
Status: Point in time view as at 01/03/2019.

Changes to legislation: There are outstanding changes not yet made to Commission Regulation (EU) 2017/2400. Any changes that have already been made to the legislation appear in the content and are referenced with annotations. (See end of Document for details)

Commission Regulation (EU) 2017/2400 of 12 December 2017 implementing Regulation (EC) No 595/2009 of the European Parliament and of the Council as regards the determination of the CO₂ emissions and fuel consumption of heavy-duty vehicles and amending Directive 2007/46/EC of the European Parliament and of the Council and Commission Regulation (EU) No 582/2011 (Text with EEA relevance)

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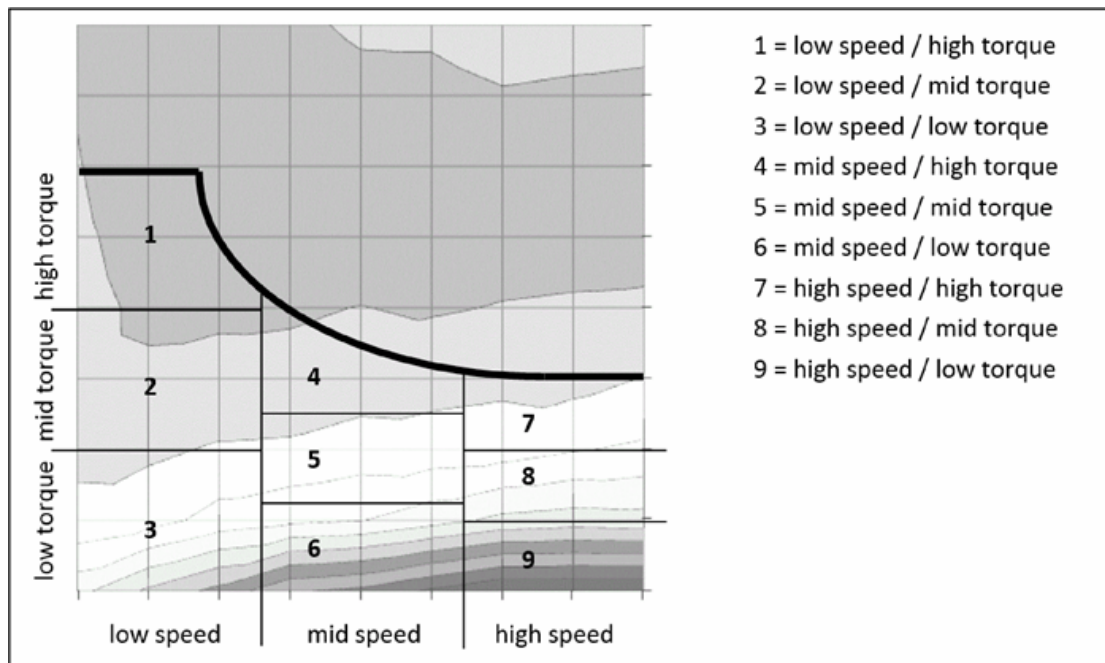
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ANNEX VII

VERIFYING AXLE DATA

6. Production conformity testing
- 6.1 For conformity of the certified CO₂ emissions and fuel consumption related properties testing, one of the following methods shall apply upon prior agreement between the approval authority and the applicant for a certificate:
- Torque loss measurement according to this Annex by following the full procedure limited to the grid points described in 6.2.
 - Torque loss measurement according to this Annex by following the full procedure limited to the grid points described in 6.2, with exception of the run-in procedure. In order to consider the run-in characteristic of an axle, a corrective factor may be applied. This factor shall be determined according to good engineering judgement and with agreement of the approval authority.
 - Measurement of drag torque according to paragraph 6.3. The manufacturer may choose a run-in procedure according to good engineering judgement up to 100 h.
- 6.2 If the conformity of the certified CO₂ emissions and fuel consumption related properties assessment is performed according to 6.1. a) or b) the grid points for this measurement are limited to 4 grid points from the approved torque loss map.
- 6.2.1 For that purpose the full torque loss map of the axle to be tested for conformity of the certified CO₂ emissions and fuel consumption related properties shall be segmented into three equidistant speed ranges and three torque ranges in order to define nine control areas as shown in figure 2.

^{F1}Figure 2 Speed and torque range for conformity of the certified CO₂ emissions and fuel consumption related properties testing



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Textual Amendments

F1 Substituted by Commission Regulation (EU) 2019/318 of 19 February 2019 amending Regulation (EU) 2017/2400 and Directive 2007/46/EC of the European Parliament and of the Council as regards the determination of the CO₂ emissions and fuel consumption of heavy-duty vehicles (Text with EEA relevance).

6.2.2 For four control areas one point shall be selected, measured and evaluated according to the full procedure as described in section 4.4. Each control point shall be selected in the following manner:

- (i) The control areas shall be selected depending on the axle line:
 - SR axles including tandem combinations: Control areas 5, 6, 8 and 9
 - HR axles including tandem combinations: Control areas 2, 3, 4 and 5
- (ii) The selected point shall be located in the centre of the area referring to the speed range and the applicable torque range for the according speed.
- (iii) In order to have a corresponding point for comparison with the loss map measured for certification, the selected point shall be moved to the closest measured point from the approved map.

6.2.3 For each measured point of the conformity of the certified CO₂ emissions and fuel consumption related properties test and its corresponding point of the type approved map, the efficiency shall be calculated with:

$$\eta_i = \frac{T_{out}}{i_{axle} \times T_{in}}$$

where:

- η_i = Efficiency of the grid point from each single control area 1 to 9
- T_{out} = Output torque [Nm]
- T_{in} = Input torque [Nm]
- i_{axle} = axle ratio [-]

6.2.4 The average efficiency of the control area shall be calculated as follows:

For SR axles:

$$\eta_{avr, mid\ speed} = \frac{\eta_5 + \eta_6}{2}$$

$$\eta_{avr, high\ speed} = \frac{\eta_8 + \eta_9}{2}$$

$$\eta_{avr, total} = \frac{\eta_{avr, mid\ speed} + \eta_{avr, high\ speed}}{2}$$

For HR axles:

$$\eta_{avr, low\ speed} = \frac{\eta_2 + \eta_3}{2}$$

$$\eta_{avr, mid\ speed} = \frac{\eta_4 + \eta_5}{2}$$

$$\eta_{avr, total} = \frac{\eta_{avr, low\ speed} + \eta_{avr, mid\ speed}}{2}$$

where:

- $\eta_{avr, low\ speed}$ = average efficiency for low speed
- $\eta_{avr, mid\ speed}$ = average efficiency for mid speed
- $\eta_{avr, high\ speed}$ = average efficiency for high speed
- $\eta_{avr, total}$ = simplified averaged efficiency for axle

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- 6.2.5 If the conformity of the certified CO₂ emissions and fuel consumption related properties assessment is performed in accordance with 6.1. c), the drag torque of the parent axle of the family to which the tested axle belongs shall be determined during the certification. This can be done prior to the run-in procedure or after the run-in procedure according to paragraph 3.1 or by linear extrapolation of all the torque map values for each speed step downwards to 0 Nm.
- 6.3 Determination of drag torque
- 6.3.1 For determination of the drag torque of an axle a simplified test set-up with one electric machine and one torque sensor on the input side is required.
- 6.3.2 The test conditions according to paragraph 4.1 shall apply. The uncertainty calculation regarding torque may be omitted.
- 6.3.3 The drag torque shall be measured in the speed range of the approved type according to paragraph 4.3.4 under consideration of the speed steps according to 4.3.5.
- 6.4. Conformity of the certified CO₂ emissions and fuel consumption related properties test assessment
- 6.4.1 A conformity of the certified CO₂ emissions and fuel consumption related properties test is passed when one of the following conditions apply:
- (a) [F¹If a torque loss measurement in accordance with points 6.1(a) or (b) is conducted, the average efficiency of the tested axle during conformity of the certified CO₂ emissions and fuel consumption related properties procedure shall not be lower than 1,5 % for SR axles and 2,0 % for all other axles lines below the corresponding average efficiency of the type approved axle.
- (b) If a measurement of drag torque in accordance with point 6.1(c) is conducted, the drag torque of the tested axle during conformity of the certified CO₂ emissions and fuel consumption related properties procedure shall be lower than the corresponding drag torque of the type approved axle or within the tolerance indicated in Table 2.]

TABLE 2

Axleline	Tolerances for axles measured in CoP after run-in Comparison to Td0				Tolerances for axles measured in CoP without run in Comparison to Td0			
	for i	tolerance for i Td0_input [Nm]	for i	tolerance for i Td0_input [Nm]	for i	tolerance for i Td0_input [Nm]	for i	tolerance for i Td0_input [Nm]
SR	≤ 3	15	> 3	12	≤ 3	25	> 3	20
SRT	≤ 3	16	> 3	13	≤ 3	27	> 3	21
SP	≤ 6	11	> 6	10	≤ 6	18	> 6	16
HR	≤ 7	10	> 7	9	≤ 7	16	> 7	15
HRT	≤ 7	11	> 7	10	≤ 7	18	> 7	16

i = gear ratio.

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