step 5	$FE_{c,5}$, km/l;	Averaging of tests and declared value. Paragraphs 1.2. to 1.2.3. inclusive of Annex B6. The conversion from $FE_{c,declared}$ to $M_{CO_2,c,declared}$, shall be performed for the applicable cycle according to paragraph 6. of Annex B7. For that purpose, the criteria emission over the applicable cycle shall be used.	$FE_{c,declared}$, km/l $FE_{c,6}$, km/l $M_{CO_2,c,declared}$, g/km.
7	For results after 4 phases: Output step 6	$M_{CO_2,c,6}$, g/km; $M_{CO_2,p,6}$, g/km. $M_{CO_2,c,declared}$, g/km.	Alignment of phase values. Paragraph 1.2.4. of Annex B6. and: $M_{CO_2,c,7} = M_{CO_2,c,declared}$	$M_{CO_2,c,7}$, g/km; $M_{CO_2,p,7}$, g/km.
	For results after 3 phases: Output step 5 Output step 6	$M_{CO_2,c,5}$, g/km; $M_{CO_2,p,5}$, g/km; $M_{CO_2,c,declared}$, g/km.	Alignment of phase values. Paragraph 1.2.4. of Annex B6.	$M_{CO_2,p,7}$, g/km.
8	Result of a Type 1 test for a test vehicle. For results after 4 phases : Output steps 6 Output steps 7	$M_{i,c,6}$, g/km; $M_{CO_2,c,7}$, g/km; $M_{CO_2,p,7}$, g/km.	<p>Calculation of fuel consumption according to Paragraph 6 of this annex.</p> <p>The calculation of fuel consumption shall be performed for the applicable cycle and its phases separately. For that purpose: (a) the applicable phase or cycle CO₂ values shall be used; (b) the criteria emission over the complete cycle shall be used.</p> <p>and: $M_{i,c,8} = M_{i,c,6}$ $M_{CO_2,c,8} = M_{CO_2,c,7}$ $M_{CO_2,p,8} = M_{CO_2,p,7}$</p>	$FC_{c,8}$, l/100 km; $FC_{p,8}$, l/100 km; $M_{i,c,8}$, g/km; $M_{CO_2,c,8}$, g/km; $M_{CO_2,p,8}$, g/km.

	For results after 3 phases : Output steps 5 Output steps 7	$M_{i,c,5}$, g/km; $M_{CO_2,p,7}$, g/km.	Calculation of fuel consumption and conversion to fuel efficiency for phase value only according to Paragraph 6 of this annex. The calculation of fuel consumption shall be performed for the phases separately. For that purpose: (a) the applicable phase CO ₂ values shall be used; (b) the criteria emission over the complete cycle shall be used. and: $M_{i,c,8} = M_{i,c,5}$ $FE_{c,8} = FE_{c,6}$	$FC_{p,8}$, l/100 km; $FE_{p,8}$, km/l; $M_{i,c,8}$, g/km; $FE_{c,8}$, km/l.
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Paragraph 3.1.2., amend to read:

"3.1.2. The mass M of gaseous compounds emitted by the vehicle during the test shall be determined by the product of the volumetric concentration of the gas in question and the volume of the diluted exhaust gas with due regard for the following densities under the reference conditions of 273.15 K (0 °C) and 101.325 kPa:

Carbon monoxide (CO)	$\rho = 1.25$ g/l
Carbon dioxide (CO ₂)	$\rho = 1.964$ g/l
Hydrocarbons:	
for petrol (E10H) (C ₁ H _{1.93} O _{0.033})	$\rho = 0.646$ g/l
for diesel (B5H) (C ₁ H _{1.86} O _{0.005})	$\rho = 0.623$ g/l
for LPG (C ₁ H _{2.525})	$\rho = 0.649$ g/l
for NG/biomethane (CH ₄)	$\rho = 0.716$ g/l
for ethanol (E85) (C ₁ H _{2.74} O _{0.385})	$\rho = 0.934$ g/l
Nitrogen oxides (NO _x)	$\rho = 2.05$ g/l
The density ..."	

Paragraph 3.2.1.1.1., amend to read:

"3.2.1.1.1. The dilution factor DF shall be calculated using the equation for the concerned fuel (as applicable):

$$DF = \frac{13.4}{C_{CO_2} + (C_{HC} + C_{CO}) \times 10^{-4}} \quad \text{for petrol (E10H)}$$

$$DF = \frac{13.5}{C_{CO_2} + (C_{HC} + C_{CO}) \times 10^{-4}} \quad \text{for diesel (B5H)}$$

$$DF = \frac{11.9}{C_{CO_2} + (C_{HC} + C_{CO}) \times 10^{-4}} \quad \text{for LPG}$$

$$DF = \frac{9.5}{C_{CO_2} + (C_{HC} + C_{CO}) \times 10^{-4}} \quad \text{for NG/biomethane}$$

$$DF = \frac{12.5}{C_{CO_2} + (C_{HC} + C_{CO}) \times 10^{-4}} \quad \text{for ethanol (E85)}$$

$$DF = \frac{35.03}{C_{H_2O} - C_{H_2O-DA} + C_{H_2} \times 10^{-4}} \quad \text{for hydrogen}$$

With respect to ..."

Paragraph 3.2.3.2.5., amend to read:

"3.2.3.2.5. ...

For 3-phase WLTP

..."

Paragraph 3.2.3.2.6., amend to read:

"3.2.3.2.6. ...

For 3-phase WLTP

..."

Paragraph 6.2., amend to read:

"6.2. ...

For 3-phase WLTP

..."

Paragraph 6.3., amend to read:

"6.3. Reserved"

Paragraph 6.5., amend to read:

"6.5. For a vehicle with a positive ignition engine fuelled with petrol (E10H)

$$FC = \left(\frac{0.1206}{\rho_{\text{fuel}}} \right) \times [(0.829 \times \text{HC}) + (0.429 \times \text{CO}) + (0.273 \times \text{CO}_2)]"$$

Paragraphs 6.8. to 6.10., amend to read:

"6.8. Reserved

6.9. For a vehicle with a compression engine fuelled with diesel (B5H)

$$FC = \left(\frac{0.1163}{\rho_{\text{fuel}}} \right) \times [(0.860 \times \text{HC}) + (0.429 \times \text{CO}) + (0.273 \times \text{CO}_2)]"$$

6.10. Reserved"

Paragraph 6.14., amend to read:

"6.14. Calculation of fuel efficiency (FE)

This paragraph is applicable for the 3-phase WLTP only:

6.14.1. ..."

Annex B8

Paragraph 3.1.3., amend to read:

"3.1.3. The requirements of paragraphs 2.2.2.1.2. and 2.2.2.1.3. of Annex B6 are exempted when testing was conducted for PEVs according to paragraph 3.4. and for FCHVs according to paragraph 3.5."

Paragraph 4., amend to read:

"4. Calculations for hybrid electric, pure electric and compressed hydrogen fuel cell vehicles

For results after 4 phases and results after 3 phases, the calculations in this chapter need to be performed separately."

Table A8/5., amend the table caption to read:

"Table A8/5

Calculation of final charge-sustaining gaseous emission and fuel efficiency values (FE applicable for results after 3 phases only)

Table A8/5 shall be performed separately for results after 4 phases and for results after 3 phases."

Table A8/5., Steps 4a to 7., amend to read:

			<p>production, the fuel efficiency value shall be multiplied with the run in factor determined according to paragraph 8.2.4. of this Regulation: $FE_{c,4c} = RI_{FE} (j) \times FE_{c,4c_temp}$</p> <p>In the case these values are not used for the purpose of conformity of production:</p> $FE_{c,4c} = FE_{c,4c_temp}$	
5 Result of a single test.	Output step 4b and 4c	$M_{CO_2,CS,p,4}$, g/km; $M_{CO_2,CS,c,4c}$, g/km;	<p>For results after 4 phases:</p> <p>ATCT correction of $M_{CO_2,CS,c,4c}$ and $M_{CO_2,CS,p,4}$ in accordance with paragraph 3.8.2. of Annex B6a.</p> <p>For results after 3 phases:</p> $M_{CO_2,c,5} = M_{CO_2,c,4c}$ $M_{CO_2,p,5} = M_{CO_2,p,4}$	$M_{CO_2,CS,c,5}$, g/km; $M_{CO_2,CS,p,5}$, g/km.
		$M_{i,CS,c,4c}$, g/km; $FE_{c,4c}$, km/l;	<p>Apply deterioration factors calculated in accordance with Annex C4 to the criteria emissions values.</p> <p>In the case these values are used for the purpose of conformity of production, the further steps (6 to 9) are not required and the output of this step is the final result.</p>	$M_{i,CS,c,5}$, g/km; $FE_{c,5}$, km/l;
6 $M_{i,CS}$ results of a Type 1 test for a test vehicle.	For results after 4 phases Output step 5	For every test: $M_{i,CS,c,5}$, g/km; $M_{CO_2,CS,c,5}$, g/km; $M_{CO_2,CS,p,5}$, g/km.	Averaging of tests and declared value according to paragraphs 1.2. to 1.2.3. inclusive of Annex B6.	$M_{i,CS,c,6}$, g/km; $M_{CO_2,CS,c,6}$, g/km; $M_{CO_2,CS,p,6}$, g/km; $M_{CO_2,CS,c,declared}$, g/km.
	For results after 3 phases Output step 5	$FE_{c,5}$, km/l;	<p>Averaging of tests and declared value.</p> <p>Paragraphs 1.2. to 1.2.3. inclusive of Annex B6.</p> <p>The conversion from $FE_{c,declared}$ to $M_{CO_2,c,declared}$, shall be performed for the applicable cycle. For that purpose, the criteria emission over the complete cycle shall be used.</p>	$FE_{c,declared}$, km/l $M_{CO_2,c,declared}$, g/km.
7 $M_{CO_2,CS}$ results of a Type 1 test for a test vehicle.	For results after 4 phases: Output step 6	$M_{CO_2,CS,c,6}$, g/km; $M_{CO_2,CS,p,6}$, g/km; $M_{CO_2,CS,c,declared}$, g/km.	<p>Alignment of phase values. Paragraph 1.2.4. of Annex B6,</p> <p>and:</p> $M_{CO_2,CS,c,7} = M_{CO_2,CS,c,declared}$	$M_{CO_2,CS,c,7}$, g/km; $M_{CO_2,CS,p,7}$, g/km.
	For results after 3 phases: Output step 5 Output step 6	$M_{CO_2,CS,c,5}$, g/km; $M_{CO_2,CS,p,5}$, g/km; $M_{CO_2,CS,c,declared}$, g/km.	Alignment of phase values. Paragraph 1.2.4. of Annex B6.	$M_{CO_2,CS,p,7}$, g/km.

"

Table A8/6., amend the table caption to read:

"Table A8/6

Calculation of final charge-sustaining fuel consumption and fuel efficiency for OVC-HEVs, NOVC-HEVs (FE applicable for results after 3 phases only)

Table A8/6 shall be performed separately for results after 4 phases and for results after 3 phases."

Table A8/7., amend the table caption to read:

"Table A8/7

Calculation of final charge-sustaining fuel consumption and fuel efficiency for NOVC-FCHVs (FE applicable for results after 3 phases only)

Table A8/7 shall be performed separately for results after 4 phases and for results after 3 phases.

For results after 4-phases all the calculations in this table shall be for the complete cycle

For the 3-phase WLTP all the calculations in this table shall be for the 3-phase cycle and also for individual phases"

Paragraph 4.5., insert paragraph 4.5.1. to read:

"4.5. Interpolation of individual vehicle values

4.5.1. Interpolation range

4.5.1.1. Interpolation range for NOVC- HEVs and OVC-HEVs

..."

Paragraph 4.5.1.1.5., amend to read:

"4.5.1.1.5. Vehicle M

.....

The linearity of charge-sustaining CO₂ mass emission for vehicle M shall be verified against the linearly interpolated charge-sustaining CO₂ mass emission between vehicle L and H over the 3-phase and/or 4-phase cycle, as applicable, by using the corrected measured values referring to step 6 M_{CO₂,CS,e,6} of Table A8/5 of this annex.

The linearity criterion ..."

"Table A8/8., amend the table caption to read:

"Table A8/8

Calculation of final charge-depleting values (FE applicable for results after 3 phases only)

Table A8/8 shall be performed separately for results after 4 phases and for results after 3 phases."

Table A8/8., Step 5, amend to read:

"

For results after 4 phases 5	Output step 1	M _{i,CD,j} , g/km; PM _{CD,e} , mg/km; PN _{CD,j} , particles per kilometer.	Calculation of combined values for emissions for n _{veh} cycles; in the case of interpolation for n _{veh,L} cycles for each vehicle. Output is available for each test. In the case that the interpolation method is applied, the output is available for vehicle H, L and, if applicable, M.	M _{i,CD,e} , g/km; PM _{CD,e} , mg/km; PN _{CD,e} , particles per kilometer.
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"

Table A8/9., amend the table caption to read:

"Table A8/9

Calculation of final charge-depleting and charge-sustaining weighted values (FE applicable for results after 3 phases only)

Table A8/9 shall be performed separately for results after 4 phases and for results after 3 phases."

Table A8/10., amend the table caption to read:

"Table A8/10

Calculation of final PEV values determined by application of the consecutive cycle Type 1 procedure

Table A8/10 shall be performed separately for results after 4 phases and for results after 3 phases.

For results after 4 phases;

The considered periods shall be the low phase, medium phase, high phase, extra high phase, the applicable WLTP city test cycle and the applicable WLTP test cycle.

For results after 3 phases;

The considered periods shall be the low phase, medium phase, high phase and the applicable WLTP test cycle."

Table A8/11., amend the table caption to read:

"Table A8/11

Calculation of final PEV values determined by application the shortened Type 1 test procedure

Table A8/11 shall be performed separately for results after 4 phases and for results after 3 phases.

For results after 4 phases;

The considered periods shall be the low phase, medium phase, high phase, extra high phase, the applicable WLTP city test cycle and the applicable WLTP test cycle.

For results after 3 phases;

The considered periods shall be the low phase, medium phase, high phase and the applicable WLTP test cycle."

Annex B8, Appendix 8

Paragraph 1.1., renumber final sub-paragraph as paragraph 1.1.1. and amend to read:

"1.1.1. In the case that the interpolation method is applied, the values declared and used for verifying the conformity of production with respect to the electric energy consumption of vehicle H and vehicle L shall be the input values for the interpolation of the individual electric energy consumption values according to paragraph 1.2. of this appendix. "

Paragraph 2.1., renumber final sub-paragraph as paragraph 2.1.1. and amend to read:

"2.1.1. In the case that the interpolation method is applied, the values declared and used for verifying the conformity of production with respect to the electric energy consumption of vehicle H and vehicle L shall be the input values for the interpolation of the individual electric energy consumption values according to paragraph 2.2. of this appendix. "

At the end of Annexes Part B, add a new Annex B9:

"Annex B9 - Reserved"

Annex C5

Paragraph 3.3.2., amend to read:

"3.3.2. The OBD system shall indicate the failure of an emission-related component or system when that failure results in emissions exceeding any of the OBD thresholds set out in paragraph 6.8.2. of this Regulation."

Paragraph 3.3.3.4., amend to read:

"3.3.3.4. Other emission control system components or systems, or emission related power train components or systems which are connected to a computer, if active on the selected fuel, the failure of which may result in tailpipe emissions exceeding any of the OBD thresholds set out in Table 4A and Table 4B (as applicable) in paragraph 6.8.2. of this Regulation.

The following is ..."

Paragraph 3.3.4.4., amend to read:

"3.3.4.4. Other emission control system components or systems, or emission-related power-train components or systems, which are connected to a computer, the failure of which may result in exhaust emissions exceeding any of the OBD thresholds set out in paragraph 6.8.2. of this Regulation. Examples of such systems or components are those for monitoring and control of air mass-flow, air volumetric flow (and temperature), boost pressure and inlet manifold pressure (and relevant sensors to enable these functions to be carried out)."

Paragraph 3.5.2., amend to read:

"3.5.2. For strategies requiring more than two preconditioning cycles for MI activation, the manufacturer shall provide data and/or an engineering evaluation which adequately demonstrates that the monitoring system is equally effective and timely in detecting component deterioration. Strategies requiring on average more than ten driving cycles for MI activation are not accepted. The MI shall also activate whenever the engine control enters a permanent emission default mode of operation if any of the OBD thresholds set out in paragraph 6.8.2. of this Regulation are exceeded or if the OBD system is unable to fulfil the basic monitoring requirements specified in paragraph 3.3.3. or 3.3.4. of this annex. The MI shall operate in a distinct warning mode, e.g. a flashing light, under any period during which engine misfire occurs at a level likely to cause catalyst damage, as specified by the manufacturer. The MI shall also activate when the vehicle's ignition is in the "key-on" position before engine starting or cranking and de-activate after engine starting if no malfunction has previously been detected."

Annex C5, Appendix 1

Paragraph 1., amend to read:

"1. This appendix describes the procedure of the test according to paragraph 3. of this annex. The procedure describes a method for checking the function of the On-Board Diagnostic (OBD) system installed on the vehicle by failure simulation of relevant systems in the engine management or emission control system. It also sets procedures for determining the durability of OBD systems.

The manufacturer shall make available the defective components and/or electrical devices which would be used to simulate failures. When measured over the Type 1 test cycle, such defective components or devices shall not cause the vehicle emissions to exceed any of the OBD thresholds set out in Table 4A and Table 4B (as applicable) in paragraph 6.8.2. of this Regulation by more than 20 per cent. For electrical failures (short/open circuit), the emissions may exceed these OBD thresholds by more than twenty per cent.

When the vehicle is tested with the defective component or device fitted, the OBD system is approved if the MI is activated. The OBD system is also approved if the MI is activated below the OBD thresholds."

Paragraphs 6.4.2.2. and 6.4.2.3., amend to read:

- "6.4.2.2. Where fitted, replacement of a catalyst with a deteriorated or defective catalyst or electronic simulation of a deteriorated or defective catalyst that results in emissions exceeding any of the OBD thresholds set out in paragraph 6.8.2. of this Regulation.
- 6.4.2.3. Where fitted, total removal of the particulate trap or replacement of the particulate trap with a defective particulate trap meeting the conditions of paragraph 6.3.2.2. of this appendix that results in emissions exceeding any of the OBD thresholds set out in paragraph 6.8.2. of this Regulation."

Paragraph 6., amend to read:

"6. OBD test procedure

An overview of the OBD test procedure is provided in Figure C5.App1/1.
This is for information purposes only.

..."
