

## ANNEX XI

**EC TYPE-APPROVAL OF REPLACEMENT POLLUTION CONTROL DEVICES AS SEPARATE TECHNICAL UNIT**

## 1. INTRODUCTION

1.1. This Annex contains additional requirements for the type-approval of replacement pollution control devices as separate technical units.

## 2. GENERAL REQUIREMENTS

2.1. **Marking**

2.1.1. Each replacement pollution control device shall bear at least the following identifications:

- (a) the manufacturer's name or trade mark;
- (b) the make and identifying part number of the replacement pollution control device as recorded in the information document issued in accordance with the model set out in Appendix 1.

2.1.2. Each original replacement pollution control device shall bear at least the following identifications:

- (a) the vehicle or engine manufacturer's name or trade mark;
- (b) the make and identifying part number of the original replacement pollution control device as recorded in the information referred to in point 2.3.

2.2. **Documentation**

2.2.1. Each replacement pollution control device shall be accompanied by the following information:

- (a) the manufacturer's name or trade mark;
- (b) the make and identifying part number of the replacement pollution control device as recorded in the information document issued in accordance with the model set out in Appendix 1;
- (c) the vehicles or engines including year of manufacture for which the replacement pollution control device is approved, including, where applicable, a marking to identify if the replacement pollution control device is suitable for fitting to a vehicle that is equipped with an on-board diagnostic (OBD) system;
- (d) installation instructions.

The information referred to in this point shall be available in the product catalogue distributed to points of sale by the manufacturer of replacement pollution control devices.

2.2.2. Each original replacement pollution control device shall be accompanied by the following information:

- (a) the vehicle or engine manufacturer's name or trade mark;
- (b) the make and identifying part number of the original replacement pollution control device as recorded in the information mentioned in Section 2.3;

- (c) the vehicles or engines for which the original replacement pollution control device is of a type covered by point 3.2.12.2.1 of Appendix 4 to Annex I, including, where applicable, a marking to identify if the original replacement pollution control device is suitable for fitting to a vehicle that is equipped with an on-board diagnostic (OBD) system;
- (d) installation instructions.

This information referred to in this point shall be available in the product catalogue distributed to points of sale by the vehicle or engine manufacturer.

- 2.3. For an original replacement pollution control device, the vehicle or engine manufacturer shall provide to the approval authority the necessary information in electronic format which makes the link between the relevant part numbers and the type-approval documentation.

This information shall contain the following:

- (a) make(s) and type(s) of vehicle or engine;
- (b) make(s) and type(s) of original replacement pollution control device;
- (c) part number(s) of original replacement pollution control device;
- (d) type-approval number of the relevant engine or vehicle type(s).

### 3. EC SEPARATE TECHNICAL UNIT TYPE-APPROVAL MARK

- 3.1. Every replacement pollution control device conforming to the type approved under this Regulation as a separate technical unit shall bear an EC type-approval mark.

- 3.2. This mark shall consist of a rectangle surrounding the lower-case letter 'e' followed by the distinguishing number of the Member State which has granted the EC type-approval:

- 1. for Germany
- 2. for France
- 3. for Italy
- 4. for the Netherlands
- 5. for Sweden
- 6. for Belgium
- 7. for Hungary
- 8. for Czech Republic
- 9. for Spain
- 11. for the United Kingdom
- 12. for Austria
- 13. for Luxembourg
- 17. for Finland

18. for Denmark
19. for Romania
20. for Poland
21. for Portugal
23. for Greece
24. for Ireland
26. for Slovenia
27. for Slovakia
29. for Estonia
32. for Latvia
34. for Bulgaria
36. for Lithuania
49. for Cyprus
50. for Malta

The EC type-approval mark shall also include in the vicinity of the rectangle the ‘base approval number’ contained in Section 4 of the type-approval number referred to in Annex VII to Directive 2007/46/EC, preceded by the two figures indicating the sequence number assigned to the latest major technical amendment to Regulation (EC) No 595/2009 or this Regulation on the date EC type-approval for a separate technical unit was granted. For this Regulation, the sequence number is 00.

3.3. The EC type-approval mark shall be affixed to the replacement pollution control device in such a way as to be clearly legible and indelible. It shall, wherever possible, be visible when the replacement pollution control device is installed on the vehicle.

3.4. An example of the EC type-approval mark for a separate technical unit is given in Appendix 8 to Annex I.

#### 4. TECHNICAL REQUIREMENTS

##### 4.1. **General requirements**

4.1.1. The replacement pollution control device shall be designed, constructed and capable of being mounted so as to enable the engine and vehicle to comply with the rules with which it was originally in compliance and that pollutant emissions are effectively limited throughout the normal life of the vehicle under normal conditions of use.

4.1.2. The installation of the replacement pollution control device shall be at the exact position of the original equipment pollution control device, and the position on the exhaust line of the exhaust gas, temperature and pressure sensors shall not be modified.

4.1.3. If the original equipment pollution control device includes thermal protections, the replacement pollution control device shall include equivalent protections.

4.1.4. Upon request of the applicant for the type-approval of the replacement component, the approval authority that granted the original type-approval of the engine system shall

make available on a non-discriminatory basis, the information referred to in points 3.2.12.2.6.8.1 and 3.2.12.2.6.8.2 in Part 1 of the information document contained in Appendix 4 to Annex I for each engine to be tested.

#### 4.2. **General durability requirements**

The replacement pollution control device shall be durable, that is designed, constructed and capable of being mounted so that reasonable resistance to the corrosion and oxidation phenomena to which it is exposed is obtained, having regard to the conditions of use of the vehicle.

The design of the replacement pollution control device shall be such that the elements active in controlling emissions are adequately protected from mechanical shock so as to ensure that pollutant emissions are effectively limited throughout the normal life of the vehicle under normal conditions of use.

The applicant for type-approval shall provide to the approval authority details of the test used to establish robustness to mechanical shock and the results of that test.

#### 4.3. **Requirements regarding emissions**

##### 4.3.1. *Outline of procedure for evaluation of emissions*

The engines indicated in Article 16(4)(a) equipped with a complete emissions control system including the replacement pollution control device of the type for which approval is requested, shall be subjected to tests appropriate for the intended application as described in Annex 4B to UN/ECE Regulation No 49, in order to compare its performance with the original emissions control system according to the procedure described below.

4.3.1.1. Where the replacement pollution control device does not comprise the complete emissions control system, only new original equipment or new original replacement pollution control components shall be used to provide a complete system.

4.3.1.2. The emissions control system shall be aged according to the procedure described in point 4.3.2.4 and retested to establish the durability of its emissions performance.

The durability of a replacement pollution control device is determined from a comparison of the two successive sets of exhaust gas emissions tests:

- (a) the first set is that made with the replacement pollution control device which has been run in with 12 WHSC Cycles;
- (b) the second set is that made with the replacement pollution control device which has been aged by the procedures detailed below.

Where approval is applied for different types of engines from the same engine manufacturer, and provided that these different types of engines are fitted with an identical original equipment pollution control system, the testing may be limited to at least two engines selected after agreement with the approval authority.

##### 4.3.2. *Procedure for evaluation of emissions performance of a replacement pollution control device*

4.3.2.1. The engine or engines shall be fitted with a new original equipment pollution control device according to Article 16(4).

The exhaust after-treatment system shall be preconditioned with 12 WHSC cycles. After this preconditioning, the engines shall be tested according to the WHDC test procedures specified

in Annex 4B to UN/ECE Regulation No 49. Three exhaust gas tests of each appropriate type shall be performed.

The test engines with the original exhaust after-treatment system or original replacement exhaust after-treatment system shall comply with the limit values according to the type-approval of the engine or vehicle.

#### 4.3.2.2. *Exhaust gas test with replacement pollution control device*

The replacement pollution control device to be evaluated shall be fitted to the exhaust after-treatment system tested according to the requirements of point 4.3.2.1, replacing the relevant original equipment exhaust after-treatment device.

The exhaust after-treatment system incorporating the replacement pollution control device shall then be preconditioned with 12 WHSC cycles. After this preconditioning, the engines shall be tested according to the WHDC procedures described in Annex 4B to UN/ECE Regulation No 49. Three exhaust gas tests of each appropriate type shall be performed.

#### 4.3.2.3. *Initial evaluation of the emission of pollutants of engines equipped with replacement pollution control devices*

The requirements regarding emissions of the engines equipped with the replacement pollution control device shall be deemed to be fulfilled if the results for each regulated pollutant (CO, HC, NMHC, methane, NO<sub>x</sub>, NH<sub>3</sub>, particulate mass and particle number as appropriate for the type-approval of the engine) meet the following conditions:

(1)  $M \leq 0,85S + 0,4G$ ;

(2)  $M \leq G$

where:

- M : mean value of the emissions of one pollutant obtained from the three tests with the replacement pollution control device.  
S : mean value of the emissions of one pollutant obtained from the three tests with the original or original replacement pollution control device.  
G : limit value of the emissions of one pollutant according to the type-approval of the vehicle.

#### 4.3.2.4. *Durability of emissions performance*

The exhaust after-treatment system tested in point 4.3.2.2 and incorporating the replacement pollution control device shall be subjected to the durability procedures described in Appendix 4.

#### 4.3.2.5. *Exhaust gas test with aged replacement pollution control device*

The aged exhaust after-treatment system incorporating the aged replacement control device shall then be fitted to the test engine used in points 4.3.2.1 and 4.3.2.2

The aged exhaust after-treatment systems shall be preconditioned with 12 WHSC cycles and subsequently tested using the WHDC procedures described in Annex 4B to UN/ECE Regulation No 49. Three exhaust gas tests of each appropriate type shall be performed.

#### 4.3.2.6. *Determination of ageing factor for the replacement pollution control device*

The aging factor for each pollutant shall be the ratio of the applied emission values at the useful life end point and at the start of the service accumulation. (e.g. if the emissions of pollutant A at the useful life end point are 1,50 g/kWh and those at the start of the service accumulation are 1,82 g/kWh, the ageing factor is  $1,82/1,50 = 1,21$ ).

#### 4.3.2.7. *Evaluation of the emission of pollutants of engines equipped with replacement pollution control devices*

The requirements regarding emissions of the engines equipped with the aged replacement pollution control device (as described in point 4.3.2.5) shall be deemed to be fulfilled if the results for each regulated pollutant (CO, HC, NMHC, methane, NO<sub>x</sub>, NH<sub>3</sub>, particulate mass and particle number as appropriate for the type-approval of the engine) meet the following condition:

$$M \times AF \leq G$$

where:

- M : mean value of the emissions of one pollutant obtained from the three tests with the preconditioned replacement pollution control device before ageing (i.e. results from Section 4.3.2)
- AF : the aging factor for one pollutant
- G : limit value of the emissions of one pollutant according to the type-approval of the vehicle(s).

#### 4.3.3. *Replacement pollution control device technology family*

The manufacturer may identify a replacement pollution control device technology family, to be identified by basic characteristics which shall be common to devices within the family.

To belong to the same replacement pollution control device technology family the replacement pollution control devices shall have the following:

- (a) the same emissions control mechanism (oxidation catalyst, three-way catalyst, particulate filter, selective catalytic reduction for NO<sub>x</sub>, etc.);
- (b) the same substrate material (same type of ceramic, or same type of metal);
- (c) the same substrate type and cell density;
- (d) the same catalytically active materials and, where more than one, the same ratio of catalytically active materials;
- (e) the same total charge of catalytically active materials;
- (f) the same type of washcoat applied by the same process.

#### 4.3.4. *Assessment of the durability of emissions performance of a replacement pollution control device by use of a technology family aging factor*

Where the manufacturer has identified a replacement pollution control technology family, the procedures described in point 4.3.2 may be used to determine the Aging Factors (AFs) for each pollutant for the parent of that family. The engine on which these tests are conducted shall have a minimum engine displacement of [0,75 dm<sup>3</sup>] per cylinder.

##### 4.3.4.1. *Determination of durability performance of family members*

A replacement pollution control device A within a family and intended to be mounted on an engine of displacement C<sub>A</sub> may be considered to have the same aging factors as the parent replacement pollution control device P, determined on an engine of displacement C<sub>P</sub>, if the following conditions are fulfilled:

$$V_A/C_A \geq V_P/C_P$$

where:

- $V_A$  : Substrate volume (in  $\text{dm}^3$ ) of replacement pollution control device A  
 $V_P$  : Substrate volume (in  $\text{dm}^3$ ) of the parent replacement pollution control device P of the same family; and

both engines use the same method for regeneration of any emissions control devices incorporated in the original exhaust after-treatment system. This requirement shall apply only where devices requiring regeneration are incorporated in the original exhaust after-treatment system.

If these conditions are fulfilled, the emissions durability performance of other members of the family may be determined from the emissions results (S) of that family member determined according to the requirements set out in points 4.3.2.1, 4.3.2.2 and 4.3.2.3 and using the Aging Factors determined for the parent of that family.

#### 4.4. Requirements regarding exhaust back-pressure

The back pressure shall not cause the complete exhaust system to exceed the value specified according to point 4.1.2 of Annex I.

#### 4.5. Requirements regarding OBD compatibility (applicable only to replacement pollution control devices intended to be fitted to vehicles equipped with an OBD system)

- 4.5.1. OBD compatibility demonstration is required only when the original pollution control device was monitored in the original configuration.
- 4.5.2. The compatibility of the replacement pollution control device with the OBD system shall be demonstrated by using the procedures described in Annex X to this Regulation and Annex 9B to UN/ECE Regulation No 49 for replacement pollution control devices intended to be fitted to engines or vehicles type-approved in accordance with Regulation (EC) No 595/2009 and this Regulation.
- 4.5.3. The provisions in UN/ECE Regulation No 49 applicable to components other than pollution control devices shall not apply.
- 4.5.4. The replacement pollution control device manufacturer may use the same preconditioning and test procedure as used during the original type-approval. In this case, the approval authority which granted original type-approval of an engine of a vehicle shall provide, on request and on a non-discriminatory basis, Appendix on test conditions to Appendix 4 to Annex I which contains the number and type of preconditioning cycles and the type of test cycle used by the original equipment manufacturer for OBD testing of the pollution control device.
- 4.5.5. In order to verify the correct installation and functioning of all other components monitored by the OBD system, the OBD system shall indicate no malfunction and have no stored fault codes prior to the installation of any of the replacement pollution control device. An evaluation of the status of the OBD system at the end of the tests described in points 4.3.2 to 4.3.2.7 may be used for this purpose.
- 4.5.6. The malfunction indicator shall not activate during vehicle operation required by points 4.3.2 to 4.3.2.7.

#### 5. CONFORMITY OF PRODUCTION

- 5.1. Measures to ensure the conformity of production shall be taken in accordance with Article 12 of Directive 2007/46/EC.
- 5.2. **Special provisions**
- 5.2.1. The checks referred to in Section 2.2 of Annex X to Directive 2007/46/EC shall include compliance with the characteristics as defined under ‘type of pollution control device’ in Article 2(8) of Regulation (EC) No 692/2008.
- 5.2.2. For the application of Article 12(2) of Directive 2007/46/EC, the tests described in Section 4.3 of this Annex (requirements regarding emissions) may be carried out. In this case, the holder of the approval may request, as an alternative, to use as a basis for comparison not the original equipment pollution control device, but the replacement pollution control device which was used during the type-approval tests (or another sample that has been proven to conform to the approved type). Emissions values measured with the sample under verification shall then on average not exceed by more than 15 % the mean values measured with the sample used for reference.



## Appendix 1

### **MODEL Information document No ...**

relating to the EC type-approval of replacement pollution control devices

The following information shall be supplied in triplicate and include a list of contents. Any drawings shall be supplied in appropriate scale and sufficient detail on size A4 or on a folder of A4 format. Photographs, if any, shall show sufficient detail.

If the systems, components or separate technical units have electronic controls, information concerning their performance shall be supplied.

#### 0. GENERAL

- 0.1. Make (trade name of manufacturer): ...
- 0.2. Type ...
  - 0.2.1. Commercial name(s) (if available): ...
- 0.3. Means of identification of type: ...
- 0.5. Name and address of manufacturer: ...
- 0.7. In the case of components and separate technical units, location and method of affixing of the EC approval mark: ...
- 0.8. Name(s) and address(es) of assembly plant(s): ...
- 0.9. Name and address of the manufacturer's authorised representative (if any): ...

#### 1. DESCRIPTION OF THE DEVICE

- 1.1. Type of the replacement pollution control device: (oxidation catalyst, three-way catalyst, SCR catalyst, particulate filter, etc.) ...
- 1.2. Drawings of the replacement pollution control device, identifying in particular all the characteristics referred to under 'type of pollution control device' of Article 2 of Regulation (EU) No 582/2011: ...
- 1.3. Description of the engine and vehicle type or types for which the replacement pollution control device is intended: ...
  - 1.3.1. Number(s) and/or symbol(s) characterising the engine and vehicle type(s): ...
  - 1.3.2. Number(s) and/or symbol(s) characterising the original pollution control device(s) which the replacement pollution control device is intended to replace: ...
  - 1.3.3. Is the replacement pollution control device intended to be compatible with OBD requirements (Yes/No)<sup>(1)</sup>
  - 1.3.4. Is the replacement pollution control device compatible with existing vehicle/engine control systems (yes/no)<sup>(1)</sup>
- 1.4. Description and drawings showing the position of the replacement pollution control device relative to the engine exhaust manifold(s): ...

## Appendix 2

**MODEL**(Maximum format: A4 (210 mm × 297 mm))**EC****TYPE-****APPROVAL****CERTIFICATE****EC TYPE-APPROVAL CERTIFICATE**

Stamp of administration

Communication concerning the:

- EC type-approval <sup>(1)</sup> ...,
- extension of EC type-approval <sup>(1)</sup> ...,
- refusal of EC type-approval <sup>(1)</sup> ...,
- withdrawal of EC type-approval <sup>(1)</sup> ...

of a type of component/separate technical unit<sup>(2)</sup>

with regard to Regulation (EC) No 595/2009, as implemented by Regulation (EU) No 582/2011.

Regulation (EC) No 595/2009 or Regulation (EU) No 582/2011, as last amended by ...

EC type-approval number: ...

Reason for extension: ...

*SECTION 0.1.**I*

Make (trade name of manufacturer): ...

0.2. Type: ...

0.3. Means of identification of type marked on the component/separate technical unit<sup>(3)</sup>  
(Identifying Part Number): ...

0.3.1. Location of that marking: ...

0.5. Name and address of manufacturer: ...

0.7. In the case of components and separate technical units, location and method of affixing  
of the EC approval mark: ...

0.8. Name and address(es) of assembly plant(s): ...

0.9. Name and address of manufacturer's representative: ...

*SECTION.**II*

Additional information

1.1. Make and type of the replacement pollution control device: (oxidation catalyst, three-  
way catalyst, SCR catalyst, particulate filter, etc.) ...1.2. Engine and vehicle type(s) for which the pollution control device type qualifies as  
replacement part: ...

1.3. Type(s) of engine on which the replacement pollution control device has been tested:  
...

1.3.1. Has the replacement pollution control device demonstrated compatibility with OBD requirements (yes/no)<sup>(2)</sup>: ...

2. Technical service responsible for carrying out the tests: ...

3. Date of test report: ...

4. Number of test report: ...

5. Remarks: ...

6. Place: ...

7. Date: ...

8. Signature: ...

Attachments : Information package.

Test report.

## Appendix 3

**Ageing procedure for evaluation of durability**

1. This Appendix set out the procedures for ageing a replacement pollution control device for the purpose of evaluating the durability.
2. For demonstrating the durability the replacement pollution control device shall be subject to the requirements set out in points 1 to 3.4.2 of Annex VII.
- 2.1. For the purpose of demonstrating durability of the replacement pollution control device the minimum service accumulation periods as set out in Table 1 may be used.

TABLE 1

**Minimum service accumulation period**

<b>Category of vehicle in which engine will be installed</b>	<b>Minimum service accumulation period</b>
Category N <sub>1</sub> vehicles	
Category N <sub>2</sub> vehicles	
Category N <sub>3</sub> vehicles with a maximum technically permissible mass not exceeding 16 tonnes	
Category N <sub>3</sub> vehicles with a maximum technically permissible mass exceeding 16 tonnes	
Category M <sub>1</sub> vehicles	
Category M <sub>2</sub> vehicles	
Category M <sub>3</sub> vehicles of classes I, II, A and B as defined in Annex I to Directive 2001/85/EC, with a maximum technically permissible mass not exceeding 7,5 tonnes	
Category M <sub>3</sub> vehicles of classes III and B as defined in Annex I to Directive 2001/85/EC with a maximum technically permissible mass exceeding 7,5 tonnes	

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*Status: This is the original version (as it was originally adopted).*

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- (1) Delete where not applicable.
- (2) Delete where not applicable.
- (3) If the means of identification of type contains characters not relevant to describe the vehicle, component or separate technical unit types covered by this type-approval certificate such characters shall be represented in the document by the symbol: ‘?’ (e.g. ABC??123??).