

Proposal for amendments to ECE/TRANS/WP.29/GRPE/2017/9

The text reproduced below was prepared by the IWG on Worldwide harmonized Light vehicles Test Procedure (WLTP). The modifications to the current text of ECE/TRANS/WP.29/GRPE/2017/9 are marked in bold for new or struck through for deletion.

Proposal

I Statement of technical rationale and justification, paragraph 10(a), amend to read:

"Non-hybrid combustion engine-powered ~~Conventional ICE~~ vehicles:"

Correction/justification: The use of "conventional ICE vehicles" is not technically precise.

Proposal

II Text of the global technical regulation, paragraph 3.1.16., amend to read:

""Response time" means the difference in time between the change of the component to be measured at the reference point and a system response of 90 per cent of the final reading (t₉₀) with the sampling probe being defined as the reference point, whereby the change of the measured component is at least 60 per cent full scale (FS) and takes place in less than 0.1 second. The system response time consists of the delay time to the system and of the rise time of the system."

Correction/justification: Response time is used in the GTR but was not defined.

Proposal

II Text of the global technical regulation, paragraph 3.1.17., amend to read:

""Delay time" means the difference in time between the change of the component to be measured at the reference point and a system response of 10 per cent of the final reading (t₁₀) with the sampling probe being defined as the reference point. For the gaseous components, this is the transport time of the measured component from the sampling probe to the detector."

Correction/justification: Delay time is used in the GTR but was not defined.

Proposal

II Text of the global technical regulation, paragraph 3.1.18., amend to read:

""Rise time" means the difference in time between the 10 per cent and 90 per cent response of the final reading (t₉₀ – t₁₀)."

Correction/justification: Rise time is used in the definition of "response time" GTR but is not defined.

Proposal

II Text of the global technical regulation, paragraph 3.3., amend to read:

"Pure electric, hybrid electric, ~~and~~ fuel cell **and alternatively-fuelled** vehicles "

Correction/justification: Paragraph 3.3. has been extended to include definitions of bi-fuel vehicles (see 3.3.21.) and bi-fuel gas vehicles (see 3.3.22.). The title in 3.3. has been modified to reflect this.

Proposal

II Text of the global technical regulation, paragraph 3.3.21., amend to read:

"Bi-fuel vehicle" means a vehicle with two separate fuel storage systems that is designed to run primarily on only one fuel at a time; however the simultaneous use of both fuels is permitted in limited amount and duration."

Correction/justification: Regulation 83 was amended in recent years at the request of industry to permit limited operation of a bi-fuel gas vehicle either on petrol or on a mixture of petrol and the gaseous fuel when operating in the gas fuel mode. Justification for this was the cooling of engine valves during high load operation.

Proposal

II Text of the global technical regulation, paragraph 3.3.22., amend to read:

"Bi-fuel gas vehicle" means a bi-fuel vehicle where the two fuels are petrol (petrol mode) and either LPG, NG/biomethane, or hydrogen."

Correction/justification: Regulation 83 was amended in recent years at the request of industry to permit limited operation of a bi-fuel gas vehicle either on petrol or on a mixture of petrol and the gaseous fuel when operating in the gas fuel mode. Justification for this was the cooling of engine valves during high load operation.

Proposal

II Text of the global technical regulation, paragraph 3.5.9., amend to read:

~~"Predominant mode" for the purposes of this UN GTR means a single mode that is always selected when the vehicle is switched on regardless of the operating mode selected when the vehicle was previously shut down.~~

"Predominant mode" for the purpose of this UN GTR means a single mode that is always selected when the vehicle is switched on regardless of the operating mode selected when the vehicle was previously shut down and cannot be redefined or switched to another mode without an intentional action of the driver."

Correction/justification: Approved at IWG #18, Bern.

Proposal

II Statement of technical rationale and justification, paragraph 5.6.2.(c), amend to read:

"Type of **electric** energy converter between the electric machine and traction REESS, between the traction REESS and low voltage power supply and between the recharge-plug-

in and traction REESS, and any other characteristics having a non-negligible influence on CO2 mass emission and electric energy consumption under WLTP conditions;"

Correction/justification: Consistency of terminology with paragraph 5.6.3.(e).

Proposal

II Statement of technical rationale and justification, paragraph 5.6.3.(e), amend to read:

"Type of electric **energy** converter between the electric machine and traction REESS, between the traction REESS and low voltage power supply and between the recharge-plug-in and traction REESS, and any other characteristics having a non-negligible influence on CO2 mass emission and electric energy consumption under WLTP conditions;"

Correction/justification: Consistency of terminology with paragraph 5.6.2.(c).

Proposal

Annex 2, paragraph 2.(b), amend to read:

" n_{rated} , the rated engine speed **declared by the manufacturer as the engine speed** at which ~~an~~ the engine develops its maximum power-, ~~If the maximum power is developed over an engine speed range, n_{rated} shall be the minimum of this range, $min-1$;~~"

Correction/justification: There could be slight differences between the n_{rated} and P_{rated} values declared by the manufacturer and derived from the $P_{wot(n)}$ curve according to paragraph 2 (h). The $P_{wot(n)}$ curve is one of the key elements of the gear use calculation. Technical experts agreed that it is desirable to use the values derived from this curve.

Proposal

Annex 2, paragraph 2.(h), amend to read:

" $P_{wot(n)}$, the full load power curve over the engine speed range-

$(n/v)(ng_{vmax})$ is the ratio obtained by dividing the engine speed n by the vehicle speed v for the gear ng_{vmax} , $min-1/(km/h)$;

The power curve shall consist of a sufficient number of data sets (n , P_{wot}) so that the calculation of interim points between consecutive data sets can be performed by linear interpolation. Deviation of the linear interpolation from the full load power curve according to Regulation No. 85 shall not exceed 2 per cent. The first data set shall be at $n_{min_drive_set}$ ~~of $ngear \rightarrow 2$~~ (see (k)(3) below) or lower. The last data set shall be at n_{max} or higher engine speed. Data sets need not be spaced equally **but all data sets shall be reported.**

The data sets and the values P_{rated} and n_{rated} shall be taken from the power curve as declared by the manufacturer.

The full load power at engine speeds not covered by Regulation No. 85 shall be determined according to the method described in Regulation No. 85;

Correction/justification: Approved by experts at IWG #20 (Seoul) in conjunction with the approvals in paragraph 2.(b).

Proposal

Annex 2, paragraph 2.(k), amend to read:

Definition of n_{\min_drive}

n_{\min_drive} is the minimum engine speed when the vehicle is in motion, min^{-1} ;

(1) For $n_{\text{gear}} = 1$, $n_{\min_drive} = n_{\text{idle}}$,

(2) For $n_{\text{gear}} = 2$,

(ai) for transitions from first to second gear:

$$n_{\min_drive} = 1.15 \times n_{\text{idle}},$$

(bii) for decelerations to standstill:

$$n_{\min_drive} = n_{\text{idle}},$$

(eiii) for all other driving conditions:

$$n_{\min_drive} = 0.9 \times n_{\text{idle}}.$$

(3) For $n_{\text{gear}} > 2$, n_{\min_drive} shall be determined by:

$$n_{\min_drive} = n_{\text{idle}} + 0.125 \times (n_{\text{rated}} - n_{\text{idle}}).$$

This value shall be referred to as $n_{\min_drive_set}$.

The final results for n_{\min_drive} shall be rounded to the nearest integer. Example: 1199.5 becomes 1200, 1199.4 becomes 1199.

~~Higher values~~ **Higher than $n_{\min_drive_set}$ may be used for $n_{\text{gear}} > 2$ if requested by the manufacturer. In this case, the manufacturer may specify one value for acceleration/constant speed phases ($n_{\min_drive_up}$) and a different value for deceleration phases ($n_{\min_drive_down}$). Samples with acceleration values $\geq -0.1389 \text{ m/s}^2$ shall belong to the acceleration/constant speed phases.**

In addition, for an initial period of time ($t_{\text{start_phase}}$), the manufacturer may specify higher values ($n_{\min_drive_start}$ and/or $n_{\min_drive_up_start}$) for the values n_{\min_drive} and/or $n_{\min_drive_up}$ for $n_{\text{gear}} > 2$ than specified above.

The initial time period shall be specified by the manufacturer but shall not exceed the low speed phase of the cycle and shall end in a stop phase so that there is no change of n_{\min_drive} within a short trip.

All individually chosen n_{\min_drive} values shall be equal to or higher than $n_{\min_drive_set}$ but shall not exceed ($2 \times n_{\min_drive_set}$).

All individually chosen n_{\min_drive} values and $t_{\text{start_phase}}$ shall be recorded.

~~Only $n_{\min_drive_set}$ Higher values may be used if requested by the manufacturer. However, such higher values shall not be used as the lower limit for the full load power curve according to paragraph 2.(h) above.~~

Correction/justification: Approved by experts at IWG #20 (Seoul) in conjunction with the approvals in paragraph 2.(b).

Proposal

Annex 4, new paragraph 2.6., amend to read:

"Additional masses for setting the test mass shall be applied such that the weight distribution of that vehicle is approximately the same as that of the vehicle with its mass in running order. In case of category 2 vehicles or passenger vehicles derived from category 2 vehicles, the additional masses should be located in a representative manner and shall be justified to the responsible authority upon their request. The weight distribution of the vehicle shall be recorded and shall be used for any subsequent road load determination testing."

Correction/justification: The position of the payload (25 kg and the mass representative of the vehicle load) is defined. Additional masses should not affect the weight distribution in a favourable or unfavourable way.

Proposal

Annex 4, paragraph 3.1., amend to read:

"Overall measurement accuracy, **precision, resolution and frequency**

The required overall measurement accuracy shall be as follows:

- (a) Vehicle speed **accuracy**: ± 0.2 km/h with a measurement frequency of at least 10 Hz;
- (b) Time: min. accuracy: ± 10 ms; min. precision and resolution: 10 ms;
- (c) Wheel torque **accuracy**: ± 6 Nm or ± 0.5 per cent of the maximum measured total torque, whichever is greater, for the whole vehicle, with a measurement frequency of at least 10 Hz;
- (d) Wind speed **accuracy**: ± 0.3 m/s, with a measurement frequency of at least 1 Hz;
- (e) Wind direction **accuracy**: $\pm 3^\circ$, with a measurement frequency of at least 1 Hz;
- (f) Atmospheric temperature **accuracy**: ± 1 °C, with a measurement frequency of at least 0.1 Hz;
- (g) Atmospheric pressure **accuracy**: ± 0.3 kPa, with a measurement frequency of at least 0.1 Hz;
- (h) Vehicle mass **accuracy** measured on the same weighing scale before and after the test: ± 10 kg (± 20 kg for vehicles $> 4,000$ kg);
- (i) Tyre pressure **accuracy**: ± 5 kPa;
- (j) Wheel rotational **speed accuracy** ~~frequency~~: ± 0.05 s⁻¹ or 1 per cent, whichever is greater."

Correction/justification: The modified title reflects the contents of sub-paragraphs (a) to (j) to include frequency, precision and resolution.

Proposal

Annex 4, paragraph 3.2.5., amend to read:

"Rotating wheels

To properly determine the aerodynamic influence of the wheels, the wheels of the test vehicle shall rotate at such a speed that the resulting vehicle velocity is within ~~a~~ ± 3 km/h ~~tolerance~~ of the wind velocity."

Correction/justification: The use of the word "tolerance" was incorrect.

Proposal

Annex 4, paragraph 3.2.12., amend to read:

"Measurement ~~repeatability~~ **precision**

The ~~repeatability~~ **precision** of the measured force shall be within ± 3 N."

Correction/justification: Correct use of the term precision.

Proposal

Annex 4, the title of paragraph 4.2.1.1.1., amend to read:

"Without using ~~an~~ **the** interpolation method"

Correction/justification: There is one interpolation method referred to in this paragraph.

Proposal

Annex 4, paragraph 4.2.1.1.2., amend to read:

"All items of optional equipment and/or body shapes that are chosen not to be considered **when applying** ~~in~~ the interpolation method shall be **identical fitted to** ~~for~~ both test vehicles H and L such that these items of optional equipment produce the highest combination of the cycle energy demand due to their road load relevant characteristics (i.e. mass, aerodynamic drag and tyre rolling resistance)."

Correction/justification: Sentence structure improved as body shapes are not fitted to test vehicles.

Proposal

Annex 4, paragraph 4.2.1.2.3.3., amend to read:

"In addition to ~~Notwithstanding~~ the requirements of an interpolation family in paragraphs 2.3.1. and 2.3.2. of Annex 6, the difference in cycle energy demand between HR and LR of the road load family shall be at least 4 per cent and shall not exceed 35 per cent based on HR over a complete WLTC Class 3 cycle."

Correction/justification: Editorial.

Proposal

Annex 4, Table A4/1, row1, column 2, amend to read:

Requirements to be fulfilled:	(1) w/o interpolation method	(2) Interpolation method w/o road load family	(3) Applying the road load family	(4) Interpolation method using one or more road load families
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Correction/justification: The word "method" was missing.

Proposal

Annex 4, table A4/2, title, amend to read:

"Energy efficiency classes according to rolling resistance coefficients (RRC) for C1, C2 and C3 tyres and the RRC values to be used for those energy efficiency classes in the interpolation, kg/tonne"

Classes of rolling resistance coefficients (RRC) for tyre categories C1, C2 and C3, kg/tonne"

Correction/justification: The title has been modified to reflect the contents of the table. The table lists ranges of rolling resistance coefficients for tyres according to their classes, and the rolling resistance coefficients for various energy efficiency classes.

Proposal

Annex 4, Table A4/2, row 1, amend to read:

Energy efficiency €class	Range of RRC for C1 range tyres	Range of RRC for C2 range tyres	Range of RRC for C3 tyres range
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Correction/justification: The titles of each column has been modified to reflect the contents of the table.

Proposal

Annex 4, Table A4/2, row 8, amend to read:

Energy efficiency €class	Value of RRC to be used for interpolation for C1 tyres class value	Value of RRC to be used for interpolation for C1 tyres class value	Value of RRC to be used for interpolation for C1 tyres class value
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Correction/justification: The titles of each column has been modified to reflect the contents of the table.

Proposal

Annex 4, paragraph 4.3.1.4., amend to read:

"~~Determination of road load by e~~Coastdown time measurement"

Correction/justification: 4.3.1.4. is the title of paragraphs 4.3.1.4.1. to 4.3.1.4.4. which deal with coastdown time measurement and not with determination of road load.

Proposal

Annex 4, paragraph 4.3.1.4.2., amend to read:

$$p_j = \frac{h \times \sigma_j}{\sqrt{n} \times \Delta t_{pj} \Delta t_{pj}} \leq 0.03$$

Correction/justification: An error in the numerator has been corrected. Δt_{pj} replaces Δt_{pj} .

Proposal

Annex 4, paragraph 4.3.1.4.3., amend to read:

"If during a measurement in one direction any external factor or driver action occurs that obviously influences the road load test, that measurement and the corresponding measurement in the opposite direction shall be rejected. All the rejected data and the reason

for rejection shall be recorded, and the number of rejected pairs of measurement shall not exceed 1/3 of the total number of measurement pairs. The maximum number of pairs that still fulfil the statistical ~~accuracy~~ **precision** as defined in paragraph 4.3.1.4.2. of this annex shall be evaluated. In the case of exclusion, pairs shall be excluded from the evaluations starting with the pair having the maximum deviation from the average."

Correction/justification: Consistency of terminology using "precision" with paragraph 4.3.1.4.2.

Proposal

Annex 4, paragraph 4.5.5.1., amend to read:

"The result of the calculation $((f_0 - w_1 - K_1) \times (1 + K_0 \times \times (T-20)))$ shall be used as the target road load coefficient A_t in the calculation of the chassis dynamometer load setting described in paragraph 8.1. of this annex.

The result of the calculation $(f_1 \times \times (1 + K_0 \times \times (T-20)))$ shall be used as the target road load coefficient B_t in the calculation of the chassis dynamometer load setting described in paragraph 8.1. of this annex.

The result of the calculation $(K_2 \times \times f_2)$ shall be used as the target road load coefficient C_t in the calculation of the chassis dynamometer load setting described in paragraph 8.1. of this annex."

Correction/justification: Consistency with the rest of GTR 15 in using standard Word mathematical symbols.

Proposal

Annex 4, paragraph 4.5.5.2.3., amend to read:

"The result of the calculation $((c_0 - w_2 - K_1) \times (1 + K_0 \times \times (T-20)))$ shall be used as the target running resistance coefficient a_t in the calculation of the chassis dynamometer load setting described in paragraph 8.2. of this annex."

Correction/justification: Consistency with the rest of GTR 15 in using standard Word mathematical symbols.

Proposal

Annex 4, paragraph 5.1.1.1., amend to read:

" $f_0 = \text{Max}((0.05 \times f_{0r} + 0.95 \times (f_{0r} \times \text{TM}/\text{TM}_r + ((\text{RR} - \text{RR}_r)/1000) \times 9.81 \times \times \text{TM}));$
 $(0.2 \times f_{0r} + 0.8 \times (f_{0r} \times \text{TM}/\text{TM}_r + ((\text{RR} - \text{RR}_r)/1000) \times 9.81 \times \times \text{TM}))"$

Correction/justification: Consistency with the rest of GTR 15 in using standard Word mathematical symbols.

Proposal

Annex 4, paragraph 5.1.1.1., amend to read:

"If the same tyres were fitted to test vehicles L and H, the value of RR_{ind} **when using** ~~for~~ the interpolation method shall be set to RR_H ."

Correction/justification: Grammatical improvement.

Proposal

Annex 4, paragraph 5.1.2.1., amend to read:

" $c_0 = r'/1.02 \times \text{Max}((0.05 \times 1.02 \times c_{0r}/r' + 0.95 \times (1.02 \times c_{0r}/r' \times \text{TM}/\text{TM}_r + ((\text{RR} - \text{RR}_r)/1000) \times 9.81 \times \text{TM}));$
 $(0.2 \times 1.02 \times c_{0r}/r' + 0.8 \times (1.02 \times c_{0r}/r' \times \text{TM}/\text{TM}_r + ((\text{RR} - \text{RR}_r)/1000) \times 9.81 \times \text{TM}))$ "

Correction/justification: Consistency with the rest of GTR 15 in using standard Word mathematical symbols.

Proposal

Annex 4, paragraph 5.1.2.1., amend to read:

" $c_2 = r'/1.02 \times \text{Max}((0.05 \times 1.02 \times c_{2r}/r' + 0.95 \times 1.02 \times c_{2r}/r' \times A_f / A_{fr});$ $(0.2 \times 1.02 \times c_{2r}/r' + 0.8 \times 1.02 \times c_{2r}/r' \times A_f / A_{fr})$ "

Correction/justification: Consistency with the rest of GTR 15 in using standard Word mathematical symbols.

Proposal

Annex 4, paragraph 6.4.1., amend to read:

"The wind tunnel design, test methods and the corrections shall provide a value of $(C_D \times A_f)$ representative of the on-road $(C_D \times A_f)$ value and with a ~~repeatability~~ **precision** of $\pm 0.015 \text{ m}^2$."

Correction/justification: Correct use of the term "precision".

Proposal

Annex 4, paragraph 6.4.2., amend to read:

"The vehicle shall be placed parallel to the longitudinal centre line of the tunnel with a maximum ~~deviation~~ **tolerance** of $\pm 10 \text{ mm}$.

The vehicle shall be placed with a yaw angle of 0° ~~and~~ **within** a tolerance of $\pm 0.1^\circ$."

Correction/justification: Correct use of the term "tolerance". Also, grammatical improvement.

Proposal

Annex 4, paragraph 6.5.1.6., amend to read:

"A current of air of variable speed shall be blown towards the vehicle. The set point of the linear velocity of the air at the blower outlet shall be equal to the corresponding dynamometer speed above measurement speeds of 5 km/h. The ~~deviation of the~~ linear velocity of the air at the blower outlet shall ~~be remain~~ within $\pm 5 \text{ km/h}$ or ± 10 per cent of the corresponding measurement speed, whichever is greater."

Correction/justification: Clarification of the tolerance of the blower air velocity.

Proposal

Annex 4, paragraph 6.5.2.3.2., amend to read:

"The measurement shall be performed according to paragraphs 4.3.1.3.1. to 4.3.1.4.4. inclusive of this annex. Coasting down in opposite directions is not ~~required~~ **possible** and the equation used to calculate Δt_{ji} in paragraph 4.3.1.4.2. of this annex shall not apply. The measurement shall be stopped after two decelerations if the force of both coastdowns at each reference speed point is within ± 10 N, otherwise at least three coastdowns shall be performed using the criteria set out in paragraph 4.3.1.4.2. of this annex."

Correction/justification: Coasting down on a flat belt dynamometer is not possible.

Proposal

Annex 4, title to paragraph 6.6.3., amend to read:

~~"Correction of the chassis dynamometer roller radius~~ **Correcting measured chassis dynamometer forces to those on a flat surface"**

Correction/justification: The chassis dynamometer roller radius will not be physically corrected but measured dynamometer forces will be corrected to those on a flat surface.

Proposal

Annex 4, paragraph 6.8., amend to read:

"For the purpose of including options ~~in~~ **when using** the interpolation method which are not incorporated in the road load interpolation (i.e. aerodynamics, rolling resistance and mass), a delta in vehicle friction may be measured by the road load delta method (e.g. friction difference between brake systems). The following steps shall be performed:"

Correction/justification: Editorial.

Proposal

Annex 4, paragraph 6.8., amend to read:

"For the purpose of including options ~~in~~ **when using** the interpolation method which are not incorporated in the road load interpolation (i.e. aerodynamics, rolling resistance and mass), a delta in vehicle friction may be measured by the road load delta method (e.g. friction difference between brake systems). The following steps shall be performed:"

Correction/justification: Editorial.

Proposal

Annex 4, paragraph 6.8., amend to read:

"This alternative road load determination method may only be applied if vehicles R and N have identical aerodynamic resistance and if the measured delta appropriately covers the entire influence on the vehicle's energy consumption. This method shall not be applied if the overall accuracy of the absolute road load of ~~the~~ vehicle N is compromised in any way."

Correction/justification: Editorial.

Proposal

Annex 4, paragraph 8.1.3.4.2., amend to read:

"The calculated forces in the specified speed ranges shall either be within a tolerance of ± 10 N after a least squares regression of the forces for two consecutive coastdowns when compared with the target values, or additional coastdowns shall be performed after adjusting the chassis dynamometer load setting according to paragraph 8.1.4. of this annex until the tolerance is satisfied."

Correction/justification: Clarification of the possible range of the calculated forces.

Proposal

Annex 4, paragraph 8.2.3.2., amend to read:

"The simulated running resistance (torque) curve on the chassis dynamometer shall be calculated according to the method described and the measurement precision specified in paragraph 4.4.3.2. of this annex, and the running resistance (torque) curve determination as described in paragraph 4.4.4. of this annex with applicable corrections according to paragraph 4.5. of this annex, all with the exception of measuring in opposite directions, resulting in a simulated running resistance curve:"

Correction/justification: The previous cross-reference to paragraph 4.4.3. was not precise.

Proposal

Annex 4, paragraph 8.2.4., amend to read:

"Transformation of running resistance coefficients to road load coefficients f_0, f_1, f_2 "

Correction/justification: Editorial.

Proposal

Annex 5, paragraph 1.1.1., amend to read:

"A variable speed current of air shall be blown towards the vehicle. The set point of the linear velocity of the air at the blower outlet shall be equal to the corresponding roller speed above roller speeds of 5 km/h. The deviation of the linear velocity of the air at the blower outlet shall remain be within ± 5 km/h or ± 10 per cent of the corresponding roller speed, whichever is greater."

Correction/justification: Clarification of the tolerance of the blower air velocity.

Proposal

Annex 5, paragraph 2.4.1., amend to read:

"The accuracy and linearity of the force transducer shall be at least ± 10 N for all measured increments. This shall be verified upon initial installation, after major maintenance and within 370 days before testing."

Correction/justification: The term "linearity" is not needed as accuracy is sufficient.

Proposal

Annex 5, paragraph 3.3.5.3., amend to read:

"A temperature sensor shall be installed immediately before the volume measuring device. This temperature sensor shall have an accuracy ~~and a precision~~ of ± 1 °C and a response time of 0.1 seconds at 62 per cent of a given temperature variation (value measured in silicone oil)."

Correction/justification: The term "accuracy" is sufficient and correct in this context. Furthermore, 0.1 seconds is plural.

Proposal

Annex 5, paragraph 3.3.6.4.3.(c), amend to read:

"A temperature sensor (T) for the diluted exhaust shall be installed immediately before the ultrasonic flow meter. This sensor shall have an accuracy ~~and a precision~~ of ± 1 °C and a response time of 0.1 seconds at 62 per cent of a given temperature variation (value measured in silicone oil);"

Correction/justification: The term "accuracy" is sufficient and correct in this context. Furthermore, 0.1 seconds is plural.

Proposal

Annex 5, paragraph 3.4.1.1., amend to read:

"The CVS system shall be calibrated by using an accurate flow meter and a restricting device and at the intervals listed in Table A5/4. The flow through the system shall be measured at various pressure readings and the control parameters of the system measured and related to the flows. The flow metering device (e.g. calibrated venturi, laminar flow element (LFE), calibrated turbine meter) shall be dynamic and suitable for the high flow rate encountered in constant volume sampler testing. The device shall be of certified accuracy. ~~traceable to an approved national or international standard.~~"

Correction/justification: Accuracy is defined in 3.1.1. and includes reference to national standards.

Proposal

Annex 5, paragraph 3.4.3.2., amend to read:

"Measurements for flow calibration of a critical flow venturi are required and the following data shall be within the limits of ~~precision~~ **accuracy** given:"

Correction/justification: Use of the term "accuracy" approved by technical experts.

Proposal

Annex 5, paragraph 3.4.5.6., amend to read:

"Measurements for flow calibration of the ultrasonic flow meter are required and the following data (in the case that a laminar flow element is used) shall be found within the limits of ~~precision~~ **accuracy** given:"

Correction/justification: Use of the term "accuracy" approved by technical experts.

Proposal

Annex 5, paragraph 3.5.1.1.1., amend to read:

"A known mass of pure carbon monoxide, carbon dioxide or propane gas shall be introduced into the CVS system through the calibrated critical orifice. If the inlet pressure is high enough, the flow rate q which is restricted by means of the critical flow orifice, is independent of orifice outlet pressure (critical flow). The CVS system shall be operated as in a normal exhaust emissions test and enough time shall be allowed for subsequent analysis. The gas collected in the sample bag shall be analysed by the usual equipment (see paragraph 4.1. of this annex) and the results compared to the concentration of the known gas samples. If ~~deviations~~ **accuracy** exceeds ± 2 per cent, the cause of the malfunction shall be determined and corrected."

Correction/justification: Use of the term "accuracy" to replace "deviations" approved by technical experts.

Proposal

Annex 5, paragraph 3.5.1.1.2., amend to read:

"The weight of a small cylinder filled with either pure carbon monoxide, carbon dioxide or propane shall be determined with a precision of ± 0.01 g. The CVS system shall operate under normal exhaust emissions test conditions while the pure gas is injected into the system for a time sufficient for subsequent analysis. The quantity of pure gas involved shall be determined by means of differential weighing. The gas accumulated in the bag shall be analysed by means of the equipment normally used for exhaust gas analysis as described in paragraph 4.1. of this annex. The results shall be subsequently compared to the concentration figures computed previously. If ~~deviations~~ **accuracy** exceeds ± 2 per cent, the cause of the malfunction shall be determined and corrected."

Correction/justification: Use of the term "accuracy" to replace "deviations" approved by technical experts.

Proposal

Annex 5, paragraph 4.2.1.2.7., amend to read:

"Temperatures required for the measurement of PM shall be measured with an accuracy of ± 1 °C and a response time ($t_{90}-t_{10}$) of 15 seconds or less."

Correction/justification: Response time is defined as ($t_{90} - t_{10}$) and not to ($t_{10}-t_{90}$).

Proposal

Annex 5, paragraph 4.2.2.2., amend to read:

"The analytical balance used to determine the filter weight shall meet the linearity verification criteria of Table A5/1 applying a linear regression. This implies ~~at least~~ a precision of **at least** ± 2 μg and ~~at least~~ a resolution of **at least** 1 μg (1 digit = 1 μg). At least 4 equally-spaced reference weights shall be tested. The zero value shall be within ± 1 μg ."

Correction/justification: \pm included before 2 μg . Editorial changes.

Proposal

Annex 5, paragraph 6.1.2., amend to read:

- "6.1.1. All values in ppm mean ~~V~~**volume**-ppm (vpm)
- 6.1.2. The following pure gases shall be available, if necessary, for calibration and operation:
- 6.1.2.1. Nitrogen :
Purity: ≤ 1 ppm C1, ≤ 1 ppm CO, ≤ 400 ppm CO₂, ≤ 0.1 ppm NO, ~~≤ 0.1 ppm NO₂~~, ≤ 0.1 ppm N₂O, ≤ 0.1 ppm NH₃;
- 6.1.2.2. Synthetic air:
Purity: ≤ 1 ppm C1, ≤ 1 ppm CO, ≤ 400 ppm CO₂, ≤ 0.1 ppm NO~~;~~, **≤ 0.1 ppm NO₂**; oxygen content between 18 and 21 per cent volume~~;~~.
- 6.1.2.3. Oxygen:
Purity: > 99.5 per cent vol. O₂~~;~~.
- 6.1.2.4. Hydrogen (and mixture containing helium or nitrogen):
Purity: ≤ 1 ppm C1, ≤ 400 ppm CO₂; hydrogen content between 39 and 41 per cent volume~~;~~.
- 6.1.2.5. Carbon monoxide:
Minimum purity 99.5 per cent~~;~~."

Correction/justification: All changes approved by technical experts. Also, minor editorial changes.

Proposal

Annex 5, paragraph 6.2., amend to read:

"The true concentration of a calibration gas shall be within ± 1 per cent of the stated value or as given below, **and shall be traceable to national or international standards.**"

Correction/justification: All changes approved by technical experts.

Proposal

Annex 5, paragraph 6.2.(f), amend to read:

"(f) NO₂ in **synthetic air or** nitrogen (tolerance : ± 2 per cent), if applicable;"

Correction/justification: Change approved by experts. Use of per cent tolerance is accepted in this paragraph in order to avoid absolute values of ppm.

Proposal

Annex 6, paragraph 1.2.3.8., amend to read:

"**Determination of** dCO₂₁, dCO₂₂ and dCO₂₃ ~~determination.~~"

Correction/justification: Editorial.

Proposal

Annex 6, paragraph 2.2.1.2., amend to read:

"Atmospheric pressure shall be measurable with a ~~resolution~~ **precision** of ± 0.1 kPa."

Correction/justification: Resolution is the wrong term. Furthermore, resolutions do not have tolerances.

Proposal

Annex 6, paragraph 2.2.1.3., amend to read:

"Specific humidity H shall be measurable with a ~~resolution~~ **precision** of ± 1 g $\text{-H}_2\text{O/kg}$ dry air."

Correction/justification: Resolution is the wrong term. Furthermore, resolutions do not have tolerances.

Proposal

Annex 6, paragraph 2.6.4.1.2., amend to read:

"In the cases where LPG or NG/biomethane is used as a fuel, it is permissible that the engine is started on petrol and switched automatically to LPG or NG/biomethane after a predetermined period of time that cannot be changed by the driver. **This period of time shall not exceed 60 seconds.**

It is also permissible to use petrol only or simultaneously with gas when operating in gas mode provided that the energy consumption of gas is higher than 80 per cent of the total amount of energy consumed during the Type 1 test. This percentage shall be calculated in accordance with the method set out in Appendix 3 to this annex."

Correction/justification: Changes approved by experts at IWG #20, Seoul.

Proposal

Annex 6, Appendix 2, title, amend to read:

"Test procedure for **rechargeable electric energy storage system** ~~electric power supply system~~ monitoring"

Correction/justification: The title reflects the content of Appendix 2 whereby all REESS shall be monitored.

Proposal

Annex 6, Appendix 2, 1., amend to read:

"This ~~Appendix~~ **appendix** defines the specific provisions regarding the correction of test results for CO_2 mass emission as a function of the energy balance ΔE_{REESS} for all REESSs."

Correction/justification: Editorial.

Proposal

Annex 6, Appendix 2, 2.2.3., amend to read:

"All REESS having no influence on CO₂ mass emissions shall be excluded from monitoring."

Correction/justification: Monitoring of any REESS not directly related to vehicle propulsion is not required.

Proposal

Annex 6, Appendix 2, 3.4., amend to read:

"Correction of CO₂ mass emission over the whole cycle as a function of the correction criterion c:"

Correction/justification: Editorial change. Titles do not end with a period.

Proposal

Annex 6, Appendix 2, 3.4.1., amend to read:

"FC_{nb} is the non-balanced fuel consumption of the Type 1 test, not corrected for the energy balance, determined according to paragraph 6. of Annex 7, **and using the results for criteria emissions and CO₂ calculated in Step 2 in Table A7/1**, l/100 km;"

Correction/justification: Proposed by UTAC and approved during an Annex 4 Open Issues Task Force audio/web conference on September 6, 2017.

Proposal

Annex 6, Appendix 2, 3.4.2., 3.4.3., and 3.4.4.(a), amend to read:

"3.4.2. The correction shall be applied if ΔE_{REESS} is negative (corresponding to REESS discharging) and the correction criterion c calculated according to paragraph 3.4.1. of this appendix is greater than the applicable ~~tolerance~~ **threshold** according to Table A6.App2/2.

3.4.3. The correction shall be omitted and uncorrected values shall be used if the correction criterion c calculated according to paragraph 3.4.1. of this appendix is less than the applicable ~~tolerance~~ **threshold** according to Table A6.App2/2.

3.4.4. The correction may be omitted and uncorrected values may be used if:

(a) ΔE_{REESS} is positive (corresponding to REESS charging) and the correction criterion c calculated according to paragraph 3.4.1. of this appendix is greater than the applicable ~~tolerance~~ **threshold** according to Table A6.App2/2;"

Correction/justification: Editorial. In all three paragraphs, the term threshold is more appropriate than tolerance. A threshold is a limit which may not be exceeded.

Proposal

Annex 6, Appendix 2, Table A6.App2/2, title, amend to read:

"RCB correction criteria **thresholds**"

Correction/justification: Thresholds are limits and not tolerances. See the previous proposal.

Proposal

Annex 6, Appendix 2, Table A6.App2/2, column 1, row 2, amend to read:

Cycle
Thresholds for €correction criterion c

Correction/justification: Editorial.

Proposal

Annex 6, Appendix 3 (new), amend to read:

"Annex 6 - Appendix 3

Calculation of gas energy ratio for gaseous fuels (LPG and NG/biomethane)

1. Measurement of the mass of gaseous fuel consumed during the Type I test cycle

Measurement of the mass of gas consumed during the cycle shall be done by a fuel weighing system capable of measuring the weight of the storage container during the test in accordance with the following:

(a) An accuracy of ± 2 per cent of the difference between the readings at the beginning and at the end of the test or better.

(b) Precautions shall be taken to avoid measurement errors.

Such precautions shall at least include the careful installation of the device according to the instrument manufacturers' recommendations and to good engineering practice.

(c) Other measurement methods are permitted if an equivalent accuracy can be demonstrated.

2. Calculation of the gas energy ratio

The fuel consumption value shall be calculated from the emissions of hydrocarbons, carbon monoxide, and carbon dioxide determined from the measurement results assuming that only the gaseous fuel is burned during the test.

The gas ratio of the energy consumed in the cycle shall be determined using the following equation:

$$G_{\text{gas}} = \left(\frac{M_{\text{gas}} \times \text{cf} \times 10^4}{\text{FC}_{\text{norm}} \times \text{dist} \times \rho} \right)$$

where:

G_{gas} is the gas energy ratio, per cent;

M_{gas} is the mass of the gaseous fuel consumed during the cycle, kg;

FC_{norm} is the fuel consumption (l/100km for LPG, m³/100 km for NG/biomethane) calculated in accordance with paragraph 1.4.3., subparagraph (c), of Annex 6 to Regulation No. 101;

dist is the distance recorded during the cycle, km;

ρ is the gas density:

$\rho = 0.654 \text{ kg/m}^3$ for NG/Biomethane;

$\rho = 0.538$ kg/litre for LPG;
cf is the correction factor, assuming the following values:
cf = 1 in the case of LPG or G20 reference fuel;
cf = 0.78 in the case of G25 reference fuel."

Correction/justification: Presented and approved at IWG #20 meeting, Seoul.

Proposal

Annex 7, paragraph 3.2.3.1., amend to read:

"Fuel consumption and CO₂ emissions without using the interpolation method (**i.e. using vehicle H only**)"

Correction/justification: Clarification that fuel consumption and CO₂ emissions may be measured using only one test vehicle.

Proposal

Annex 7, paragraph 3.2.3.2., amend to read:

"The CO₂ emissions and the fuel consumption for each individual vehicle in the interpolation family may be calculated according to **paragraphs 3.2.3.2.1. to 3.2.3.2.5. inclusive** ~~the interpolation method outlined in paragraph 3.2.3.2.~~ of this annex."

Correction/justification: The cross reference has been made more specific.

Proposal

Annex 7, paragraph 3.2.3.2.2.2., amend to read:

"If the tyres have different **energy efficiency** ~~rolling resistance~~ class values on the front and the rear axle, the weighted mean shall be used, calculated with the equation in this paragraph."

Correction/justification: The term "rolling resistance" is wrongly used and could lead to incorrect calculations. It is replaced by "energy efficiency".

Proposal

Annex 7, paragraph 3.2.3.2.2.3., amend to read:

"These differences in aerodynamic drag, $\Delta(C_D \times A_f)$, shall be determined with an accuracy of ± 0.015 m².

$\Delta(C_D \times A_f)_{\text{ind}}$ may be calculated according to the following equation maintaining the accuracy of ± 0.015 m² also for the sum of items of optional equipment and body shapes:"

Correction/justification: The accuracy of $\Delta(C_D \times A_f)$ may be plus or minus 0.015 m² to allow for measurement tolerances.

Proposal

Annex 7, paragraph 3.2.3.2.2.4., title, amend to read:

"Calculation of road load **coefficients** for individual vehicles"

Correction/justification: The title is modified to indicate that paragraph 3.2.3.2.2.4. calculates road load coefficients and not road load.

Proposal

Annex 7, paragraph 3.2.4., amend to read:

"The CO₂ emissions and the fuel consumption for each individual vehicle in the road load matrix family shall be calculated according to the interpolation method ~~outlined~~ **described** in paragraphs 3.2.3.2.3. to 3.2.3.2.5. inclusive of this annex. Where applicable, references to vehicle L and/or H shall be replaced by references to vehicle LM and/or HM respectively."

Correction/justification: Editorial.

Proposal

Annex 7, paragraph 7.1., amend to read:

"The prescribed speed between time points in Tables A1/1 to A1/12 shall be determined by a linear interpolation ~~method~~ at a frequency of 10 Hz."

Correction/justification: A classical linear interpolation shall be used to determine speeds between time points. The term "interpolation method" used here is incorrect.

Proposal

Annex 8, paragraph 1.2., amend to read:

"Parameters, units and accuracy of measurements shall be the same as those required for **non-hybrid** ~~conventional~~ combustion engine-powered vehicles."

Correction/justification: The use of "conventional...vehicles" is not technically precise.

Proposal

Annex 8, Table A8/2, first row, third column, amend to read:

Precision Communication of final test result
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Correction/justification: Editorial: "precision" is the correct term to describe how final test results shall be rounded.

Proposal

Annex 8, paragraph 2.3., amend to read:

"All REESS having no influence on CO₂ mass emissions or H₂ consumption shall be excluded from monitoring."

Correction/justification: Monitoring of any REESS not directly related to vehicle propulsion is not required.

Proposal

Annex 8, paragraph 3.2.4.4., amend to read:

"For vehicles without a charge-sustaining capability over the complete applicable WLTP test cycle, the end of the charge-depleting Type 1 test is reached by an indication on a standard on-board instrument panel to stop the vehicle, or when the vehicle deviates from the prescribed speed ~~trace driving~~ tolerance for 4 consecutive seconds or more. The accelerator control shall be deactivated and the vehicle shall be braked to standstill within 60 seconds."

Correction/justification: Editorial. Consistency in using "speed trace".

Proposal

Annex 8, paragraph 3.2.4.2.3., amend to read:

"The break-off criterion is reached when the vehicle exceeds the prescribed ~~driving speed trace~~ tolerance as specified in paragraph 2.6.8.3. of Annex 6 for 4 consecutive seconds or more in the second constant speed segment CSS_E. The accelerator control shall be deactivated. The vehicle shall be braked to a standstill within 60 seconds."

Correction/justification: Editorial. Consistency in using "speed trace".

Proposal

Annex 8, paragraph 4.1.1.3., amend to read:

"M_{CO₂,CS} is the charge-sustaining CO₂ mass emission of the charge-sustaining Type 1 test according to Table A8/5, step No. ~~23~~ , g/km;"

Correction/justification: Editorial. The cross reference to step No. 2 is wrong and should be to step No. 3. Approved during a task force audio/web August 29, 2017.

Proposal

Annex 8, Table A8/7, in Step no. 1, columns 1 and 2, amend to read:

"Appendix 7 of to this annex"	"Non-balanced charge-sustaining fuel consumption FC_{CS,nb}, kg/100km "
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Correction/justification: Editorial only in column 1. In column 2, the variable was missing.

Proposal

Annex 8, Table A8/8, in Step no. 1, column 3, amend to read:

"Particle number emissions (if applicable) according to paragraph 4. of Annex 7."

Correction/justification: Consistency using "if applicable" when referring to the measurement of particle number emissions.

Proposal

Annex 8, Table A8/8, in Step no. 1, column 3, amend to read:

"**CO₂ mass emission** ~~SOC~~ **K_{CO2}** correction coefficient might be necessary according to Appendix 2 to this annex."

Correction/justification: Approved by experts during an electric vehicle task force meeting, August 2017. Furthermore, SOC (state of charge) is not defined in the GTR.

Proposal

Annex 8, Table A8/8, in Step no. 1, column 3, amend to read:

"In the case **that** the interpolation method is applied, the output (except of **K_{CO2}**) is available for vehicle H, L and, if applicable, M."

Correction/justification: Editorial.

Proposal

Annex 8, Table A8/8, in Step no. 10, column 3, amend to read:

"In the case **that the interpolation method is applied**, $n_{veh,L}$ cycles shall be used. With reference to paragraph 4.1.2. of this annex, the confirmation cycle shall be corrected according to Appendix 2 to this annex."

Correction/justification: Editorial.

Proposal

Annex 8, Table A8/8, in Step no. 11, column 3, amend to read:

"In the case **that of the interpolation method is applied**, $n_{veh,L}$ cycles shall be used. With reference to paragraph 4.1.2. of this annex, $M_{CO_2,CD,j}$ of the confirmation cycle shall be corrected according to Appendix 2 to this annex. The phase-specific fuel consumption $FC_{CD,j}$ shall be calculated using the corrected CO₂ mass emission according to paragraph 6. of Annex 7."

Correction/justification: Editorial.

Proposal

Annex 8, Table A8/9, in Step no. 1, column 3, amend to read:

"**CO₂ mass emission** ~~SOC~~ correction coefficient **K_{CO2}** might be necessary according to Appendix 2 to this annex."

Correction/justification: Approved by experts during an electric vehicle task force meeting, August 2017. SOC was never defined in the GTR.

Proposal

Annex 8, Table A8/9, in Step no. 6, column 3, amend to read:

"In the case ~~of~~ **that the** interpolation **method is applied**, $n_{veh,L}$ cycles shall be used. With reference to paragraph 4.1.2. of this annex, $M_{CO_2,CDj}$ of the confirmation cycle shall be corrected according to Appendix 2 to this annex."

Correction/justification: Editorial.

Proposal

Annex 8, Table A8/10, in Step no. 3, column 3, amend to read:

"Note: The number of weighting factors depends on the applicable cycle that was used (3- or 4-phase WLTC). In the case of ~~34~~ -phase WLTCs, the output in brackets might be needed in addition."

Correction/justification: Incorrect reference to 3-phase WLTCs. Approved by experts July 2017.

Proposal

Annex 8, Appendix 2, paragraphs 1.1.3., 1.1.4.(a) and 1.1.4.(b), amend to read:

1.1.3. The correction shall be applied if $\Delta E_{REESS,CS}$ is negative which corresponds to REESS discharging and the correction criterion c calculated in paragraph 1.2. of this appendix is greater than the applicable ~~tolerance~~ **threshold** according to Table A8.App2/1.

1.1.4. The correction may be omitted and uncorrected values may be used if:

- (a) $\Delta E_{REESS,CS}$ is positive which corresponds to REESS charging and the correction criterion c calculated in paragraph 1.2. of this appendix is greater than the applicable ~~tolerance~~ **threshold** according to Table A8.App2/1;
- (b) The correction criterion c calculated in paragraph 1.2. of this appendix is smaller than the applicable ~~tolerance~~ **threshold** according to Table A8.App2/1;"

Correction/justification: Editorial. In all three paragraphs, the term threshold is more appropriate than tolerance. A threshold is a limit which may not be exceeded.

Proposal

Annex 8, Table A8.App2/1, amend to read:

"**RCB** ~~€~~correction criteria **thresholds**"

Correction/justification: Editorial. The table lists limits for the REESS charge balance correction criteria.

Proposal

Annex 8, Table A8.App2/1, second row, first column, amend to read:

Correction/justification: Editorial. See the previous proposal.

Proposal

Annex 8, Appendix 2, paragraph 2.2.(a), amend to read:

"The set shall contain at least one test with $\Delta E_{REESS,CS,n} \leq 0$ and at least one test with $\Delta E_{REESS,CS,n} > 0$. $\Delta E_{REESS,CS,n}$ is the sum of electric energy changes of all REESSs of test n calculated according to paragraph 4.3. of this annex."

Correction/justification: Editorial. Subscript "n" was missing at two places.

Proposal

Annex 8, Appendix 2, paragraph 2.2.(e), amend to read:

"The difference in $M_{CO_2,CS}$ between the test with the highest negative electric energy change and the mid-point, and the difference in $M_{CO_2,CS}$ between **the** mid-point and the test with the highest positive electric energy change shall be similar and preferably be within the range defined by (d). ~~If this requirement is not feasible, the manufacturer shall clarify the underlying reason to the TS, who will decide if a retest is ordered or if the clarification is reasonable.~~ **If this requirement is not feasible, the responsible authority shall decide if a retest is necessary.**"

Correction/justification: $M_{CO_2,CS}$ shall lie midway between the test with the highest negative electric energy change and the test with the highest positive electric energy change.

Proposal

Annex 8, Appendix 6, paragraph 1.2.(c), amend to read:

"The best and worst case mode identified by the evidence on the fuel consumption and, if applicable, on the CO₂ mass emission in all modes. See paragraph 2.6.5.3.3. in Annex 6;"

Correction/justification: Incorrect cross reference. Paragraph 2.6.5.3.3. does not exist.

Proposal

Annex 8, Appendix 4, paragraph 2.1.2., amend to read:

"In such a case, a preconditioning procedure, such as that applicable to **non-hybrid combustion engine-powered conventional** vehicles as described in paragraph 2.6. of Annex 6, shall be applied."

Correction/justification: The use of "conventional vehicles" was not technically precise.

Proposal

Annex 8, Appendix 7, paragraph 2.1.5., title, amend to read:

"~~Precision~~ **Balance**"

Correction/justification: The term "balance" is sufficient to describe the weighing instrument.

Proposal

Annex 8, Appendix 7, paragraph 2.1.5.1., amend to read:

"The ~~precision~~ balance used for fuel consumption measurement shall meet the specification of Table A8.App7/1."

Correction/justification: See the previous comment.

Proposal

Annex 8, Appendix 7, Table A8.App7/1, first column, second row, amend to read:

"~~Precision~~ Balance"

Correction/justification: Editorial.

Proposal

Annex 8, Appendix 7, Table A8.App7/1, third column, second row, amend to read:

±0.02 maximum

Correction/justification: Precision given a ± tolerance.

Proposal

Annex 8, Appendix 7, paragraph 2.1.5.2., amend to read:

"The ~~precision~~ balance shall be calibrated in accordance with the specifications provided by the balance manufacturer or at least as often as specified in Table A8.App7/2."

Correction/justification: Editorial.

Proposal

Annex 8, Appendix 7, Table A8.App7/2, first column, second row, amend to read:

"Precision (~~Repeatability~~)"

Correction/justification: Precision implies repeatability.

Proposal

Annex 8, Appendix 7, Figure A8.App7/1, item 5, amend to read:

"5 is the ~~precision~~ balance"

Correction/justification: Editorial.

Proposal

Annex 9, paragraph 1.1., amend to read:

"A candidate method shall be considered equivalent if the accuracy and ~~the~~ precision is equal to or better than the reference method."

Correction/justification: Editorial.