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**Consideration and vote by AC.3 of draft UN Global Technical Regulations
and/or draft amendments to established UN Global Technical Regulations**

**Proposal for a global technical regulation on
the Worldwide harmonized Light vehicles Test Procedure**

Corrigendum to the proposal for a new global technical regulation on the Worldwide harmonized Light vehicles Test Procedure (WLTP)

Submitted by the Secretariat

The text reproduced below was prepared by the secretariat to correct editorial issues in the text of the proposal for a new UN Global Technical Regulation (UN GTR) on the Worldwide harmonized Light vehicles Test Procedure (WLTP), following communications with the draft coordinator of the WLTP UN GTR.

Corrigendum

Page 7, paragraph 3.1.5., correct to read:

"3.1.5. "Full-flow exhaust dilution system" means the continuous dilution of the total vehicle exhaust with ambient air in a controlled manner using a constant ~~y~~Volume ~~s~~ampler (CVS)."

Page 7, paragraph 3.1.8., correct to read:

"3.1.8. "Non-methane hydrocarbons" (NMHC) are the ~~t~~Total ~~Hydro~~hydrocarbons (THC) minus the methane (CH₄) contribution."

Page 8, paragraph 3.1.13., correct to read:

"3.1.13. "Total ~~Hydro~~hydrocarbons" (THC) means all volatile compounds measurable by a flame ionization detector (FID)."

Page 11, paragraph 3.1.13., correct to read:

"3.3.19. "Off-vehicle charging" (OVC)" means that the REESS can be charged externally. This ~~is a~~ REESS is also known as externally-chargeable."

Page 19, paragraph 1.2. of Annex 1, correct to read:

"1.2. v_{max} is the maximum speed of a vehicle as defined in 3.7.2. of 3. Definitions paragraph 3 and not that which may be artificially restricted.

Page 28, table A1/2 of Annex 1, delete all zeros in the third column (Time in s).

Page 79, table A3/5 of Annex 3, correct to read:

"

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Research octane number, RON		95.0		EN 25164 pr EN ISO 5164
Motor octane number, MON		85.0		EN 25163 pr EN ISO 5163
...

"

Page 82, table A3/8 of Annex 3, correct to read:

"

Parameter	Unit	Fuel E1	Fuel E2	Fuel J	Fuel K	Test method
...
Evaporation residue	mg/kg	Max 50	Max 50			pr EN 15470
Evaporation residue (100ml)	ml	-			0.05	ASTM D2158
Water at 0°C		Free				pr EN 15469
...

"

Page 83, table A3/9 of Annex 3, correct to read:

"Table A3/9

"G20" "High Gas" (nominal 100 per cent Methane)

Characteristics	Units	Basis	Limits		Test method
			Minimum	Maximum	
Composition:					
Methane	% mole	100	99	100	ISO 6974
Balance ⁽¹⁾	% mole	—	—	1	ISO 6974
N ₂	% mole				ISO 6974
Sulphur content	mg/m ³⁽²⁾	—	—	10	ISO 6326-5
Wobbe Index (net)	MJ/m ³⁽³⁾	48.2	47.2	49.2	

(1) Inerts (different from N₂) + C2 + C2+.

(2) Value to be determined at 293.215 K (20°C) and 101.325 kPa.

(3) Value to be determined at 273.215 K (0°C) and 101.325 kPa.

"

Page 89, paragraph 2. of Annex 4, correct to read:

"2. Terms and definitions

For the purpose of this document, the terms and definitions given in ISO 3833 and in paragraph 3 of II. Text of the Global Regulation~~paragraph 3. of this gr~~ apply."

Page 97, table A4/2 of Annex 4, correct to read:

" Table A4/2

Warming up and stabilization across phases

Vehicle class	Applicable WLTC	90 per cent of maximum speed	Next higher phase
Class1	Low ₁ + Medium ₁	58 km/h	NA
Class2	Low ₂ + Medium ₂ + High ₂ & ± Extra High ₂	111 km/h	NA
	Low ₂ + Medium ₂ + High ₂	77 km/h	Extra High (111 km/h)
Class3	Low ₃ + Medium ₃ + High ₃ + Extra High ₃	118 km/h	NA
	Low ₃ + Medium ₃ + High ₃	88 km/h	Extra High (118 km/h)

"

Page 98, paragraph 4.3.1.4.1. of Annex 4, correct to read:

"4.3.1.4.1. The coastdown time corresponding to reference speed v_j as the elapsed time from vehicle speed $(v_i + \Delta v)$ to $(v_i - \Delta v)$ shall be measured. It is recommended that $\Delta v = 5$ km/h with the option of $\Delta v = 10$ km/h when the vehicle speed is more than 60 km/h."

Page 98, paragraph 4.3.1.4.2. of Annex 4, correct to read:

"4.3.1.4.2. These measurements shall be carried out in both directions until a minimum of three consecutive pairs of measurements have been obtained which satisfy the statistical accuracy p , in per cent, defined below.

$$p = \frac{h \times \sigma}{\sqrt{n}} \times \frac{100}{\Delta t_j} \leq 3 \text{ per cent}$$

where:

...

Δt_j is the mean coastdown time at reference speed v_i , in seconds, given by the equation $\Delta t_j = \frac{1}{n} \sum_{i=1}^n \Delta t_{ji}$, where Δt_{ji} is the harmonized average coastdown time of the i^{th} pair of measurements at velocity v_i , seconds (s), given by the equation: $\Delta t_{ji} = \frac{2}{\left(\frac{1}{\Delta t_{jai}}\right) + \left(\frac{1}{\Delta t_{jbi}}\right)}$. Δt_{jai} and

Δt_{jbi} are the coastdown times of the i^{th} measurement at reference speed v_i , in seconds (s), in each direction, respectively;

..."

Page 99, paragraph 4.3.1.4.4. of Annex 4, correct to read:

"4.3.1.4.4. The total resistances, F_{ja} and F_{jb} at reference speed v_i in directions a and b, in Newton (N), are determined by the equations:

$$F_{ja} = -\frac{1}{3.6} \times (m_{av} + m_r) \times \frac{2 \times \Delta v}{\Delta t_{ja}}$$

and

$$F_{jb} = -\frac{1}{3.6} \times (m_{av} + m_r) \times \frac{2 \times \Delta v}{\Delta t_{jb}}$$

where:

F_{ja} is the total resistance at reference speed (j) in direction a, in Newton (N);

F_{jb} is the total resistance at reference speed (j) in direction b, in Newton (N);

m_{av} is the average of the test vehicle masses at the beginning and end of road load determination, kg;

m_r is the equivalent effective mass of all the wheels and vehicle components rotating with the wheels during coastdowns on the road, in kilograms (kg); m_r shall be measured or calculated using an appropriate technique agreed by the responsible authority. Alternatively, m_r may be estimated to be three per cent of the unladen vehicle mass in running order plus 25 kg for the CO₂ vehicle family;

Δt_{ja} and Δt_{jb} are the mean coastdown times in directions a and b, respectively, corresponding to reference speed v_i , seconds (s), given by the equations $\Delta t_{ja} = \frac{1}{n} \sum_{i=1}^n \Delta t_{jai}$ and $\Delta t_{jb} = \frac{1}{n} \sum_{i=1}^n \Delta t_{jbi}$."

Page 100, paragraph 4.3.1.4.5. of Annex 4, correct to read:

"4.3.1.4.5. The following equation shall be used to compute the average total resistance where the harmonized average of the alternate coastdown times shall be used.

$$F_j = - \frac{1}{3.6} \times (m_{av} + m_r) \times \frac{2 \times \Delta v}{\Delta t_j}$$

where:

Δt_j is the harmonized average of alternate coastdown time measurements at velocity v_i , seconds (s), given by $\Delta t_j = \frac{2}{\frac{1}{\Delta t_{ja}} + \frac{1}{\Delta t_{jb}}}$ where Δt_{ja} and

Δt_{jb} are the coastdown times at velocity v_i , seconds (s), in each direction, respectively;

m_{av} is the average of the test vehicle masses at the beginning and end of road load determination, kg;

m_r is the equivalent effective mass of all the wheels and vehicle components rotating with the wheels during coastdowns on the road, in kilograms (kg); m_r shall be measured or calculated using an appropriate technique. Alternatively, m_r may be estimated to be three per cent of the mass in running order plus 25 kg for the vehicle family.

The coefficients f_0 , f_1 and f_2 in the total resistance equation shall be calculated with a least squares regression analysis."

Pages 105 and 106, paragraph 4.4.3.1. of Annex 4, correct the format to read:

"4.4.3.1. Calculation process

Mean velocity v_{jm} , km/h, and mean torque C_{jm} , Nm, over a time period, shall be calculated from the data sets collected in paragraph 4.4.2.3. above as follows:

$$v_{jm} = \frac{1}{k} \sum_{i=1}^k v_{ji}$$

and

$$C_{jm} = \frac{1}{k} \sum_{i=1}^k C_{ji} - C_{js}$$

where:

v_{ji} is vehicle speed of the i^{th} data set, km/h;

k is the number of data sets;

C_{ji} is torque of the i^{th} data set, Nm;

C_{js} is the compensation term for speed drift, Nm, given by the following equation $C_{js} = (m_{av} + m_r) \times \alpha_j r_j$.

C_{js} shall be no greater than five per cent of the mean torque before compensation, and may be neglected if α_j is not greater than $\pm 0.005 \text{ m/s}^2$.

m_{av} and m_r are the average test vehicle mass and the equivalent effective mass, in kg, , respectively, defined in paragraph 4.3.1.4.4. above.

r_j is the dynamic radius of the tyre, in meters (m), given by the equation $r_j = \frac{1}{3.6} \times \frac{v_{jm}}{2 \times \pi N}$, where N is the rotational frequency of the driven tyre, in s^{-1} ;

α_j is the mean acceleration, in metres per second squared (m/s^2), which shall be calculated by the equation

$$\alpha_j = \frac{1}{3.6} \times \frac{k \sum_{i=1}^k t_i v_{ji} - \sum_{i=1}^k t_i \sum_{i=1}^k v_{ji}}{k \times \sum_{i=1}^k t_i^2 - [\sum_{i=1}^k t_i]^2}, \text{ where } t_i \text{ is the time at which the } i^{\text{th}} \text{ data set was sampled, seconds (s)."$$

Pages 114, paragraph 8.2.3.2. of Annex 4, correct to read:

"8.2.3.2. The error, ε_j , in per cent of the simulated road load F_{sj} shall be calculated. F_{sj} is determined according to the method specified in Appendix 1 to this Annex, paragraph 2, for target road load F_{tj} at each reference speed v_j .

..."

Page 119, letter b) of paragraph 1.1.2. of Annex 5, correct read:

"1.1.2. ...

(b) For circular fan outlets, the outlet shall be divided into 8 equal sections by vertical, horizontal and 45° lines. The measurement points lie on the radial centre line of each arc (22.5°) at two thirds of the outlet radius (as shown in Figure A5/2).

..."

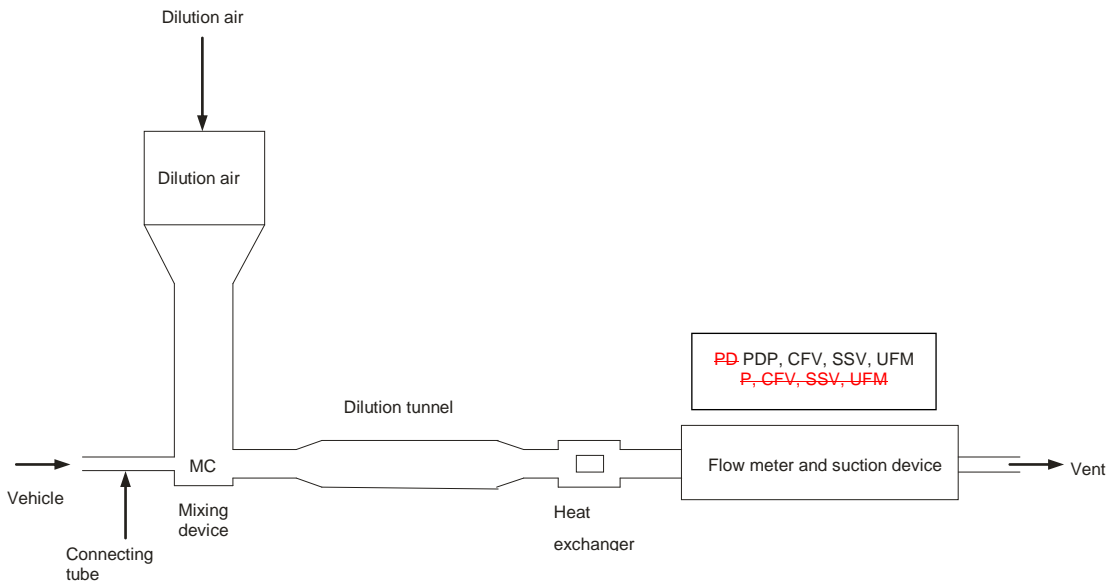
Page 121, paragraph 2.3.1.2. of Annex 5, correct to read:

"2.3.1.2. The difference in distance covered by the front and rear rolls shall be less than 0.1 m in any 200 ms time period. If it can be demonstrated that this criteria is met, the speed synchronization requirement in paragraph ~~2.3.1.3.~~ below is not required. This must be checked for new dynamometer instalments and after major repairs or maintenance."

Page 124, paragraph 3.3.3.4. of Annex 5, renumber as 3.3.3.3.

Page 126, Figure A5/3 of Annex 5, correct to read:

"Figure A5/3
Exhaust Dilution System



Page 139, paragraph 4.1.4.8.1.2. of Annex 5, renumber as 4.1.4.8.2.2.

Pages 146 and 147, paragraphs 4.2.1.3.5.2., 4.2.1.3.5.3. and 4.2.1.3.5.4. of Annex 5, renumber and correct to read:

"4.2.1.3.5.2. For a given test, the gas filter face velocity shall be set to a single value within the range 20 cm/s to 105 cm/s and should be set at the start of the test so that 105 cm/s will not be exceeded when the dilution system is being operated with sampling flow proportional to CVS flow rate.

~~4.2.1.3.5.3.~~ 4.2.1.3.5.4. Fluorocarbon coated glass fibre filters or fluorocarbon membrane filters are required.

All filter types shall have a 0.3 µm DOP (di-octylphthalate) or PAO (poly-alpha-olefin) CS 68649-12-7 or CS 68037-01-4 collection efficiency of at least 99 per cent at a gas filter face velocity of 5.33cm/s measured according to one of the following standards:

- (a) U.S.A. Department of Defense Test Method Standard, MIL-STD-282 method 102.8: DOP-Smoke Penetration of Aerosol-Filter Element
- (b) U.S.A. Department of Defense Test Method Standard, MIL-STD-282 method 502.1.1: DOP-Smoke Penetration of Gas-Mask Canisters

- (c) Institute of Environmental Sciences and Technology, IEST-RP-CC021: Testing HEPA and ULPA Filter Media.

~~4.2.1.3.5.4.4.2.1.3.5.3.~~ The filter holder assembly shall be of a design that provides an even flow distribution across the filter stain area. The filter shall be round and have a stain area of at least 1075 mm²."

Page 149, paragraph 4.3.#, following paragraph 4.3.1.2.1.2. of Annex 5, renumber and correct to read:

"~~4.3.1.2.1.3.4.3.#~~ Any other sampling configuration for the PTS for which equivalent particle penetration at 30 nm can be demonstrated will be considered acceptable."

Pages 149 and 150, letter h) of paragraph 4.3.1.3.3. of Annex 5, correct to read:

"4.3.1.3.3. ...

- (h) Also achieve > 99.0 per cent vaporization of 30 nm tetracontane (CH₃(CH₂)₃₈CH₃) particles, with an inlet concentration of ≥ 10,000 cm⁻³, by means of heating and reduction of partial pressures of the tetracontane."

Page 153, paragraph 4.3.1.4.4.3. of Annex 5, correct to read:

"4.3.1.4.4.3. The VPR shall achieve > 99.0 per cent vaporization of 30 nm tetracontane (CH₃(CH₂)₃₈CH₃) particles, with an inlet concentration of ≥ 10,000 cm⁻³, by means of heating and reduction of partial pressures of the tetracontane."

Page 167, paragraph 1.2.2.1.1. of Annex 6, correct to read:

"1.2.2.1.1. The following temperatures shall be measured with an accuracy of ± 1.5 K:

- (a) Test cell ambient air
(b) Dilution and sampling system temperatures as required for emissions measurement systems defined ~~in~~ Annex 5."

Page 181, paragraph 2.2.2. of Annex 6 -Appendix 1, correct to read:

"2.2.2. The test and vehicle conditions for the Type 1 test described in this ~~gtr~~ apply before the first valid emission test is carried out."

Page 188, table A6.App2/1 of Annex 6 -Appendix 2, correct to read:

"Table A6.App2/1

RCB correction criteria

Cycle	WLTC city(low + + medium)	WLTC (low + medium + + high)	WLTC(low + medium + high + + extra high)
RCB correction criteria (%)	1.5	1	0.5

"

Page 190, table A6.App2/2 of Annex 6 -Appendix 2, correct to read:

" Table A6.App2/2

Willans factors

			<i>Naturally aspirated</i>	<i>Pressure charged Supercharged</i>
Positive ignition	Gasoline (E0)	l/kWh	0.264	0.28
		gCO ₂ /kWh	630	668
	Gasoline (E5)	l/kWh	0.268	0.284
		gCO ₂ /kWh	628	666
	CNG (G20)	m ³ /kWh	0.259	0.275
		gCO ₂ /kWh	465	493
	LPG	l/kWh	0.342	0.363
		gCO ₂ /kWh	557	591
	E85	l/kWh	0.367	0.389
		gCO ₂ /kWh	608	645
Compression ignition	Diesel (B0)	l/kWh	0.22	0.22
		gCO ₂ /kWh	581	581
	Diesel (B5)	l/kWh	0.22	0.22
		gCO ₂ /kWh	581	581

"

Pages 191 and 192, paragraph 2.2.1.1.1. of Annex 7, correct to read:

"2.2.1.1.1. The diluted exhaust gas volume, V, shall be corrected to standard conditions according to the following equation:

$$V_{\text{mix}} = V \times K_1 \times \left(\frac{P_B - P_1}{T_p} \right) \quad (2)$$

where:

$$K_1 = \frac{273.15 \text{ (K)}}{101.325 \text{ (kPa)}} = 2.6961$$

P_B is the test room barometric pressure, kPa;

P_1 is the vacuum at the inlet to the positive displacement pump relative to the ambient barometric pressure, kPa;

T_p is the average temperature of the diluted exhaust gas entering the positive displacement pump during the test, Kelvin (K)."

Page 211, paragraph 3.2.4.6. of Annex 8, correct to read:

"3.2.4.6. REESS charging and measuring electric energy consumption

The vehicle shall be connected to the mains within 120 minutes after the conclusion of the charge-depleting Type 1 test. The energy measurement equipment, placed before the vehicle charger, shall measure the charge energy, E_{AC} , delivered from the mains, as well as its duration. Electric energy measurement can be stopped when the state of charge after the CD test is at

least equal to the state of charge measured before the CD test. The state of charge can be determined by on-board or external instruments."

Page 212, paragraphs 3.2.6.2. to 3.2.7. of Annex 8, correct to read:

"3.2.6.2. Subsequently, the procedures for the CS test from paragraph 3.2.5.1. up to and including paragraph 3.2.5.3. (except paragraph 3.2.5.2.5.) in this Annex shall be followed.

3.2.6.3. REESS charging and measuring electric energy consumption

The vehicle shall be connected to the mains within 120 minutes after the conclusion of the charge-sustaining Type 1 test. The energy measurement equipment, placed before the vehicle charger, shall measure the charge energy, E, delivered from the mains, as well as its duration. Electric energy measurement may be stopped when the state of charge after the CS test is at least equal to the state of charge measured before the CD test. The state of charge shall be determined by on-board or external instruments.

3.2.7. CS test with a subsequent CD test (option 2)"

Page 217, paragraph 4.2.1.3.1. of Annex 8, correct to read:

"4.2.1.3.1. Test result correction as a function of REESS charging balance

The corrected values $CO_{2,CS,corrected}$ and $FC_{CS,corrected}$ shall correspond to a zero charging balance ($RCB = 0$), and shall be determined according to Appendix 2 to this Annex."

Page 219, paragraph 4.2.2.3. of Annex 8, correct to read:

"4.2.2.3. Test result correction as a function of REESS charging balance

The corrected values $CO_{2,CS,corrected}$ and $FC_{CS,corrected}$ shall correspond to a zero energy balance ($RCB = 0$), and shall be determined according to Appendix 2 to this Annex."

Page 219, paragraph 4.2.2.3.2. of Annex 8, correct to read:

"4.2.2.3.2. The test results shall be the uncorrected measured values of $CO_{2,CS}$ and FC_{CS} in case any of the following applies:

..."

Page 228, add paragraph 2.3 after paragraph 2.2.1. of Annex 8 -Appendix 2, to read:

2.3. Fuel consumption at zero REESS energy balance (FC_0)"