

**COMMISSION IMPLEMENTING REGULATION (EU) 2017/1153****of 2 June 2017****setting out a methodology for determining the correlation parameters necessary for reflecting the change in the regulatory test procedure and amending Regulation (EU) No 1014/2010****(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to Regulation (EC) No 443/2009 of the European Parliament and of the Council of 23 April 2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO<sub>2</sub> emissions from light-duty vehicles <sup>(1)</sup>, and in particular the first subparagraph of Article 8(9) and the first subparagraph of Article 13(7) thereof,

Whereas:

- (1) A new regulatory test procedure for measuring CO<sub>2</sub> emissions and fuel consumption from light-duty vehicles, the World Harmonised Light Vehicles Test Procedure (WLTP), set out in Commission Regulation (EU) 2017/1151 <sup>(2)</sup>, will replace the New European Test Cycle (NEDC), which is currently used pursuant to Commission Regulation (EC) No 692/2008 <sup>(3)</sup>, with effect starting from 1 September 2017. The WLTP is expected to provide CO<sub>2</sub> emission and fuel consumption values that are more representative of real driving conditions.
- (2) In order to take into account the difference in the level of CO<sub>2</sub> emissions measured under the existing NEDC and the new WLTP procedures, a methodology for correlating those values should be provided to allow the determination of the manufacturers' compliance with their specific CO<sub>2</sub> emission targets pursuant to Regulation (EC) No 443/2009.
- (3) The WLTP is to be phased in, starting with new vehicle types from 1 September 2017 and all vehicles from 1 September 2018. From 1 September 2019, when also end-of-series vehicles have been phased out, all new vehicles placed on the Union market will be tested in accordance with the WLTP. It is appropriate to continue to verify compliance with the specific emission targets using NEDC-based CO<sub>2</sub> emission values during this period.
- (4) It is however desirable to limit the testing burden for both manufacturers and type-approval authorities and the possibility to determine the reference NEDC CO<sub>2</sub> emission values by way of simulations should therefore be provided. A specific vehicle simulation tool (the correlation tool) has been developed for that purpose. The input data for the correlation tool should not require additional tests but be derived from the WLTP type-approval tests.
- (5) The stringency of the CO<sub>2</sub> reduction requirements following the change to WLTP must, in accordance with the second subparagraph of Article 13(7) to Regulation (EC) No 443/2009, remain comparable for manufacturers and vehicles of different utility to that defined in Regulation (EC) No 443/2009 by reference to the CO<sub>2</sub> emission levels determined in accordance with the NEDC procedure. The correlation procedure should therefore take into account those NEDC test conditions which are explicitly required for granting a type-approval.

<sup>(1)</sup> OJ L 140, 5.6.2009, p. 1.

<sup>(2)</sup> Commission Regulation (EU) 2017/1151 of 1 June 2017 supplementing Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information, amending Directive 2007/46/EC of the European Parliament and of the Council, Commission Regulation (EC) No 692/2008 and Commission Regulation (EU) No 1230/2012 and repealing Commission Regulation (EC) No 692/2008 (See page 1 of this Official Journal).

<sup>(3)</sup> Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information (OJ L 199, 28.7.2008, p. 1).

- (6) There may be advanced vehicle technologies or specific technology configurations for which the correlation tool might not be able to deliver NEDC CO<sub>2</sub> values with sufficient accuracy. In those cases, the manufacturer should have the possibility to perform a physical vehicle test instead. In order to ensure a level playing field, the same NEDC test conditions that have been defined for the correlation tool should apply for those tests.
- (7) Regulation (EC) No 443/2009 provides a number of modalities which may be applied to facilitate achieving the specific emission targets. In order to ensure comparable stringency, it is necessary to make certain adjustments to the calculation of the super-credits specified in Article 5a of Regulation (EC) No 443/2009 and to the eco-innovation savings referred to in Article 12 of that Regulation. However, the framework conditions for those modalities are considered not to be directly dependent on the applicable test procedure, and, should, as a consequence, be maintained without adjustments, including the caps set for both super-credits and eco-innovation savings.
- (8) It is important to ensure that procedural tolerances and correlation tool outputs are applied as intended and not as a means to artificially lower the CO<sub>2</sub> emission values used for target compliance purposes. Therefore, a limited number of random physical tests should be performed with a view to verifying that the input data and the NEDC reference values based on the correlation tool output are correctly determined. If it is found, as a result of a random test, that a manufacturer has declared an NEDC CO<sub>2</sub> value for the purpose of the type-approval that is lower than the tolerance permitted in the measurement result or if incorrect input data has been provided, it should be possible for the Commission to determine and apply a correction factor to increase the average specific emissions of a manufacturer. This should also act as a disincentive for any abuse or overexploitations of measurement tolerances.
- (9) The monitoring of CO<sub>2</sub> emission values is set out in Commission Regulation (EU) No 1014/2010 <sup>(1)</sup> and these provisions also needs to be adjusted to the new test procedure. With the WLTP, a specific CO<sub>2</sub> emission value will be calculated and recorded in the certificate of conformity of each individual vehicle. In order to effectively monitor and verify those values, it is necessary to use vehicle identification numbers as a basis for the monitoring.
- (10) In view of the required extensive adaptations of vehicle registration and CO<sub>2</sub> monitoring systems, it is appropriate to provide Member States with the possibility to gradually introduce the new monitoring parameters in 2017 and require the complete new dataset from 2018 only. The 2017 data to be reported should include as a minimum the data required for target compliance purposes and for preventing abuse of the correlation procedure.
- (11) The measures provided for in this Regulation are in accordance with the opinion of the Climate Change Committee,

HAS ADOPTED THIS REGULATION:

#### *Article 1*

#### **Subject matter**

This Regulation provides for:

- (a) a methodology for the correlation of the CO<sub>2</sub> emissions measured in accordance with Annex XXI to Regulation (EU) 2017/1151 with those determined in accordance with Annex XII to Regulation (EC) No 692/2008;
- (b) a procedure for applying the methodology referred to in point (a) for the purpose of determining each manufacturer's average specific emissions of CO<sub>2</sub>;
- (c) the amendments to Regulation (EU) No 1014/2010 required for the purpose of adapting the monitoring of CO<sub>2</sub> emissions data to reflect the change in emission values.

<sup>(1)</sup> Commission Regulation (EU) No 1014/2010 of 10 November 2010 on monitoring and reporting of data on the registration of new passenger cars pursuant to Regulation (EC) No 443/2009 of the European Parliament and the Council (OJ L 293, 11.11.2010, p. 15).

*Article 2***Definitions**

For the purposes of this Regulation, the following definitions shall apply:

- (1) 'NEDC CO<sub>2</sub> values' means the CO<sub>2</sub> emissions determined in accordance with Annex I and entered into the certificates of conformity;
- (2) 'Measured NEDC CO<sub>2</sub> values' means the CO<sub>2</sub> emissions (phases and combined) determined in accordance with Annex XII to Regulation (EC) No 692/2008 by way of physical vehicle tests;
- (3) 'WLTP CO<sub>2</sub> values' means the CO<sub>2</sub> emissions (combined) determined in accordance with the test procedure set out in Annex XXI to Regulation (EU) 2017/1151;
- (4) 'WLTP interpolation family' means the interpolation family as determined in accordance with point 5.6 of Annex XXI to Regulation (EU) 2017/1151;
- (5) 'Correlation tool' means the simulation model referred to in point 2 of Annex I.

*Article 3***Determination of average specific emissions of CO<sub>2</sub> for target compliance purpose in the period 2017 to 2020**

1. For the calendar years 2017 to 2020 inclusive, the average specific emissions of a manufacturer shall be determined using the following CO<sub>2</sub> mass emissions (combined) values:

- (a) with regard to M1 passenger cars type-approved in accordance with Annex XXI to Regulation (EU) 2017/1151, the NEDC CO<sub>2</sub> values;
- (b) with regard to existing types of M1 passenger cars that have been type-approved in accordance with Annex XII to Regulation (EC) No 692/2008, the measured NEDC CO<sub>2</sub> values for the calendar year 2017 until 31 August 2018 and the NEDC CO<sub>2</sub> values from 1 September 2018 to 31 December 2020;
- (c) with regard to end-of-series vehicles referred to in Article 27 of Directive 2007/46/EC of the European Parliament and of the Council <sup>(1)</sup>, the measured NEDC CO<sub>2</sub> values.

2. Manufacturers responsible for more than 1 000 but fewer than 10 000 new passenger cars registered in the Union in each of the calendar years 2017 to 2020 inclusive may use either the NEDC CO<sub>2</sub> values or the measured NEDC CO<sub>2</sub> values.

*Article 4***Determination of average specific emissions based on WLTP CO<sub>2</sub> values**

1. The WLTP CO<sub>2</sub> emissions (combined) or, where applicable, (weighted combined) specified in entry 49.4 of the certificate of conformity shall be monitored for all new registered vehicles starting from 1 January 2018.

2. For each manufacturer, the average specific emissions based on WLTP CO<sub>2</sub> values shall be determined starting from 1 January 2018.

With effect from 1 January 2021, those average specific emissions shall be used to determine the manufacturer's compliance with its specific emission target.

<sup>(1)</sup> Directive 2007/46/EC of the European Parliament and of the Council of 5 September 2007 establishing a framework for the approval of motor vehicles and their trailers, and of systems, components and separate technical units intended for such vehicles (OJ L 263, 9.10.2007, p. 1).

## Article 5

**Application of Article 5a of Regulation (EC) No 443/2009 — super-credits**

Where the measured NEDC CO<sub>2</sub> value of a new passenger car is less than 50 g CO<sub>2</sub>/km, the manufacturer shall, for the purpose of the application of Article 5a of Regulation (EC) No 443/2009, record that value in the certificate of conformity of the vehicles concerned until 31 December 2022.

With effect from 1 January 2021:

- (a) the specific emissions of those vehicles shall be calculated in accordance with Article 5a of that Regulation, using the WLTP CO<sub>2</sub> values of those vehicles;
- (b) the 7,5 g CO<sub>2</sub>/km cap provided for in Article 5a of that Regulation shall be taken into account as follows:

$$Cap_{n,r} = \left( \frac{7,5 - SC_{n2020}}{7,5} \right)$$

$$Cap_w = Cap_{n,r} \cdot \left( \frac{SC_{w2020} \cdot 7,5}{SC_{n2020}} \right)$$

Where:

$Cap_{n,r}$  is the proportion of the remaining cap on NEDC in 2020;

$SC_{n2020}$  is the super-credit savings on NEDC in 2020;

$SC_{w2020}$  is the super-credit savings on WLTP in 2020;

$Cap_w$  is the remaining super-credit savings cap to be taken into account for the calculation of the average specific emissions in 2021 and 2022.

## Article 6

**Application of Article 12 of Regulation (EC) No 443/2009 — eco-innovations**

1. With effect from 1 January 2021, only CO<sub>2</sub> savings due to eco-innovations, within the meaning of Article 12 of Regulation (EC) No 443/2009, that are not covered by the test procedure set out in Annex XXI to Regulation (EU) 2017/1151, shall be taken into account for the calculation of the average specific emissions of a manufacturer.

2. A manufacturer's total eco-innovation CO<sub>2</sub> savings in the following calendar years shall be adjusted as follows:

(a) in 2021:  $EI\ savings_{adjusted\ 2021} = WLTP_{EI\ savings\ 2021} \cdot 1,9$

(b) in 2022:  $EI\ savings_{adjusted\ 2022} = WLTP_{EI\ savings\ 2022} \cdot 1,7$

(c) in 2023:  $EI\ savings_{adjusted\ 2023} = WLTP_{EI\ savings\ 2023} \cdot 1,5$

Where:

$EI\ savings_{adjusted\ 20xx}$  are the eco-innovation savings in the relevant year to be taken into account for the calculation of the average specific emissions;

$WLTP_{EI\ savings\ 20xx}$  are the eco-innovation savings in the relevant year determined in relation to the WLTP and recorded in the certificate of conformity.

From calendar year 2024 eco-innovation savings shall be taken into account for the calculation of the specific average emissions without adjustment.

#### Article 7

##### Determination and correction of NEDC CO<sub>2</sub> values for the calculation of the specific average emissions

1. Starting from the calendar year 2017 until 2020 inclusive, the average specific CO<sub>2</sub> emissions of a manufacturer shall be calculated using the NEDC CO<sub>2</sub> values determined in accordance with the procedure laid down in Section 4 of Annex I, unless paragraph (1)(b) or (c) or paragraph (2) of Article 3 applies.

2. Where for a WLTP interpolation family the deviation factor  $De_i$ , determined in accordance with point 3.2.8 of Annex I, exceeds the value 0,04, or in the presence of a verification factor '1' as determined in that point, the average specific NEDC CO<sub>2</sub> emissions of the manufacturer responsible for that interpolation family shall be multiplied by the following correction factor:

$$\text{correction factor} = 1 + \frac{\sum_{i=1}^N De_i \cdot r_i}{\sum_{i=1}^N \delta_{3,i} \cdot r_i}$$

Where:

$De_i$  is the value determined in accordance with point 3.2.8 of Annex I;

$r_i$  is the number of annual registrations of vehicles belonging to the respective WLTP interpolation family  $i$  concerned;

$\delta_{3,i}$  is equal to 0 if  $De_i$  is missing and equal to 1 otherwise;

$N$  is the number of WLTP interpolation families for which a manufacturer is responsible.

#### Article 8

##### Amendments to Regulation (EU) No 1014/2010

Regulation (EU) No 1014/2010 is amended as follows:

(1) Article 5 is amended as follows:

(a) point (b) is replaced by the following:

'(b) for each vehicle, the deviation factor ( $De$ ) and the verification factor determined in accordance with point 3.2.8 of Annex I to Commission Implementing Regulation (EU) 2017/1153 (\*)

(\*) Commission Implementing Regulation (EU) 2017/1153 of 2 June 2017 setting out a methodology for determining the correlation parameters necessary for reflecting the change in the regulatory test procedure and amending Regulation (EU) No 1014/2010 (OJ L 175, 7.7.2017, p. 679).;

(b) the following third paragraph is added:

'Notwithstanding the detailed data parameters referred to in Annex II to Regulation (EC) No 443/2009, a Member State shall, with regard to the data monitored until 31 December 2017, in addition to the already required parameters, report only the deviation factor "De" and the verification factor. From 1 January 2018 all detailed monitoring data specified in Annex II shall be monitored and reported.;

- (2) Article 6 is deleted;
- (3) the following Article 9a is inserted:

*'Article 9a*

**Preparation of the provisional dataset**

1. The provisional dataset to be notified to a manufacturer in accordance with the second subparagraph of Article 8(4) of Regulation (EC) No 443/2009 shall include the records which, on the basis of the manufacturer's name and, from 1 January 2018, the vehicle identification number, can be attributed to that manufacturer.

The central register referred to in the first subparagraph of Article 8(4) of Regulation (EC) No 443/2009 shall not include any data on vehicle identification numbers.

2. The processing of the vehicle identification numbers shall not include the processing of any personal data that could be linked to those numbers or any other data that could permit the linking of vehicle identification numbers with personal data.;

- (4) Annex I is replaced by the text in Annex II to this Regulation.

*Article 9*

**Entry into force**

This Regulation shall enter into force on the twentieth day following that of its publication in the *Official Journal of the European Union*.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

Done at Brussels, 2 June 2017.

*For the Commission*  
*The President*  
Jean-Claude JUNCKER

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## ANNEX I

## 1. INTRODUCTION

This Annex sets out the methodology for determining the NEDC CO<sub>2</sub> value of individual M1 vehicles.

2. DETERMINATION OF THE NEDC CO<sub>2</sub> VALUE FOR THE WLTP INTERPOLATION FAMILY2.1. **Correlation tool**

The type-approval authority shall ensure that the NEDC CO<sub>2</sub> values to be used as reference for the purpose of Section 3 are determined by way of simulations in accordance with the provisions set out in this Annex.

The Commission shall provide a simulation tool for that purpose (hereinafter the 'correlation tool') in the form of downloadable, executable, software. The Commission shall also provide guidance on the capacity of the correlation tool to simulate vehicles with advanced technologies, and, where necessary, recommend the use of physical measurements instead of simulations.

2.1.1. *Access to the correlation tool*

The correlation tool shall be installed on a computer of the type-approval authority or, where applicable, the technical service, following the instructions provided in the following website:

([http://ec.europa.eu/clima/policies/transport/vehicles/cars/documentation\\_en.htm](http://ec.europa.eu/clima/policies/transport/vehicles/cars/documentation_en.htm))

The type-approval authority shall ensure that the correlation tool is operated in accordance with the requirements of this Regulation and the user instructions set out in the user manual <sup>(1)</sup>.

Support to the approval authorities and technical services using the correlation tool for the purpose of this Regulation shall be provided by the Commission on request. Requests for support shall be addressed to the following functional mailbox:

[co2mpas@jrc.ec.europa.eu](mailto:co2mpas@jrc.ec.europa.eu) <sup>(2)</sup>

The correlation tool shall be accessible to other users, however, support shall only be provided to those users within the limits of available resources.

2.1.2. *Electronic signature and sealing of the correlation tool output*

An electronic signing-key for the purpose of electronically signing and sealing the original correlation tool output file referred to in point 3.1 shall be made available to the approval authorities and, where applicable, technical services following a request to the Commission. The request shall include the relevant name and contact details (mail address, email address, telephone number) of the person responsible for the execution of the correlation tool output and be sent to the following functional mailbox:

[EC-CO2-LDV-IMPLEMENTATION@ec.europa.eu](mailto:EC-CO2-LDV-IMPLEMENTATION@ec.europa.eu)

2.1.3. *Annual update of the correlation tool*

The performance of the correlation tool shall be continuously reviewed, taking into account information provided, in particular, by the contact persons referred to in point 2.1.2. Where appropriate, the Commission shall prepare a new version of the tool to be released annually on 1 September. The new version shall not affect the validity of results provided by previous versions.

The new version may be applied for the purpose of the procedure set out in Section 3 of this Annex from the date of its release. With the agreement of the type-approval authority or the technical service, the previous version of the correlation tool may, however, continue to be used during a maximum period of two months following the release of the new version.

The version used as well as the operating system of the computer on which the correlation tool has been run by the type-approval authority or technical service shall be indicated in the electronically signed correlation tool output report.

<sup>(1)</sup> <https://co2mpas.io/>

<sup>(2)</sup> From 1 August 2017 [jrc-co2mpas@ec.europa.eu](mailto:jrc-co2mpas@ec.europa.eu)

Where the applicability of the new version requires the adjustment of any provisions set out in this Regulation, the release of the new version shall not take place until the Regulation has been amended accordingly.

#### 2.1.4. *Ad-hoc adjustments of the correlation tool*

Notwithstanding point 2.1.3, in case of serious malfunctioning of the correlation tool for the purpose of the procedure set out in Section 3, a new version of the tool shall be prepared and released as soon as possible following the detection of the malfunction. The new version shall apply from the date of its release and shall not affect the validity of results provided by previous versions.

Where the applicability of the new version requires the adjustment of any provisions set out in this Regulation, the release of the new version shall not take place until the Regulation has been amended accordingly.

### 2.2. **Identification of the WLTP test results to be used for the purpose of defining the input data for the simulation model**

The input data for the correlation tool simulations shall be taken from the relevant WLTP test results for vehicle H and, where applicable, vehicle L as defined in accordance with point 4.2.1 of Sub-Annex 4 to Annex XXI to Regulation (EU) 2017/1151. Where more than one WLTP type-approval test of vehicle H or L is performed in accordance with Table A6/2 of Annex XXI to that Regulation, the following test results shall be used for the purpose of determining the input data:

- (a) in the case where two type-approval tests are performed, the test results with the highest CO<sub>2</sub> emissions shall be used;
- (b) in the case where three type-approval tests are performed, the test results with the median CO<sub>2</sub> emissions shall be used.

### 2.3. **Determination of the input data and conditions for the operation of the correlation tool**

The test conditions referred to in Annex XII to Regulation (EC) No 692/2008 shall be taken into account in the correlation tool simulations, including the precisions provided for in points 2.3.1 to 2.3.7 of this Annex.

The physical vehicle measurements referred to in point 3 shall be performed in accordance with the conditions referred to in that Regulation, with the precisions given in this Annex, and, where applicable, the input data defined in point 2.4.

#### 2.3.1. *Determination of the NEDC vehicle inertia*

The NEDC reference mass of vehicles H and L shall be determined as follows:

$$RM_{n,L} = (MRO_L - 75 + 100) \text{ [kg]}$$

$$RM_{n,H} = (MRO_H - 75 + 100) \text{ [kg]}$$

Where:

MRO is the mass in running order as defined in Article 3(d) of Regulation (EC) No 443/2009 for vehicle H and L respectively.

The reference mass to be used as input for the simulations shall be the inertia value set out in Table 3 of Annex 4a to UN/ECE Regulation No 83 which is equivalent to the reference mass, RM, determined in accordance with this point and referred to as  $TM_{n,L}$  and  $TM_{n,H}$ .

#### 2.3.2. *Determination of the pre-conditioning effect*

In preparing the chassis-dynamometer for the execution of a type-approval test, the vehicle is pre-conditioned in order to reach similar conditions to those used in the coast-down test. The pre-conditioning procedure used in the WLTP test differs from that used for the purpose of NEDC so that, with equal road loads, the vehicle is considered subject to higher forces under the WLTP. That difference shall be set at 6 Newton and that value shall be used for the calculation of the NEDC road loads in accordance with point 2.3.8.

#### 2.3.3. *Ambient conditions referred to in point 3.1.1 of UN/ECE Regulation No 83*

For the purpose of the correlation tool, the test cell temperature shall be set at 25 °C.

Also in the case of a physical vehicle measurement pursuant to point 3, the test cell temperature shall be set at 25 °C. However, on request by the manufacturer, the test cell temperature may be set at a value between 20 to 25 °C for the physical measurement.

#### 2.3.4. Determination of the initial battery state of charge

The initial battery state of charge shall be set to at least 99 per cent for the purpose of the correlation tool test. The same shall apply in the case of a physical vehicle test.

#### 2.3.5. Determination of the difference in tyre pressure prescriptions

According to the WLTP, the lowest tyre pressure for the vehicle test mass shall be used, while this is not specified in the NEDC. For the purpose of determining the tyre pressure to be taken into account for the purpose of calculating the NEDC road load in accordance with point 2.3.8, the tyre pressure shall, taking into account the different tyre pressure per vehicle axle, be the average between the two axles of the average between the minimum and maximum tyre pressure permitted for the selected tyres on each axle for the NEDC reference mass of the vehicle. The calculation shall be carried out for both vehicles H and L in accordance with following formulae:

$$\text{For vehicle H: } P_{\text{avg,H}} = \left( \frac{P_{\text{max,H}} + P_{\text{min,H}}}{2} \right)$$

$$\text{For vehicle L: } P_{\text{avg,L}} = \left( \frac{P_{\text{max,L}} + P_{\text{min,L}}}{2} \right)$$

Where:

$P_{\text{max}}$ , is the average of the maximum tyre pressures of the selected tyres for the two axles;

$P_{\text{min}}$ , is the average of the minimum tyre pressures of the selected tyres for the two axles.

The corresponding effect in terms of resistance applied to the vehicle shall be calculated using the following formulae for the respective vehicle H and L:

$$TP_H = \left( \frac{P_{\text{avg,H}}}{P_{\text{min,H}}} \right)^{-0,4}$$

$$TP_L = \left( \frac{P_{\text{avg,L}}}{P_{\text{min,L}}} \right)^{-0,4}$$

#### 2.3.6. Determination of the tyre tread depth (TTD)

According to point 4.2.2.2 of Sub-Annex 4 to Annex XXI to Regulation (EU) 2017/1151 a minimum tyre tread depth of 80 % is to be considered for the WLTP test, while pursuant to point 4.2 of Appendix 7 to Annex 4a to UN/ECE Regulation No 83, the minimum allowed tyre tread depth for the purpose of the NEDC test is to be considered as equal to 50 % of the nominal value. This results in an average difference of 2 mm in tread depth between the two procedures. The corresponding effect in terms of the resistance applied to the vehicle shall be determined for the purpose of the NEDC road load calculation in point 2.3.8 in accordance with the following formulae for the respective vehicle H and L:

$$TTD_H = \left( 2 \cdot \frac{0,1 \cdot RM_{n,H} \cdot 9,81}{1\,000} \right)$$

$$TTD_L = \left( 2 \cdot \frac{0,1 \cdot RM_{n,L} \cdot 9,81}{1\,000} \right)$$

Where:

$RM_{n,H}$  and  $RM_{n,L}$  are the reference masses of vehicle H and L determined in accordance with point 2.3.1.

### 2.3.7. Determination of the inertia of rotating parts

For the purpose of the correlation tool:

During the simulation of the WLTP test four rotating wheels are to be considered, while for the purpose of the NEDC tests only two rotating wheels are to be considered. The effect this has on the forces applied to the vehicle shall be taken into account in accordance with the formulae set out in point 2.3.8.1.1(a)(3).

The acceleration and deceleration forces in the correlation tool shall be calculated for the NEDC simulation by considering the inertia of only two rotating wheels.

For the purpose of a physical test:

During the WLTP coastdown setting, coastdown times are to be transferred to forces and vice versa by taking into account the applicable test mass plus the effect of rotational mass (3 % of the sum of the MRO and 25 kg). For the NEDC coastdown setting, coastdown times are to be transferred to forces and vice versa by neglecting the effect of rotational mass (only NEDC vehicle inertia calculated in point 2.3.1 is used).

### 2.3.8. Determination of the NEDC road loads

2.3.8.1. In the case of road loads being determined in accordance with points 1-4 and 6 of Sub-Annex 4 of Annex XXI to Regulation (EU) 2017/1151

2.3.8.1.1. Determination of the NEDC road load coefficients for vehicle H

(a) The road load coefficient  $F_{0,n}$  expressed in Newton (N) for vehicle H shall be determined as follows:

(1) Effect of different inertia:

$$F_{0n,H}^1 = F_{0w,H} \cdot \left( \frac{RM_{n,H}}{TM_{w,H}} \right)$$

Where the factors in the formula are as defined in point 2.3.1, with the exception of the following:

$F_{0w,H}$  is the road load coefficient  $F_0$  determined for the WLTP test of vehicle H;  $TM_{w,H}$  is the test mass used for the WLTP test of vehicle H.

(2) Effect of different tyre pressure:

$$F_{0n,H}^2 = F_{0n,H}^1 \cdot TP_H$$

Where the factors in the formula are as defined in point 2.3.5.

(3) Effect of the inertia of rotating parts:

$$F_{0n,H}^3 = F_{0n,H}^2 \cdot \left( \frac{1,015}{1,03} \right)$$

In the case of a physical vehicle test, the following formula applies:

$$F_{0n,H}^3 = F_{0n,H}^2 \cdot \left( \frac{1}{1,03} \right)$$

(4) Effect of different tyre tread depth:

$$F_{0n,H}^4 = F_{0n,H}^3 - TTD_H$$

Where the factors in the formula are as defined in point 2.3.6.

(5) Effect of preconditioning:

$$F_{0n,H} = F_{0n,H}^4 - 6$$

In the case of a physical vehicle test, the correction for the effect of preconditioning shall not be applied

- (b) The road load coefficient  $F_{1n}$  for vehicle H shall be determined as follows:

Effect of the inertia of rotating parts

$$F_{1n,H} = F_{1w,H} \cdot \left( \frac{1,015}{1,03} \right)$$

In the case of a physical vehicle test, the following formula applies:

$$F_{1n,H} = F_{1w,H} \cdot \left( \frac{1}{1,03} \right)$$

- (c) The road load coefficient  $F_{2n}$  for vehicle H shall be determined as follows:

Effect of the inertia of rotating parts

$$F_{2n,H} = F_{2w,H}^* \cdot \left( \frac{1,015}{1,03} \right)$$

In the case of a physical vehicle test, the following formula applies:

$$F_{2n,H} = F_{2w,H}^* \cdot \left( \frac{1}{1,03} \right)$$

Where the factor  $F_{2w,L}$  is the road load coefficient  $F_2$  determined for the WLTP test of vehicle H from which the effect of all aerodynamic optional equipment has been removed.

#### 2.3.8.1.2. Determination of the NEDC road load coefficients for vehicle L

- (a) The road load coefficient  $F_{0n}$  for vehicle L shall be determined as follows:

- (1) Effect of different inertia:

$$F_{0n,L}^1 = F_{0w,L} \cdot \left( \frac{RM_{n,L}}{TM_{w,L}} \right)$$

Where the factors in the formula are as defined in point 2.3.1, with the exception of  $F_{0w,L}$  which is the road load coefficient  $F_0$  determined for the WLTP test of vehicle L, and  $TM_{w,L}$  which is the test mass used for the WLTP test of vehicle L.

- (2) Effect of different tyre pressure:

$$F_{0n,L}^2 = F_{0n,L}^1 \cdot TP_L$$

Where the factors in the formula are as defined in point 2.3.5.

- (3) Effect of the inertia of rotating parts:

$$F_{0n,L}^3 = F_{0n,L}^2 \cdot \left( \frac{1,015}{1,03} \right)$$

In the case of a physical vehicle test, the following formula applies:

$$F_{0n,L}^3 = F_{0n,L}^2 \cdot \left( \frac{1}{1,03} \right)$$

- (4) Effect of different tyre tread depth:

$$F_{0n,L}^4 = F_{0n,L}^3 - TTD_L$$

Where the factors in the formula are as defined in point 2.3.6.

(5) Effect of preconditioning:

$$F_{0n,L} = F_{0n,L}^4 - 6$$

In the case of a physical vehicle test, the correction for the effect of preconditioning shall not be applied.

(b) The road load coefficient  $F_{1n}$  for vehicle L shall be determined as follows:

Effect of the inertia of rotating parts

$$F_{1n,L} = F_{1w,L} \cdot \left( \frac{1,015}{1,03} \right)$$

In the case of a physical vehicle test, the following formula applies:

$$F_{1n,L} = F_{1w,L} \cdot \left( \frac{1}{1,03} \right)$$

Where the factor  $F_{1w,L}$  is the road load coefficient  $F_1$  determined for the WLTP test of vehicle L.

(c) The road load coefficient  $F_{2n}$  for vehicle L shall be determined as follows:

Effect of the inertia of rotating parts

$$F_{2n,L} = F_{2w,L}^* \cdot \left( \frac{1,015}{1,03} \right)$$

In the case of a physical vehicle test, the following formula applies:

$$F_{2n,L} = F_{2w,L}^* \cdot \left( \frac{1}{1,03} \right)$$

Where the factor  $F_{2w,L}^*$  is the road load coefficient  $F_2$  determined for the WLTP test of vehicle L from which the effect of all aerodynamic optional equipment has been removed.

2.3.8.2. Determination of the road loads where, for the purpose of the WLTP test, the road loads have been determined in accordance with point 5 of Sub-Annex 4 of Annex XXI to Regulation (EU) 2017/1151.

(a) Where the road load of a vehicle has been calculated in accordance with point 5.1 of Sub-Annex 4 to Annex XXI to Regulation (EU) 2017/1151, the NEDC road load to be used as input for the correlation tool simulations shall be derived as follows:

Vehicle H:

$$F_{0n,H} = T_{0n,H} + (F_{0w,M} - A_{w,M})$$

$$F_{1n,H} = F_{1w,M} - B_{w,M}$$

$$F_{2n,H} = T_{2n,H} + (F_{2w,M} - C_{w,M})$$

Vehicle L:

$$F_{0n,L} = T_{0n,L} + (F_{0w,M} - A_{w,M})$$

$$F_{1n,L} = F_{1w,M} - B_{w,M}$$

$$F_{2n,L} = T_{2n,L} + (F_{2w,M} - C_{w,M})$$

Where:

$F_{0n,i}$ ,  $F_{1n,i}$ ,  $F_{2n,i}$ , with  $i = H,L$ , are the NEDC road load coefficients for vehicle H or L;

$T_{0n,i}$ ,  $T_{2n,i}$ , with  $i = H,L$  are the NEDC chassis dynamometer coefficients for vehicles H or L determined in accordance with Table 3 of Annex 4a to UN/ECE Regulation No 83;

$A_{W,M}$ ,  $B_{W,M}$ ,  $C_{W,M}$  are the chassis dynamometer coefficients for the vehicle used for the purpose of the preparation of the chassis dynamometer in accordance with points 7 and 8 of Sub-Annex 4 to Annex XXI to Regulation (EU) 2017/1151.

- (b) Where default road loads have been calculated in accordance with point 5.2 of Sub-Annex 4 to Annex XXI to Regulation (EU) 2017/1151, the NEDC road loads shall be calculated as follows:

Vehicle H:

$$F_{0n,H} = T_{0n,H} + (F_{0w,H} - A_{w,H})$$

$$F_{1n,H} = F_{1w,H} - B_{w,H}$$

$$F_{2n,H} = T_{2n,H} + (F_{2w,H} - C_{w,H})$$

Vehicle L:

$$F_{0n,L} = T_{0n,L} + (F_{0w,M} - A_{w,M})$$

$$F_{1n,L} = F_{1w,M} - B_{w,M}$$

$$F_{2n,L} = T_{2n,L} + (F_{2w,M} - C_{w,M})$$

Where:

$F_{0n,i}$ ,  $F_{1n,i}$ ,  $F_{2n,i}$ , with  $i = H,L$ , are the NEDC road load coefficients for vehicle H or L;

$T_{0n,i}$ ,  $T_{2n,i}$ , with  $i = H,L$  are the NEDC chassis dynamometer coefficients for vehicles H or L determined in accordance with Table 3 of Annex 4a to UN/ECE Regulation No 83;

$A_{W,i}$ ,  $B_{W,i}$ ,  $C_{W,i}$ , with  $i = H,L$  are the chassis dynamometer coefficients for vehicles H or L determined for the purpose of the preparation of the chassis dynamometer in accordance with points 7 and 8 of Sub-Annex 4 to Annex XXI to Regulation (EU) 2017/1151.

#### 2.4. Input data matrix

The manufacturer shall determine the input data for each vehicle H and vehicle L in accordance with point 2.2 and submit the completed matrix set out in Table 1 to the type-approval authority or, where applicable, the technical service appointed to perform the test, with the exception of entries 31, 32 and 33 (the NEDC road loads) which shall be calculated by the type-approval authority or the technical service in accordance with the formulae specified in point 2.3.8.

The type-approval authority or technical service shall independently verify and confirm the correctness of the input data provided by the manufacturer. In case of doubt, the type-approval authority or technical service shall determine the relevant input data independently of the information provided by the manufacturer or, where appropriate, act in accordance with point 3.2.7 and 3.2.8.

Table 1

**Matrix of input data for the correlation tool**

No	Input parameters for the correlation tool	Unit	Source	Remarks
1	Fuel type	—	Point 3.2.2.1 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	Diesel/Petrol/LPG/NG or Biomethane/Ethanol(E85)/Biodiesel
2	Fuel lower heating value	kJ/kg	Declaration by manufacturer and/or technical service	
3	Fuel carbon content	%	Idem	% of carbon in the fuel by weight, e.g. 85,5 %
4	Engine type		Point 3.2.1.1 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	Positive ignition or compression ignition
5	Engine capacity	cc	Point 3.2.1.3 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	
6	Engine stroke	mm	Point 3.2.1.2.2 Appendix 3 to Annex I to Regulation (EU) 2017/1151	
7	Rated engine power	kW...min <sup>-1</sup>	Point 3.2.1.8 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	
8	Engine speed at rated engine power	min <sup>-1</sup>	Point 3.2.1.8 in Appendix 3 to Annex I to Regulation (EU) 2017/1151	Engine speed at maximum net power
9	High engine idling speed (*)	min <sup>-1</sup>	Point 3.2.1.6.1 Appendix 3 to Annex I to Regulation (EU) 2017/1151	
10	Maximum net torque (*)	Nm at... min <sup>-1</sup>	Point 3.2.1.10 Appendix 3 to Annex I to Regulation (EU) 2017/1151	
11	T1 map speed (*)	rpm	Sub-Annex 2 to Annex XXI to Regulation (EU) 2017/1151	Array
12	T1 map torque (*)	Nm	Sub-Annex 2 to Annex XXI to Regulation (EU) 2017/1151	Array
13	T1 map power (*)	kW	Sub-Annex 2 to Annex XXI to Regulation (EU) 2017/1151	Array

No	Input parameters for the correlation tool	Unit	Source	Remarks
14	Engine idle speed	rpm	Sub-Annex 2 to Annex XXI to Regulation (EU) 2017/1151	Idle speed in warm condition
15	Engine idle fuel consumption	g/s	Manufacturer declaration	Idle fuel consumption in warm condition
16	Final drive ratios	—	Point 4.6 in Appendix 3 to Annex I to Regulation (EU) 2017/1151	Final drive ratio
17	Tyre code (**)	—	Point 6 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	Tyre code (e.g. P195/55R1685H) of the tyres used in the WLTP test
18	Gearbox type	—	Point 4.5 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	automatic/manual/CVT
19	Torque converter	—	Manufacturer declaration	0 = No, 1 = Yes; Does the vehicle use torque converter?
20	Fuel saving gear for automatic transmission	—	Manufacturer declaration	0 = No, 1 = Yes Setting this value to 1 will allow the correlation tool to use a higher gear at constant speed driving than in the case of transient conditions
21	Drive mode	—	Point 2.3.1 of Sub-Annex 5 to Annex XXI to Regulation (EU) 2017/1151	Two-wheel drive, four-wheel drive.
22	Start-stop activation time	sec	Manufacturer declaration	Start-stop activation time elapsed from test start
23	Nominal voltage of the alternator	V	Point 3.4.4.5 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	
24	Battery capacity	Ah	Point 3.4.4.5 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	

No	Input parameters for the correlation tool	Unit	Source	Remarks
25	Starting ambient temperature WLTP	°C		Default value = 23 °C WLTP test measurement
26	Alternator maximum power	kW	Manufacturer declaration	
27	Efficiency of the alternator	—	Manufacturer declaration	Default value = 0,67
28	Gearbox ratios	—	Point 4.6 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	Array: ratio gear 1, ratio gear 2, etc.
29	Ratio of vehicle speed to engine speed (**)	(km/h)/rpm	Manufacturer declaration	Array: [constant velocity speed ratio gear 1, constant velocity speed ratio gear 2, ...]; Alternative to gear box ratios
30	Vehicle inertia NEDC	kg	Point 2.6 of Appendix 3 to Annex I to Regulation (EU) 2017/1151	To be derived in accordance with point 2.3.1 of this Annex.
31	F0 NEDC	N	Point 2.3.8 of this Annex, To be completed by the type-approval authority or Technical Service	F0 road load coefficient
32	F1 NEDC	N/(km/h)	Idem	F1 road load coefficient
33	F2 NEDC	N/(km/h) <sup>2</sup>	Idem	F2 road load coefficient
34	Test mass WLTP	kg	Point 2.4.6 of the Appendix to the information document in Appendix 3 to Annex I to Regulation (EU) 2017/1151	no correction for rotating parts
35	F0 WLTP	N	Point 2.4.8 of the Appendix to the information document in Appendix 3 to Annex I to Regulation (EU) 2017/1151	F0 road load coefficient
36	F1 WLTP	N/(km/h)	Idem	F1 road load coefficient
37	F2 WLTP	N/(km/h) <sup>2</sup>	Idem	F2 road load coefficient

No	Input parameters for the correlation tool	Unit	Source	Remarks
38	WLTP CO <sub>2</sub> value phase 1	gCO <sub>2</sub> /km	Point 2.1.1 of test report of Annex I, Appendix 8a of Regulation (EU) 2017/1151	Phase low, bag values not corrected for RCB, not rounded WLTP test measurement
39	WLTP CO <sub>2</sub> value phase 2	gCO <sub>2</sub> /km	Idem	Phase medium, bag values not corrected for RCB, not rounded WLTP test measurement
40	WLTP CO <sub>2</sub> value phase 3	gCO <sub>2</sub> /km	Idem	Phase high, bag values not corrected for RCB, not rounded WLTP test measurement
41	WLTP CO <sub>2</sub> value phase 4	gCO <sub>2</sub> /km	Idem	Phase extra high, bag values not corrected for RCB, not rounded WLTP test measurement
42	Turbo- or Super-charger	—	Manufacturer declaration	0 = No   1 = Yes — Is the engine equipped with any kind of charging system?
43	Start-stop	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have start-stop system?
44	Brake energy Recuperation	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have energy recuperation technologies?
45	Variable valve actuation	—	Manufacturer declaration	0 = No   1 = Yes — Does the engine feature variable valve actuation?
46	Thermal management	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have technologies that actively manage temperature at the gear box?
47	Direct injection/Port Fuel Injection	—	Manufacturer declaration	0 = PFI   1 = DI
48	Lean burn	—	Manufacturer declaration	0 = No   1 = Yes — Does the engine use lean burn?
49	Cylinder deactivation	—	Manufacturer declaration	0 = No   1 = Yes — Does the engine use a cylinder deactivation system?

No	Input parameters for the correlation tool	Unit	Source	Remarks
50	Exhaust gas recirculation	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have an external EGR system?
51	Particulate filter	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have a particulate filter?
52	Selective Catalytic Reduction	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have an SCR system?
53	NOx storage catalyst	—	Manufacturer declaration	0 = No   1 = Yes — Does the vehicle have a NOx storage catalyst?
54	WLTP Time	sec	WLTP test measurement (identified in accordance to Point 2.2 of this Annex)	Array: OBD and Chassis Dynamometer data, 1hz
55	WLTP Velocity (theoretical)	km/h	As defined in sub-Annex 1 to Annex XXI to Regulation (EU) 2017/1151	Array: 1hz, resolution 0,1 km/h. If not provided the speed profile defined in Point 6 of sub-Annex 1 to Annex XXI to Regulation (EU) 2017/1151 and in particular to Tables A1/7-A1/9, A1/11, and A1/12 applies
56	WLTP Velocity (actual)	km/h	WLTP test measurement (identified in accordance to Point 2.2 of this Annex)	Array: OBD and Chassis Dynamometer data, 1hz, resolution 0,1 km/h
57	WLTP Gear (theoretical)	—	As defined in sub-Annex 2 to Annex XXI to Regulation (EU) 2017/1151	Array: 1hz. If not provided, the calculation by the correlation tool applies
58	WLTP Engine Speed	rpm	WLTP test measurement (identified in accordance to Point 2.2 of this Annex)	Array: 1hz, 10 RPM resolution from OBD
59	WLTP Engine Coolant Temperature	°C	Idem	Array: OBD Data, 1hz, 0,5 °C resolution
60	WLTP Alternator Current	A	As defined, for the low-voltage battery current, in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151	Array: 1hz, 0,1 A resolution, external measurement device synchronised with the chassis dynamometer
61	WLTP Low-Voltage Battery Current	A	As defined in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151	Array: 1hz, 0,1 A resolution, external measurement device synchronised with the chassis dynamometer

No	Input parameters for the correlation tool	Unit	Source	Remarks
62	WLTP calculated load	—	As defined in Annex 11 of UN/ECE Regulation No 83	Array: OBD data, 1hz at least (higher frequencies possible, 1 % resolution) WLTP test measurement
63	WLTP preconditioning time	sec	Preconditioning test measurement, point 1.2.6 of Annex XXI, Sub-Annex 6 of Regulation (EU) 2017/1151	Array: OBD and Chassis Dynamometer data, 1hz
64	WLTP preconditioning velocity	km/h	Idem	Array: OBD and Chassis Dynamometer data, 1hz, resolution 0,1 km/h
65	WLTP preconditioning alternator current	A	To be measured in accordance with the methodology defined for the low-voltage battery current, in point 2.1 of Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151	Array: 1hz, 0,1 A resolution, external measurement device synchronised with the chassis dynamometer
66	WLTP preconditioning low-voltage battery current	A	As defined in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151	Array: 1hz, 0,1 A resolution, external measurement device synchronised with the chassis dynamometer

(\*) Either normal engine idling speed, high engine idling speed and maximum net torque or T1 maps speed torque and power are necessary (for gearshift)

(\*\*) Either tyre dimensions or velocity speed ratio is necessary (for gearshift)

### 3. DETERMINATION OF NEDC CO<sub>2</sub> EMISSION AND FUEL CONSUMPTION VALUES FOR VEHICLE H AND L

#### 3.1. **Determination of NEDC CO<sub>2</sub> reference values, phase-specific values and fuel consumption values for vehicle H and L**

The type-approval authority shall ensure that the NEDC CO<sub>2</sub> reference value for the respective vehicle H and, where applicable, vehicle L of a WLTP interpolation family as well as the phase-specific values and the fuel consumption is determined in accordance with points 3.1.2 and 3.1.3.

In the case the NEDC road loads calculated in accordance with point 2.3.8 for vehicle H and L are the same, the NEDC CO<sub>2</sub> reference value shall be determined for vehicle H only.

##### 3.1.1. *Correlation tool input and output*

The type-approval authority or designated technical service shall ensure that the input data file for the correlation tool is complete. Following a completed test run on the correlation tool, the person designated in accordance with point 2.1.1 shall digitally sign

- (a) the original correlation output report;
- (b) the summary text file.

The correlation output report referred to in point (a) shall include the input data used, the output data resulting from the execution of the correlation, the manufacturer-declared value and, where available, the result of physical vehicle tests. The summary text file referred to in point (b) shall include the manufacturer-declared value and the CO<sub>2</sub> emission value resulting from the correlation tool and relevant identifiers, such as the code for the interpolation family concerned.

### 3.1.2. NEDC CO<sub>2</sub> reference value for vehicle H

The correlation tool shall be used to execute the following simulated tests using the relevant input data file referred to in point 3.1.1.:

- (a) a WLTP test of vehicle H;
- (b) an NEDC test of vehicle H.

The NEDC CO<sub>2</sub> reference value for vehicle H shall be determined as follows:

$$CO_{2,H} = (WLTP_{ACGcorr,H} + RCB_{corr,H} - DE_{c,H}) \cdot K_{i,H}$$

Where:

$CO_{2,H}$  is the NEDC CO<sub>2</sub> reference value for vehicle H;

$WLTP_{ACGcorr,H}$  is the average of the WLTP CO<sub>2</sub> values for vehicle H resulting from the tests referred to in point 2.2 corrected for the REESS charge balance (RCB) following the procedure set out in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151; Correction for the RCB shall be applied in cases when RCB is negative (corresponding to REESS discharging) and positive (corresponding to REESS charging) and also in the cases when the correction criterion c specified in Table A6. App 2/2 in that Appendix is less than the applicable tolerance according to that Table;

$RCB_{corr,H}$  is the CO<sub>2</sub> correction for RCB of the WLTP test for vehicle H selected in accordance with point 2.2 for the purpose of defining the input data, gCO<sub>2</sub>/km, calculated following the procedure set out in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151 with RCB negative (corresponding to REESS discharging) and positive (corresponding to REESS charging);

$DE_{c,H}$  is the difference between the WLTP test result referred to in point (a) and the NEDC test result referred to in point (b) for vehicle H;

$K_{i,H}$  is the value determined in accordance with appendix 1 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151 for vehicle H.

### 3.1.3. NEDC CO<sub>2</sub> reference value for vehicle L

Where applicable, the following simulations shall be performed using the correlation tool and the relevant input data as recorded in the matrix referred to in point 2.4:

- (a) a WLTP test of vehicle L;
- (b) an NEDC test of vehicle L.

The NEDC CO<sub>2</sub> reference value for vehicle L shall be determined as follows:

$$CO_{2,L} = (WLTP_{ACGcorr,L} + RCB_{corr,L} - DE_{c,L}) \cdot K_{i,L}$$

Where:

$CO_{2,L}$  is the NEDC CO<sub>2</sub> reference value for vehicle L;

$WLTP_{ACGcorr,L}$  is the average of the WLTP CO<sub>2</sub> values resulting from the vehicle L tests referred to in point 2.2 corrected for the REESS charge balance (RCB) following the procedure set out in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151; Correction for the RCB shall be applied in cases when RCB is negative (corresponding to REESS discharging) and positive (corresponding to REESS charging) and also in the cases when the correction criterion c specified in Table A6. App 2/2 in that Appendix is less than the applicable tolerance according to that Table;

$RCB_{corr,L}$	is the CO <sub>2</sub> correction for RCB of the WLTP test of vehicle L selected in accordance with point 2.2 for the purpose of defining the input data, gCO <sub>2</sub> /km, calculated following the procedure set out in Appendix 2 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151 with RCB negative (corresponding to REESS discharging) and positive (corresponding to REESS charging);
$DE_{c,L}$	is the difference between the WLTP test result referred to in point (a) and the NEDC test result referred to in point (b) for vehicle L;
$K_{i,L}$	is the value determined in accordance with appendix 1 to Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151 for vehicle L.

### 3.2. Interpretation of the NEDC CO<sub>2</sub> reference values determined for vehicle H and L

For each WLTP interpolation family, the manufacturer shall declare the NEDC CO<sub>2</sub> mass emissions combined value for vehicle H, and, where applicable, vehicle L, to the approval authority. The type-approval authority shall ensure that the NEDC CO<sub>2</sub> reference values for vehicle H and, where applicable, vehicle L are determined in accordance with point 3.1.2 and 3.1.3, and that the reference values for the respective vehicle is interpreted in accordance with points 3.2.1 to 3.2.5.

- 3.2.1. The NEDC CO<sub>2</sub> value for test vehicle H or L to be used for the purpose of the calculations set out in point 4 shall be the manufacturer-declared value, if the NEDC CO<sub>2</sub> reference value does not exceed that value by more than 4 per cent. The reference value may be lower without any limitation.
- 3.2.2. If the NEDC CO<sub>2</sub> reference value exceeds the manufacturer-declared value by more than 4 per cent, the reference value may be used for the purpose of the calculations set out in point 4 for test vehicle H or L, or the manufacturer may request that a physical measurement is performed under the responsibility of the type-approval authority in accordance with the procedure referred to in Annex XII to Regulation (EC) No 692/2008, taking into account the precisions specified in point 2 of this Annex.
- 3.2.3. If the physical measurement referred to in point 3.2.2, amplified by the Ki-factor, does not exceed the manufacturer-declared value by more than 4 per cent, the declared value shall be used for the purpose of the calculations set out in point 4.
- 3.2.4. If the physical measurement, amplified by the Ki-factor, exceeds the manufacturer-declared value by more than 4 per cent, another physical measurement of the same vehicle shall be performed and the results shall be amplified by the Ki-factor. If the average of those two measurements does not exceed the declared value by more than 4 per cent, the declared value shall be used for the purpose of the calculations set out in point 4.
- 3.2.5. If the average of the two measurements referred to in point 3.2.4 exceeds the manufacturer-declared value by more than 4 per cent, a third measurement shall be performed and the results shall be amplified by the Ki-factor. The average of the three measurements shall be used for the purpose of the calculations set out in point 4.
- 3.2.6. Where the NEDC CO<sub>2</sub> value for vehicle H or L is determined in accordance with point 3.2.1, the type-approval authority or the designated technical service shall use the relevant commands in the correlation tool to send the signed summary text file to a time-stamp-server and the following functional mailbox:

EC-CO2-LDV-IMPLEMENTATION@ec.europa.eu

A time-stamped reply shall be sent in return including a randomly generated integer number in the range 1 to 100 calculated by the correlation tool. Where the number is in the range of 91 to 100 the vehicle shall be selected for one physical measurement in accordance with the procedure referred to in Annex XII to Regulation (EC) No 692/2008, taking into account the precisions specified in point 2 of this Annex. The test results shall be documented in accordance with Annex VIII to Directive 2007/46/EC.

In the case the NEDC CO<sub>2</sub> value for both vehicles H and L is determined in accordance with point 3.2.1, the vehicle configuration selected for physical measurement shall be the vehicle L, if the random number is in the range to 91 to 95, and vehicle H, if the random number is in the range of 96 to 100.

3.2.7. Notwithstanding point 3.2.6, a type-approval authority shall, where applicable, based on a proposal by a technical service, in those cases where the NEDC CO<sub>2</sub> value is determined in accordance with point 3.2.1, request that a vehicle undergoes one physical measurement where, based on their independent expertise, there are justified reasons to consider that the declared NEDC CO<sub>2</sub> value is too low in relation to a measured NEDC CO<sub>2</sub> value. The test results shall be documented in accordance with Annex VIII to Directive 2007/46/EC.

3.2.8. Where a physical test is performed in accordance with point 3.2.6 or point 3.2.7, the type-approval authority shall for each WLTP interpolation family record the relative deviation (De) between the measured value and the manufacturer-declared value determined as follows:

$$De = \frac{RTr - DV}{DV}$$

Where:

RTr is the random test result, amplified by the Ki-factor;

DV is the manufacturer-declared value.

The De factor shall be recorded in the type-approval certificate and in the certificate of conformity.

Where the type-approval authority finds that the physical test results do not confirm the input data provided by the manufacturer and, in particular, the data referred to in points 20, 22 and 44 of Table 1 in point 2.4, a verification factor shall be set to 1 and be recorded in the type-approval certificate and in the certificate of conformity. Where the input data is confirmed or where the error in the input data is not to the benefit of the manufacturer the verification factor shall be set to 0.

### 3.3. Calculation of the NEDC phase-specific CO<sub>2</sub> values and fuel consumption values for vehicle H and L

The type-approval authority or, where applicable, the technical service shall determine the NEDC phase-specific values and the fuel consumption values for vehicle H and L in accordance with points 3.3.1 to 3.3.4.

#### 3.3.1. Calculation of the NEDC phase-specific CO<sub>2</sub> values for vehicle H

$$NEDC\ CO_{2,p,H} = NEDC\ CO_{2,p,H,c} \cdot CO_{2,AF,H}$$

Where:

*p* is the NEDC phase 'UDC' or 'EUDC';

*NEDC CO<sub>2,p,H,c</sub>* is the NEDC CO<sub>2</sub> test result for the phase *p* referred to in point (b) of paragraph 3.1.2

*NEDC CO<sub>2,p,H</sub>* is the NEDC phase-specific value for the vehicle H of the applicable phase *p*, gCO<sub>2</sub>/km

*CO<sub>2,AF,H</sub>* is the adjustment factor for the vehicle H calculated by the ratio between the NEDC CO<sub>2</sub> value determined in accordance with point 3.2 and the NEDC test result referred to in point (b) of paragraph 3.1.2

#### 3.3.2. Calculation of the NEDC phase-specific CO<sub>2</sub> values for vehicle L

The NEDC phase-specific values shall be calculated as follows:

$$NEDC\ CO_{2,p,L} = NEDC\ CO_{2,p,L,c} \cdot CO_{2,AF,L}$$

Where:

*p* is the NEDC phase 'UDC' or 'EUDC';

*NEDC CO<sub>2,p,L,c</sub>* is the NEDC CO<sub>2</sub> test result for the phase *p* determined in accordance with point (b) of paragraph 3.1.3;

*NEDC CO<sub>2,p,L</sub>* is the NEDC phase-specific value for the vehicle L of the applicable phase *p*, gCO<sub>2</sub>/km;

$CO_{2,AF,L}$  is the adjustment factor for the vehicle L calculated by the ratio between the NEDC  $CO_2$  value determined in accordance with point 3.2 and the NEDC test result referred to in point (b) of paragraph 3.1.3.

### 3.3.3. Calculation of the NEDC fuel consumption for vehicle H

#### 3.3.3.1. Calculation of the NEDC fuel consumption (combined)

The NEDC fuel consumption (combined) for vehicle H shall be calculated as follows:

$$NEDC FC_H = NEDC FC_{H,c} \cdot CO_{2,AF,H}$$

Where:

$NEDC FC_{H,c}$  is the NEDC fuel consumption (combined) test result determined in accordance with Annex XII to Regulation (EC) No 692/2008 using the  $CO_2$  emissions determined in accordance with point (b) of paragraph 3.1.2 or a physical measurement result as referred to in point 3.2.2; the emissions of other pollutants relevant to the fuel consumption calculation (hydrocarbons, carbon monoxide) shall be considered equal to 0 (zero) g/km;

$NEDC FC_H$  is the NEDC fuel consumption (combined) for the vehicle H, l/100km;

$CO_{2,AF,H}$  is the adjustment factor for the vehicle H calculated by the ratio between the NEDC  $CO_2$  value determined in accordance with point 3.2 and the NEDC test result referred to in point (b) of paragraph 3.1.2.

#### 3.3.3.2. Calculation of the NEDC phase-specific fuel consumption for vehicle H

The NEDC phase-specific fuel consumption for vehicle H shall be calculated as follows:

$$NEDC FC_{p,H} = NEDC FC_{p,H,c} \cdot CO_{2,AF,H}$$

Where:

$p$  is the NEDC phase 'UDC' or 'EUDC';

$NEDC FC_{p,H,c}$  is the NEDC fuel consumption for the phase  $p$  determined in accordance with Annex XII to Regulation (EC) No 692/2008 using the  $CO_2$  emissions determined in accordance with point (b) of paragraph 3.1.2 or a physical measurement result as referred to in point 3.2.2; the emissions of other pollutants relevant to the fuel consumption calculation (hydrocarbons, carbon monoxide) shall be considered equal to 0 (zero) g/km;

$NEDC FC_{p,H}$  is the NEDC phase-specific fuel consumption for the vehicle H of the applicable phase  $p$ , l/100km;

$CO_{2,AF,H}$  is the adjustment factor for the vehicle H calculated by the ratio between the NEDC  $CO_2$  value determined in accordance with point 3.2 and the NEDC test result referred to in point (b) of paragraph 3.1.2.

### 3.3.4. Calculation of the NEDC fuel consumption for vehicle L

#### 3.3.4.1. Calculation of the NEDC fuel consumption (combined) for vehicle L

The NEDC combined fuel consumption for vehicle L shall be calculated as follows:

$$NEDC FC_L = NEDC FC_{L,c} \cdot CO_{2,AF,L}$$

Where:

$NEDC FC_{L,c}$  is the NEDC fuel consumption (combined) test result determined in accordance with Annex XII to Regulation (EC) No 692/2008 using the  $CO_2$  emissions determined in accordance with point (b) of paragraph 3.1.3 or a physical measurement result as referred to in point 3.2.2; the emissions of other pollutants relevant to the fuel consumption calculation (hydrocarbons, carbon monoxide) shall be considered equal to 0 (zero) g/km;

$NEDC FC_L$  is the NEDC fuel consumption (combined) for the vehicle L, l/100km;

$CO_{2,AF,L}$  is the adjustment factor for the vehicle L calculated by the ratio between the NEDC  $CO_2$  value determined in accordance with point 3.2 and the NEDC test result referred to in point (b) of paragraph 3.1.3;

#### 3.3.4.2. Calculation of the NEDC phase-specific fuel consumption for vehicle L

The NEDC phase-specific fuel consumption for vehicle L shall be calculated as follows:

$$NEDC FC_{p,L} = NEDC FC_{p,L,c} \cdot CO_{2,AF,L}$$

Where:

$p$  is the NEDC phase 'UDC' or 'EUDC';

$NEDC FC_{p,L,c}$  is the NEDC fuel consumption test result for the phase  $p$  determined in accordance with Annex XII to Regulation (EC) No 692/2008 using the  $CO_2$  emissions determined in accordance with point (b) of paragraph 3.1.2 or a physical measurement result as referred to in point 3.2.2; the emissions of other pollutants relevant to the fuel consumption calculation (hydrocarbons, carbon monoxide) shall be considered equal to 0 (zero) g/km;

$NEDC FC_{p,L}$  is the NEDC phase-specific fuel consumption for the vehicle L of the applicable phase  $p$ , l/100km;

$CO_{2,AF,L}$  is the adjustment factor for the vehicle L calculated by the ratio between the NEDC  $CO_2$  value determined in accordance with point 3.2 and the NEDC test result referred to in point (b) of paragraph 3.1.3.

#### 4. CALCULATION OF THE NEDC $CO_2$ VALUES AND FUEL CONSUMPTION VALUES TO BE ATTRIBUTED TO INDIVIDUAL M1 VEHICLES

The manufacturer shall calculate the (phase-specific and combined) NEDC  $CO_2$  values and the fuel consumption values to be attributed to individual passenger cars in accordance with points 4.1 and 4.2 and record those values in the certificates of conformity.

The provisions on rounding set out in point 1.3 of Sub-Annex 7 to Annex XXI to Regulation (EU) 2017/1151 shall apply.

##### 4.1. **Determination of the NEDC $CO_2$ values in the case of a WLTP interpolation family based on vehicle H**

Where the  $CO_2$  emissions of the WLTP interpolation family are determined by reference to vehicle H only in accordance with point 1.2.3.1 of Sub-Annex 6 to Annex XXI to Regulation (EU) 2017/1151, the NEDC  $CO_2$  value to be recorded in the certificates of conformity of the vehicles belonging to that family shall be the NEDC  $CO_2$  emissions determined in accordance with point 3.2 of this Annex and recorded in the type-approval certificate of the vehicle H in question.

##### 4.2. **Determination of the NEDC $CO_2$ value in the case of a WLTP interpolation family based on vehicle L and vehicle H**

###### 4.2.1. *Road load calculation of an individual vehicle*

###### 4.2.1.1. Mass of the relevant vehicle

The NEDC reference mass of the individual vehicle ( $RM_{n,ind}$ ) shall be determined as follows:

$$RM_{n,ind} = (MRO_{ind} - 75 + 100) \text{ [kg]}$$

Where:  $MRO_{ind}$  is the mass in running order as defined in Article 3(d) of Regulation (EC) No 443/2009 of the individual vehicle.

The mass to be used for the calculation of the NEDC  $CO_2$  values of the individual vehicle shall be the inertia value set out in Table 3 of Annex 4a to UN/ECE Regulation No 83 which is equivalent to the reference mass determined in accordance with this point and referred to as  $TM_{n,ind}$ .

## 4.2.1.2. Rolling resistance of the individual vehicle

The tyre rolling resistance values determined in accordance with point 3.2.3.2.2.2 of sub-Annex 7 to Annex XXI to Regulation (EU) 2017/1151 shall be used for the purpose of the interpolation of the NEDC CO<sub>2</sub> value of the individual vehicle.

## 4.2.1.3. Aerodynamic drag of an individual vehicle

The aerodynamic drag of the individual vehicle shall be calculated by considering the difference in aerodynamic drag between an individual vehicle and vehicle L, due to a difference in body shape (m<sup>2</sup>):

$$\Delta [C_d \cdot A_f]_{ind-L,n}$$

Where:

$C_d$  is the aerodynamic drag coefficient;

$A_f$  is the frontal area of the vehicle, m<sup>2</sup>.

The type-approval authority or, where applicable, the technical service shall verify if the wind tunnel facility referred to in 3.2.3.2.2.3. in Sub-Annex 7 to Annex XXI to Regulation (EU) 2017/1151 is qualified to accurately determine the  $\Delta(C_d \times A_f)$  for body shapes that differ between vehicle L and H. If the wind tunnel facility is not qualified, the  $\Delta [C_d \cdot A_f]_{H-L,n}$  for vehicle H shall apply for the individual vehicle.

If vehicles L and H have the same body shape, the value of  $\Delta [C_d \cdot A_f]_{ind-L,n}$  for the interpolation method shall be set to zero.

## 4.2.1.4. Calculation of the road load for an individual vehicle in a WLTP interpolation family

The road load coefficients  $F_{0,n}$ ,  $F_{1,n}$  and  $F_{2,n}$  for test vehicles H and L determined in accordance with point 2.3.8 are referred to as  $F_{0n,H}$ ,  $F_{1n,H}$  and  $F_{2n,H}$  and  $F_{0n,L}$ ,  $F_{1n,L}$  and  $F_{2n,L}$  respectively.

The road load coefficients  $f_{0n,ind}$ ,  $f_{1n,ind}$  and  $f_{2n,ind}$  for an individual vehicle shall be calculated in accordance with the following formula:

Formula 1

$$f_{0n,ind} = F_{0n,H} - \Delta F_{0n} \cdot \frac{(TM_{n,H} \cdot RR_{n,H} - TM_{n,ind} \cdot RR_{n,ind})}{(TM_{n,H} \cdot RR_{n,H} - TM_{n,L} \cdot RR_{n,L})}$$

Or, if  $(TM_{n,H} \cdot RR_{n,H} - TM_{n,L} \cdot RR_{n,L}) = 0$  Formula 2 shall apply:

Formula 2

$$f_{0n,ind} = F_{0n,H} - \Delta F_{0n}$$

$$f_{1n,ind} = F_{1n,H}$$

$$f_{2n,ind} = F_{2n,H} - \Delta F_{2n} \cdot \frac{(\Delta[C_d \times A_f]_{LH,n} - \Delta[C_d \times A_f]_{ind,n})}{(\Delta[C_d \times A_f]_{LH,n})}$$

or, if  $\Delta[C_d \times A_f]_{n,LH} = 0$ , Formula 3 shall apply:

Formula 3

$$f_{2n,ind} = F_{2n,H} - \Delta F_{2n}$$

where:

$$\Delta F_{0,n} = F_{0n,H} - F_{0n,L}$$

$$\Delta F_{2,n} = F_{2n,H} - F_{2n,L}$$

## 4.2.1.5. Calculation of cycle energy demand

The cycle energy demand of the applicable NEDC  $E_{k,n}$  and the energy demand for all applicable cycle phases  $E_{k,p,n}$  applicable for individual vehicles in the WLTP interpolation family shall be calculated according to the procedure in paragraph 5 of Sub-Annex 7 to Annex XXI to Regulation (EU) 2017/1151, for the following sets  $k$  of road load coefficients and masses:

$$k = 1: F_0 = F_{0n,L}, F_1 = F_{1n,H}, F_2 = F_{2n,L}, m = TM_{n,L}$$

(test vehicle L)

$$k = 2: F_0 = F_{0n,H}, F_1 = F_{1n,H}, F_2 = F_{2n,H}, m = TM_{n,H}$$

(test vehicle H)

$$k = 3: F_0 = f_{0n,ind}, F_1 = F_{1n,H}, F_2 = f_{2n,ind}, m = TM_{n,ind}$$

(an individual vehicle in the WLTP interpolation family)

In case the chassis dynamometer coefficients specified in Table 3 of Annex 4a of UN/ECE Regulation No 83 are applied, the following formulae shall be used:

$$f_{0n,ind} = F_{0n,H} - \Delta F_{0n} \cdot \frac{TM_{n,H} - TM_{n,ind}}{TM_{n,H} - TM_{n,L}}$$

$$f_{1n,ind} = F_{1n,H} - \Delta F_{1n} \cdot \frac{TM_{n,H} - TM_{n,ind}}{TM_{n,H} - TM_{n,L}}$$

$$f_{2n,ind} = F_{2n,H} - \Delta F_{2n} \cdot \frac{TM_{n,H} - TM_{n,ind}}{TM_{n,H} - TM_{n,L}}$$

4.2.1.6. Calculation of the NEDC CO<sub>2</sub> value for an individual vehicle by the CO<sub>2</sub> interpolation method

For each cycle phase  $p$  of the NEDC applicable for individual vehicles in the WLTP interpolation family, the contribution to the total mass of CO<sub>2</sub> for an individual vehicle shall be calculated as follows:

$$M_{CO_2-ind,p,n} = M_{CO_2-L,p,n} + \left( \frac{E_{3,p,n} - E_{1,p,n}}{E_{2,p,n} - E_{1,p,n}} \right) \cdot (M_{CO_2-H,p,n} - M_{CO_2-L,p,n})$$

The mass of CO<sub>2</sub> emissions, g/km, attributed to an individual vehicle of the WLTP interpolation family  $M_{CO_2-ind,n}$  shall be calculated as follows:

$$M_{CO_2-ind,n} = M_{CO_2-L,n} + \left( \frac{E_{3,n} - E_{1,n}}{E_{2,n} - E_{1,n}} \right) \cdot (M_{CO_2-H,n} - M_{CO_2-L,n})$$

The terms  $E_{1,p,n}$ ,  $E_{2,p,n}$ ,  $E_{3,p,n}$  and  $E_{1,n}$ ,  $E_{2,n}$ ,  $E_{3,n}$  respectively are defined in paragraph 4.2.1.5.

## 4.2.1.7. Calculation of the NEDC fuel consumption value for an individual vehicle by the interpolation method

For each cycle phase  $p$  of the NEDC applicable for individual vehicles in the WLTP interpolation family, the fuel consumption, l/100km, shall be calculated as follows:

$$FC_{p,n} = FC_{L,p,n} + \left( \frac{E_{3,p,n} - E_{1,p,n}}{E_{2,p,n} - E_{1,p,n}} \right) \cdot (FC_{H,p,n} - FC_{L,p,n})$$

The fuel consumption, l/100km, of the complete cycle for an individual vehicle of the WLTP interpolation family shall be calculated as follows:

$$FC_{ind,n} = FC_{L,n} + \left( \frac{E_{3,n} - E_{1,n}}{E_{2,n} - E_{1,n}} \right) \cdot (FC_{H,n} - FC_{L,n})$$

The terms  $E_{1,p,n}$ ,  $E_{2,p,n}$ ,  $E_{3,p,n}$  and  $E_{1,n}$ ,  $E_{2,n}$ ,  $E_{3,n}$  respectively are defined in paragraph 4.2.1.5.

## 5. RECORDING OF DATA

The type-approval authority or the designated Technical Service shall ensure that the following information is recorded:

- (a) the correlation tool output report referred to in point 3.1.1 including the NEDC CO<sub>2</sub> reference value referred to in points 3.1.2 and 3.1.3 and the manufacturer-declared value, as a test report in accordance with Annex VIII to Directive 2007/46/EC;
  - (b) the NEDC CO<sub>2</sub> values resulting from physical measurements referred to in point 3.2 in this Annex, in the type-approval certificate specified in the Appendix to the Addendum to the type-approval certificate set out in Appendix 4 to Annex I to Regulation (EU) 2017/1151;
  - (c) the deviation factor (De) and the verification factor determined in accordance with point 3.2.8 of this Annex (if available), in the type-approval certificate as specified in the Appendix to the Addendum to the type-approval certificate set out in Appendix 4 to Annex I to Regulation (EU) 2017/1151 and in entry 49.1 of the certificate of conformity as specified in Annex IX to Directive 2007/46/EC;
  - (d) the NEDC phase-specific values and the phase-specific and combined fuel consumption values determined in accordance with point 3.3, as specified in the Appendix to the Addendum to the type-approval certificate set out in Appendix 4 to Annex I to Regulation (EU) 2017/1151;
  - (e) the NEDC CO<sub>2</sub> (all phases and combined) and fuel consumption values (all phases and combined) determined in accordance with point 4.2 of this Annex, in entry 49.1 of the certificate of conformity as specified in Annex IX to Directive 2007/46/EC.
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## ANNEX II

## 'ANNEX I

**Data sources**

Parameter	Certificate of conformity (Part 1, Model B set out in Annex IX of Directive 2007/46/EC)	Type-approval documentation (Directive 2007/46/EC)
Manufacturer	Section 0.5	Section 0.5 of Part I of Annex III
Type-approval number and its extension	Section 0.10	Type-approval certificate as specified in Annex VI
Type	Section 0.2	Section 0.2 of Part I of Annex III (where applicable)
Variant	Section 0.2	Section 3 of Annex VIII (where applicable)
Version	Section 0.2	Section 3 of Annex VIII (where applicable)
Make	Section 0.1	Section 0.1 of Part I of Annex III
Commercial name	Section 0.2.1	Section 0.2.1 of Part I of Annex III
Category of the vehicle type-approved	Section 0.4	Section 0.4 of Part I of Annex III
Category of the vehicle registered	n/a	n/a
Mass in running order (kg)	Section 13	Section 2.6 of Part I of Annex III <sup>(1)</sup>
Footprint — Wheel base (mm)	Section 4	Section 2.1 of Part I of Annex III <sup>(2)</sup>
Footprint — Track width (mm)	Section 30	Section 2.3.1 and 2.3.2 of Part I of Annex III <sup>(3)</sup>
Specific NEDC CO <sub>2</sub> emissions (g/km) <sup>(4)</sup>	Section 49.1	Section 3 of Annex VIII
Specific WLTP CO <sub>2</sub> emissions (g/km) <sup>(4)</sup>	Section 49.4	n/a
Fuel type	Section 26	Section 3.2.2.1 of Part I of Annex III
Fuel mode	Section 26.1	Section 3.2.2.4 of Part I of Annex III
Engine capacity (cm <sup>3</sup> )	Section 25	Section 3.2.1.3 of Part I of Annex III
Electric energy consumption (Wh/km)	Section 49.2	Section 3 of Annex VIII

Parameter	Certificate of conformity (Part 1, Model B set out in Annex IX of Directive 2007/46/EC)	Type-approval documentation (Directive 2007/46/EC)
Code of the eco-innovation(s)	Section 49.3.1	Section 4 of Annex VIII
Total NEDC CO <sub>2</sub> emissions savings due to the eco-innovation(s)	Section 49.3.2.1	Section 4 of Annex VIII
Total emissions WLTP CO <sub>2</sub> savings due to the eco-innovation(s)	Section 49.3.2.2	
Vehicle identification number	Section 0.10	Point 9.17 of Part I of Annex III
Test mass [WLTP]	Section 47.1.1	n/a
Deviation factor De	Section 49.1	Appendix to the Addendum to the type-approval certificate set out in Appendix 4 to Annex I to Regulation (EU) 2017/1151
Verification factor ("1" or "0")	Section 49.1	Appendix to the Addendum to the type-approval certificate set out in Appendix 4 to Annex I to Regulation (EU) 2017/1151

<sup>(1)</sup> In accordance with Article 3(8) of this Regulation

<sup>(2)</sup> In accordance with Article 3(8) of this Regulation

<sup>(3)</sup> In accordance with Articles 3(7) and 3(8) of this Regulation

<sup>(4)</sup> In accordance with Articles 3 and 4 of Implementing Regulation (EU) 2017/1152.