COMMISSION IMPLEMENTING DECISION (EU) 2015/1132

of 10 July 2015

on the approval of the Porsche AG coasting function as an innovative technology for reducing CO_2 emissions from passenger cars pursuant to Regulation (EC) No 443/2009 of the European Parliament and of the Council

(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_2 emissions from light-duty vehicles ([1]), and in particular Article 12(4) thereof,

Whereas:

(1) The manufacturer Porsche AG (the 'Applicant') submitted an application for the approval of a 'coasting function' as an innovative technology on 13 October 2014. The completeness of the application was assessed in accordance with Article 4 of Commission Implementing Regulation (EU) No 725/2011 ([2]). The application was found to be complete and the period for the Commission's assessment of the application started on the 14 October 2014 being the day following the date of official receipt.

(2) The application has been assessed in accordance with Article 12 of Regulation (EC) No 443/2009, Implementing Regulation (EU) No 725/2011 and the Technical Guidelines for the preparation of applications for the approval of innovative technologies pursuant to Regulation (EC) No 443/2009 (the 'Technical Guidelines') ([3]).

(3) The application refers to the Porsche AG 'coasting' function. The innovative technology is an automatic gearbox intelligent control strategy that allows the possibility of a driving mode during which the vehicle runs while the combustion engine is decoupled from the wheels (i.e. the clutch is disengaged). During the coasting driving mode, the engine idles but the functioning of auxiliary equipment (e.g. generator, compressor, water pump) is ensured. In addition, when 'coasting', the kinetic and potential energy of the vehicle is directly used to overcome driving resistance and, as consequence, to decrease fuel consumption.

(4) The Applicant has demonstrated that a coasting function of the kind described in this application did not exceed 3 % of the new passenger cars registered in the reference year 2009.

(5) The accountability criteria specified in Article 4(2)(f)(iii) and Article 9(3) of Implementing Regulation (EU) No 725/2011 require the demonstration that the CO_2 reducing performance of the technology is not dependent on the behaviour of driver or on settings or choices outside the control of the applicant. Having considered the information provided by the Applicant, as well as that from other public sources, the Commission considers that this condition would not be met where the coasting function can be disengaged and would require manual

([1]) OJ L 140, 5.6.2009, p. 1.
([2]) Commission Implementing Regulation (EU) No 725/2011of 25 July 2011 establishing a procedure for the approval and certification of innovative technologies for reducing CO_2 emissions from passenger cars pursuant to Regulation (EC) No 443/2009 of the European Parliament and of the Council (OJ L 194, 26.7.2011, p. 19).
([3]) http://ec.europa.eu/clima/policies/transport/vehicles/cars/docs/guidelines_en.pdf

re-initiation. This is the case, for example, when the road or car conditions do not allow coasting, where there is a pronounced downhill gradient and when the driver touches the brake pedal, or activates cruise control or sport mode, switches off the start-stop system or uses the manual gear selector. The Applicant has provided an analysis related to some of these matters: when the road or car conditions do not allow coasting, when the driver touches the brake pedal or uses the manual gear selector. Other aspects of driver behaviour regarding manual re-activation of coasting have not been examined. The Commission concludes that the conditions should be specified in order for the coasting technology to meet the accountability criteria set out in the Implementing Regulation. These conditions should ensure that the coasting function cannot be deactivated by the driver, or, where the function is otherwise deactivated, e.g. by the automatic gearbox intelligent control strategy or by any other device, it is automatically activated again immediately after the deactivation event. In view of the above, subject to this condition, the Commission concludes that the information provided in the application demonstrates that the conditions and criteria referred to in Article 12 of Regulation (EC) No 443/2009 and in Articles 2 and 4 of Implementing Regulation (EU) No 725/2011 have been met.

(6) In order to determine the CO_2 savings that the innovative technology will deliver when fitted to a vehicle, it is necessary to define the baseline vehicle against which the efficiency of the vehicle equipped with the innovative technology should be compared as provided for in Articles 5 and 8 of Implementing Regulation (EU) No 725/2011. The Commission finds that it is appropriate to consider a vehicle with the coasting function installed and deactivated as a baseline vehicle. If it is not possible to deactivate the coasting function, it should be ensured that the coasting function is not in operation during the testing procedure.

(7) The Applicant has provided a methodology for testing the CO_2 reductions from the use of the 'coasting' technology. A number of factors in the formulae are derived from the analysis of the influence of the driver's behaviour on the 'coasting' technology. The Commission finds that the number of trips included in the database is satisfactory to conclude that the innovative technology would deliver CO_2 savings. However, a larger number of robust, independent data, including additional analysis of how much driving takes place when the engine transmission and battery are being employed at their appropriate operating temperature and what proportion of driving time takes place when more pronounced downhill gradients are being driven when the coasting function is turned off would be necessary to alleviate the uncertainties associated with the CO_2 savings from the innovative technology.

(8) A conversion factor is required in the formulae for the calculation of the potential CO_2 savings to address the difference between CO_2 emissions from the standard NEDC test and those under modified NEDC testing conditions for the baseline vehicle. In discussions with industry limited data has been provided on relevant values for the c-parameter based on simulations. These showed different results which depend on the characteristics of the transmission and other parameters of the vehicle. From these data, the c-parameter appears to lie within the range 0,96 to 0,99. The Applicant has not provided strong evidence for the use of a specific value for c. In view of this, it is determined that a value of c at the lower end of the identified range should be used to provide certainty over the likely CO_2 savings that will be achieved. The conversion factor c is therefore set at a value of 0,96 (compared to 0,97 in the application for which no justification is provided).

(9) A key element in determining the CO_2 savings is the proportion of the distance travelled by the vehicle over which the coasting function will be activated. A usage factor is determined which relates the observed distance covered under coasting conditions by the applicant in tests compared to the coasting distance under modified NEDC conditions. The Applicant proposed a value of 1. The Commission analysis shows that this value cannot be justified by the data provided. Using the Applicant's data would result in a value of 0,87 for the usage factor. However, the Applicant has provided insufficient data to provide certainty that other factors which may result in the coasting function being de-activated are fully taken into account. It is therefore considered appropriate to address the uncertainties by a further proportionate adjustment, resulting in a usage factor of 0,8. This is considered to provide an appropriate margin to take account of these uncertainties and to address their statistical significance. This conclusion could be re-examined if a sufficient number of robust, independent data would be available.

(10) Furthermore, and in agreement with the Applicant, the Commission finds it appropriate to address the shortcomings in the current assumptions relating to the operation of the cruise control by further adjusting the usage factor since coasting is deactivated when cruise control is activated. The Applicant has not provided any information on this aspect in their application. The Commission has identified that data is available from research in the US on cruise control usage. This shows that, when fitted, cruise control is used for about half of the distance travelled. This means that the usage factor should be halved in cases where cruise control is fitted.

The Applicant has confirmed this conclusion and therefore the usage factor is halved to a value of 0,4 when cruise control is fitted to the vehicle. This conclusion could be re-examined if a sufficient number of robust, independent data would be available.

(11) Against this background, the Commission finds that the methodology provides accurate and reliable results that are reproducible by a third party with regard to the Porsche S-segment vehicles (sport coupé cars) referred to in the application.

(12) Moreover, the Commission finds that the Applicant has demonstrated satisfactorily that the emission reduction achieved by the innovative technology is at least 1 g CO_2/km for the Porsche S-segment vehicles referred to in the application.

(13) Since the effects of the coasting function are not covered by the CO_2 emissions type approval test referred to in Regulation (EC) No 715/2007 of the European Parliament and of the Council ([1]) and Commission Regulation (EC) No 692/2008 ([2]), the Commission is satisfied that the Porsche coasting function is not covered by the standard test cycle.

(14) The Commission finds that the verification report has been prepared by the TÜV Nord and that the report supports the findings set out in the application.

(15) Therefore, the Commission finds that no objections should be raised as regards the approval of the innovative technology in question, provided the above specified conditions to ensure accountability and adjustments to the methodology are introduced.

(16) For the purposes of determining the general eco-innovation code to be used in the relevant type-approval documents in accordance with Annexes I, VIII and IX to Directive 2007/46/EC of the European Parliament and of the Council ([3]), the individual code to be used for the innovative technology approved through this Decision should be specified,

HAS ADOPTED THIS DECISION:

Article 1

1. The Porsche AG coasting function intended for use in Porsche S-segment M1 vehicles (sports coupé) is approved as an innovative technology within the meaning of Article 12 of Regulation (EC) No 443/2009, provided that any of the following conditions is met:

(a) the coasting function cannot be deactivated,

(b) where the function has been otherwise deactivated, that it is automatically activated immediately after the deactivation event.

2. The CO_2 emissions reduction from the use of the coasting function referred to in paragraph 1 shall be determined using the methodology set out in the Annex. This reduction is differentiated between those vehicles which have cruise control and those that do not.

3. The individual eco-innovation code to be entered into type approval documentation to be used for the innovative technology approved through this Decision shall be '13'.

([1]) Regulation (EC) No 715/2007 of the European Parliament and of the Council of 20 June 2007 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 171, 29.6.2007, p. 1).

([2]) 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).

([3]) 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 (Framework Directive) (OJ L 263, 9.10.2007, p. 1).

Article 2

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

Done at Brussels, 10 July 2015.

For the Commission
The President
Jean-Claude JUNCKER

ANNEX

1. **TESTING METHODOLOGY — INTRODUCTION**

In order to determine the CO_2 reduction that can be attributed to the use of the Porsche AG 'coasting' technology it is necessary to establish all of the following:

(1) the testing vehicles;

(2) the testing procedure to define the modified testing condition (modified NEDC speed profile);

(3) the testing procedure to be followed to determine the CO_2 emission of the eco-innovative vehicle under modified testing conditions;

(4) the testing procedure to be followed to determine the CO_2 emission of the baseline vehicle under modified testing conditions;

(5) the formulae to calculate the CO_2 savings;

(6) the formulae to calculate the statistical error in the CO_2 savings.

1.1. THE TESTING VEHICLES

The following vehicles are to be provided:

(a) eco-innovation vehicle: a vehicle with the innovative technology activated;

(b) baseline vehicle: a vehicle with the innovative technology deactivated. If it is not possible to deactivate the technology, it has to be assured that the coasting function is not activated during the testing procedure.

1.2. THE TESTING PROCEDURE TO DETERMINE THE CO_2 EMISSION OF THE ECO-INNOVATIVE VEHICLE UNDER MODIFIED TESTING CONDITIONS (MODIFIED NEDC SPEED PROFILE) (E_{MC})

Measurement condition and procedure

The emissions of CO_2 and fuel consumption of the eco-innovative vehicles have to be measured in accordance with Annex 6 to UN/ECE Regulation No 101 [1] (Method of measuring emissions of carbon dioxide and fuel consumption of vehicles powered by an internal combustion engine only). All of the following procedures shall be modified:

1.2.1. Preconditioning of the vehicle;

1.2.2. Definition of the coast down curve;

1.2.3. Generation of the modified NEDC speed profile;

1.2.4. Number of tests.

[1] http://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1435246393829&uri=CELEX:42007X0619(02)

1.2.1. **Preconditioning of the vehicle**

One or more complete preconditioning NEDC tests shall be performed, with the innovative technology deactivated (or, when not possible, assuring that the coasting function is not in operation during the testing procedure), to reach the hot testing conditions of engine, motor and battery.

1.2.2. **Definition of the coast down curve**

The determination of the coast down curve in coasting mode is carried out on a single-roll dynamometer as described in the following compulsory steps:

(a) performing dynamometer road load determination, according to the standard operating procedures;

(b) bringing the car to operating temperature using the preconditioning procedure;

(c) executing a coast down in coasting mode from 120 km/h to either a standstill or to the lowest possible coasting speed.

1.2.3. **Generation of the modified NEDC profile (mNEDC)**

1.2.3.1. *Assumptions*

(a) The test sequence is composed of an urban cycle made of four elementary urban cycles and an extra-urban cycle.

(b) All acceleration ramps are identical to the NEDC-profile.

(c) All constant speed levels are identical to the NEDC-profile.

(d) The deceleration within deceleration phases is equal to the ones within the NEDC-profile.

(e) The speed and time tolerances shall be in accordance with paragraph 1.4 of Annex 7 to UN/ECE Regulation No 101.

1.2.3.2. *Constraints*

(a) The deviation from the NEDC profile shall be minimised and the overall distance must comply with the NEDC specified tolerances.

(b) The distance at the end of each deceleration phase of the mNEDC-profile shall be equal to the distances at the end of each deceleration phase of the NEDC-profile.

(c) For all phases of acceleration, constant velocity and deceleration, standard NEDC tolerances shall be applied.

(d) During coasting phases the internal combustion engine is decoupled and no active correction of the vehicles velocity trajectory is permitted.

1.2.3.3. *Defining the system boundaries*

(a) Lower speed limit for coasting;

The coasting mode has to be disabled at a speed of 15 km/h by engaging the brake. At this point, a coast down curve is followed by a deceleration ramp as described for the NEDC-profile (v_{min} in Figure 1);

(b) Minimal stop time;

The minimum time after every coasting deceleration to a standstill or constant speed phase is 2 seconds (t_{min}^{stop} in Figure 1);

(c) Minimum time for constant speed phases;

The minimum time for constant speed phases after acceleration or coasting deceleration is 2 seconds (t_{min}^{const} in Figure 1). For technical reasons this value can be increased.

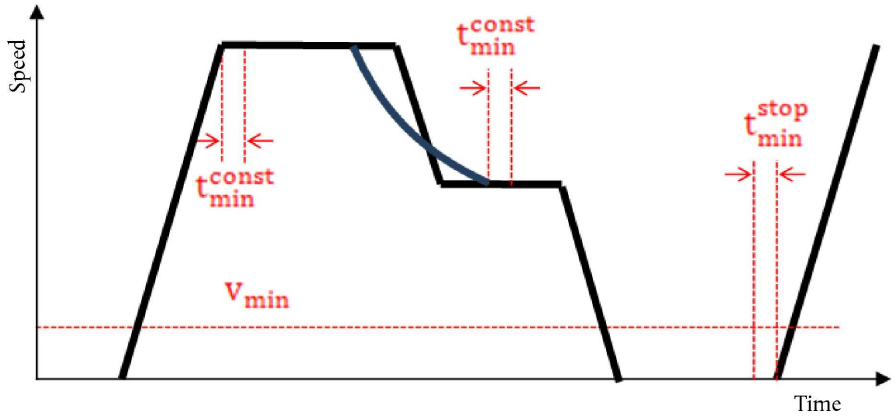

Figure 1

NEDC profile with system boundaries for coasting mode

1.2.4. **Number of tests**

The complete test procedure on the test bench shall be repeated at least three times. The arithmetic means of the CO_2 emission from the eco-innovation vehicle (E_{MC}) and the respective standard deviation of the arithmetic mean ($s_{E_{MC}}$) shall be calculated.

1.3. THE TESTING PROCEDURE TO DETERMINE THE CO_2 EMISSIONS OF THE BASELINE VEHICLE UNDER MODIFIED TESTING CONDITIONS (HOT START NEDC) ($B_{TA_{hot}}$)

1.3.1. **Measurement condition and procedure**

The emissions of CO_2 and fuel consumption of the baseline vehicles have to be measured in accordance with Annex 6 of UN/ECE Regulation No 101 (Method of measuring emissions of carbon dioxide and fuel consumption of vehicles powered by an internal combustion engine only). Both of the following procedures shall be modified:

1.3.1.1. Preconditioning of the vehicle;

1.3.1.2. Number of tests.

1.3.1.1. *Preconditioning of the vehicle*

One or more complete preconditioning NEDC tests shall be performed, with the innovative technology deactivated (or, when not possible, assuring that the coasting function is not activated during the testing procedure), to reach the hot testing conditions of engine, motor and battery with regard to temperatures.

1.3.1.2. *Number of tests*

The complete test procedure on the test bench shall be repeated at least three times. The arithmetic means of the CO_2 emission from the eco-innovation vehicle ($B_{TA_{hot}}$) and the respective standard deviation of the arithmetic mean ($S_{B_{TA_{hot}}}$) shall be calculated.

1.4. THE FORMULAE TO CALCULATE THE CO_2 SAVINGS

To calculate the CO_2 savings of the eco-innovation, the following formula shall be used:

Formula 1

$$C_{CO_2} = (c \cdot B_{TA_{hot}} - E_{MC}) \cdot UF$$

Where:

C_{CO_2}: CO_2 savings [g CO_2/km];

c: Conversion parameter is 0,96;

$B_{TA_{hot}}$: Arithmetic means of the CO_2 emission of the baseline vehicle under modified testing conditions [g CO_2/km];

E_{MC}: Arithmetic means of the CO_2 emission of the eco-innovation vehicle under modified testing conditions [g CO_2/km];

UF: Usage factor of the coasting technology for the Porsche technology is 0,8; this value is representative only of the Porsche S-segment vehicles (sport coupé cars); where vehicles are fitted with cruise control this value is 0,4.

1.5. DETERMINING THE STATISTICAL SIGNIFICANCE OF THE RESULTS

The standard error of the total CO_2 saving shall not exceed 0,5 g CO_2/km and shall be calculated in accordance with the following formula:

Formula 2

$$S_{C_{CO_2}} \leq 0{,}5 \text{ g } CO_2/\text{km}$$

$S_{C_{CO_2}}$: Standard error of the total CO_2 saving [g CO_2/km],

In case this constraint is not fulfilled, further efforts, e.g. more or better performed measurements, shall be taken into account to reduce the uncertainty of the measurements.

The formula to calculate the standard error is

Formula 3

$$S_{C_{CO_2}} = \sqrt{(c \cdot UF \cdot s_{B_{TA_{hot}}})^2 + (UF \cdot s_{E_{MC}})^2 + \left[(c \cdot B_{TA_{hot}} - E_{MC}) \cdot s_{UF}\right]^2}$$

Where:

$s_{C_{CO_2}}$: Standard error of the total CO_2 saving [g CO_2/km];

c: Conversion parameter is 0,96;

$B_{TA_{hot}}$: Arithmetic means of the CO_2 emission of the baseline vehicle under modified testing conditions [g CO_2/km];

$s_{B_{TA_{hot}}}$: Standard deviation of the arithmetic mean of the CO_2 emission of the baseline vehicle under modified testing conditions [g CO_2/km];

E_{MC}: Arithmetic means of the CO_2 emission of the eco-innovation vehicle under modified testing conditions [g CO_2/km];

$s_{E_{MC}}$: Standard deviation of the arithmetic mean of the CO_2 emission of the eco-innovation vehicle under modified testing conditions [g CO_2/km];

UF: Usage factor of the coasting technology for the Porsche technology is 0,8; this value is representative only of the Porsche S-segment vehicles (sport coupé cars); where vehicles are fitted with cruise control this value is 0,4;

s_{UF}: Standard deviation of the arithmetic mean of the usage factor, which is 0,024.

1.6. DEMONSTRATION THAT THE MINIMUM THRESHOLD OF 1 g CO_2/km IS EXCEEDED IN A STATISTICALLY SIGNIFICANT WAY

In order to demonstrate that the 1,0 g CO_2/km threshold is exceeded with a statistic relevance, the following formula shall be used:

Formula 4

$$MT = 1g\,CO_2/km \leq C_{CO_2} - s_{C_{CO_2}}$$

Where:

MT: Minimum threshold [g CO_2/km];

C_{CO_2}: CO_2 savings [g CO_2/km];

$s_{C_{CO_2}}$: Standard error of the total CO_2 saving [g CO_2/km].

Where the CO_2 emission savings, as a result of the calculation using Formula 4 are below the threshold specified in Article 9(1) of Implementing Regulation (EU) No 725/2011, the second subparagraph of Article 11(2) of that Regulation shall apply.