COMMISSION IMPLEMENTING DECISION (EU) 2016/587

of 14 April 2016

on the approval of the technology used in efficient vehicle exterior lighting using light emitting diodes 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 emissions 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 application submitted by the manufacturer Mazda Motor Europe GmbH on 7 July 2015 for the approval of light emitting diodes (LED) lighting, and the application submitted by Honda on 8 January 2016 for the approval of efficient exterior LED lighting have been assessed in accordance with Article 12 of Regulation (EC) No 443/2009, Commission Implementing Regulation (EU) No 725/2011 ([2]) and the Technical Guidelines for the preparation of applications for the approval of innovative technologies pursuant to Regulation (EC) No 443/2009.

(2) The information provided in the Mazda and Honda applications demonstrates that the conditions and the 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. As a consequence, the Mazda and Honda efficient exterior LED lighting should be approved as innovative technologies.

(3) By Implementing Decisions 2014/128/EU ([3]), (EU) 2015/206 ([4]) and (EU) 2016/160 ([5]) the Commission has approved three applications concerning technologies that contribute to improving the efficiency of exterior lighting systems. Based on the experience gained from the assessment of those applications as well as the Mazdaand Honda applications, it has been satisfactorily and conclusively demonstrated that efficient exterior LED lighting including one or appropriate combinations of efficient exterior LED lights such as the low beam headlamp, high beam headlamp, front position, front fog, rear fog, front turn signal, rear turn signal, licence plate and reversing lamps meet the eligibility criteria referred to in Article 12 of Regulation (EC) No 443/2009 and Implementing Regulation (EU) No 725/2011 and provide a reduction in CO_2 emissions of at least 1 g CO_2/km as compared to a baseline exterior lighting package including the same combination of vehicle lights.

(4) It is therefore appropriate to provide manufacturers with the possibility to certify the CO_2 savings from efficient exterior LED lighting that satisfy those conditions. In order to ensure that only exterior LED lighting that are compliant with those conditions are proposed for certification, the manufacturer should provide a verification report from an independent verification body confirming the compliance together with the application for certification submitted to the type approval authority.

([1]) OJ L 140, 5.6.2009, p. 1.

([2]) Commission Implementing Regulation (EU) No 725/2011 of 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]) Commission Implementing Decision 2014/128/EU of 10 March 2014 on the approval of the light emitting diodes low beam module 'E-Light' 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 (OJ L 70, 11.3.2014, p. 30).

([4]) Commission Implementing Decision (EU) 2015/206 of 9 February 2015 on the approval of the Daimler AG efficient exterior lighting using light emitting diodes 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 (OJ L 33, 10.2.2015, p. 52).

([5]) Commission Implementing Decision (EU) 2016/160 of 5 February 2016 on the approval of the Toyota Motor Europe efficient exterior lighting using light emitting diodes 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 (OJ L 31, 6.2.2016, p. 70).

(5) If the type approval authority finds that the LED lighting does not satisfy the conditions for certification the application for certification of the savings should be rejected.

(6) It is appropriate to approve the testing methodology for determining the CO_2 savings from exterior LED lighting.

(7) In order to determine the CO_2 savings from an exterior LED lighting, it is necessary to establish the baseline technology against which the efficiency of the LED lighting should be assessed. On the basis of the experience gained, it is appropriate to consider halogen lighting as a baseline technology.

(8) The savings from an exterior LED lighting may be partially demonstrated by the test referred to in Annex XII to Commission Regulation (EC) No 692/2008 ([1]). It is therefore necessary to ensure that this partial coverage is taken into account in the testing methodology for CO_2 savings from exterior LED lighting.

(9) In order to facilitate a wider deployment of efficient exterior LED lighting in new vehicles, a manufacturer should also have the possibility to apply for the certification of the CO_2 savings from several exterior LED lighting by a single certification application. It is however appropriate to ensure that where this possibility is used a mechanism is applied that incentivises the deployment of only those exterior LED lighting that offer the highest efficiency.

(10) 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 ([2]), the individual code to be used for the innovative technology for exterior LED lighting should be specified,

HAS ADOPTED THIS DECISION:

Article 1

Approval

The technology used in the Mazda light emitting diodes (LED) lighting and in the Honda LED lighting is approved as an innovative technology within the meaning of Article 12 of Regulation (EC) No 443/2009.

Article 2

Application for certification of CO_2 savings

1. The manufacturer may apply for the certification of CO_2 savings from one or several exterior LED lighting intended for use in M_1 vehicles that include one or a combination of the following LED lights,

(a) low beam headlamp;

(b) high beam headlamp;

(c) front position lamp;

(d) front fog lamp;

(e) rear fog lamp;

(f) front turn signal lamp;

([1]) 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).

([2]) Directive 2007/46/EC of the European Parliament and 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).

(g) rear turn signal lamp;

(h) licence plate lamp;

(i) reversing lamp.

The LED light or the combination of LED lights forming the efficient exterior LED lighting shall as a minimum provide the CO_2 reduction specified in Article 9(1) of Regulation (EU) No 725/2011.

2. An application for the certification of the savings from one or several efficient exterior LED lighting shall be accompanied by an independent verification report certifying that that or those LED lighting complies with the conditions set out in paragraph 1.

3. The type approval authority shall reject the application for certification if it finds that one or several exterior LED lighting do not comply with the conditions set out in paragraph 1.

Article 3

Certification of CO_2 savings

1. The reduction in CO_2 emissions from the use of efficient exterior LED lighting referred to in Article 2(1) shall be determined using the methodology set out in the Annex.

2. Where a manufacturer applies for the certification of the CO_2 savings from more than one efficient exterior LED lighting referred to in Article 2(1) in relation to one vehicle version, the type approval authority shall determine which of the efficient exterior LED lighting tested delivers the lowest CO_2 savings, and record the lowest value in the relevant type approval documentation. That value shall be indicated in the certificate of conformity in accordance with Article 11(2) of Implementing Regulation (EU) No 725/2011.

Article 4

Eco-innovation code

The eco-innovation code No 19 shall be entered into the type approval documentation where reference is made to this Decision in accordance with Article 11(1) of Implementing Regulation (EU) No 725/2011.

Article 5

Entry into force

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, 14 April 2016.

For the Commission
The President
Jean-Claude JUNCKER

ANNEX

METHODOLOGY TO DETERMINE THE CO_2 SAVINGS OF EXTERIOR VEHICLE LIGHTING USING LIGHT EMITTING DIODES (LED).

1. INTRODUCTION

In order to determine the CO_2 emission reductions that can be attributed to a package of efficient exterior LED lights consisting of an appropriate combination of vehicle lights referred to in Article 2 for the use in an M_1 vehicle, it is necessary to establish the following:

(1) testing conditions;

(2) test equipment;

(3) determination of the power savings;

(4) calculation of the CO_2 savings;

(5) calculation of the statistical error.

2. SYMBOLS, PARAMETERS AND UNITS

Latin symbols

C_{CO_2} — CO_2 savings [g CO_2/km]

CO_2 — Carbon dioxide

CF — Conversion factor (l/100 km) — (g CO_2/km) [gCO_2/l] as defined in Table 3

m — Number of efficient exterior LED lights composing the package

n — Number of measurements of the sample

P — Power consumption of the vehicle light [W]

$S_{P_{EI}}$ — Standard deviation of the LED light power consumption [W]

$S_{\overline{P_{EI}}}$ — Standard deviation of the LED light power consumption mean [W]

$S_{C_{CO_2}}$ — Standard deviation of the total CO_2 savings [g CO_2/km]

UF — Usage factor [-] as defined in Table 4

v — Mean driving speed of the New European Driving Cycle (NEDC) [km/h]

V_{Pe} — Consumption of effective power [l/kWh] as defined in Table 2

$\frac{\partial C_{CO_2}}{\partial P_{EI}}$ — Sensitivity of calculated CO_2 savings related to the LED light power consumption

Greek symbols

Δ — Difference

η_A — Alternator efficiency [%]

Subscripts

Index (i) refers to vehicle lights

Index (j) refers to measurement of the sample

EI — Eco-innovative

RW — Real-world conditions

TA — Type approval conditions

B — Baseline

3. TESTING CONDITIONS

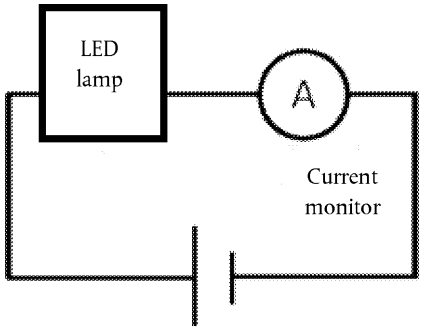
The testing conditions shall fulfil the requirements of Regulation UN/ECE No 112 ([1]) on Uniform provisions concerning the approval of motor vehicle headlamps emitting an asymmetrical passing beam or a driving beam or both and equipped with filament lamps and/or light-emitting diode (LED) modules. The power consumption shall be determined in accordance with point 6.1.4 of Regulation UN/ECE No 112 and points 3.2.1 and 3.2.2 of Annex 10 to that Regulation.

4. TEST EQUIPMENT

The following equipment is to be used, as shown in the figure:

— a power supply unit (i.e. variable voltage supplier);

— two digital multimeters, one for measuring the DC-current, and the other for measuring the DC-voltage. In the figure, a possible test set-up is shown, when the DC-voltage meter is integrated in the power supply unit.



Test set-up

5. MEASUREMENTS AND DETERMINATION OF THE POWER SAVINGS

For each efficient exterior LED light included in the package the measurement of the current shall be performed as shown in the figure at a voltage of 13,2 V. LED module(s) operated by an electronic light source control gear, shall be measured as specified by the applicant.

The manufacturer may request that other measurements of the current shall be done at other additional voltages. In that case, the manufacturer must hand over verified documentation on the necessity to perform these other measurements to the type-approval authority. The measurements of the currents at each of those additional voltages are to be performed consecutively at least five (5) times. The exact installed voltages and the measured current is to be recorded in four decimals.

([1]) E/ECE/324/Rev.2/Add.111/Rev.3 — E/ECE/TRANS/505/Rev.2/Add.111/Rev.3, 9 January 2013

The power consumption has to be determined by multiplying the installed voltage with the measured current. The average of the power consumption for each efficient exterior LED light ($\overline{P_{EL_i}}$) has to be calculated. Each value must be expressed in 4 decimals. When a stepper motor or electronic controller is used for the supply of the electricity to the LED lamps, then the electric load of this component part is to be excluded from the measurement.

The resulting power savings of each efficient exterior LED light (ΔP_i) are to be calculated with the following formula:

Formula 1

$$\Delta P_i = P_{B_i} - \overline{P_{EL_i}}$$

where the power consumption of the corresponding baseline vehicle light is defined by Table 1.

Table 1

Power requirements for different baseline vehicle lights

Vehicle light	Total electric power (P_B) [W]
Low beam headlamp	137
High beam headlamp	150
Front position	12
License plate	12
Front fog lamp	124
Rear fog lamp	26
Front turn signal lamp	13
Rear turn signal lamp	13
Reversing lamp	52

6. CALCULATION OF THE CO_2 SAVINGS

The total CO_2 savings of the lighting package are to be calculated by Formula 2.

Formula 2

$$C_{CO_2} = \left(\sum_{i=1}^{m} \Delta P_i \cdot UF_i\right) \cdot \frac{V_{PE} \cdot CF}{\eta_A \cdot v}$$

where

v: Mean driving speed of the NEDC [km/h], which is 33,58 km/h

η_A: Alternator efficiency [%], which is 67 %

V_{Pe}: Consumption of effective power [l/kWh] as defined in Table 2

Table 2

Consumption of effective power

Type of engine	Consumption of effective power (V_{Pe}) [l/kWh]
Petrol	0,264
Petrol Turbo	0,280
Diesel	0,220

CF: Conversion factor (l/100 km) – (g CO_2/km) [gCO_2/l] as defined in Table 3

Table 3

Fuel conversion factor

Type of fuel	Conversion factor (l/100 km) – (g CO_2/km) (CF) [gCO_2/l]
Petrol	2 330
Diesel	2 640

UF: Usage factor of the vehicle light [-] as defined in Table 4

Table 4

Usage factor for different vehicle lights

Vehicle light	Usage factor (UF) [-]
Low beam headlamp	0,33
High beam headlamp	0,03
Front position	0,36
License plate	0,36
Front fog lamp	0,01
Rear fog lamp	0,01
Front turn signal lamp	0,15
Rear turn signal lamp	0,15
Reversing lamp	0,01

7. CALCULATION OF THE STATISTICAL ERROR

The statistical errors in the outcomes of the testing methodology caused by the measurements are to be quantified. For each efficient exterior LED light included in the package the standard deviation is calculated as defined by Formula 3.

Formula 3

$$S_{\overline{P_{EI_i}}} = \frac{S_{P_{EI_i}}}{\sqrt{n}} = \sqrt{\frac{\sum_{j=1}^{n} \left(P_{EI_{ij}} - \overline{P_{EI_i}}\right)^2}{n(n-1)}}$$

where:

n: Number of measurements of the sample, which is at least 5

The standard deviation of the power consumption of each efficient exterior LED light ($S_{\overline{P_{EI_i}}}$) leads to an error in the CO_2 savings ($S_{C_{CO_2}}$). This error is to be calculated by means of Formula 4

Formula 4

$$s_{C_{CO_2}} = \sqrt{\sum_{i=1}^{m} \left(\frac{\partial C_{CO_2}}{\partial P_{EI_i}} \cdot s_{\overline{P_{EI_i}}}\right)^2} = \sqrt{\sum_{i=1}^{m} \left(UF_i \cdot s_{\overline{P_{EI_i}}}\right)^2} \cdot \frac{V_{Pe} \cdot CF}{\eta_A \cdot v}$$

8. STATISTICAL SIGNIFICANCE

It has to be demonstrated for each type, variant and version of a vehicle fitted with the combination of the efficient exterior LED lights that the error in the CO_2 savings calculated with Formula 4 is not greater than the difference between the total CO_2 savings and the minimum savings threshold specified in Article 9(1) of Implementing Regulation (EU) No 725/2011 (see Formula 5).

Formula 5

$$MT \leq C_{CO_2} - S_{C_{CO_2}}$$

where:

MT: Minimum threshold [gCO_2/km], which is 1 gCO_2/km

Where the total CO_2 emission savings of the of the package of the efficient exterior LED lights, as a result of the calculation using Formula 5, 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.