COMMISSION IMPLEMENTING DECISION (EU) 2018/1876

of 29 November 2018

on the approval of the technology used in 12 Volt efficient alternators for use in conventional combustion engine powered light commercial vehicles as an innovative technology for reducing CO_2 emissions from light commercial vehicles pursuant to Regulation (EU) No 510/2011 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 (EU) No 510/2011 of the European Parliament and of the Council of 11 May 2011 setting emission performance standards for new light commercial vehicles as part of the Union's integrated approach to reduce CO_2 emissions from light-duty vehicles ([1]), and in particular Article 12(4) thereof,

Whereas:

(1) On 22 December 2017, the supplier Mitsubishi Electric Corporation (MELCO), represented in the Union by MELCO Electric Automotive Europe B.V., submitted an application for the approval of the MELCO GXi alternator for N_1 vehicles as an eco-innovation. The application has been assessed in accordance with Article 12 of Regulation (EU) No 510/2011 and Commission Implementing Regulation (EU) No 427/2014 ([2]).

(2) The information provided in the application demonstrates that the conditions and the criteria referred to in Article 12 of Regulation (EU) No 510/2011 and in Articles 2 and 4 of Implementing Regulation (EU) No 427/2014 have been met. As a consequence, the MELCO GXi alternator applied to N_1 vehicles should be approved as an eco-innovation.

(3) By Implementing Decisions 2013/341/EU ([3]), 2014/465/EU ([4]), (EU) 2015/158 ([5]), (EU) 2015/295 ([6]), (EU) 2015/2280 ([7]) and (EU) 2016/588 ([8]), the Commission has approved six applications concerning technologies that contribute to improving the efficiency of alternators for vehicles of category M_1. Based on the experience gained from the assessment of those applications as well as the information contained in the MELCO Electric Automotive Europe B.V. application giving rise to this Decision, it has been satisfactorily and conclusively demonstrated that the MELCO GXi alternator for vehicles of category N_1, it being a 12 Volt (12 V) alternator with a minimum efficiency ranging from 73,4 % to 74,2 %, depending on the powertrain, meets the eligibility criteria referred to in Article 12 of Regulation (EU) No 510/2011 and in Implementing Regulation (EU) No 427/2014, and that it provides a reduction in CO_2 emissions of at least 1 g CO_2/km compared to a baseline alternator with an efficiency of 67 %.

([1]) OJ L 145, 31.5.2011, p. 1.

([2]) Commission Implementing Regulation (EU) No 427/2014 of 25 April 2014 establishing a procedure for the approval and certification of innovative technologies for reducing CO_2 emissions from light commercial vehicles pursuant to Regulation (EU) No 510/2011 of the European Parliament and of the Council (OJ L 125, 26.4.2014, p. 57).

([3]) Commission Implementing Decision 2013/341/EU of 27 June 2013 on the approval of the Valeo Efficient Generation Alternator 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 179, 29.6.2013, p. 98).

([4]) Commission Implementing Decision 2014/465/EU of 16 July 2014 on the approval of the DENSO efficient alternator 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 and amending Commission Implementing Decision 2013/341/EU (OJ L 210, 17.7.2014, p. 17).

([5]) Commission Implementing Decision (EU) 2015/158 of 30 January 2015 on the approval of two Robert Bosch GmbH high efficient alternators as the 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 26, 31.1.2015, p. 31).

([6]) Commission Implementing Decision (EU) 2015/295 of 24 February 2015 on the approval of the MELCO GXi efficient alternator 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 53, 25.2.2015, p. 11).

([7]) Commission Implementing Decision (EU) 2015/2280 of 7 December 2015 on the approval of the DENSO efficient alternator 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 322, 8.12.2015, p. 64).

([8]) Commission Implementing Decision (EU) 2016/588 of 14 April 2016 on the approval of the technology used in 12 Volt efficient alternators 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 101, 16.4.2016, p. 25).

(4) It is therefore appropriate to provide manufacturers with the possibility to apply to an approval authority within the meaning of Directive 2007/46/EC of the European Parliament and of the Council ([1]) for the certification of the CO_2 savings from vehicles fitted with 12 V efficient alternators that meet those conditions. In order to ensure that only CO_2 savings for vehicles equipped with alternators that are compliant with those conditions are certified, manufacturers should be required to provide to the type approval authority a verification report from an independent verification body confirming the compliance together with the application for certification.

(5) If the type approval authority finds that the 12 V alternator does not satisfy the conditions laid down in this Decision, 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 12 V efficient alternators.

(7) In order to determine the CO_2 savings of a vehicle equipped with a 12 V efficient alternator, it is necessary to establish the baseline technology against which the efficiency of the alternator should be assessed. On the basis of the experience gained, it is appropriate to consider a 12 V alternator with 67 % efficiency as an appropriate baseline technology.

(8) The CO_2 savings of a vehicle equipped with a 12 V efficient alternator may be partially demonstrated by means of the test referred to in Annex XII to Commission Regulation (EC) No 692/2008 ([2]). It is therefore necessary to ensure that this partial coverage is taken into account in the testing methodology for CO_2 savings from vehicles fitted with 12 V efficient alternators.

(9) In order to facilitate a wider deployment of 12 V efficient alternators in new vehicles, a manufacturer should also have the possibility to apply for the certification of the CO_2 savings for vehicles equipped with several 12 V efficient alternators 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 alternators 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, the individual code to be used for the innovative technology should be specified,

HAS ADOPTED THIS DECISION:

Article 1

Approval

The technology used in the MELCO GXi alternator for category N_1 vehicles is approved as an innovative technology within the meaning of Article 12 of Regulation (EU) No 510/2011.

Article 2

Application for certification of CO_2 savings

1. A manufacturer may apply for certification of the CO_2 savings from one or several 12 Volt (V) efficient alternators intended for use in N_1 vehicles, provided that each alternator is a component used solely to charge the vehicle battery and to power the electrical system of the vehicle when its combustion engine is running and complies with either of the following conditions:

(a) where the mass of the 12 V efficient alternator does not exceed the mass of the baseline alternator of 7 kg, the efficiency of the alternator, determined in accordance with the Annex, shall be at least:

   (i) 73,8 % for petrol-fuelled vehicles;

([1]) 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).

([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).

(ii) 73,4 % for petrol turbo-fuelled vehicles;

(iii) 74,2 % for diesel-fuelled vehicles;

(b) where the mass of the 12 V efficient alternator exceeds the mass of the baseline alternator of 7 kg, the vehicle fitted with this alternator shall meet the minimum reduction threshold of 1 g CO_2/km specified in Article 9(1)(a) of Implementing Regulation (EU) No 427/2014; that reduction shall be determined taking into account the extra mass according to Formula 10 set out in the Annex to this Decision; the extra mass shall be verified and confirmed in the verification report to be submitted to the type approval authority together with the application for certifications.

2. An application for the certification of the savings from one or several efficient alternators shall be accompanied by an independent verification report certifying that the alternator or alternators comply with the conditions set out in paragraph 1, and verifying and confirming the mass of the alternator.

3. The type approval authority shall reject the application for certification if it finds that the alternator or alternators 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 an efficient alternator 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 one vehicle version fitted with more than one efficient alternator referred to in Article 2(1), the type approval authority shall determine which of the alternators 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 427/2014.

Article 4

Eco-innovation code

The eco-innovation code No 24 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 427/2014.

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, 29 November 2018.

For the Commission
The President
Jean-Claude JUNCKER

ANNEX

METHODOLOGY TO DETERMINE THE CO_2 SAVINGS OF A 12 V EFFICIENT ALTERNATOR FOR CONVENTIONAL COMBUSTION ENGINE POWERED N1 VEHICLES

1. Introduction

In order to determine the CO_2 savings that can be attributed to the use of an efficient alternator in an N1 vehicle, it is necessary to specify the following:

(1) The testing conditions;

(2) The test equipment;

(3) The determination of the efficiency of the efficient alternator and the baseline alternator;

(4) The calculation of the CO_2 savings;

(5) The calculation of the statistical error.

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

h — Frequency as defined in Table 1

I — Current intensity at which the measurement shall be carried out [A]

m — Number of measurements of the sample

M — Torque [Nm]

n — Rotational frequency [min^{-1}] as defined in Table 1

P — Power [W]

$S_{\eta_{EI}}$ — Standard deviation of the eco-innovative alternator efficiency [%]

$S_{\overline{\eta_{EI}}}$ — Standard deviation of the eco-innovative alternator efficiency mean [%]

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

U — Test voltage at which the measurement shall be carried out [V]

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

$\frac{\partial C_{CO_2}}{\partial \eta_{EI}}$ — Sensitivity of calculated CO_2 savings related to the efficiency of the eco-innovative alternator

Greek symbols

Δ — Difference

η — Baseline alternator efficiency [%]

η_{EI} — Efficient alternator efficiency [%]

$\overline{\eta_{EI_i}}$ — Mean of the eco-innovative alternator efficiency at operating point i [%]

Subscripts

Index (i) refers to operating point

Index (j) refers to measurement of the sample

EI — Eco-innovative

m — Mechanical

RW — Real-world conditions

TA — Type approval conditions

B — Baseline

2. **Test conditions and equipment**

The testing conditions shall fulfil the requirements specified in ISO 8854:2012 ([1]).

The test equipment shall be in accordance with the specifications set out in ISO 8854:2012.

3. **Measurements and determination of the efficiency**

The efficiency of the efficient alternator shall be determined in accordance with ISO 8854:2012, with the exception of the elements specified in the present paragraph.

The measurements shall be conducted at different operating points i, as defined in Table 1. The alternator current intensity is defined as half of the rated current for all operating points. For each speed the voltage and the output current of the alternator are to be kept constant, the voltage at 14,3 V.

Table 1

Operating points

Operating point i	Holding time [s]	Rotational frequency n_i [min^{-1}]	Frequency h_i
1	1 200	1 800	0,25
2	1 200	3 000	0,40
3	600	6 000	0,25
4	300	10 000	0,10

The efficiency shall be calculated in accordance with to Formula 1.

Formula 1

$$\eta_{EI_i} = \frac{60 \cdot U_i \cdot I_i}{2\pi \cdot M_i \cdot n_i} \cdot 100$$

All efficiency measurements are to be performed consecutively at least five (5) times. The average of the measurements at each operating point ($\overline{\eta_{EI_i}}$) has to be calculated.

The efficiency of the eco-innovative alternator (η_{EI}) shall be calculated in accordance with Formula 2.

Formula 2

$$\eta_{EI} = \sum_{i=1}^{4} h_i \cdot \overline{\eta_{EI_i}}$$

The efficient alternator leads to saved mechanical power under real-world conditions (ΔP_{mRW}) and type approval conditions (ΔP_{mTA}) as defined in Formula 3.

Formula 3

$$\Delta P_m = \Delta P_{mRW} - \Delta P_{mTA}$$

Where the saved mechanical power under real-world conditions (ΔP_{mRW}) is calculated in accordance with Formula 4 and the saved mechanical power under type-approval conditions (ΔP_{mTA}) in accordance with Formula 5.

Formula 4

$$\Delta P_{mRW} = \frac{P_{RW}}{\eta_B} - \frac{P_{RW}}{\eta_{EI}}$$

([1]) ISO 8854:2012 Road vehicles – Alternators with regulators – Test methods and general requirements Reference number ISO 8854:2012, published on 1 June 2012.

Formula 5

$$\Delta P_{mTA} = \frac{P_{TA}}{\eta_B} - \frac{P_{TA}}{\eta_{EI}}$$

where

P_{RW}: Power requirement under 'real-world' conditions [W], which is 750W

P_{TA}: Power requirement under type-approval conditions [W], which is 350W

η_B: Efficiency of the baseline alternator [%], which is 67 %

4. **Calculation of the CO_2 savings**

The CO_2 savings of the efficient alternator are to be calculated with the following formula.

Formula 6

$$C_{CO_2} = \Delta P_m \cdot \frac{V_{Pe} \cdot CF}{v}$$

where

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

V_{Pe}: Is the consumption of effective power specified in the following 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: Is the factor specified in the following 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

5. **Calculation of the statistical error**

The statistical errors in the results of the testing methodology caused by the measurements are to be quantified. For each operating point the standard deviation is calculated as defined by the following formula:

Formula 7

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

The standard deviation of the efficiency value of the efficient alternator ($S_{\eta EI}$) is calculated in accordance with formula 8:

Formula 8

$$S_{\eta EI} = \sqrt{\sum_{i=1}^{4} \left(h_i \cdot S\overline{\eta_{EI_i}} \right)^2}$$

The standard deviation of the alternator efficiency ($S_{\eta EI}$) leads to an error in the CO_2 savings ($S_{C_{CO_2}}$). That error is calculated in accordance with formula 9:

Formula 9

$$S_{C_{CO_2}} = \sqrt{\left(\frac{\partial C_{CO_2}}{\partial \eta_{EI}} \cdot S_{\eta EI} \right)^2} = \frac{(P_{RW} - P_{TA})}{{\eta_{EI}}^2} \cdot \frac{V_{Pe} \cdot CF}{v} \cdot S_{\eta EI}$$

Statistical Significance

It has to be demonstrated for each type, variant and version of a vehicle fitted with the efficient alternator that the error in the CO_2 savings calculated in accordance with Formula 9 is not greater than the difference between the total CO_2 savings and the minimum savings threshold specified in Article 9(1) of Regulation (EU) No 427/2014 (see Formula 10).

Formula 10

$$MT \leq C_{CO_2} - S_{C_{CO_2}} - \Delta CO_{2m}$$

Where:

MT: minimum threshold [gCO_2/km]

C_{CO_2}: total CO_2 saving [gCO_2/km]

$S_{C_{CO_2}}$: standard deviation of the total CO_2 saving [gCO_2/km]

ΔCO_{2m}: CO_2 correction coefficient due to the positive mass difference between the efficient alternator and the baseline alternator. ΔCO_{2m} is calculated following Table 4:

Table 4

CO_2 correction coefficient due to the extra mass	
Petrol (ΔCO_{2mP}) [g CO_2/km kg]	0,0277 · Δm
Diesel (ΔCO_{2mD}) [g CO_2/km kg]	0,0383 · Δm

In Table 4 Δm is the extra mass due to the installation of the efficient alternator. It is the positive difference between the mass of the efficient alternator and the mass of baseline alternator. The mass of the baseline alternator is 7 kg. On the evaluation of the extra mass the manufacturer must hand over verified documentation to the Type-Approval Authority.

Test and evaluation Report

The report shall include:

— Model and mass of the tested alternators

— Description of the bench

— Test results (measured values)

— Calculated results and corresponding formulae

The efficient alternator to be fitted in vehicles

The type approval authority is to certify the CO_2 savings based on measurements of the efficient alternator and the baseline alternator using the test methodology set out in this Annex. Where the CO_2 emission savings are below the threshold specified in Article 9(1), the second subparagraph of Article 11(2) of Regulation (EU) No 427/2014 shall apply.