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Item 14.1.1 of the provisional agenda

1958 Agreement:

**Consideration of additional proposals for amendments
to existing UN Regulations submitted by the
Working Parties subsidiary to the World Forum, if any**

**Proposal for a new 03 series of amendments to
UN Regulation No. 154 (Worldwide harmonized
Light vehicles Test Procedures (WLTP))**

Proposal for a new 03 series of amendments to UN Regulation No. 154 (Worldwide harmonized Light vehicles Test Procedures (WLTP))

Revision

Submitted by the Working Party on Pollution and Energy*

The text reproduced below was adopted by the Working Party on Pollution and Energy (GRPE) at its eighty-fourth session (ECE/TRANS/WP.29/GRPE/84, para. 16). It is based on ECE/TRANS/WP.29/GRPE/2021/22 as amended by Addendum 3 of the report. It is submitted to the World Forum for Harmonization of Vehicle Regulations (WP.29) and to the Administrative Committee (AC.1) for consideration at their March 2022 sessions. This is a consolidated version.

* In accordance with the programme of work of the Inland Transport Committee for 2022 as outlined in proposed programme budget for 2022 (A/76/6 (part V sect. 20) para 20.76), the World Forum will develop, harmonize and update UN Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.



6.2.6. Each of the vehicle families specified below shall be attributed a unique identifier of the following format:

FT-nnnnnnnnnnnnn-WMI

Where:

FT is an identifier of the family type:

- (a) IP = Interpolation family as defined in paragraph 6.3.2. with or without using the interpolation method
- (b) RL = Road load family as defined in paragraph 6.3.3.
- (c) RM = Road load matrix family as defined in paragraph 6.3.4.
- (d) PR = Periodically regenerating systems (K_i) family as defined in paragraph 6.3.5.
- (e) AT = ATCT family as defined in paragraph 2. of Annex B6a.
- (f) EV = Evaporative emissions family, as defined in paragraph 6.6.3.
- (g) DF = Durability family, as defined in paragraph 6.7.5.
- (h) OB = OBD family identifier, as defined paragraph 6.8.1.
- (i) ER = Exhaust after-treatment system using reagent (ER)family identifier, as defined in paragraph 6.9.2.
- (j) GV = GFV family identifier, as defined in paragraph 6.3.6.3.
- (k) KC = K_{CO_2} correction factor family identifier, as defined in paragraph 6.3.11.

nnnnnnnnnnnnnn is a string with a maximum of fifteen characters, restricted to using the characters 0-9, A-Z and the underscore character '_'.

WMI (world manufacturer identifier) is a code that identifies the manufacturer in a unique manner defined in ISO 3780:2009.

It is the responsibility of the owner of the WMI to ensure that the combination of the string nnnnnnnnnnnnn and the WMI is unique to the family and that the string nnnnnnnnnnnnn is unique within that WMI to the approval tests performed to obtain the approval.

Commented [JPN_rev11]: Right position ?.

6.3.2.2. Interpolation family for NOVC-HEVs and OVC-HEVs

In addition to the requirements of paragraph 6.3.2.1., only OVC-HEVs and NOVC-HEVs that are identical with respect to the following characteristics may be part of the same interpolation family:

- (a) Type and number of electric machines: construction type (asynchronous/ synchronous, etc.), type of coolant (air, liquid) and any other characteristics having a non-negligible influence on CO₂ emission and electric energy consumption under WLTP conditions;
- (b) Type of traction REESS (type of cell, capacity, nominal voltage, nominal power, type of coolant (air, liquid));
- (c) 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 emission and electric energy consumption under WLTP conditions. At the request of the manufacturer and with the approval of the approval authority, electric energy converters between recharge-plug-in and traction REESS with lower recharge losses may be included in the family;
- ~~(d) The difference between the number of charge-depleting cycles from the beginning of the test up to and including the transition cycle shall not be more than one.~~

<Justification> This definition is combination of R_CDC provision. Since R_CDC provision is deleted, this criteria is no longer necessary

6.7.2.1. This paragraph is only applicable for emissions measurements to be compared against the limits in Table 1B

In the case that the limit value is different from the value defined in Table ~~3b1B~~, the assigned additive deterioration factor shall be calculated using the following equation and shall be rounded according to approval authority instruction:

the assigned additive deterioration factor = Limit value * A * (Useful life – 3,000)/(80,000 – 3,000)

where :

A 0.11 for CO, 0.12 for NMHC, 0.21 for NOx and 0.00 for PM and PN.

<Justifications> refer incorrect table

8.2.4. Run-in factors

8.2.4.3. At the option of the manufacturer, for CO₂ emissions, in g/km an assigned run-in factor of 0.98 may be applied if the system odometer setting at the start of the CoP test is less than or equal to 80 km.

At the option of the manufacturer, for fuel efficiency, in km/l, an assigned run-in factor of 1.02 may be applied if the system odometer setting at the start of the CoP test is less than or equal to 80 km.

If the assigned run-in factors for CO₂ emissions and fuel efficiency are applied, no run-in factors shall be applied for criteria emissions and electric energy consumption.

<Justifications> run-in factors of CO₂/FE are independent from that of electric energy consumption

8.2.4.4. ~~The run-in factor shall be applied to the CoP test result that is calculated according to Step 4e of Table A7/1 in Annex B7 or Step 4e in Table A8/5 of Annex B8.~~

<Justifications> reference steps are insufficient and incorrect. All necessary process are described in Appendix 1

Appendix 1

The procedure for Type 1 test and for determination of test results during CoP~~Type 1 test CoP verification for specific vehicle types~~

<Justification> focus on test procedure and how to derive the CoP test results in this appendix

1. ~~Type 1 test procedure for V~~verifying CoP ~~on the criteria emissions for pure ICE vehicles, NOVC-HEVs and OVC-HEVs~~

~~Unless otherwise stated in this appendix, Type 1 test shall be performed according to Annex B6 or B8~~

- 1.1. Each vehicle shall be tested on the chassis dynamometer set with the specific mass inertia setting and road load parameters of the individual vehicle. The chassis dynamometer shall be set to the target road load for the test vehicle according to the procedure specified in paragraph 7. of Annex B4.
- 1.2. The applicable test cycle is the same used for the type approval of the interpolation family to which the vehicle belongs.
- 1.3. ~~The preconditioning test shall be carried out according to the provisions of paragraph 2.6. of Annex B6, or of Appendix 4 to Annex B8, as applicable.~~

2. ~~Verification of CoP on criteria emission for pure ICE vehicles, NOVC-HEVs and OVC-HEVs~~

- 1.4. The criteria emissions test results shall be determined according to:

- a) Step 9-5 of Table A7/1 of Annex B7 for pure ICE vehicles;
- b) Step 8-5 of Table A8/5 of Annex B8 for NOVC-HEVs and charge-sustaining condition of OVC-HEVs; and
- c) Step 6 of Table A8/8 of Annex B8 for the charge-depleting condition of OVC-HEVs.

~~and, if available, applying a run-in factor including test cell correction as defined in paragraph 8.2.4. of this Regulation~~Conformity against the applicable criteria emission limits shall be checked using the pass/fail criteria specified in paragraph 6.3.10. of this Regulation.

<Justification> refer incorrect steps, miss to apply run-in factor

- 2.3. Verification of CoP on CO₂ emissions/ fuel efficiency of pure ICE vehicles

- 2.1. ~~The vehicle shall be tested according to the Type 1 test procedure described in Annex B6.~~

- 2.2. The CO₂ emission after 4 phases ~~M~~_{CO₂,e,4} shall be determined according to step 6-5 of Table A7/1 of Annex B7 ~~and, if available, applying a run-in factor in paragraph 8.2.4. of this Regulation.~~

The fuel efficiency after 3 phases ~~F~~_{Ee,5} shall be determined according to step 5 of Table A7/1 of Annex B7 ~~and, if available, applying a run-in factor in paragraph 8.2.4. of this Regulation.~~

- 2.3. ~~The conformity of production with regard to CO₂ emissions shall be verified on the basis of the values for the tested vehicle as described in paragraph 2.3.1. and applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.~~

~~The conformity of production with regard to fuel efficiency shall be verified on the basis of the values for the tested vehicle as described in paragraph 1.3.1. and applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.~~

- 2.3.1. CO₂ emission values for CoP / Fuel efficiency values for CoP

Commented [JPN_rev12]: Overlooked that test cell correction is allowed for Level 1B only

- In the case the interpolation method is not applied, the CO₂ emission value after 4 phases $M_{CO_2,CS}$ 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 emission value after 4 phases $M_{CO_2,CS,ind}$ 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 $FE_{e,3}$ 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 $FE_{e,ind}$ for the individual vehicle according to step 10 of Table A7/1 of Annex B7 shall be used for verifying the conformity of production
- <Justification> refer incorrect steps, avoid confusion to derive test results during COP (reference value are moved to Appendix 2):
34. Verification of CoP on CO₂ emissions/ fuel efficiency of NOVC-HEVs and OVC-HEVs charge-sustaining condition
- 3.1. The vehicle shall be tested as described in paragraph 3.3. of Annex B8.
- 3.2. The CO₂ emission after 4 phases $M_{CO_2,CS,e4}$ of the NOVC-HEV and the charge-sustaining OVC-HEV shall be determined according to step 6-5 of Table A8/5 of Annex B8 and, if available, applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.
- The fuel efficiency after 3 phases $FE_{CS,e3}$ of the NOVC-HEV and the charge-sustaining OVC-HEV shall be determined according to step 4e-5 of Table A8/5 of Annex B8 and, if available, applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.
- 3.3. The conformity of production with regard to CO₂ emissions or fuel efficiency, as applicable, shall be verified on the basis of the values for the tested vehicle as described in paragraph 3.3.1. and applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.
- 3.3.1. CO₂ emission values for CoP / Fuel efficiency values for CoP
- In the case the interpolation method is not applied, the charge-sustaining CO₂ emission value after 4 phases $M_{CO_2,CS,e2}$ 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 emission value after 4 phases $M_{CO_2,CS,e,ind}$ 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 $FE_{CS,e,1}$ 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 $FE_{CS,e,ind}$ for the individual vehicle according to step 3 of Table A8/6 of Annex B8 shall be used for verifying the conformity of production.
- <Justification> refer incorrect steps, avoid confusion to derive test results during COP (reference value are moved to Appendix 2)
45. Verification of CoP on electric energy consumption of PEVs
- 45.1. The vehicle shall be tested as described in paragraph either 3.4.4.1. or 3.4.4.2. of Annex B8, whilst the break-off criterion for the Type 1 test procedure according to paragraph 3.4.4.1.3. of Annex B8 (consecutive cycle procedure) and paragraph 3.4.4.2.3. of Annex B8 (Shortened Test Procedure) shall be

Commented [JPN_rev13]: It doesn't matter "consecutive" or "shorten" since only first cycle needs to be performed

considered to have been reached when having finished the first applicable WLTP test cycle.

The DC electric energy consumption from the REESS(s) $EC_{DC,first,i}$ shall be determined according to paragraph 4.3 of Annex B8 where $\Delta E_{REESS,j}$ shall be the electric energy change of all REESS and d_j shall be the actual driven distance during this test cycle.

~~4.2. The conformity of production with regard to electric energy consumption (EC) shall be verified on the basis of the values for the tested vehicle as described in paragraph 4.2.1. in the case that the type approval was conducted with the consecutive cycle Type 1 test procedure and in paragraph 4.2.2. in case that the type approval was conducted using the shortened Type 1 test procedure.~~

~~4.2.1. The electric energy consumption Consecutive cycle Type 1 test procedure values for CoP~~

~~In the case the interpolation method is not applied, the electric energy consumption value $EC_{DC,COP,final}$ shall be determined according to step 9.4 of Table A8/10 or step 3 of Table A8/11 of Annex B8 and, if available, applying a run-in factor as defined in paragraph 8.2.4. of this Regulation shall be used for verifying the conformity of production.~~

~~In the case that the interpolation method is applied, the electric energy consumption value $EC_{DC,COP,ind}$ for the individual vehicle according to step 10 of Table A8/10 of Annex B8 shall be used for verifying the conformity of production.~~

~~4.2.2. Shortened Type 1 Test Procedure values for CoP~~

~~In the case the interpolation method is not applied, the electric energy consumption value $EC_{DC,COP,final}$ according to step 8 of Table A8/11 of Annex B8 shall be used for verifying the conformity of production.~~

~~In the case the interpolation method is applied, the electric energy consumption value $EC_{DC,COP,ind}$ for the individual vehicle according to step 9 of Table A8/11 of Annex B8 shall be used for verifying the conformity of production.~~

~~<Justification> COP has only one test procedure. refer incorrect steps, avoid confusion to derive test results during COP (reference value are moved to Appendix 2)~~

~~5.6. Verification of CoP on charge-depleting electric energy consumption of OVC-HEVs~~

~~5.6.1. At the request of the manufacturer it is allowed to use different test vehicles for the charge-sustaining test and charge-depleting test.~~

~~5.2. Verification of the charge-sustaining CO₂ emissions / fuel efficiency, as applicable, for conformity of production.~~

~~5.2.1. The vehicle shall be tested according to the charge-sustaining Type 1 test as described in paragraph 3.2.5. of Annex B8.~~

~~5.2.2. The charge-sustaining CO₂ emission after 4 phases $M_{CO_2,CS,e,6}$ shall be determined according to step 6 of Table A8/5 of Annex B8.~~

~~The charge-sustaining fuel efficiency after 3 phases $FE_{CS,e,4e}$ shall be determined according to step 4e of Table A8/5 of Annex B8.~~

~~5.2.3. The conformity of production with regard to charge-sustaining CO₂ emissions shall be verified on the basis of the values for the tested vehicle as described in paragraph 5.2.3.1. for charge-sustaining CO₂ emissions, and applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.~~

~~The conformity of production with regard to charge-sustaining fuel efficiency shall be verified on the basis of the values for the tested vehicle as described~~

in paragraph 5.2.3.1. for charge-sustaining fuel efficiency, and applying a run-in factor as defined in paragraph 8.2.4. of this Regulation.

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

~~In the case the interpolation method is not applied, the charge-sustaining CO₂ emission value after 4 phases $M_{CO_2,CS,e,7}$ 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 emission value after 4 phases $M_{CO_2,CS,e,ind}$ 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 $FE_{CS,e}$ 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 $FE_{CS,e,ind}$ for the individual vehicle according to step 3 of Table A8/6 of Annex B8 shall be used for verifying the conformity of production.~~

~~<Justification> paragraph 5.2. moves to new paragraph 4.~~

~~5.3. Verification of CoP on charge-depleting electric energy consumption of OVC-HEVs~~

~~5.3.2.1. The vehicle shall be tested during conformity of production according to paragraph 5.3.6.2.1.1. If there is no engine start during the first cycle of the type approval procedure of this vehicle, at the option of the manufacturer the vehicle may be tested according to paragraph 5.3.6.2.1.2.~~

~~5.3.6.2.1.1. Charge-Depleting Type 1 test procedure~~

~~The vehicle shall be tested according to the charge-depleting Type 1 test procedure as described in paragraph 3.2.4. of Annex B8.~~

~~If deemed necessary, the manufacturer shall demonstrate that preconditioning of the traction REESS in advance of the CoP procedure is required. In such a case, at the request of the manufacturer and with approval of the approval authority, preconditioning of the traction REESS shall be done in advance of the CoP procedure according to manufacturer's recommendation.~~

~~The electric energy consumption $EC_{AC,CD}$ shall be determined according to step 9 of Table A8/8 of Annex B8.~~

~~5.3.6.2.1.2. First cycle of the Charge-Depleting Type 1 Test~~

~~5.3.6.2.1.2.1. The vehicle shall be tested according to the charge-depleting Type 1 test as described in paragraph 3.2.4. of Annex B8, whilst the break-off criterion of the charge-depleting Type 1 test procedure shall be considered to have been reached when having finished the first applicable WLTP test cycle.~~

~~The DC electric energy consumption from the REESS(s) $EC_{DC,first,i}$ shall be determined according to paragraph 4.3. of Annex B8 where $\Delta E_{REESS,j}$ shall be the electric energy change of all REESS and d_j shall be the actual driven distance during this test cycle.~~

~~5.3.6.2.1.2.2. In this cycle, there is no engine operation allowed. If there is engine operation, the test during conformity of production shall be considered as void.~~

~~5.3.2. The conformity of production with regard to the charge-depleting electric energy consumption shall be verified on the basis of the values for the tested vehicle as described in paragraph 5.3.2.1. in the case that the vehicle is tested according to paragraph 5.3.1.1. and as described in paragraph 5.3.2.2. in the case that the vehicle is tested according to paragraph 5.3.1.2.~~

5.36.2.2.1. Conformity of production for a test according to paragraph 5.36.2.1.1.

~~In the case that the interpolation method is not applied, the charge-depleting electric energy consumption value $EC_{AC,CD,final}$ shall be determined according to~~

~~For 4-phase WLTP test~~

~~step 16-9 of Table A8/8 of Annex B8~~

~~For 3-phase WLTP test~~

~~step 7 of Table A8/9 of Annex B8~~

~~and, if available, applying a run-in factor as defined in paragraph 8.2.4. of this Regulation shall be used for verifying the conformity of production.~~

~~In the case the interpolation method is applied, the charge-depleting electric energy consumption value $EC_{AC,CD,ind}$ for the individual vehicle according to step 17 of Table A8/8 of Annex B8 shall be used for verifying the conformity of production.~~

5.36.2.2.2. Conformity of production for a test according to paragraph 5.36.2.1.2.

~~In the case the interpolation method is not applied, the charge-depleting electric energy consumption value $EC_{DC,CD,COP,final}$ shall be determined according to step 16-12 of Table A8/8 of Annex B8 and, if available, applying a run-in factor as defined in paragraph 8.2.4. of this Regulation shall be used for verifying the conformity of production.~~

~~In the case the interpolation method is applied, the charge-depleting electric energy consumption value $EC_{DC,CD,COP,ind}$ for the individual vehicle according to step 17 of Table A8/8 of Annex B8 shall be used for verifying the conformity of production.~~

~~<Justification> refer incorrect steps, avoid confusion to derive test results during COP (reference value are moved to Appendix 2)~~

Appendix 2

Verification of conformity of production for Type 1 test - statistical method

3.2. Statistical evaluation

3.2.1. For the CO₂ emissions ~~and electric energy consumption~~ from the 4 phases of a WLTP test:

For the evaluation of CO₂ emissions the normalised values shall be calculated as follows:

$$x_i = \frac{CO_{2\ test-i}}{CO_{2\ declared-i}}$$

where:

CO_{2 test-i} is the CO₂ emission measured for the individual vehicle i

CO_{2 declared-i} is the declared CO₂ value for the individual vehicle i

~~For the evaluation of electric energy consumption EC the normalised values shall be calculated as follows:~~

~~$$x_i = \frac{EC_{test-i}}{EC_{DC,COP-i}}$$~~

~~where:~~

~~EC_{test-i} is the electric energy consumption measured for individual vehicle i. In the case that the complete charge-depleting Type 1 test has been applied, EC_{test-i} shall be determined according to paragraph 5.3.1.1. of Appendix 1. In the case that only the first cycle is tested for verification of CoP, EC_{test-i} shall be determined according to paragraph 5.3.1.2. of Appendix 1.~~

~~EC_{DC,COP-i} is the declared electric energy consumption for the individual vehicle i, according to Appendix 8 to Annex B8. In the case that the complete charge-depleting Type 1 test has been applied, EC_{DC,COP-i} shall be determined according to paragraph 5.3.2.1. of Appendix 1. In the case that only the first cycle is tested for verification of CoP, EC_{COP-i} shall be determined according to paragraph 5.3.2.2 of Appendix 1.~~

~~<Justification> duplication, new paragraph 3.2.3.~~

The normalised x_i values shall be used to determine the parameters X_{tests} and s according to paragraph 3.1.

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

For the evaluation of fuel efficiency the normalised values shall be calculated as follows:

$$x_i = \frac{FE_{test-i}}{FE_{declared-i}}$$

where:

FE_{test-i} is the fuel efficiency measured for individual vehicle i

FE_{declared-i} is the declared fuel efficiency value for the individual vehicle

~~3.2.3. For electric energy consumption:~~

~~For the evaluation of electric energy consumption EC the normalised values shall be calculated as follows:~~

~~$$x_i = \frac{EC_{test-i}}{EC_{DC,COP-i}}$$~~

where:

EC_{test-i} is the electric energy consumption measured for individual vehicle i according to the table below. In the case that the complete charge-depleting Type 1 test has been applied, EC_{test-i} shall be determined according to paragraph 5.3.1.1. of Appendix 1. In the case that only the first cycle is tested for verification of CoP, EC_{test-i} shall be determined according to paragraph 5.3.1.2. of Appendix 1.

$EC_{DC, COP-i}$ is the declared electric energy consumption for the individual vehicle i , according to the table below. Appendix 8 to Annex B8. In the case that the complete charge-depleting Type 1 test has been applied, $EC_{DC, COP-i}$ shall be determined according to paragraph 5.3.2.1. of Appendix 1. In the case that only the first cycle is tested for verification of CoP, $EC_{DC, COP-i}$ shall be determined according to paragraph 5.3.2.2. of Appendix 1.

Vehicle category	COP test results		Test procedure according to	Reference values	
	Test procedure according to	EC_{test-i}		$EC_{DC, COP-i}$	
				in case that the interpolation method is not applied	in case that the interpolation method is applied
OVC-HEV	Appendix 1 6.2.1.1.	Appendix 1 6.2.1.1.	Annex B8 3.2.4.	For 4-phase WLTP test Annex B8 Table A8/8 Step 16 $EC_{AC, CD, final}$	For 4-phase WLTP test Annex B8 Table A8/8 Step 17 $EC_{AC, CD, ind}$
				For 3-phase WLTP test Annex B8 Table A8/9 Step 8 EC_{dec}	For 3-phase WLTP test Annex B8 Table A8/9 Step 9 EC_{ind}
	Appendix 1 6.2.1.2.	Appendix 1 6.2.1.2.		Annex B8 Table A8/8 Step 16 $EC_{DC, CD, COP, final}$	Annex B8 Table A8/8 Step 17 $EC_{DC, CD, COP, ind}$
PEV	Appendix 1 5.1.	Appendix 1 5.1.	Annex B8 3.4.4.1.3.	Annex B8 Table A8/10 Step 9	Annex B8 Table A8/10 Step 10
			Annex B8 3.4.4.2.3.	Annex B8 Table A8/11 Step 8	Annex B8 Table A8/11 Step 9

The normalised x_i values shall be used to determine the parameters X_{tests} and s according to paragraph 3.1.

<Justification> refer insufficient step, incorrect step

Appendix 3

Run-in test procedure to determine run-in factors

1.2.1. Extension of run-in factor

At the request of the vehicle manufacturer and with approval by the responsible authority, the derived run-in factor for CO₂, pollutant emissions, fuel efficiency and electric energy/fuel consumption can be extended to other CoP families.

The vehicle manufacturer shall provide evidence on the justification and technical criteria for merging these COP families, ensuring that there is a large similarity between those families.

<Justification> incorrect description

- 1.6. Before the run-in, the test vehicle shall be tested according to the Type 1 test procedure specified in Annex B6 ~~and-or~~ Annex B8. The test shall be repeated until three valid test results have been obtained. Drive trace indexes shall be calculated according to paragraph 7. of Annex B7 and these shall fulfil the criteria specified in paragraph 2.6.8.3.1.4. of Annex B6. The system odometer setting D_i shall be recorded prior to each test. The measured criteria emissions, CO₂ emissions, fuel efficiency and electric energy consumption shall be calculated according to Step 4a of Table A7/1 in Annex B7 or Step 4a of Table A8/5 in Annex B8.

The signal of the acceleration control position shall be recorded during all tests at a sampling frequency of 10 Hz. It is allowed to use the OBD acceleration control position signal for this purpose. The responsible authority may request the manufacturer to evaluate this signal to ensure that the test result is performed correctly.

- 1.8. After the run-in, the test vehicle shall be tested according to the Type 1 test procedure specified in Annex B6 ~~and-or~~ Annex B8. The test shall be repeated until three valid test results have been obtained.

Drive trace indexes shall be calculated according to paragraph 7. of Annex B7 and these shall fulfil the criteria specified in paragraph 2.6.8.3.1.4. of Annex B6.

These tests shall be performed in the same test cell as used for the tests prior to the run-in and by applying the same chassis dynamometer setting method. If this is not possible, the manufacturer shall justify the reason for using a different test cell. The system odometer setting D_i in km shall be recorded prior to each test. The measured criteria emissions, CO₂ emissions, fuel efficiency and electric energy consumption, as applicable and in accordance with paragraph 8.2.4.1. of this Regulation, shall be calculated according to Step 4a of Table A7/1 in Annex B7 or Step 4a of Table A8/5 in Annex B8.

<Justification> incorrect description

- 1.9. support GRPE86-16 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 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. support GRPE86-16 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:

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

- 1.10. [support GRPE86-16](#) 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 CO₂ 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. ([excluding paragraph 1.9.1.](#)) and 1.10. of this appendix, where CO₂ in the formulae is replaced by FE and EC respectively.

- <Justification> in line with 02 series description
2. Prior to the application of the derived run-in factor for fuel efficiency, 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.
- <Justification> in line with 02 series description. only FE run-in factor requires the verification after SOP (Start Of Production)

Annex B4

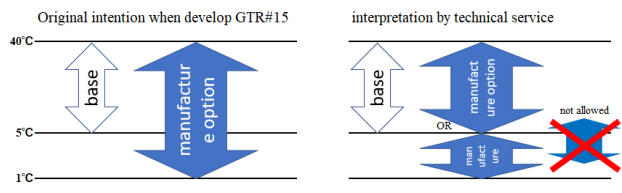
Road load and dynamometer setting

4.1.1.2. Atmospheric temperature

The atmospheric temperature should be within the range of 5 °C up to and including 40 °C.

At the option of the manufacturer, coastdowns may be performed between 1 °C and ~~5~~40 °C.

<Justification>



If the difference between the highest and the lowest measured temperature during the coastdown test is more than 5 °C, the temperature correction shall be applied separately for each run with the arithmetic average of the ambient temperature of that run.

In that case, the values of the road load coefficients f_0 , f_1 and f_2 shall be determined and corrected for each run pair. The final set of f_0 , f_1 and f_2 values shall be the arithmetic average of the individually corrected coefficients f_0 , f_1 and f_2 respectively.

- 5.1.1. For the calculation of the road load of vehicles of a road load matrix family, the vehicle parameters described in paragraph 4.2.1.4. of this annex and the road load coefficients of the representative test vehicle determined in paragraph 4.3. or in paragraph 6. of this annex shall be used.

<Justification> 5.1. refers both coastdown and wind tunnel method, but 5.1.1. refers only coastdown method

- 5.1.2. For the calculation of the running resistance of vehicles of a road load matrix family, the vehicle parameters described in paragraph 4.2.1.4. of this annex and the running resistance coefficients of the representative test vehicle determined in paragraph 4.44.5.5.2. of this annex shall be used.

<Justification> refer incorrect paragraph (should refer after correction to reference conditions)

- 6.5.2.3.3. The force $f_{j\text{Dyno}}$ at each reference speed v_j shall be calculated by removing the dynamometer set force:

$$f_{j\text{Dyno}} = f_{j\text{Decel}} - f_{dj}$$

where:

$f_{j\text{Decel}}$ is the force determined according to the equation calculating F_j in paragraph 4.3.1.4.4. of this annex at reference speed point j , N;

f_{dj} is the force determined to the equation calculating F_d in paragraph 6.5.2.1. of this annex at reference speed point j , N.

Alternatively, at the request of the manufacturer, b_d and c_d may be set to zero during the coastdown and for calculating $f_{j\text{Dyno}}$.

<Justification> practically impossible, overlooked when modified para. 6.5.2.1.

Annex B7

Calculations

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.

Step No.	Source	Input	Process	Output
1	Annex B6	Raw test results	Mass emissions Paragraphs 3. to 3.2.2. inclusive of this annex.	$M_{i,p,1}$, g/km; $M_{CO2,p,1}$, g/km.
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.
4a	Output step 2 Output step 3	$M_{i,c,2}$, g/km; $M_{CO2,c,3}$, g/km.	Emissions test procedure for all vehicles equipped with periodically regenerating systems, K_i . Annex B6, Appendix 1. $M_{i,c,4a} = K_i \times M_{i,c,2}$ or $M_{i,c,4a} = K_i + M_{i,c,2}$ and $M_{CO2,c,4a} = K_{CO2} \times M_{CO2,c,3}$ or $M_{CO2,c,4a} = K_{CO2} + M_{CO2,c,3}$ Additive offset or multiplicative factor to be used according to K_i determination. If K_i is not applicable: $M_{i,c,4a} = M_{i,c,2}$ $M_{CO2,c,4a} = M_{CO2,c,3}$	$M_{i,c,4a}$, g/km; $M_{CO2,c,4a}$, g/km.
4b	Output step 3 Output step 4a	$M_{CO2,p,3}$, g/km; $M_{CO2,c,3}$, g/km; $M_{CO2,c,4a}$, g/km.	If K_i is applicable, align CO_2 phase values to the combined cycle value: $M_{CO2,p,4} = M_{CO2,p,3} \times AF_{K_i}$ for every cycle phase p; where: $AF_{K_i} = \frac{M_{CO2,c,4a}}{M_{CO2,c,3}}$ If K_i is not applicable: $M_{CO2,p,4} = M_{CO2,p,3}$	$M_{CO2,p,4}$, g/km.

Step No.	Source	Input	Process	Output
4c	Output step 4a	M _{i,c,4a} , g/km; M _{CO₂,c,4a} , g/km.	<p>In the case these values are used for the purpose of conformity of production, the criteria emission values and CO₂ emission values shall be multiplied with the run in factor determined according to paragraph 8.2.4. of this Regulation:</p> <p>$M_{i,c,4c} = R_{IF}(j) \times M_{i,c,4a}$</p> <p>$M_{CO_2,c,4c} = R_{IF}(j) \times M_{CO_2,c,4a}$</p> <p>In the case these values are not used for the purpose of conformity of production:</p> <p>$M_{i,c,4c} = M_{i,c,4a}$</p> <p>$M_{CO_2,c,4c} = M_{CO_2,c,4a}$</p>	M _{i,c,4c} ; M _{CO₂,c,4c}
			<p>Calculate fuel efficiency (FE_{c,4c,temp}) according to paragraph 6. of Annex B6<u>B7</u>.</p> <p>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:</p> <p>$FE_{c,4c} = R_{IF}(j) \times FE_{c,4c,temp}$</p> <p>In the case these values are not used for the purpose of conformity of production:</p> <p>$FE_{c,4c} = FE_{c,4c,temp}$</p>	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.	<p>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.</p> <p>For results after 3 phases: $M_{CO_2,c,5} = M_{CO_2,c,4c}$ $M_{CO_2,p,5} = M_{CO_2,p,4}$</p>	M _{CO₂,c,5} , g/km; M _{CO₂,p,5} , g/km.
		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. FE_{c,5}=FE_{c,4c}</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 _{CO₂,c,5} , g/km; M _{CO₂,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 _{CO₂,c,6} , g/km; M _{CO₂,p,6} , g/km. M _{CO₂,c,declared} , g/km.
	For results after 3 phases Output step 5	FE _{c,5} , km/l; M _{i,c,4e5} , g/km	<p>Averaging of tests and declared value. Paragraphs 1.2. to 1.2.3. inclusive of Annex B6.</p> <p>$M_{i,c,5} = M_{i,c,6}$</p> <p>The conversion from FE_{c,declared} to M_{CO₂,c,declared} shall be performed for the applicable cycle according to paragraph 6.</p>	FE _{c,declared} , km/l FE _{c,6} , km/l <u>M_{i,c,6}</u> M _{CO₂,c,declared} , g/km.

Step No.	Source	Input	Process	Output
			of Annex B7. For that purpose, the criteria emission over the applicable cycle shall be used.	
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.	Calculation of fuel consumption according to Paragraph 6 of this annex. 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 CO ₂ values shall be used; (b) the criteria emission over the complete cycle shall be used. and: $M_{i,c,8} = M_{i,c,6}$ $M_{CO_2,c,8} = M_{CO_2,c,7}$ $M_{CO_2,p,8} = M_{CO_2,p,7}$	$FC_{c,8}$, 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 6 Output steps 7	$M_{i,c,6}$, g/km; <u>$FE_{c,6}$, km/l</u> $M_{CO_2,p,7}$, 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: $M_{i,c,8} = M_{i,c,6}$ $FE_{c,8} = FE_{c,6}$	$FC_{p,8}$, l/100 km; $FE_{p,8}$, km/l; $M_{i,c,8}$, g/km; $FE_{c,8}$, km/l.
9 For results after 4 phases Final criteria emission result	Output step 8	For each of the test vehicles H and L: $M_{i,c,8}$, g/km; $M_{CO_2,c,8}$, g/km; $M_{CO_2,p,8}$, g/km; $FC_{c,8}$, l/100 km; $FC_{p,8}$, l/100 km;	For results after 4 phases; If in addition to a test vehicle H a test vehicle M and/or vehicle L was also tested, the resulting criteria emission value shall be the highest of the two or, in case vehicle M does not meet the linearity criterion three values and referred to as $M_{i,c}$.	$M_{i,c}$, g/km; $M_{CO_2,c,H}$, g/km; $M_{CO_2,p,H}$, g/km; $FC_{c,H}$, l/100 km; $FC_{p,H}$, l/100 km; $FE_{c,H}$, km/l; $FE_{p,H}$, km/l;

Step No.	Source	Input	Process	Output
		FE _{c,8} , km/l. FE _{p,8} , km/l	In the case of the combined THC + NOx emissions, the highest value of the sum referring to either the vehicle H or vehicle L or, if applicable, vehicle M is to be taken as the type approval value. Otherwise, if no vehicle L was tested, M _{i,c} = M _{i,c,8} For CO ₂ , FE and FC, the values derived in step 8 shall be used, and CO ₂ values shall be rounded according to paragraph 6.1.8. of this Regulation to two places of decimal, and FE and FC values shall be rounded according to paragraph 6.1.8. of this Regulation to three places of decimal.	and if a vehicle L was tested: M _{CO₂,c,L} , g/km; M _{CO₂,p,L} , g/km; FC _{c,L} , l/100 km; FC _{p,L} , l/100 km; FE _{c,L} , km/l FE _{p,L} , km/l.
10 Result of an individual vehicle. Final CO ₂ , FE and FC result.	Output step 9	M _{CO₂,c,H} , g/km; M _{CO₂,p,H} , g/km; FC _{c,H} , l/100 km; FC _{p,H} , l/100 km; FE _{c,H} , km/l; FE _{p,H} , km/l; and if a vehicle L was tested: M _{CO₂,c,L} , g/km; M _{CO₂,p,L} , g/km; FC _{c,L} , l/100 km; FC _{p,L} , l/100 km. FE _{c,L} , km/l; FE _{p,L} , km/l.	Fuel consumption, fuel efficiency and CO ₂ calculations for individual vehicles in an interpolation family. Paragraph 3.2.3. of this annex. Fuel consumption, fuel efficiency and CO ₂ calculations for individual vehicles in a road load matrix family. Paragraph 3.2.4. of this annex. CO ₂ emissions shall be expressed in grams per kilometre (g/km) rounded to the nearest whole number; FC values shall be rounded according to paragraph 6.1.8. of this Regulation to one place of decimal, expressed in (l/100 km) ; FE values shall be rounded according to paragraph 6.1.8. of this Regulation to one place of decimal, expressed in (km/l).	M _{CO₂,c,ind} g/km; M _{CO₂,p,ind} , g/km; FC _{c,ind} l/100 km; FC _{p,ind} , l/100 km; FE _{c,ind} , km/l; FE _{p,ind} , km/l.

<Justification> mislead incorrect results, all necessary process are described in Appendix 1 of main body

<Justification for rev1> missing the parameter and/or refer incorrect parameter

Annex B8

Pure electric, hybrid electric and compressed hydrogen fuel cell hybrid vehicles

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.

Step No.	Source	Input	Process	Output
1	Annex B6	Raw test results	Charge-sustaining mass emissions Paragraphs 3. to 3.2.2. inclusive of Annex B7.	$M_{i,CS,p,1}$, g/km; $M_{CO_2,CS,p,1}$, g/km.
2	Output step 1	$M_{i,CS,p,1}$, g/km; $M_{CO_2,CS,p,1}$, g/km.	Calculation of combined charge-sustaining cycle values: $M_{i,CS,c,2} = \frac{\sum_p M_{i,CS,p,1} \times d_p}{\sum_p d_p}$ $M_{CO_2,CS,c,2} = \frac{\sum_p M_{CO_2,CS,p,1} \times d_p}{\sum_p d_p}$ where: $M_{i,CS,c,2}$ is the charge-sustaining mass emission result over the total cycle; $M_{CO_2,CS,c,2}$ is the charge-sustaining CO ₂ emission result over the total cycle; d_p are the driven distances of the cycle phases p.	$M_{i,CS,c,2}$, g/km; $M_{CO_2,CS,c,2}$, g/km.
3	Output step 1 Output step 2	$M_{CO_2,CS,p,1}$, g/km; $M_{CO_2,CS,c,2}$, g/km.	REESS electric energy change correction Paragraphs 4.1.1.2. to 4.1.1.5. inclusive of this annex.	$M_{CO_2,CS,p,3}$, g/km; $M_{CO_2,CS,c,3}$, g/km.
4a	Output step 2 Output step 3	$M_{i,CS,c,2}$, g/km; $M_{CO_2,CS,c,3}$, g/km.	Charge-sustaining mass emission correction for all vehicles equipped with periodically regenerating systems K_i according to Annex B6, Appendix 1. $M_{i,CS,c,4a} = K_i \times M_{i,CS,c,2}$ or $M_{i,CS,c,4a} = K_i + M_{i,CS,c,2}$ and $M_{CO_2,CS,c,4a} = K_{CO_2,K_i} \times M_{CO_2,CS,c,3}$ or $M_{CO_2,CS,c,4a} = K_{CO_2,K_i} + M_{CO_2,CS,c,3}$	$M_{i,CS,c,4a}$, g/km; $M_{CO_2,CS,c,4a}$, g/km.

Step No.	Source	Input	Process	Output
			Additive offset or multiplicative factor to be used according to K_i determination. If K_i is not applicable: $M_{i,CS,c,4a} = M_{i,CS,c,2}$ $M_{CO_2,CS,c,4a} = M_{CO_2,CS,c,3}$	
4b	Output step 3 Output step 4a	$M_{CO_2,CS,p,3}$, g/km; $M_{CO_2,CS,c,3}$, g/km; $M_{CO_2,CS,c,4a}$, g/km.	If K_i is applicable, align CO ₂ phase values to combined cycle value: $M_{CO_2,CS,p,4} = M_{CO_2,CS,p,3} \times AF_{Ki}$ for every cycle phase p; where: $AF_{Ki} = \frac{M_{CO_2,CS,c,4a}}{M_{CO_2,CS,c,3}}$ If K_i is not applicable: $M_{CO_2,CS,p,4} = M_{CO_2,CS,p,3}$	$M_{CO_2,CS,p,4}$, g/km.
4c	Output step 4a	$M_{i,CS,c,4a}$, g/km; $M_{CO_2,CS,c,4a}$, g/km.	In the case these values are used for the purpose of conformity of production, the criteria emission values and CO₂ emission values shall be multiplied with the run-in factor RI determined according to paragraph 8.2.4. of this Regulation: $M_{i,CS,c,4c} = RI_c(j) \times M_{i,CS,c,4a}$ $M_{CO_2,CS,c,4c} = RI_{CO_2}(j) \times M_{CO_2,CS,c,4a}$ In the case these values are not used for the purpose of conformity of production: $M_{i,c,4c} = M_{i,c,4a}$ $M_{CO_2,c,4c} = M_{CO_2,c,4a}$	$M_{i,CS,c,4c}$; $M_{CO_2,CS,c,4c}$
			Calculate fuel efficiency ($FE_{c,4c_temp}$) according to paragraph 6.14.1. of Annex B7. 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		$M_{CO_2,CS,p,4}$, g/km; $M_{CO_2,CS,c,4c}$, g/km;	For results after 4 phases:	$M_{CO_2,CS,c,5}$, g/km; $M_{CO_2,CS,p,5}$, g/km.

Step No.	Source	Input	Process	Output
Result of a single test.	Output step 4b and 4c		ATCT correction of $M_{CO_2,CS,e,4e}$ and $M_{CO_2,CS,p,4}$ in accordance with paragraph 3.8.2. of Annex B6a. For results after 3 phases: $M_{CO_2,e,5} = M_{CO_2,e,4e}$ $M_{CO_2,p,5} = M_{CO_2,p,4}$	
		$M_{i,CS,c,4c}$, g/km; $FE_{e,4c}$, km/l;	Apply deterioration factors calculated in accordance with Annex C4 to the criteria emissions values. $FE_{e,5} = FE_{e,4c}$ <i>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.</i>	$M_{i,CS,c,5}$, g/km; $FE_{e,5}$, 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	$FE_{e,5}$, km/l; $M_{i,CS,c,4c}$	Averaging of tests and declared value. Paragraphs 1.2. to 1.2.3. inclusive of Annex B6. The conversion from $FE_{e,declared}$ to $M_{CO_2,e,declared}$ shall be performed for the applicable cycle. For that purpose, the criteria emission over the complete cycle shall be used.	$FE_{e,declared}$, km/l $M_{CO_2,e,declared}$, 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.	Alignment of phase values. Paragraph 1.2.4. of Annex B6, and: $M_{CO_2,CS,c,7} = M_{CO_2,CS,c,declared}$	$M_{CO_2,CS,c,7}$, 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.

Step No.	Source	Input	Process	Output
For results after 4 phases only 8 Final criteria emission result. If the interpolation method is not applied, step No. 9 is not required and the output of this step is the final CO ₂ result.	Output step 6	For each of the test vehicles H and L and, if applicable, vehicle M: $M_{i,CS,c,6}$, g/km;	If in addition to a test vehicle H a test vehicle M and/or vehicle L was also tested, the resulting criteria emission value shall be the highest of the two or, in case vehicle M does not meet the linearity criterion three values and referred to as $M_{i,CS,c}$ In the case of the combined THC+NO _x emissions, the highest value of the sum referring to either the vehicle H or vehicle L or, if applicable, vehicle M is to be taken as the type approval value. Otherwise, if no vehicle L or if applicable vehicle M was tested, $M_{i,CS,c} = M_{i,CS,c,6}$	$M_{i,CS,c}$, g/km; $M_{CO_2,CS,c}$, g/km; $M_{CO_2,CS,p}$, g/km;
	Output step 7	For each of the test vehicles H and L and, if applicable, vehicle M: $M_{CO_2,CS,c,7}$, g/km; $M_{CO_2,CS,p,7}$, g/km.	In the case that the interpolation method is applied, intermediate rounding shall be applied according to paragraph 6.1.8. of this Regulation: CO ₂ values derived in step 7 of this table shall be rounded to two places of decimal. Also, the output for CO ₂ is available for vehicle H and vehicle L and, if applicable, for vehicle M. In the case that the interpolation method is not applied, final rounding shall be applied according to paragraph 6.1.8. of this Regulation: CO ₂ values derived in step 7 of this table shall be rounded to the nearest whole number.	
For results after 4 phases only 9 Result of an individual vehicle. Final CO ₂ result.	Output step 8	$M_{CO_2,CS,c}$, g/km; $M_{CO_2,CS,p}$, g/km;	CO ₂ emission calculation according to paragraph 4.5.4.1. of this annex for individual vehicles in an interpolation family. Final rounding of individual vehicle CO ₂ values shall be performed according to paragraph 6.1.8. of this Regulation. CO ₂ values shall be rounded to the nearest whole number. Output is available for each individual vehicle.	$M_{CO_2,CS,c,ind}$, g/km; $M_{CO_2,CS,p,ind}$, g/km.

<Justification> mislead incorrect results, all necessary process are described in Appendix 1 of main body

4.1.2. Charge-depleting CO₂ emission for OVC-HEVs

For 4-phase WLTP test

The utility factor-weighted charge-depleting CO₂ emission $M_{CO_2,CD}$ shall be calculated using the following equation:

$$M_{CO_2,CD} = \frac{\sum_{j=1}^k (UF_j \times M_{CO_2,CD,j})}{\sum_{j=1}^k UF_j}$$

For 3-phase WLTP test

The charge-depleting CO₂ emission $M_{CO_2,CD}$ shall be calculated using the following equation:

$$M_{CO_2,CD} = \frac{\sum_{j=1}^k (M_{CO_2,CD,j} \times d_j)}{\sum_{j=1}^k d_j}$$

where:

$M_{CO_2,CD}$ is the utility factor-weighted charge-depleting CO₂ emission, g/km;

$M_{CO_2,CD,j}$ is the CO₂ emission determined according to paragraph 3.2.1. of Annex B7 of phase j of the charge-depleting Type 1 test, g/km;

UF_j is the utility factor of phase j according to Appendix 5 to this annex;

j is the index number of the considered phase;

k is the number of phases driven up to the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

~~In the case that the interpolation method is applied, k shall be the number of phases driven up to the end of the transition cycle of vehicle L, n_{veh-L} .~~

~~If the transition cycle number driven by vehicle H, n_{veh-H} , and, if applicable, by an individual vehicle within the vehicle interpolation family, $n_{veh-int}$, is lower than the transition cycle number driven by vehicle L, n_{veh-L} , the confirmation cycle of vehicle H and, if applicable, an individual vehicle shall be included in the calculation. The CO₂ emission of each phase of the confirmation cycle shall be subsequently corrected to an electric energy consumption of zero ($EC_{DC,CD,j} = 0$) by using the CO₂ correction coefficient according to Appendix 2 to this annex.~~

~~<Justification> high possibility to mislead the incorrect value during in-service testing~~

4.1.3. This paragraph is applicable for 4-phase WLTP test only:

Utility factor-weighted mass emissions of gaseous compounds, particulate matter emission and particle number emission for OVC-HEVs

4.1.3.1. The utility factor-weighted mass emission of gaseous compounds

$$M_{i,weighted} = \sum_{j=1}^k (UF_j \times M_{i,CD,j}) + (1 - \sum_{j=1}^k UF_j) \times M_{i,CS}$$

where:

$M_{i,weighted}$ is the utility factor-weighted mass emission compound i, g/km;

i is the index of the considered gaseous emission compound (except CO₂);

UF_j is the utility factor of phase j according to Appendix 5 to this annex;

$M_{i,CD,j}$ is the mass emission of the gaseous emission compound i determined according to paragraph 3.2.1. of Annex B7 of phase j of the charge-depleting Type 1 test, g/km;

$M_{i,CS}$ is the charge-sustaining mass emission of gaseous emission compound i for the charge-sustaining Type 1 test according to Table A8/5, step No. 6, g/km;

j is the index number of the considered phase;

k is the number of phases driven until the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

For calculating the utility-factor weighted CO₂ emission the following equation shall be used:

$$M_{CO_2,weighted} = \left(\sum_{j=1}^k UF_j \right)_{ave} \times M_{CO_2,CD,declared} + \left(1 - \left(\sum_{j=1}^k UF_j \right)_{ave} \right) \times M_{CO_2,CS,declared}$$

where:

$M_{CO_2,weighted}$ is the utility-factor weighted charge-depleting CO₂ emission, g/km.

$M_{CO_2,CD,declared}$ is the declared charge-depleting CO₂ emission according to Table A8/8, step no. 14, g/km.

$M_{CO_2,CS,declared}$ is the declared charge-sustaining CO₂ emission according to Table A8/5, step no. 7, g/km.

$\left(\sum_{j=1}^k UF_j \right)_{ave}$ is the average of the sum of utility factors of each charge-depleting test.

j is the index number of the considered phase;

k is the number of phases driven until the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

~~In the case that the interpolation method is applied for CO₂, k shall be the number of phases driven up to the end of the transition cycle of vehicle L $n_{veh,L}$, for the application of both equations of this paragraph.~~

~~If the transition cycle number driven by vehicle H, $n_{veh,H}$, and, if applicable, by an individual vehicle within the vehicle interpolation family $n_{veh,interp}$ is lower than the transition cycle number driven by vehicle L, $n_{veh,L}$, the confirmation cycle of vehicle H and, if applicable, an individual vehicle shall be included in the calculation. The CO₂ emission of each phase of the confirmation cycle shall then be corrected to an electric energy consumption of zero ($EC_{DC,CD,j} = 0$) by using the CO₂ correction coefficient according to Appendix 2 to this annex.~~

~~<Justification> high possibility to mislead the incorrect value during in-service testing~~

4.2.2. The charge-depleting fuel consumption and charge-depleting fuel efficiency for OVC-HEVs

For 4-phase WLTP test:

The utility factor-weighted charge-depleting fuel consumption FC_{CD} shall be calculated using the following equation:

$$FC_{CD} = \frac{\sum_{j=1}^k (UF_j \times FC_{CD,j})}{\sum_{j=1}^k UF_j}$$

where:

- FC_{CD} is the utility factor weighted charge-depleting fuel consumption, l/100 km;
- $FC_{CD,j}$ is the fuel consumption for phase j of the charge-depleting Type 1 test, determined according to paragraph 6. of Annex B7, l/100 km;
- UF_j is the utility factor of phase j according to Appendix 5 to this annex;
- j is the index number for the considered phase;
- k is the number of phases driven up to the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

~~In the case that the interpolation method is applied, k shall be the number of phases driven up to the end of the transition cycle of vehicle L $n_{veh,L}$.~~

~~If the transition cycle number driven by vehicle H, $n_{veh,H}$, and, if applicable, by an individual vehicle within the vehicle interpolation family, $n_{veh,inf}$, is lower than the transition cycle number driven by vehicle L $n_{veh,L}$, the confirmation cycle of vehicle H and, if applicable, an individual vehicle shall be included in the calculation.~~

~~The fuel consumption of each phase of the confirmation cycle shall be calculated according to paragraph 6. of Annex B7 with the criteria emission over the complete confirmation cycle and the applicable CO_2 phase value which shall be corrected to an electric energy consumption of zero, $EC_{DC,CD,j} = 0$, by using the CO_2 mass correction coefficient (K_{CO_2}) according to Appendix 2 to this annex.~~

~~<Justification> high possibility to mislead the incorrect value during in-service testing~~

For 3-phase WLTP test

The charge-depleting fuel efficiency FE_{CD} shall be calculated using the following equation:

$$FE_{CD} = \frac{R_{CDA}}{\sum_{c=1}^{n-1} d_c \times \frac{1}{FE_{CD,c}} + d_n \times \frac{k_{CD}}{FE_{CD,avg,n-1}}}$$

where:

- FE_{CD} is the charge-depleting fuel efficiency, km/l;
- R_{CDA} actual charge-depleting range defined in paragraph 4.4.5. of this Annex, km;

$FE_{CD,c}$ is the fuel efficiency for cycle c of the charge-depleting Type 1 test, determined according to paragraph 6. of Annex B7, km/l;

$$FE_{CD,avg,n-1} = \frac{\sum_{c=1}^{n-1} d_c}{\sum_{c=1}^{n-1} d_c \times \frac{1}{FE_{CD,c}}};$$

c	is the index number for the considered cycle;
n	is the number of applicable WLTP test cycles driven up to the end of the transition cycle according to paragraph 3.2.4.4. of this annex
d_c	is the distance driven in the applicable WLTP test cycle c of the charge-depleting Type 1 test, km;
d_n	is the distance driven in the applicable WLTP test cycle n of the charge-depleting Type 1 test, km;
k_{CD}	$k_{CD} = \frac{M_{CO_2,CS} - M_{CO_2,CD,n}}{M_{CO_2,CS} - M_{CO_2,CD,avg,n-1}}$

4.2.3. This paragraph is applicable only for 4-phase WLTP test

Utility factor-weighted fuel consumption for OVC-HEVs

The utility factor-weighted fuel consumption for OVC-HEVs from the charge-depleting and charge-sustaining Type 1 test shall be calculated using the following equation:

$$FC_{\text{weighted}} = \sum_{j=1}^k (UF_j \times FC_{CD,j}) \times \frac{M_{CO_2,CD,declared}}{M_{CO_2,CD,ave}} + (1 - \sum_{j=1}^k UF_j) \times FC_{CS}$$

where:

FC_{weighted}	is the utility factor-weighted fuel consumption, l/100 km;
UF_j	is the utility factor of phase j according to Appendix 5 to this annex;
$FC_{CD,j}$	is the fuel consumption of phase j of the charge-depleting Type 1 test, determined according to paragraph 6. of Annex B7, l/100 km;
$M_{CO_2,CD,declared}$	is the declared charge-depleting CO ₂ emission according to Table A8/8, step no. 14, g/km;
$M_{CO_2,CD,ave}$	is the arithmetic average charge-depleting CO ₂ emission according to Table A8/8, step no. 13, g/km;
FC_{CS}	is the fuel consumption determined according to Table A8/6, step No. 1, l/100 km;
j	is the index number for the considered phase;
k	is the number of phases driven up to the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

~~In the case that the interpolation method is applied, k shall be the number of phases driven up to the end of the transition cycle of vehicle L, $n_{veh,L}$.~~

~~If the transition cycle number driven by vehicle H, $n_{veh,H}$, and, if applicable, by an individual vehicle within the vehicle interpolation family $n_{veh,ind}$ is lower than the transition cycle number driven by vehicle L, $n_{veh,L}$, the confirmation cycle of vehicle H and, if applicable, an individual vehicle shall be included in the calculation.~~

~~The fuel consumption of each phase of the confirmation cycle shall be calculated according to paragraph 6. of Annex B7 with the criteria emission over the complete confirmation cycle and the applicable CO₂ phase value which shall be corrected to an electric energy consumption of zero $EC_{DC,CD,j} = 0$ by using the CO₂ mass correction coefficient (K_{CO_2}) according to Appendix 2 to this annex.~~

<Justification> high possibility to mislead the incorrect value during in-service testing

4.3.1. This paragraph is applicable only for 4-phase WLTP test

Utility factor-weighted charge-depleting electric energy consumption based on the recharged electric energy from the mains for OVC-HEVs

The utility factor-weighted charge-depleting electric energy consumption based on the recharged electric energy from the mains shall be calculated using the following equation:

$$EC_{AC,CD} = \frac{\sum_{j=1}^k (UF_j \times EC_{AC,CD,j})}{\sum_{j=1}^k UF_j}$$

where:

$EC_{AC,CD}$ is the utility factor-weighted charge-depleting electric energy consumption based on the recharged electric energy from the mains, Wh/km;

UF_j is the utility factor of phase j according to Appendix 5 to this annex;

$EC_{AC,CD,j}$ is the electric energy consumption based on the recharged electric energy from the mains of phase j, Wh/km;

and

$$EC_{AC,CD,j} = EC_{DC,CD,j} \times \frac{E_{AC}}{\sum_{j=1}^k \Delta E_{REESS,j}}$$

where:

$EC_{DC,CD,j}$ is the electric energy consumption based on the REESS depletion of phase j of the charge-depleting Type 1 test according to paragraph 4.3. of this annex, Wh/km;

E_{AC} is the recharged electric energy from the mains determined according to paragraph 3.2.4.6. of this annex, Wh;

$\Delta E_{REESS,j}$ is the electric energy change of all REESSs of phase j according to paragraph 4.3. of this annex, Wh;

j is the index number for the considered phase;

k is the number of phases driven up to the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

~~In the case that the interpolation method is applied, k is the number of phases driven up to the end of the transition cycle of $L_{75\%Wh-15}$.~~

<Justification> high possibility to mislead the incorrect value during in-service testing

4.3.2. This paragraph is applicable for 4-phase WLTP test only:

Utility factor-weighted electric energy consumption based on the recharged electric energy from the mains for OVC-HEVs

The utility factor-weighted electric energy consumption based on the recharged electric energy from the mains shall be calculated using the following equation:

$$EC_{AC,weighted} = (\sum_{j=1}^k UF_j) \times EC_{AC,CD,declared}$$

where:

$EC_{AC,weighted}$	is the utility factor-weighted electric energy consumption based on the recharged electric energy from the mains, Wh/km;
UF_j	is the utility factor of phase j according to Appendix 5 to this annex;
$EC_{AC,CD,declared}$	is the declared charge-depleting electric energy consumption based on the recharged electric energy from the mains for OVC-HEVs according to Table A8/8, step 14, Wh/km;
j	is the index number for the considered phase;
k	is the number of phases driven up to the end of the transition cycle according to paragraph 3.2.4.4. of this annex.

~~In the case that the interpolation method is applied, k is the number of phases driven up to the end of the transition cycle of vehicle L, n_{veh-L} .~~

<Justification> high possibility to mislead the incorrect value during in-service testing

4.4.4.1. Determination of cycle-specific equivalent all-electric range

The cycle-specific equivalent all-electric range shall be calculated using the following equation:

For 4 phase WLTP test;

$$EAER = \left(\frac{M_{CO_2,CS,declared} - M_{CO_2,CD,avg} \times \frac{M_{CO_2,CD,declared}}{M_{CO_2,CD,ave}}}{M_{CO_2,CS,declared}} \right) \times R_{CDC}$$

For 3 phase WLTP test;

$$EAER = \left(\frac{M_{CO_2,CS,ave,declared} - M_{CO_2,CD,avg}}{M_{CO_2,CS,ave}} \right) \times R_{CDC}$$

where:

EAER	is the cycle-specific equivalent all-electric range, km;
$M_{CO_2,CS,declared}$	is the declared charge-sustaining CO ₂ emission according to Table A8/5, step No. 7, g/km for 4 phase WLTP test to Table A8/5, step No. 6, g/km for 3 phase WLTP test ;
$M_{CO_2,CD,avg}$	is the arithmetic average charge-depleting CO ₂ emission according to the equation below, g/km;
$M_{CO_2,CD,declared}$	is the declared charge-depleting CO ₂ emission according to Table A8/8, step no. 14, g/km;
$M_{CO_2,CD,ave}$	is the arithmetic average charge-depleting CO ₂ emission according to Table A8/8, step no. 13, g/km;
R_{CDC}	is the charge-depleting cycle range according to paragraph 4.4.3. of this annex, km;
$M_{CO_2,CS,ave}$	is the arithmetic average charge-sustaining CO ₂ emission according to Table A8/5, step No. 6, g/km;

and

$$M_{CO_2,CD,avg} = \frac{\sum_{j=1}^k (M_{CO_2,CD,j} \times d_j)}{\sum_{j=1}^k d_j}$$

where:

$M_{CO_2,CD,avg}$	is the arithmetic average charge-depleting CO ₂ emission, g/km. In the case of more than one charge-depleting test, the additional arithmetic average of each test shall be calculated;
$M_{CO_2,CD,j}$	is the CO ₂ emission determined according to paragraph 3.2.1. of Annex B7 of phase j of the charge-depleting Type 1 test, g/km;
d_j	is the distance driven in phase j of the charge-depleting Type 1 test, km;
j	is the index number of the considered phase;
k	is the number of phases driven up to the end of the transition cycle n according to paragraph 3.2.4.4. of this annex.

[<Justification> in line with 4-phase test process \(CD CO₂ has no declared value, so measured value is only option to be used\)](#)

4.4.4.2. [This paragraph applies to 4 phase WLTP test only](#)

Determination of the phase-specific equivalent all-electric range

The phase-specific equivalent all-electric range shall be calculated using the following equation:

For 4-phase WLTP test:

$$EAER_p = \left(\frac{M_{CO_2,CS,p} - M_{CO_2,CD,avg,p} \times \frac{M_{CO_2,CD,declared}}{M_{CO_2,CD,ave}}}{M_{CO_2,CS,p}} \right) \times \frac{\sum_{j=1}^k \Delta E_{REESS,j}}{EC_{DC,CD,p}}$$

For 3-phase WLTP test:

$$EAER_p = \left(\frac{M_{CO_2,CS,p} - M_{CO_2,CD,avg,p}}{M_{CO_2,CS,p}} \right) \times \frac{\sum_{j=1}^k \Delta E_{REESS,j}}{EC_{DC,CD,p}}$$

where:

$EAER_p$ is the phase-specific equivalent all-electric range for the considered phase p, km;

$M_{CO_2,CS,p}$ is the phase-specific CO₂ emission from the charge-sustaining Type 1 test for the considered phase p according to Table A8/5, step No. 7, g/km;

$M_{CO_2,CD,declared}$ is the declared charge-depleting CO₂ emission according to Table A8/8, step no. 14, g/km;

$M_{CO_2,CD,ave}$ is the arithmetic average charge-depleting CO₂ emission according to Table A8/8, step no. 13, g/km;

$\Delta E_{REESS,j}$ are the electric energy changes of all REESSs during the considered phase j, Wh. In the case of more than one charge-depleting test, the additional arithmetic average of each test shall be calculated;

$EC_{DC,CD,p}$ is the electric energy consumption over the considered phase p based on the REESS depletion, Wh/km. In the case of more than one charge-depleting test, the additional arithmetic average of each test shall be calculated;

j is the index number of the considered phase;

k is the number of phases driven up to the end of the transition cycle n according to paragraph 3.2.4.4 of this annex;

and

$$M_{CO_2,CD,avg,p} = \frac{\sum_{c=1}^{n_c} (M_{CO_2,CD,p,c} \times d_{p,c})}{\sum_{c=1}^{n_c} d_{p,c}}$$

where:

$M_{CO_2,CD,avg,p}$ is the arithmetic average charge-depleting CO₂ emission for the considered phase p, g/km. In the case of more than one charge-depleting test, the additional arithmetic average of each test shall be calculated;

$M_{CO_2,CD,p,c}$ is the CO₂ emission determined according to paragraph 3.2.1. of Annex B7 of phase p in cycle c of the charge-depleting Type 1 test, g/km;

$d_{p,c}$ is the distance driven in the considered phase p of cycle c of the charge-depleting Type 1 test, km. In the case of more than one charge-depleting test, the additional arithmetic average of each test shall be calculated;

c is the index number of the considered applicable WLTP test cycle;

- p is the index of the individual phase within the applicable WLTP test cycle;
- n_c is the number of applicable WLTP test cycles driven up to the end of the transition cycle n according to paragraph 3.2.4.4. of this annex;

and:

$$EC_{DC,CD,p} = \frac{\sum_{c=1}^{n_c} EC_{DC,CD,p,c} \times d_{p,c}}{\sum_{c=1}^{n_c} d_{p,c}}$$

where:

- $EC_{DC,CD,p}$ is the electric energy consumption of the considered phase p based on the REESS depletion of the charge-depleting Type 1 test, Wh/km. In the case of more than one charge-depleting test, the additional arithmetic average of each test shall be calculated;
- $EC_{DC,CD,p,c}$ is the electric energy consumption of the considered phase p of cycle c based on the REESS depletion of the charge-depleting Type 1 test according to paragraph 4.3. of this annex, Wh/km;
- $d_{p,c}$ is the distance driven in the considered phase p of cycle c of the charge-depleting Type 1 test, km;
- c is the index number of the considered applicable WLTP test cycle;
- p is the index of the individual phase within the applicable WLTP test cycle;
- n_c is the number of applicable WLTP test cycles driven up to the end of the transition cycle n according to paragraph 3.2.4.4. of this annex.

For the 4-phase WLTP test:

The considered phase shall be the low phase, medium phase, high phase, extra high phase, and the city driving cycle.

For the 3-phase WLTP test:

The considered phase shall be the low phase, medium phase and high phase.

<Justifications> During 02/03 SoA, 3-phase process was accidentally deleted.

4.5.8. ~~[For 3 phase WLTP test or delete paragraph]~~ Adjustment of values

~~The individual EAER value determined in accordance with paragraph 4.5.7.3. of this annex may be decreased by the manufacturer. In such cases:~~

~~The EAER phase values shall be decreased by the ratio of the decreased EAER value divided by the calculated EAER value. This shall not compensate for technical elements that would effectively require a vehicle to be excluded from the interpolation family.~~

~~<Justification> for Level 1A, can be used to disable GTR#22 requirement (battery deterioration) without disadvantage~~

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.

<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
1	Annex B8	Charge-depleting test results	<p>Results measured according to Appendix 3 to this annex, pre-calculated according to paragraph 4.3. of this annex.</p> <p>Recharged electric energy according to paragraph 3.2.4.6. of this annex.</p> <p>Cycle energy according to paragraph 5. of Annex B7.</p> <p>CO₂ emission according to paragraph 3.2.1. of Annex B7.</p> <p>Mass of gaseous emission compound i according to paragraph 4.1.3.1. of Annex B8.</p> <p>All-electric range determined according to paragraph 4.4.1.1. of this annex.</p> <p>CO₂ emission K_{CO2} correction coefficient might be necessary according to Appendix 2 to this annex.</p> <p>Output is available for each test.</p>	<p>$\Delta E_{REESS,j}$, Wh; d_j, km;</p> <p>E_{AC}, Wh;</p> <p>E_{cycle}, Ws;</p> <p>$M_{CO_2,CD,j}$, g/km;</p> <p>$M_{i,CD,j}$, g/km;</p> <p>AER, km;</p> <p>K_{CO_2}, (g/km)/(Wh/km).</p>
	For results after 4 phases Annex B8		<p>Usable battery energy according to paragraph 4.4.1.2.2. of this annex.</p> <p>In the case that the applicable WLTC city test cycle was driven: all- electric range city according to paragraph 4.4.1.2.1. of this annex.</p> <p>Particle number emissions (if applicable) according to paragraph 4. of Annex B7.</p> <p>Particulate matter emissions according to paragraph 4. of Annex B7.</p>	<p>UBE_{city}, Wh; AER_{city}, km.</p> <p>$PN_{CD,j}$, particles per kilometer;</p> <p>$PM_{CD,e}$, mg/km;</p>
2	Output step 1	$\Delta E_{REESS,j}$, Wh; E_{cycle} , Ws.	Calculation of relative electric energy change for each cycle according to paragraph 3.2.4.5.2. of this annex.	$REEC_i$.

Step no.	Source	Input	Process	Output
			Output is available for each test and each applicable WLTP test cycle.	
3	Output step 2	REEC _i .	Determination of the transition and confirmation cycle according to paragraph 3.2.4.4. of this annex. In the case that more than one charge-depleting test is available for one configuration, for the purpose of averaging, each test shall have the same transition cycle number n_{veh} . Determination of the charge-depleting cycle range according to paragraph 4.4.3. of this annex. Output is available for each test.	n_{veh} ; R _{CD} ; km.
4	Output step 3	n_{veh} ;	In the case that the interpolation method is used, the transition cycle shall be determined for vehicle H, L and, if applicable, M. <i>Check whether the interpolation criterion according to paragraph 6.3.2.2. (d) of this Regulation is fulfilled.</i>	$n_{veh,L}$; $n_{veh,H}$; if applicable $n_{veh,M}$.
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 that the interpolation method is applied, $n_{veh,L}$ cycles shall be used for $n_{veh,H}$ cycles and $n_{veh,M}$ cycles, if applicable. Output is available for each test.	$M_{i,CD,e}$, g/km; $PM_{CD,e}$, mg/km; $PN_{CD,e}$, particles per kilometer.
For results after 4 phases 6	Output step 5	$M_{i,CD,e}$, g/km; $PM_{CD,e}$, mg/km; $PN_{CD,e}$, particles per kilometer.	Emission averaging of tests for each applicable WLTP test cycle within the charge-depleting Type 1 test and checking compliance with the limits according to Table A6/2 of Annex B6.	$M_{i,CD,e,ave}$, g/km; $PM_{CD,e,ave}$, mg/km; $PN_{CD,e,ave}$, particles per kilometer.
For results after 4 phases 7	Output step 1	$\Delta E_{REESS,j}$, Wh; d_j , km; UBE_{city} , Wh.	In the case that AER _{city} is derived from the Type 1 test by driving the applicable WLTP test cycles, the value shall be calculated according to paragraph 4.4.1.2.2. of this annex. In the case of more than one test, $n_{city,pe}$ shall be equal for each test.	AER _{city} , km; AER _{city,ave}} , km.

Step no.	Source	Input	Process	Output
			Output is available for each test. Averaging of AER _{city} .	
For results after 4 phases 8	Output step 1	d_j , km;	Phase-specific and cycle-specific UF calculation. Output is available for each test.	$UF_{\text{phase},j}$; $UF_{\text{cycle},c}$.
	Output step 3	n_{veh} ;		
	Output step 4	$n_{\text{veh},L}$;		
For results after 4 phases 9	Output step 1	$\Delta E_{\text{REESS},j}$, Wh; d_j , km; E_{AC} , Wh;	Calculation of the electric energy consumption based on the recharged energy according to paragraphs 4.3.1. of this annex. <i>In the case of interpolation, $n_{\text{veh},L}$ cycles shall be used. Therefore, due to the required correction of the CO₂ emission, the electric energy consumption of the confirmation cycle and its phases shall be set to zero.</i> Output is available for each test.	$EC_{AC,CD}$, Wh/km;
	Output step 3	n_{veh} ;		
	Output step 4	$n_{\text{veh},L}$;		
	Output step 8	$UF_{\text{phase},j}$;		
10	Output step 1	$M_{CO_2,CD,j}$, g/km; K_{CO_2} , (g/km)/(Wh/km); $\Delta E_{\text{REESS},j}$, Wh; d_j , km; n_{veh} ; $n_{\text{veh},L}$; $UF_{\text{phase},j}$.	Calculation of the charge-depleting CO ₂ emission according to paragraph 4.1.2. of this annex. <i>In the case that the interpolation method is applied, $n_{\text{veh},L}$ 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.</i> Output is available for each test.	$M_{CO_2,CD}$, g/km;
	Output step 3	d_j , km;		
	Output step 4	n_{veh} ;		
	Output step 8	$n_{\text{veh},L}$; $UF_{\text{phase},j}$.		
11	Output step 1	$M_{CO_2,CD,j}$, g/km; $M_{i,CD,j}$, g/km; K_{CO_2} , (g/km)/(Wh/km). n_{veh} ; $n_{\text{veh},L}$; $UF_{\text{phase},j}$;	Calculation of the charge-depleting fuel consumption and fuel efficiency according to paragraph 4.2.2. of this annex. <i>In the case that the interpolation method is applied, $n_{\text{veh},L}$ cycles shall be used. With reference to paragraph 4.1.2. of this annex, $M_{CO_2,CD,j}$ of the confirmation cycle</i>	For results after 4 phases, $FC_{CD,j}$, l/100 km; FC_{CD} , l/100 km.
	Output step 3	n_{veh} ;		For results after 3 phases, FE_{CD} , km/l.

Step no.	Source	Input	Process	Output
	Output step 4	$n_{veh,L}$;	shall be corrected according to Appendix 2 to this annex.	
	Output step 8	$UF_{phase,j}$;	For results after 4 phases, the phase-specific fuel consumption $FC_{CD,j}$ shall be calculated using the corrected CO_2 emission according to paragraph 6. of Annex B7. Output is available for each test.	
12	Output step 1	$\Delta E_{REESS,j}$, Wh; d_j , km;	If applicable, calculation of the electric energy consumption from the first applicable WLTP test cycle as described in paragraph 2.2. of Appendix 8 to this annex. Output is available for each test.	$EC_{DC,CD,first}$, Wh/km
13	Output step 9	$EC_{AC,CD}$, Wh/km;	Averaging of tests for each vehicle. In the case that the interpolation method is applied, the output is available for each vehicle H, L and, if applicable, M.	If applicable: $EC_{DC,CD,first,ave}$, Wh/km
	Output step 10	$M_{CO2,CD}$, g/km;		For results after 4 phases,
	Output step 11	FC_{CD} , l/100 km; FE_{CD} , km/l.		$EC_{AC,CD,ave}$, Wh/km; $M_{CO2,CD,ave}$, g/km; $FC_{CD,ave}$, l/100 km;
	Output step 12	If applicable: $EC_{DC,CD,first}$, Wh/km.		For results after 3 phases, $FE_{CD,ave}$, km/l.
14	Output step 13	$EC_{AC,CD,ave}$, Wh/km; $M_{CO2,CD,ave}$, g/km. $FE_{CD,ave}$, km/l.	Declaration of charge-depleting electric energy consumption, fuel efficiency and CO_2 emission for each vehicle. Calculation of $EC_{AC,weighted}$ according to paragraph 4.3.2. of this annex. In the case that the interpolation method is applied, the output is available for each vehicle H, L and, if applicable, M.	For results after 4 phases, $EC_{AC,CD,declared}$, Wh/km; $EC_{AC,weighted}$, Wh/km; $M_{CO2,CD,declared}$, g/km. For results after 3 phases, $FE_{CD,declared}$, km/l.
15	Output step 13	$EC_{AC,CD,ave}$, Wh/km; If applicable: $EC_{DC,CD,first,ave}$, Wh/km;	If applicable: Adjustment of electric energy consumption for the purpose of COP as described in paragraph 2.2. of Appendix 8 to this annex.	$EC_{DC,CD,COP}$, Wh/km;

Step no.	Source	Input	Process	Output
	Output step 14	$EC_{AC,CD,declared}$, Wh/km;	In the case that the interpolation method is applied, the output is available for each vehicle H, L and, if applicable, M.	
16 If the interpolation method is not applied, step No. 17 is not required and the output of this step is the final result.	Output step 15	If applicable: $EC_{DC,CD,COP}$, Wh/km;	In the case that the interpolation method is applied, intermediate rounding shall be performed according to paragraph 6.1.8. of this Regulation: $M_{CO2,CD}$ shall be rounded to the second place of decimal.	If applicable: $EC_{DC,CD,COP,final}$, Wh/km;
	Output step 14	$EC_{AC,CD,declared}$, Wh/km; $EC_{AC,weighted}$, Wh/km; $FE_{CD,declared}$, km/l; $M_{CO2,CD,declared}$, g/km.	$M_{CO2,CD}$ shall be rounded to the second place of decimal.	For results after 4 phases, $EC_{AC,CD,final}$, Wh/km; $M_{CO2,CD,final}$, g/km; $EC_{AC,weighted,final}$, Wh/km;
	Output step 13	$FC_{CD,ave}$, l/100 km;	$EC_{AC,CD,final}$ and $EC_{AC,weighted,final}$ shall be rounded to the first place of decimal. If applicable: $EC_{DC,CD,COP}$ shall be rounded to the first place of decimal. FC_{CD} and FE_{CD} shall be rounded to the third place of decimal. Output is available for vehicle H and for vehicle L and, if applicable, for vehicle M. In case that the interpolation method is not applied, final rounding shall be applied according to paragraph 6.1.8. of this Regulation: $EC_{AC,CD}$, $EC_{AC,weighted}$ and $M_{CO2,CD}$ shall be rounded to the nearest whole number. If applicable: $EC_{DC,CD,COP}$ shall be rounded to the nearest whole number. FC_{CD} and FE_{CD} shall be rounded to the first place of decimal.	$FC_{CD,final}$, l/100 km; For results after 3 phases, $FE_{CD,final}$, km/l;
17 Result of an individual vehicle. Final test result.	Output step 16	If applicable: $EC_{DC,CD,COP,final}$, Wh/km; $EC_{AC,CD,final}$, Wh/km; $M_{CO2,CD,final}$, g/km; $EC_{AC,weighted,final}$, Wh/km; $FC_{CD,final}$, l/100 km; $FE_{CD,final}$, km/l;	Interpolation of individual values based on input from vehicles H and L and, if applicable, vehicle M. Final rounding of individual vehicle values shall be performed according to paragraph 6.1.8. of this Regulation.	If applicable: $EC_{DC,CD,COP,ind}$, Wh/km; For results after 4 phases, $EC_{AC,CD,ind}$, Wh/km; $M_{CO2,CD,ind}$, g/km; $EC_{AC,weighted,ind}$, Wh/km; $FC_{CD,ind}$, l/100 km;

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<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
			<p>$EC_{AC,CD}$, $EC_{AC,weighted}$ and $M_{CO2,CD}$ shall be rounded to the nearest whole number.</p> <p>If applicable: $EC_{DC,CD,COP}$ shall be rounded to the nearest whole number.</p> <p>FC_{CD} shall be rounded to the first place of decimal.</p> <p>Output is available for each individual vehicle.</p>	<p>For results after 3 phases, $FE_{CD,ind}$, km/l;</p>

<Justifications> [delete R_CDC provision, double process](#)

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.

Step no.	Source	Input	Process	Output
1	Output step 1, Table A8/8	$M_{i,CD,j}$, g/km; $PN_{CD,j}$, particles per kilometer; $PM_{CD,e}$, mg/km; $M_{CO_2,CD,j}$, g/km; $\Delta E_{REESS,j}$, Wh; d_j , km; AER, km; E_{AC} , Wh;	Input from CD and CS post processing.	$M_{CO_2,CD,j}$, g/km; AER, km; E_{AC} , Wh; $M_{CO_2,CS,declared}$, g/km; $M_{CO_2,CD,declared}$, g/km; $M_{CO_2,CD,ave}$, g/km;
	Output step 7, Table A8/8	$AER_{city,ave}$, km;		For results after 4 phases $M_{i,CD,j}$, g/km; $PN_{CD,j}$, particles per kilometer; $PM_{CD,e}$, mg/km; $\Delta E_{REESS,j}$, Wh; d_j , km; $AER_{city,ave}$, km;
	Output step 3, Table A8/8	n_{veh} ; R_{CDC} , km;	Output in the case of CD is available for each CD test. Output in the case of CS is available once due to CS test averaged values. In the case that the interpolation method is applied, the output (except of K_{CO_2}) is available for vehicle H, L and, if applicable, M.	n_{veh} ; R_{CDC} , km;
	Output step 4, Table A8/8	$n_{veh,L}$; $n_{veh,H}$;		$n_{veh,L}$; $n_{veh,H}$;
	Output step 8, Table A8/8	$UF_{phase,j}$; $UF_{cycle,c}$;		$UF_{phase,j}$; $UF_{cycle,c}$;
	Output step 6, Table A8/5	$M_{i,CS,c,6}$, g/km;		$M_{i,CS,c,6}$, g/km;
	Output step 7, Table A8/5	$M_{CO_2,CS,declared}$, g/km; $M_{CO_2,CS,p}$		$M_{CO_2,CS,p}$
	Output step 14, Table A8/8	$M_{CO_2,CD,declared}$, g/km;		$M_{CO_2,CD,declared}$, g/km;
Output step 13, Table A8/8	$M_{CO_2,CD,ave}$, g/km; K_{CO_2} , (g/km)/(Wh/km).	K_{CO_2} , (g/km)/(Wh/km).		

<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
For results after 4 phases 2	Output step 1	$M_{i,CD,j}$, g/km; $PN_{CD,j}$, particles per kilometer; $PM_{CD,e}$, mg/km; n_{veh} ; $n_{veh,L}$; $UF_{phase,j}$; $UF_{cycle,c}$; $M_{i,CS,e,6}$, g/km;	Calculation of weighted emission (except $M_{CO2,weighted}$) compounds according to paragraphs 4.1.3.1. to 4.1.3.3. inclusive of this annex. Remark: $M_{i,CS,e,6}$ includes $PN_{CS,e}$ and $PM_{CS,e}$. Output is available for each CD test.	$M_{i,weighted}$, g/km; $PN_{weighted}$, particles per kilometer; $PM_{weighted}$, mg/km;
3	Output step 1	$M_{CO2,CD,j}$, g/km; $\Delta E_{REESS,j}$, Wh; d_j , km; n_{veh} ; R_{CDC} , km $M_{CO2,CS,declared}$, g/km; $M_{CO2,CS,p}$	Calculation of equivalent all-electric range according to paragraphs 4.4.4.1. and 4.4.4.2. of this annex, and actual charge-depleting range according to paragraph 4.4.5. of this annex. Output is available for each CD test. R_{CDA} shall be rounded according to paragraph 6.1.8. of this Regulation to the nearest whole number.	EAER, km; EAER _p , km; R _{CDA} , km.
4	Output step 1 Output step 3	AER, km; R_{CDA} , km.	Output is available for each CD test. In the case that the interpolation method is applied, check the availability of AER interpolation between vehicle H, L and, if applicable, M according to paragraph 4.5.7.1. of this annex. If the interpolation method is used, each test shall fulfil the requirement.	AER-interpolation availability.

Step no.	Source	Input	Process	Output
5 If the interpolation method is not applied, step No. 9 is not required and the output of this step is the final result.	Output step 1	AER, km.	<p>Averaging AER and AER declaration. The declared AER shall be rounded according to paragraph 6.1.8. of this Regulation to the number of decimal places specified in Table A6/1 of Annex B6.</p> <p>In the case that the interpolation method is applied and the AER interpolation availability criterion is fulfilled, AER shall be rounded according to paragraph 6.1.8. of this Regulation to the first place of decimal.</p> <p>The output is available for each vehicles H and L and, if applicable, for vehicle M.</p> <p>If the case that the interpolation method is applied but the criterion is not fulfilled, AER of vehicle H shall be applied for the whole interpolation family and shall be rounded according to paragraph 6.1.8. of this Regulation to the nearest whole number.</p> <p>In the case that the interpolation method is not applied, AER shall be rounded according to paragraph 6.1.8. of this Regulation to the nearest whole number.</p>	<p>AER_{ave}, km;</p> <p>For results after 4 phases AER_{dec}, km.</p>
For results after 4 phases, 6	Output step 1	<p>M_{i,CD,j}, g/km; M_{CO₂,CD,j}, g/km; n_{veh}; n_{veh,L}; UF_{phase,j}; M_{i,CS,c,6}, g/km; M_{CO₂,CS,declared}, g/km. M_{CO₂,CD,declared}, g/km; M_{CO₂,CD,ave}, g/km;</p>	<p>Calculation of weighted CO₂ emission and fuel consumption according to paragraphs 4.1.3.1. and 4.2.3. of this annex.</p> <p>Output is available for each CD test.</p> <p>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, M_{CO₂,CD,j} of the confirmation cycle shall be corrected according to Appendix 2 to this annex.</p>	<p>M_{CO₂,weighted}, g/km; FC_{weighted} l/100 km;</p>
7	Output step 1 Output step 3	<p>E_{AC}, Wh;</p> <p>EAER, km; EAER_p, km;</p>	<p>Calculation of the electric energy consumption based on EAER according to paragraphs 4.3.3.1. and 4.3.3.2. of this annex.</p> <p>Output is available for each CD test.</p>	<p>EC, Wh/km; EC_p, Wh/km;</p>

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<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
8 If the interpolation method is not applied, step No. 9 is not required and the output of this step is	Output step 1	AER _{city, ave} , km;	For results after 3 phases Averaging EC and EC declaration. $EC_{p,final} = EC_{p,ave} \times \frac{EC_{dec}}{EC_{ave}}$	For results after 3 phases EC _{dec} , Wh/km; EC _{p,final} , Wh/km; EAER _{final} , km;
	Output step 6	M _{CO2,weighted} , g/km; FC _{weighted} , l/100 km;		
	Output step 7	EC, Wh/km; EC _p , Wh/km;	For results after 3 phases and 4 phases	For results after 4 phases
	Output step 3	EAER, km; EAER _p , km;	Averaging and intermediate rounding according to paragraph 6.1.8. of this Regulation.	AER _{city,final} , km; M _{CO2,weighted,final} , g/km;

Step no.	Source	Input	Process	Output
the final result.	Output step 5	AER _{dec} , km; AER _{ave} , km.	<p>In the case that the interpolation method is applied, intermediate rounding shall be performed according to paragraph 6.1.8. of this Regulation.</p> $AER_{city,final} = AER_{city,ave} \times \frac{AER_{dec}}{AER_{ave}}$ <p>AER_{city,ave}, EAER and EAER_p shall be rounded to the first place of decimal.</p> <p>M_{CO2,weighted} shall be rounded to the second place of decimal.</p> <p>FC_{weighted} shall be rounded to the third place of decimal.</p> <p>EC and EC_p shall be rounded to the first place of decimal.</p> <p>The output is available for each vehicle H, vehicle L and, if applicable, vehicle M.</p> <p>In case that the interpolation method is not applied, final rounding of the test results shall be applied according to paragraph 6.1.8. of this Regulation.</p> <p>AER_{city,final}, EAER and EAER_p shall be rounded to the nearest whole number.</p> <p>M_{CO2,weighted} shall be rounded to the nearest whole number.</p> <p>FC_{weighted} shall be rounded to the first place of decimal.</p> <p>EC and EC_p shall be rounded to the nearest whole number.</p>	FC _{weighted,final} , l/100 km; EC _{final} , Wh/km; EC _{p,final} , Wh/km; EAER _{final} , km; EAER _{p,final} , km.
9	Output step 5	AER _{dec} , km;	Interpolation of individual values based on input from vehicle low,	EC _{ind} , Wh/km; EC _{p,ind} , Wh/km;

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<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
Result of an individual vehicle. Final test result.	Output step 8	AER _{city,final} , km; M _{CO2,weighted,final} , g/km; FC _{weighted,final} , l/100 km; EC _{final} , Wh/km; EC _{p,final} , Wh/km; EAER _{final} , km; EAER _{p,final} , km;	medium and high according to paragraph 4.5. of this annex, and final rounding according to paragraph 6.1.8. of this Regulation. AER _{ind} , AER _{city,ind} , EAER _{ind} and EAER _{p,ind} shall be rounded to the nearest whole number. M _{CO2,weighted,ind} shall be rounded to the nearest whole number. EC _{weighted,ind} shall be rounded to the first place of decimal. FC _{weighted,ind} shall be rounded to the first place of decimal. EC _{ind} and EC _{p,ind} shall be rounded to the nearest whole number. Output is available for each individual vehicles. R _{CDC} shall be rounded according to paragraph 6.1.8. of this Regulation to the nearest whole number.	EAER _{ind} , km; For results after 4 phases, AER _{ind} , km; AER _{city,ind} , km; M _{CO2,weighted,ind} , g/km; FC _{weighted,ind} , l/100 km; EAER _{p,ind} , km.
	Output step 4	AER-interpolation availability		
	Output step 1	R _{CDC}		R _{CDC,final}

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.

<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
1	Annex B8	Test results	Results measured according to Appendix 3 to this annex and pre-calculated according to paragraph 4.3. of this annex. Usable battery energy according to paragraph 4.4.2.2.1. of this annex. Recharged electric energy according to paragraph 3.4.4.3. of this annex. Output is available for each test. E_{AC} shall be rounded according to paragraph 6.1.8. of this Regulation to the first place of decimal.	$\Delta E_{REESS,j}$, Wh; d_j , km; UBE_{CCP} , Wh; E_{AC} , Wh.
2	Output step 1	$\Delta E_{REESS,j}$, Wh; UBE_{CCP} , Wh.	Determination of the number of completely driven applicable WLTC phases and cycles according to paragraph 4.4.2.2. of this annex. Output is available for each test.	n_{WLTC} ; n_{city} ; n_{low} ; n_{med} ; n_{high} ; n_{exHigh} .
3	Output step 1	$\Delta E_{REESS,j}$, Wh; UBE_{CCP} , Wh.	Calculation of weighting factors according to paragraph 4.4.2.2. of this annex.	$K_{WLTC,1}$ $K_{WLTC,2}$ $K_{WLTC,3}$

Step no.	Source	Input	Process	Output
	Output step 2	n _{WLTC} ; n _{city} ; n _{low} ; n _{med} ; n _{high} ; n _{exHigh} .	<i>Note:</i> The number of weighting factors depends on the applicable cycle that was used (3- or 4-phase WLTC). In the case of 4-phase WLTCs, the output in brackets might be needed in addition. Output is available for each test.	(K _{WLTC,4}) K _{city,1} K _{city,2} K _{city,3} (K _{city,4}) K _{low,1} K _{low,2} K _{low,3} (K _{low,4}) K _{med,1} K _{med,2} K _{med,3} (K _{med,4}) K _{high,1} K _{high,2} K _{high,3} (K _{high,4}) K _{exHigh,1} K _{exHigh,2} K _{exHigh,3} (K _{exHigh,4})
4	Output step 1	$\Delta E_{REESS,j}$, Wh; d _j , km; UB _{ECCP} , Wh.	Calculation of electric energy consumption at the REESSs according to paragraph 4.4.2.2. of this annex.	EC _{DC,WLTC} , Wh/km; EC _{DC,city} , Wh/km; EC _{DC,low} , Wh/km; EC _{DC,med} , Wh/km; EC _{DC,high} , Wh/km; EC _{DC,exHigh} , Wh/km; EC _{DC,first} , Wh/km.
	Output step 2	n _{WLTC} ; n _{city} ; n _{low} ; n _{med} ; n _{high} ; n _{exHigh} .	Calculation of the electric energy consumption from the first applicable WLTP test cycle EC _{DC,first} as described in paragraph 1.2. of Appendix 8 to this annex.	EC _{DC,high} , Wh/km; EC _{DC,exHigh} , Wh/km; EC _{DC,first} , Wh/km.
	Output step 3	All weighting factors	Output is available for each test.	
5	Output step 1	UB _{ECCP} , Wh;	Calculation of pure electric range according to paragraph 4.4.2.2. of this annex.	PER _{WLTC} , km; PER _{city} , km; PER _{low} , km; PER _{med} , km; PER _{high} , km; PER _{exHigh} , km.
	Output step 4	EC _{DC,WLTC} , Wh/km; EC _{DC,city} , Wh/km; EC _{DC,low} , Wh/km; EC _{DC,med} , Wh/km; EC _{DC,high} , Wh/km; EC _{DC,exHigh} ,	Output is available for each test.	
6	Output step 1	E _{AC} , Wh;		EC _{WLTC} , Wh/km; EC _{city} , Wh/km;

Step no.	Source	Input	Process	Output
	Output step 5	PER _{WLTC} , km; PER _{city} , km; PER _{low} , km; PER _{med} , km; PER _{high} , km; PER _{exHigh} , km.	Calculation of electric energy consumption at the mains according to paragraph 4.3.4. of this annex. Output is available for each test.	EC _{low} , Wh/km; EC _{med} , Wh/km; EC _{high} , Wh/km; EC _{exHigh} , Wh/km.
7 If the interpolation method is not applied, step No. 10 is not required and the output of this step for PER _{WLTC,dec} and EC _{WLTC,dec} is the final result.	Output step 5 Output step 6	PER _{WLTC} , km; PER _{city} , km; PER _{low} , km; PER _{med} , km; PER _{high} , km; PER _{exHigh} , km; EC _{WLTC} , Wh/km; EC _{city} , Wh/km; EC _{low} , Wh/km; EC _{med} , Wh/km; EC _{high} , Wh/km; EC _{exHigh} , Wh/km.	Averaging of tests for all input values. Declaration of PER _{WLTC,dec} and EC _{WLTC,dec} based on PER _{WLTC,ave} and EC _{WLTC,ave} . Alignment of PER in case of city, low, med, high and exHigh based on the ratio between PER _{WLTC,dec} and PER _{WLTC,ave} : $AF_{PER} = \frac{PER_{WLTC,dec}}{PER_{WLTC,ave}}$ Alignment of EC in case of city, low, med, high and exHigh based on the ratio between EC _{WLTC,dec} and EC _{WLTC,ave} : $AF_{EC} = \frac{EC_{WLTC,dec}}{EC_{WLTC,ave}}$ In the case that the interpolation method is applied, the output is available for vehicle H and vehicle L. PER _{WLTC,dec} as well as EC _{WLTC,dec} shall be rounded according to paragraph 6.1.8. of this Regulation to the number of places of decimal as specified in Table A6/1 of Annex B6. In the case that the interpolation method is not applied, PER _{WLTC,dec} and EC _{WLTC,dec} shall be rounded according to paragraph 6.1.8. of this Regulation to the nearest whole number.	PER _{WLTC,dec} , km; PER _{WLTC,ave} , km; PER _{city,ave} , km; PER _{low,ave} , km; PER _{med,ave} , km; PER _{high,ave} , km; PER _{exHigh,ave} , km; EC _{WLTC,dec} , Wh/km; EC _{WLTC,ave} , Wh/km; EC _{city,ave} , Wh/km; EC _{low,ave} , Wh/km; EC _{med,ave} , Wh/km; EC _{high,ave} , Wh/km; EC _{exHigh,ave} , Wh/km; EC _{DC,first,ave} , Wh/km.
	Output step 4	EC _{DC,first} , Wh/km.		
8	Output step 7	EC _{WLTC,dec} , Wh/km; EC _{WLTC,ave} , Wh/km; EC _{DC,first,ave} , Wh/km.	Adjustment of the electric energy consumption for the purpose of COP as described in paragraph 1.2. of Appendix 8 to this annex. In the case that the interpolation method is applied, the output is available for vehicle H and vehicle L.	EC _{DC,COP} , Wh/km.

<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
9 If the interpolation method is not applied, step No. 10 is not required and the output of this step is the final result.	Output step 7	PER _{city,ave} , km; PER _{low,ave} , km; PER _{med,ave} , km; PER _{high,ave} , km; PER _{exHigh,ave} , km; EC _{city,ave} , Wh/km; EC _{low,ave} , Wh/km; EC _{med,ave} , Wh/km; EC _{high,ave} , Wh/km; EC _{exHigh,ave} , Wh/km;	Intermediate rounding according to paragraph 6.1.8. of this Regulation. In the case that the interpolation method is applied, intermediate rounding shall be performed according to paragraph 6.1.8. of this Regulation: PER _{city} and PER _p shall be rounded to the first place of decimal. EC _{city} and EC _p shall be rounded to the first place of decimal.	PER _{city,final} , km; PER _{low,final} , km; PER _{med,final} , km; PER _{high,final} , km; PER _{exHigh,final} , km; EC _{city,final} , Wh/km; EC _{low,final} , Wh/km; EC _{med,final} , Wh/km; EC _{high,final} , Wh/km; EC _{exHigh,final} , Wh/km; EC _{DC,COP,final} , Wh/km.
	Output step 8	EC _{DC,COP} , Wh/km.	EC _{DC,COP} shall be rounded to the first place of decimal. The output is available for vehicle H and vehicle L. In case that the interpolation method is not applied, final rounding of the test results according to paragraph 6.1.8. of this Regulation: PER _{city} and PER _p shall be rounded to the nearest whole number. EC _{city} and EC _p shall be rounded to the nearest whole number. EC _{DC,COP} shall be rounded to the nearest whole number.	
10 Result of an individual vehicle. Final test result.	Output step 7 Output step 9	PER _{WLTC,dec} , km; EC _{WLTC,dec} , Wh/km PER _{city,final} , km; PER _{low,final} , km; PER _{med,final} , km; PER _{high,final} , km; PER _{exHigh,final} , km; EC _{city,final} , Wh/km; EC _{low,final} , Wh/km; EC _{med,final} , Wh/km; EC _{high,final} , Wh/km; EC _{exHigh,final} , Wh/km; EC _{DC,COP,final} , Wh/km.	Interpolation of individual values based on input from vehicle H and vehicle L according to paragraph 4.5. of this annex, and final rounding according to paragraph 6.1.8. of this Regulation. PER _{ind} , PER _{city,ind} , and PER _{p,ind} shall be rounded to the nearest whole number. EC _{ind} , EC _{city} and EC _{p,ind} shall be rounded to the nearest whole number. EC _{DC,COP,ind} shall be rounded to the nearest whole number. The output is available for each individual vehicle.	PER _{WLTC,ind} , km; PER _{city,ind} , km; PER _{low,ind} , km; PER _{med,ind} , km; PER _{high,ind} , km; PER _{exHigh,ind} , km; EC _{WLTC,ind} , Wh/km; EC _{city,ind} , Wh/km; EC _{low,ind} , Wh/km; EC _{med,ind} , Wh/km; EC _{high,ind} , Wh/km; EC _{exHigh,ind} , Wh/km; EC _{DC,COP,ind} , Wh/km.

<Justification> double process

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.

<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
1	Annex B8	Test results	<p>Results measured according to Appendix 3 to this annex, and pre-calculated according to paragraph 4.3. of this annex.</p> <p>Usable battery energy according to paragraph 4.4.2.1.1. of this annex.</p> <p>Recharged electric energy according to paragraph 3.4.4.3. of this annex.</p> <p>Output is available for each test.</p> <p>E_{AC} shall be rounded according to paragraph 6.1.8. of this Regulation to the first place of decimal.</p>	$\Delta E_{REESS,j}$, Wh; d_j , km; UBE_{STP} , Wh; E_{AC} , Wh.
2	Output step 1	$\Delta E_{REESS,j}$, Wh; UBE_{STP} , Wh.	<p>Calculation of weighting factors according to paragraph 4.4.2.1. of this annex.</p> <p>Output is available for each test.</p>	$K_{WLTC,1}$ $K_{WLTC,2}$ $K_{city,1}$ $K_{city,2}$ $K_{city,3}$ $K_{city,4}$ $K_{low,1}$ $K_{low,2}$ $K_{low,3}$ $K_{low,4}$ $K_{med,1}$ $K_{med,2}$ $K_{med,3}$ $K_{med,4}$ $K_{high,1}$ $K_{high,2}$ $K_{exHigh,1}$ $K_{exHigh,2}$

Step no.	Source	Input	Process	Output
3	Output step 1 Output step 2	$\Delta E_{REESS,j}$, Wh; d_j , km; UBE_{STP} , Wh. All weighting	Calculation of electric energy consumption at the REESSs according to paragraph 4.4.2.1. of this annex. Calculation of the electric energy consumption from the first applicable WLTP test cycle $EC_{DC,first}$ as described in paragraph 1.2. of Appendix 8 to this annex. Output is available for each test.	$EC_{DC,WLTC}$, Wh/km; $EC_{DC,city}$, Wh/km; $EC_{DC,low}$, Wh/km; $EC_{DC,med}$, Wh/km; $EC_{DC,high}$, Wh/km; $EC_{DC,exHigh}$, Wh/km; $EC_{DC,first}$, Wh/km.
4	Output step 1 Output step 3	UBE_{STP} , Wh; $EC_{DC,WLTC}$, Wh/km; $EC_{DC,city}$, Wh/km; $EC_{DC,low}$, Wh/km; $EC_{DC,med}$, Wh/km; $EC_{DC,high}$, Wh/km; $EC_{DC,exHigh}$, Wh/km.	Calculation of pure electric range according to paragraph 4.4.2.1. of this annex. Output is available for each test.	PER_{WLTC} , km; PER_{city} , km; PER_{low} , km; PER_{med} , km; PER_{high} , km; PER_{exHigh} , km.
5	Output step 1 Output step 4	E_{AC} , Wh; PER_{WLTC} , km; PER_{city} , km; PER_{low} , km; PER_{med} , km; PER_{high} , km; PER_{exHigh} , km.	Calculation of electric energy consumption at the mains according to paragraph 4.3.4. of this annex. Output is available for each test.	EC_{WLTC} , Wh/km; EC_{city} , Wh/km; EC_{low} , Wh/km; EC_{med} , Wh/km; EC_{high} , Wh/km; EC_{exHigh} , Wh/km.
6	Output step 4 Output step 5	PER_{WLTC} , km; PER_{city} , km; PER_{low} , km; PER_{med} , km; PER_{high} , km; PER_{exHigh} , km; EC_{WLTC} , Wh/km; EC_{city} , Wh/km; EC_{low} , Wh/km; EC_{med} , Wh/km; EC_{high} , Wh/km; EC_{exHigh} , Wh/km.	Averaging of tests for all input values. Declaration of $PER_{WLTC,dec}$ and $EC_{WLTC,dec}$ based on $PER_{WLTC,ave}$ and $EC_{WLTC,ave}$. Alignment of PER in case of city, low, med, high and exHigh based on the ratio between $PER_{WLTC,dec}$ and $PER_{WLTC,ave}$:	$PER_{WLTC,dec}$, km; $PER_{WLTC,ave}$, km; $PER_{city,ave}$, km; $PER_{low,ave}$, km; $PER_{med,ave}$, km; $PER_{high,ave}$, km; $PER_{exHigh,ave}$, km; $EC_{WLTC,dec}$, Wh/km; $EC_{WLTC,ave}$, Wh/km; $EC_{city,ave}$, Wh/km; $EC_{low,ave}$, Wh/km;

Step no.	Source	Input	Process	Output
the final result.	Output step 3	EC _{DC,first} , Wh/km.	$AF_{PER} = \frac{PER_{WLTC,dec}}{PER_{WLTC,ave}}$ <p>Alignment of EC in case of city, low, med, high and exHigh based on the ratio between EC_{WLTC,dec} and EC_{WLTC,ave}:</p> $AF_{EC} = \frac{EC_{WLTC,dec}}{EC_{WLTC,ave}}$ <p>In the case that the interpolation method is applied, the output is available for vehicle H and vehicle L. PER_{WLTC,dec} as well as EC_{WLTC,dec} shall be rounded according to paragraph 6.1.8. of this Regulation to the number of places of decimal specified in Table A6/1 of Annex B6.</p> <p>In the case that the interpolation method is not applied, PER_{WLTC,dec} and EC_{WLTC,dec} shall be rounded according to paragraph 6.1.8. of this Regulation to the nearest whole number.</p>	EC _{med,ave} , Wh/km; EC _{high,ave} , Wh/km; EC _{exHigh,ave} , Wh/km; EC _{DC,first,ave} , Wh/km.
7	Output step 6	EC _{WLTC,dec} , Wh/km; EC _{WLTC,ave} , Wh/km; EC _{DC,first,ave} , Wh/km.	Adjustment of the electric energy consumption for the purpose of COP as described in paragraph 1.2. of Appendix 8 to this annex. In the case that the interpolation method is applied, the output is available for vehicle H and vehicle L.	EC _{DC,COP} , Wh/km.
8 If the interpolation method is not applied, step No. 9 is not required and the output of this step is the final result.	Output step 6	PER _{city,ave} , km; PER _{low,ave} , km; PER _{med,ave} , km; PER _{high,ave} , km; PER _{exHigh,ave} , km; EC _{city,ave} , Wh/km; EC _{low,ave} , Wh/km; EC _{med,ave} , Wh/km; EC _{high,ave} , Wh/km; EC _{exHigh,ave} , Wh/km;	Intermediate rounding according to paragraph 6.1.8. of this Regulation. In the case that the interpolation method is applied, intermediate rounding shall be performed according to paragraph 6.1.8. of this Regulation: PER _{city} and PER _p shall be rounded to the first place of decimal. EC _{city} and EC _p shall be rounded to the first place of decimal.	PER _{city,final} , km; PER _{low,final} , km; PER _{med,final} , km; PER _{high,final} , km; PER _{exHigh,final} , km; EC _{city,final} , Wh/km; EC _{low,final} , Wh/km; EC _{med,final} , Wh/km; EC _{high,final} , Wh/km; EC _{exHigh,final} , Wh/km; EC _{DC,COP,final} , Wh/km.

<i>Step no.</i>	<i>Source</i>	<i>Input</i>	<i>Process</i>	<i>Output</i>
	Output step 7	EC _{DC,COP} , Wh/km.	<p>EC_{DC,COP} shall be rounded to the first place of decimal.</p> <p>The output is available for vehicle H and vehicle L.</p> <p>In case that the interpolation method is not applied, final rounding of the test results according to paragraph 6.1.8. of this Regulation shall apply:</p> <p>PER_{city} and PER_p shall be rounded to the nearest whole number.</p> <p>EC_{city} and EC_p shall be rounded to the nearest whole number.</p> <p>EC_{DC,COP} shall be rounded to the nearest whole number.</p>	
9	Output step 6	PER _{WLTC,dec} , km; EC _{WLTC,dec} , Wh/km;	<p>Interpolation of individual values based on input from vehicle H and vehicle L according to paragraph 4.5. of this annex, and final rounding according to paragraph 6.1.8. of this Regulation.</p> <p>PER_{ind}, PER_{city,ind}, and PER_{p,ind} shall be rounded to the nearest whole number.</p> <p>EC_{ind}, EC_{city} and EC_{p,ind} shall be rounded to the nearest whole number.</p> <p>EC_{DC,COP,ind} shall be rounded to the nearest whole number.</p> <p>Output is available for each individual vehicle.</p>	PER _{WLTC,ind} , km; PER _{city,ind} , km; PER _{low,ind} , km; PER _{med,ind} , km; PER _{high,ind} , km; PER _{exHigh,ind} , km;
Result of an individual vehicle. Final test result.	Output step 8	<p>PER_{city,final}, km; PER_{low,final}, km; PER_{med,final}, km; PER_{high,final}, km; PER_{exHigh,final}, km;</p> <p>EC_{city,final}, Wh/km; EC_{low,final}, Wh/km; EC_{med,final}, Wh/km; EC_{high,final}, Wh/km; EC_{exHigh,final}, Wh/km;</p> <p>EC_{DC,COP,final}, Wh/km.</p>		<p>EC_{WLTC,ind}, Wh/km; EC_{city,ind}, Wh/km; EC_{low,ind}, Wh/km; EC_{med,ind}, Wh/km; EC_{high,ind}, Wh/km; EC_{exHigh,ind}, Wh/km;</p> <p>EC_{DC,COP,ind}, Wh/km.</p>

<Justification> double process

Annex B8 - Appendix 3

Determination of REESS current and REESS voltage for NOVC-HEVs, OVC-HEVs, PEVs and NOVC-FCHVs

Table A8 App3/1

Test events	Paragraph 3.1.	Paragraph 3.2.		Paragraph 3.3.
		60V or more	Less than 60V	
NOVC-HEV	shall not to be used	shall be used		shall not to be used
OVC-HEV CS condition				
NOVC-FCHV				
OVC-FCHV CS condition				
REESS energy change-based correction procedure (Appendix 2)				
Break-Off Criterion calculation for CD-test (Annex B8, paragraph 3.2.5.4.2.)				
OVC-HEV CD condition	allowed to use shall be used	shall not to be used	allowed to use	allowed to use
OVC-FCHV CD condition				
PEV				

<Justification> incorrect description

Annex C3: Type 4 test

Determination of evaporative emissions from vehicles fuelled with petrol

Type 4 test procedures and test conditions

- 4.7.1. The following pure gases shall be available for calibration and operation:
- Purified synthetic air: (purity < 1 ppm C₁ equivalent, ≤ 1 ppm CO, ≤ 400 ppm CO₂, ≤ 0.1 ppm NO);
 - Oxygen content between 18 and 21 per cent by volume.
 - Hydrocarbon analyser fuel gas: [defined in paragraph 6.1.2.4. of Annex B5 to this Regulation](#) or (40 ± 2 per cent hydrogen, and balance helium with less than 1 ppm C₁ equivalent hydrocarbon, less than 400 ppm CO₂),
 - Propane (C₃H₈): 99.5 per cent minimum purity.
 - Butane (C₄H₁₀): 98 per cent minimum purity.
 - Nitrogen (N₂): [defined in paragraph 6.1.2.1. of Annex B5 to this Regulation](#) or 98 per cent minimum purity.
- [<Justification> allow to use gases for Type1 test as an option to improve test operation efficiency](#)