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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

(Text with EEA relevance)

(OJ L 199, 28.7.2008, p. 1)

Amended by:

		Official Journal		
		No	page	date
► <u>M1</u>	Commission Regulation (EU) No 566/2011 of 8 June 2011	L 158	1	16.6.2011
► <u>M2</u>	Commission Regulation (EU) No 459/2012 of 29 May 2012	L 142	16	1.6.2012
► <u>M3</u>	Commission Regulation (EU) No 630/2012 of 12 July 2012	L 182	14	13.7.2012
► <u>M4</u>	Commission Regulation (EU) No 143/2013 of 19 February 2013	L 47	51	20.2.2013
► <u>M5</u>	Commission Regulation (EU) No 171/2013 of 26 February 2013	L 55	9	27.2.2013
► <u>M6</u>	Commission Regulation (EU) No 195/2013 of 7 March 2013	L 65	1	8.3.2013
► <u>M7</u>	Commission Regulation (EU) No 519/2013 of 21 February 2013	L 158	74	10.6.2013
► <u>M8</u>	Commission Regulation (EU) No 136/2014 of 11 February 2014	L 43	12	13.2.2014
► <u>M9</u>	Commission Regulation (EU) 2015/45 of 14 January 2015	L 9	1	15.1.2015

Corrected by:

► **C1** Corrigendum, OJ L 336, 21.12.2010, p. 68 (692/2008)



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

(Text with EEA relevance)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community, and in particular Article 95 thereof,

Having regard to 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⁽¹⁾, and in particular Articles 4(4), 5(3) and 8 thereof

Whereas:

- (1) Regulation (EC) No 715/2007 is one of the separate regulatory acts under the type-approval procedure laid down by Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers⁽²⁾.
- (2) Regulation (EC) No 715/2007 requires new light-duty vehicles to comply with new emission limits and makes additional requirements on access to information. The technical requirements take effect in two stages, Euro 5 starting from 1 September 2009 and Euro 6 from 1 September 2014. The specific technical provisions necessary to implement that Regulation should be adopted. Therefore, the present Regulation aims at setting the requirements necessary for the type-approval of Euro 5 and 6 specification vehicles.
- (3) Article 5 of Regulation (EC) No 715/2007 provides for specific technical requirements relating to the control of emissions from vehicles to be set in its implementing legislation. Therefore, it is appropriate to adopt such requirements.

⁽¹⁾ OJ L 171, 29.6.2007, p. 1.

⁽²⁾ OJ L 42, 23.2.1970, p. 1 Directive as last amended by Regulation (EC) No 715/2007

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- (4) Following the adoption of the main requirements for type approval in Regulation (EC) No 715/2007, it is necessary to establish administrative provisions for EC type-approval of light duty vehicles. These administrative requirements include provisions for conformity of production and in-service conformity to ensure continued good performance of production vehicles.
- (5) In accordance with Article 11 of Regulation (EC) No 715/2007, it is necessary to establish requirements for type approval of replacement pollution control devices so as to ensure that they function correctly.
- (6) In accordance with Articles 6 and 7 of Regulation (EC) No 715/2007, it is also necessary to establish requirements to ensure that vehicle on board diagnostic (OBD) and vehicle repair and maintenance information is readily accessible, so as to ensure that independent operators have access to such information.
- (7) In accordance with Regulation (EC) No 715/2007, the measures provided for in this Regulation regarding access to vehicle repair and maintenance information, information for diagnostic tools and the compatibility of replacement parts with vehicle OBD systems, should not be restricted to emissions-related components and systems but cover all aspects of a vehicle subject to type-approval within the scope of this Regulation.
- (8) As provided by Article 14(2) of Regulation (EC) No 715/2007, recalibrated limit values for particulate mass and new limit values for number of particles emitted are introduced.
- (9) The measures provided for in this Regulation are in accordance with the opinion of the Technical Committee — Motor Vehicles established by Article 40 of 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)⁽¹⁾.
- (10) A Forum should be established to examine any concerns raised regarding the implementation of section 2.2 of Annex XIV, concerning access information relating to vehicle security features. The information exchange in the Forum should help to reduce the risk of misuse of vehicle security information. Due to the sensitivity of the subject matter it might be necessary to keep discussions and findings of the Forum confidential.

⁽¹⁾ OJ L 263, 9.10.2007, p. 1.

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HAS ADOPTED THIS REGULATION:

*Article 1***Subject matter**

This Regulation lays down measures for the implementation of Articles 4, 5 and 8 of Regulation (EC) No 715/2007.

*Article 2***Definitions**

For the purposes of this Regulation, the following definitions shall apply:

1. ‘vehicle type with regard to emissions and vehicle repair and maintenance information’ means a group of vehicles which do not differ in the following respects:
 - (a) the equivalent inertia determined in relation to the reference mass as provided for in paragraph 5.1 of Annex 4 of UN/ECE Regulation 83 ⁽¹⁾;
 - (b) the engine and vehicle characteristics as set out in Appendix 3 of Annex I;
2. ‘EC type-approval of a vehicle with regard to emissions and vehicle repair and maintenance information’ means an EC type-approval of a vehicle with regard to its tailpipe emissions, crankcase emissions, evaporative emissions, fuel consumption and access to vehicle OBD and vehicle repair and maintenance information;
3. ‘gaseous pollutants’ means the exhaust gas emissions of carbon monoxide, oxides of nitrogen, expressed in nitrogen dioxide (NO₂) equivalent, and hydrocarbons with the following ratio:
 - (a) C₁H_{1,89}O_{0,016} for petrol (E5);
 - (b) C₁H_{1,86}O_{0,005} for diesel (B5);
 - (c) C₁H_{2,525} for liquefied petroleum gas (LPG);
 - (d) CH₄ for natural gas (NG) and biomethane;
 - (e) C₁H_{2,74}O_{0,385} for ethanol (E85);
4. ‘starting aid’ means glow plugs, modifications to the injection timing and other devices which assist the engine to start without enrichment of the air/fuel mixture of the engine;
5. ‘engine capacity’ means either of the following:
 - (a) for reciprocating piston engines, the nominal engine swept volume;
 - (b) for rotary piston (Wankel) engines, double the nominal engine swept volume;

⁽¹⁾ OJ L 375, 27.12.2006, p. 223.

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6. 'periodically regenerating system' means catalytic converters, particulate filters or other pollution control devices that require a periodical regeneration process in less than 4 000 km of normal vehicle operation
7. 'original replacement pollution control device' means a pollution control device or an assembly of pollution control devices whose types are indicated in Appendix 4 to Annex I to this Regulation but are offered on the market as separate technical units by the holder of the vehicle type-approval;
8. 'type of pollution control device' means catalytic converters and particulate filters which do not differ in any of the following essential aspects:
 - (a) number of substrates, structure and material;
 - (b) type of activity of each substrate;
 - (c) volume, ratio of frontal area and substrate length;
 - (d) catalyst material content;
 - (e) catalyst material ratio;
 - (f) cell density;
 - (g) dimensions and shape;
 - (h) thermal protection;
9. 'mono fuel vehicle' means a vehicle that is designed to run primarily on one type of fuel;
10. 'mono fuel gas vehicle' means a mono fuel vehicle that primarily runs on LPG, NG/biomethane, or hydrogen but may also have a petrol system for emergency purposes or starting only, where the petrol tank does not contain more than 15 litres of petrol;
11. 'bi fuel vehicle' means a vehicle with two separate fuel storage systems that can run part-time on two different fuels and is designed to run on only one fuel at a time;
12. 'bi fuel gas vehicle' means a bi fuel vehicle that can run on petrol and also on either LPG, NG/biomethane or hydrogen;
13. 'flex fuel vehicle' means a vehicle with one fuel storage system that can run on different mixtures of two or more fuels;
14. 'flex fuel ethanol vehicle' means a flex fuel vehicle that can run on petrol or a mixture of petrol and ethanol up to an 85 % ethanol blend (E85);

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15. ‘flex fuel biodiesel vehicle’ means a flex fuel vehicle that can run on mineral diesel or a mixture of mineral diesel and biodiesel;

▼ M3

16. ‘hybrid electric vehicle’ (HEV) means a vehicle, including vehicles which draw energy from a consumable fuel only for the purpose of re-charging the electrical energy/power storage device, that, for the purpose of mechanical propulsion, draws energy from both of the following on-vehicle sources of stored energy/power:

- (a) a consumable fuel;
- (b) a battery, capacitor, flywheel/generator or other electrical energy/power storage device;

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17. ‘properly maintained and used’ means, for the purpose of a test vehicle, that such a vehicle satisfies the criteria for acceptance of a selected vehicle laid down in section 2 of Appendix 1 to Annex II;
18. ‘emission control system’ means, in the context of the OBD system, the electronic engine management controller and any emission-related component in the exhaust or evaporative system which supplies an input to or receives an output from this controller;
19. ‘malfunction indicator (MI)’ means a visible or audible indicator that clearly informs the driver of the vehicle in the event of a malfunction of any emission-related component connected to the OBD system, or of the OBD system itself;
20. ‘malfunction’ means the failure of an emission-related component or system that would result in emissions exceeding the limits in section 3.3.2 of Annex XI or if the OBD system is unable to fulfil the basic monitoring requirements set out in Annex XI;
21. ‘secondary air’ means the air introduced into the exhaust system by means of a pump or aspirator valve or other means that is intended to aid in the oxidation of HC and CO contained in the exhaust gas stream;
22. ‘driving cycle’, in respect of vehicle OBD systems, consists of engine start-up, driving mode where a malfunction would be detected if present, and engine shut-off;
23. ‘access to information’ means the availability of all vehicle OBD and vehicle repair and maintenance information, required for the inspection, diagnosis, servicing or repair of the vehicle.
24. ‘deficiency’ means, in the context of the OBD system, that up to two separate components or systems which are monitored contain temporary or permanent operating characteristics that impair the otherwise efficient OBD monitoring of those components or systems or do not meet all of the other detailed requirements for OBD;

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25. 'deteriorated replacement pollution control device' means a pollution control device as defined in Article 3(11) of Regulation (EC) No 715/2007 that has been aged or artificially deteriorated to such an extent that it fulfils the requirements laid out in Section 1 to Appendix 1 to Annex XI of UN/ECE Regulation No 83;
26. 'vehicle OBD information' means information relating to an on-board diagnostic system for any electronic system on the vehicle
27. 'reagent' means any product other than fuel that is stored on-board the vehicle and is provided to the exhaust after-treatment system upon request of the emission control system;
28. 'mass of the vehicle in running order' means the mass described in point 2.6 of Annex I to Directive 2007/46/EC;
29. 'engine misfire' means lack of combustion in the cylinder of a positive ignition engine due to absence of spark, poor fuel metering, poor compression or any other cause;
30. 'cold start system or device' means a system which temporarily enriches the air/fuel mixture of the engine thus assisting the engine to start;
31. 'power take-off operation or unit' means an engine-driven output provision for the purposes of powering auxiliary, vehicle mounted, equipment;
32. 'small volume manufacturers' means vehicle manufacturers whose worldwide annual production is less than 10 000 units;

▼ M3

33. 'Electric power train' means a system consisting of one or more electric energy storage devices, one or more electric power conditioning devices and one or more electric machines that convert stored electric energy to mechanical energy delivered at the wheels for propulsion of the vehicle;
34. 'Pure electric vehicle' means a vehicle powered by an electric power train only;
35. 'flex fuel H2NG vehicle' means a flex fuel vehicle that can run on different mixtures of hydrogen and NG/biomethane;
36. 'Hydrogen fuel cell vehicle' means a vehicle powered by a fuel cell that converts chemical energy from hydrogen into electric energy, for propulsion of the vehicle;

▼ M8

37. 'net power' means the power obtained on a test bench at the end of the crankshaft or its equivalent at the corresponding engine or motor speed with the auxiliaries, tested in accordance with Annex XX (Measurements of net engine power, net power and the maximum 30 minutes power of electric drive train), and determined under reference atmospheric conditions;

▼M8

38. ‘maximum net power’ means the maximum value of the net power measured at full engine load;
39. ‘maximum 30 minutes power’ means the maximum net power of an electric drive train at DC voltage as set out in paragraph 5.3.2. of UNECE Regulation No 85 ⁽¹⁾;
40. ‘cold start’ means an engine coolant temperature (or equivalent temperature) at engine start less than or equal to 35 °C and less than or equal to 7 K higher than ambient temperature (if available) at engine start.

▼B*Article 3***Requirements for type-approval****▼M8**

1. In order to receive an EC type-approval with regard to emissions and vehicle repair and maintenance information, the manufacturer shall demonstrate that the vehicles comply with the test procedures specified in Annexes III to VIII, X to XII, XIV, XVI and XX to this Regulation. The manufacturer shall also ensure compliance with the specifications of reference fuels set out in Annex IX to this Regulation.

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2. Vehicles shall be subject to the tests specified in Figure I.2.4 of Annex I.

3. As an alternative to the requirements contained in Annexes II, III, V to XI and XVI, small volume manufacturers may request the granting of EC type-approval to a vehicle type which was approved by an authority of a third country on the basis of the legislative acts set out in Section 2.1 of Annex I.

The emissions tests for roadworthiness purposes set out in Annex IV, tests fuel consumption and CO₂ emissions set out in Annex XII and the requirements for access to vehicle OBD and vehicle repair and maintenance information set out in Annex XIV shall still be required to obtain EC type-approval with regard to emissions and vehicle repair and maintenance information under this paragraph.

The approval authority shall inform the Commission of the circumstances of each type approval granted under this paragraph.

4. Specific requirements for inlets to fuel tanks and electronic system security are laid down in Section 2.2 and 2.3 of Annex I.

5. The manufacturer shall take technical measures so as to ensure that the tailpipe and evaporative emissions are effectively limited, in accordance with this Regulation, throughout the normal life of the vehicle and under normal conditions of use.

⁽¹⁾ OJ L 326, 24.11.2006, p. 55

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These measures shall include ensuring that the security of hoses, joints and connections, used within the emission control systems, are constructed so as to conform with the original design intent.

6. The manufacturer shall ensure that the emissions test results comply with the applicable limit value under the specified test conditions of this Regulation.

7. For the Type 2 test set out in Appendix 1 to Annex IV, at normal engine idling speed, the maximum permissible carbon monoxide content in the exhaust gases shall be that stated by the vehicle manufacturer. However, the maximum carbon monoxide content shall not exceed 0,3 % vol.

At high idle speed, the carbon monoxide content by volume of the exhaust gases shall not exceed 0,2 %, with the engine speed being at least 2 000 min⁻¹ and Lambda being $1 \pm 0,03$ or in accordance with the specifications of the manufacturer.

8. The manufacturer shall ensure that for the Type 3 test set out in Annex V, the engine's ventilation system does not permit the emission of any crankcase gases into the atmosphere.

9. The Type 6 test measuring emissions at low temperatures set out in Annex VIII shall not apply to diesel vehicles.

However, when applying for type-approval, manufacturers shall present to the approval authority with information showing that the NO_x after-treatment device reaches a sufficiently high temperature for efficient operation within 400 seconds after a cold start at - 7 °C as described in the Type 6 test.

In addition, the manufacturer shall provide the approval authority with information on the operating strategy of the exhaust gas recirculation system (EGR), including its functioning at low temperatures.

This information shall also include a description of any effects on emissions.

The approval authority shall not grant type-approval if the information provided is insufficient to demonstrate that the aftertreatment device actually reaches a sufficiently high temperature for efficient operation within the designated period of time.

At the request of the Commission, the approval authority shall provide information on the performance of NO_x aftertreatment devices and EGR system at low temperatures.

*Article 4***Requirements for type-approval regarding the OBD system**

1. The manufacturer shall ensure that all vehicles are equipped with an OBD system.

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2. The OBD system shall be designed, constructed and installed on a vehicle so as to enable it to identify types of deterioration or malfunction over the entire life of the vehicle.
3. The OBD system shall comply with the requirements of this Regulation during conditions of normal use.
4. When tested with a defective component in accordance with Appendix 1 of Annex XI, the OBD system malfunction indicator shall be activated.

The OBD system malfunction indicator may also activate during this test at levels of emissions below the OBD thresholds limits specified in Annex XI.

5. The manufacturer shall ensure that the OBD system complies with the requirements for in-use performance set out in section 3 of Appendix 1 to Annex XI of this Regulation under all reasonably foreseeable driving conditions.
6. In-use performance related data to be stored and reported by a vehicle's OBD system according to the provisions of point 3.6 of Appendix 1 to Annex XI shall be made readily available by the manufacturer to national authorities and independent operators without any encryption.

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▼ B*Article 5***Application for EC type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information**

1. The manufacturer shall submit to the approval authority an application for EC type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information.
2. The application referred to in paragraph 1 shall be drawn up in accordance with the model of the information document set out in Appendix 3 to Annex I.
3. In addition, the manufacturer shall submit the following information:
 - (a) in the case of vehicles equipped with positive-ignition engines, a declaration by the manufacturer of the minimum percentage of misfires out of a total number of firing events that either would result in emissions exceeding the limits given in section 2.3 of Annex XI if that percentage of misfire had been present from the start of a type 1 test as described in Annex III to this Regulation or could lead to an exhaust catalyst, or catalysts, overheating prior to causing irreversible damage;
 - (b) detailed written information fully describing the functional operation characteristics of the OBD system, including a listing of all relevant parts of the emission control system of the vehicle that are monitored by the OBD system;
 - (c) a description of the malfunction indicator used by the OBD system to signal the presence of a fault to a driver of the vehicle;

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- (d) a declaration by the manufacturer that the OBD system complies with the provisions of section 3 of Appendix 1 to Annex XI relating to in-use performance under all reasonably foreseeable driving conditions;
- (e) a plan describing the detailed technical criteria and justification for incrementing the numerator and denominator of each monitor that must fulfil the requirements of sections 3.2 and 3.3 of Appendix 1 to Annex XI, as well as for disabling numerators, denominators and the general denominator under the conditions outlined in section 3.7 of Appendix 1 to Annex XI;
- (f) a description of the provisions taken to prevent tampering with and modification of the emission control computer;
- (g) if applicable, the particulars of the vehicle family as referred to in Appendix 2 to Annex XI;
- (h) where appropriate, copies of other type-approvals with the relevant data to enable extension of approvals and establishment of deterioration factors.

4. For the purposes of paragraph 3(d), the manufacturer shall use the model of a manufacturer's certificate of compliance with the OBD in-use performance requirements set out in Appendix 7 of Annex I

5. For the purposes of paragraph 3(e), the approval authority that grants the approval shall make the information referred to in that point available to the approval authorities or the Commission upon request.

6. For the purposes of points (d) and (e) of paragraph 3, approval authorities shall not approve a vehicle if the information submitted by the manufacturer is inappropriate for fulfilling the requirements of section 3 of Appendix 1 to Annex XI.

Sections 3.2, 3.3 and 3.7 of Appendix 1 to Annex XI shall apply under all reasonably foreseeable driving conditions.

For the assessment of the implementation of the requirements set out in the first and second subparagraphs, the approval authorities shall take into account the state of technology.

7. For the purposes of paragraph 3(f), the provisions taken to prevent tampering with and modification of the emission control computer shall include the facility for updating using a manufacturer-approved programme or calibration.

8. For the tests specified in Figure I.2.4 of Annex I the manufacturer shall submit to the technical service responsible for the type-approval tests a vehicle representative of the type to be approved.

9. The application for type-approval of mono fuel, bi-fuel and flex-fuel vehicles shall comply with the additional requirements laid down in Sections 1.1 and 1.2 of Annex I.

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10. Changes to the make of a system, component or separate technical unit that occur after a type-approval shall not automatically invalidate a type approval, unless its original characteristics or technical parameters are changed in such a way that the functionality of the engine or pollution control system is affected.

*Article 6***Administrative provisions for EC type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information****▼M8**

1. If all the relevant requirements are met, the approval authority shall grant an EC type-approval and issue a type-approval number in accordance with the numbering system set out in Annex VII to Directive 2007/46/EC.

Without prejudice to the provisions of Annex VII to Directive 2007/46/EC, section 3 of the type-approval number shall be drawn up in accordance with Appendix 6 to Annex I to this Regulation.

An approval authority shall not assign the same number to another vehicle type.

For vehicles type approved to the Euro 5 emission limits given in Table 1 of Annex I of Regulation (EC) 715/2007 the relevant requirements shall be deemed to be met if all the following conditions are fulfilled:

- (a) the requirements of Article 13 are met;
- (b) the vehicle has been approved according to UN/ECE Regulations No 83, series of amendments 06, No 85, No 101, series of amendments 01 and in the case of compression ignition vehicles No 24 Part III, series of amendments 03.

In the case referred to in the fourth subparagraph Article 14 shall also apply.

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2. By way of derogation from paragraph 1, at the request of the manufacturer, a vehicle with an OBD system may be accepted for type-approval with regard to emissions and vehicle repair and maintenance information, even though the system contains one or more deficiencies such that the specific requirements of Annex XI are not fully met, provided that the specific administrative provisions set out in Section 3 of that Annex are complied with.

The approval authority shall notify the decision to grant such a type approval to all approval authorities in the other Member States in accordance with the requirements set out in Article 8 of Directive 2007/46/EC.

3. When granting an EC type approval under paragraph 1, the approval authority shall issue an EC type-approval certificate using the model set out in Appendix 4 to Annex I.

▼B*Article 7***Amendments to type-approvals**

Articles 13, 14 and 16 of Directive 2007/46/EC shall apply to any amendments to the type-approvals.

At the manufacturer's request the provisions specified in Section 3 of Annex I shall apply without the need for additional testing only to vehicles of the same type.

*Article 8***Conformity of production**

1. Measures to ensure the conformity of production shall be taken in accordance with the provisions of Article 12 of Directive 2007/46/EC.
2. Conformity of production shall be checked on the basis of the description in the type-approval certificate set out in Appendix 4 to Annex I to this Regulation.
3. The specific provisions concerning conformity of production are laid down in Section 4 of Annex I to this Regulation and the relevant statistical methods in Appendices 1 and 2 to that Annex.

*Article 9***In service conformity**

1. The provisions for in-service conformity are laid down in Annex II to this Regulation and, for vehicles type-approved under Council Directive 70/220/EEC ⁽¹⁾, in Annex XV to this Regulation.
2. Measures to ensure in-service conformity of vehicles type-approved under this Regulation or Directive 70/220/EEC shall be taken in accordance with Article 12 of Directive 2007/46/EC.
3. The in-service conformity measures shall be appropriate for confirming the functionality of the pollution control devices during the normal useful life of the vehicles under normal conditions of use as specified in Annex II to this Regulation.
4. The in-service conformity measures shall be checked for a period of up to 5 years of age or 100 000 km, whichever is the sooner.
5. The manufacturer shall not be obliged to carry out an audit of in-service conformity if the number of vehicles sold precludes obtaining sufficient samples to test. Therefore, an audit shall not be required if the annual sales of that vehicle type are less than 5 000 across the Community.

However, the manufacturer of such small series vehicles shall provide the approval authority with a report of any emissions related warranty and repair claims and OBD faults as set out in point 2.3 of Annex II to this Regulation. In addition, the type-approval authority may require such vehicle types to be tested in accordance with Appendix 1 to Annex II to this Regulation.

⁽¹⁾ OJ L 76, 6.4.1970, p. 1.

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6. With regard to vehicles type-approved under this Regulation, where the approval authority is not satisfied with the results of the tests in accordance with the criteria defined in Appendix 2 to Annex II, the remedial measures referred to in Article 30(1) and in Annex X to Directive 2007/46/EC shall be extended to vehicles in service belonging to the same vehicle type which are likely to be affected with the same defects in accordance with section 6 of Appendix 1 to Annex II.

The plan of remedial measures presented by the manufacturer according to section 6.1 of Appendix 1 of Annex II to this Regulation shall be approved by the approval authority. The manufacturer shall be responsible for the execution of the approved remedial plan.

The approval authority shall notify its decision to all Member States within 30 days. Member States may require that the same plan of remedial measures be applied to all vehicles of the same type registered in their territory.

7. If an approval authority has established that a vehicle type does not conform to the applicable requirements of Appendix 1, it shall notify without delay the Member State which granted the original type-approval in accordance with the requirements of Article 30(3) of Directive 2007/46/EC.

Following that notification and subject to the provision of Article 30(6) of Directive 2007/46/EC, the approval authority which granted the original type-approval shall inform the manufacturer that a vehicle type fails to satisfy the requirements of these provisions and that certain measures are expected of the manufacturer. The manufacturer shall submit to that authority, within two months after this notification, a plan of measures to overcome the defects, the substance of which should correspond to the requirements of sections 6.1 to 6.8 of Appendix 1. The approval authority which granted the original type-approval shall, within two months, consult the manufacturer in order to secure agreement on a plan of measures and on the carrying out the plan. If the approval authority which granted the original type-approval establishes that no agreement can be reached, the procedure pursuant to Article 30(3) and (4) of Directive 2007/46/EC shall be initiated

*Article 10***Pollution control devices**

1. The manufacturer shall ensure that replacement pollution control devices intended to be fitted to EC type-approved vehicles covered by the scope of Regulation (EC) No 715/2007 are EC type-approved, as separate technical units within the meaning of Article 10(2) of Directive 2007/46/EC, in accordance with Article 12, Article 13 and Annex XIII to this Regulation.

Catalytic converters and particulate filters shall be considered to be pollution control devices for the purposes of this Regulation.

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The relevant requirements shall be deemed to be met if all the following conditions are fulfilled:

- (a) the requirements of Article 13 are met;
- (b) the replacement pollution control devices have been approved according to UN/ECE Regulation No 103.

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In the case referred to in the third subparagraph Article 14 shall also apply.

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2. Original equipment replacement pollution control devices, which fall within the type covered by point 2.3 of the Addendum to Appendix 4 to Annex I and are intended for fitment to a vehicle to which the relevant type-approval document refers, do not need to comply with Annex XIII provided they fulfil the requirements of points 2.1 and 2.2 of that Annex.

3. The manufacturer shall ensure that the original pollution control device carries identification markings.

4. The identification markings referred to in paragraph 3 shall comprise the following:

- (a) the vehicle or engine manufacturer's name or trade mark;
- (b) the make and identifying part number of the original pollution control device as recorded in the information mentioned in point 3.2.12.2 of Appendix 3 to Annex I.

*Article 11***Application for EC type-approval of a type of replacement pollution control device as a separate technical unit**

1. The manufacturer shall submit to the approval authority an application for EC type-approval of a type of replacement pollution control device as a separate technical unit.

The application shall be drawn up in accordance with the model of the information document set out in Appendix 1 to Annex XIII.

2. In addition to the requirements laid down in paragraph 1, the manufacturer shall submit to the technical service responsible for the type-approval test the following:

- (a) a vehicle or vehicles of a type approved in accordance with this Regulation equipped with a new original equipment pollution control device
- (b) one sample of the type of the replacement pollution control device
- (c) an additional sample of the type of the replacement pollution control device, in the case of a replacement pollution control device intended to be fitted to a vehicle equipped with an OBD system.

3. For the purposes of paragraph 2(a), the test vehicles shall be selected by the applicant with the agreement of the technical service.

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The test vehicles shall comply with the requirements set out in Section 3.1 of Annex 4 to UN/ECE Regulation 83.

The test vehicles shall respect the following requirements:

- (a) they shall have no emission control system defects;
- (b) any excessively worn out or malfunctioning emission-related original part shall be repaired or replaced;
- (c) they shall be tuned properly and set to manufacturer's specification prior to emission testing.

4. For the purposes of points (b) and (c) of paragraph 2, the sample shall be clearly and indelibly marked with the applicant's trade name or mark and its commercial designation.

5. For the purposes of paragraph 2(c), the sample shall have been deteriorated as defined under point 25 of Article 2.

*Article 12***Administrative provisions for EC type-approval of replacement pollution control device as separate technical unit**

1. If all the relevant requirements are met, the type approval authority shall grant an EC type-approval for replacement pollution control devices as separate technical unit and issue a type-approval number in accordance with the numbering system set out in Annex VII to Directive 2007/46/EC.

The approval authority shall not assign the same number to another replacement pollution control device type.

The same type-approval number may cover the use of that replacement pollution control device type on a number of different vehicle types.

2. For the purposes of paragraph 1, the approval authority shall issue an EC type-approval certificate established in accordance with the model set out in Appendix 2 to Annex XIII.

3. If the applicant for type-approval is able to demonstrate to the approval authority or technical service that the replacement pollution control device is of a type indicated in section 2.3 of the Addendum to Appendix 4 to Annex I, the granting of a type-approval shall not be dependent on verification of compliance with the requirements specified in section 4 of Annex XIII.

*Article 13***Access to vehicle OBD and vehicle repair and maintenance information**

1. Manufacturers shall put in place the necessary arrangements and procedures, in accordance with Articles 6 and 7 of Regulation (EC) No 715/2007 and Annex XIV of this regulation, to ensure that vehicle OBD and vehicle repair and maintenance information is readily accessible.

2. Approval authorities shall only grant type-approval after receiving from the manufacturer a Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information.

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3. The Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information shall serve as the proof of compliance with Article 6(7) of Regulation (EC) No 715/2007.
4. The Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information shall be drawn up in accordance with the model set out in Appendix 1 of Annex XIV.
5. If the vehicle OBD and vehicle repair and maintenance information is not available, or does not conform to Article 6 and 7 of Regulation (EC) No 715/2007 and Annex XIV of this Regulation, when the application for type-approval is made, the manufacturer shall provide that information within six months of the relevant date set out in paragraph 2 of Article 10 of Regulation (EC) No 715/2007 or within six months of the date of type-approval, whichever date is later.
6. The obligations to provide information within the dates specified in paragraph 5 shall apply only if, following type-approval, the vehicle is placed on the market.

When the vehicle is placed on the market more than six months after type-approval, the information shall be provided on the date on which the vehicle is placed on the market.

7. The approval authority may presume that the manufacturer has put in place satisfactory arrangements and procedures with regard to access to vehicle OBD and vehicle repair and maintenance information, on the basis of a completed Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information, providing that no complaint was made, and that the manufacturer provides this information within the period set out in paragraph 5.
8. In addition to the requirements for the access to OBD information that are specified in Section 4 of Annex XI, the manufacturer shall make available to interested parties the following information:
 - (a) relevant information to enable the development of replacement components which are critical to the correct functioning of the OBD system.
 - (b) information to enable the development of generic diagnostic tools.

For the purposes of point (a), the development of replacement components shall not be restricted by: the unavailability of pertinent information, the technical requirements relating to malfunction indication strategies if the OBD thresholds are exceeded or if the OBD system is unable to fulfil the basic OBD monitoring requirements of this Regulation; specific modifications to the handling of OBD information to deal independently with vehicle operation on petrol or on gas; and the type-approval of gas-fuelled vehicles that contain a limited number of minor deficiencies.

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For the purposes of point (b), where manufacturers use diagnostic and test tools in accordance with ISO 22900 Modular Vehicle Communication Interface (MVCI) and ISO 22901 Open Diagnostic Data Exchange (ODX) in their franchised networks, the ODX files shall be accessible to independent operators via the web site of the manufacturer.

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9. The Forum on Access to Vehicle Information (the Forum) is hereby established.

The Forum shall consider whether access to information affects the advances made in reducing vehicle theft and shall make recommendations for improving the requirements relating to access to information. In particular, the Forum shall advise the Commission on the introduction of a process for approving and authorising independent operators by accredited organisations to access information on vehicle security.

The Commission may decide to keep the discussions and findings of the Forum confidential.

▼B*Article 14***Compliance with the obligations regarding access to vehicle OBD and vehicle repair and maintenance information**

1. An approval authority may, at any time, whether on its own initiative, on the basis of a complaint, or on the basis of an assessment by a technical service, check the compliance of a manufacturer with the provisions of Regulation (EC) No 715/2007, this Regulation, and the terms of the Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information.

2. Where an approval authority finds that the manufacturer has failed to comply with its obligations regarding access to vehicle OBD and vehicle repair and maintenance information, the approval authority which granted the relevant type approval shall take appropriate steps to remedy the situation.

3. These steps may include withdrawal or suspension of type-approval, fines, or other measures adopted in accordance with Article 13 of Regulation (EC) No 715/2007.

4. The approval authority shall proceed to an audit in order to verify compliance by the manufacturer with the obligations concerning access to vehicle OBD and vehicle repair and maintenance information, if an independent operator or a trade association representing independent operators files a complaint to the approval authority.

5. When carrying out the audit, the approval authority may ask a technical service or any other independent expert to carry out an assessment to verify whether these obligations are met.



Article 15

Special requirements regarding type approval information

1. By way of derogation from Annex I to Council Directive 70/156/EEC ⁽¹⁾ and until 29 April 2009, the additional requirements set out in Annex XVIII to this Regulation shall also apply.
2. By way of derogation from Annex III to Council Directive 70/156/EEC and until 29 April 2009, the additional requirements set out in Annex XIX to this Regulation shall also apply.

Article 16

Amendments to Regulation (EC) No 715/2007

Regulation (EC) No 715/2007 is amended in accordance with Annex XVII to this Regulation.

Article 17

Entry into force

This Regulation shall enter into force on the third day following its publication in the *Official Journal of the European Union*.

However, the obligations set out in Articles 4(5), 4(6), 5(3)(d) and 5(3)(e) shall apply from 1 September 2011 for the type-approval of new types of vehicles and from 1 January 2014 for all new vehicles sold, registered or put into service in the Community.

This Regulation shall be binding in its entirety and directly applicable in all Member States.

⁽¹⁾ OJ L 42, 23.2.1970, p. 1 Directive as last amended by Commission Directive 2007/37/EC

▼B**LIST OF ANNEXES**

ANNEX I	Administrative provisions for EC type-approval
Appendix 1	Verification of conformity of production (1 st statistical method)
Appendix 2	Verification of conformity of production (2 nd statistical method)
Appendix 3	Model information document
Appendix 4	Model EC type-approval certificate
Appendix 5	OBD related information
Appendix 6	EC type-approval certificate numbering system
Appendix 7	Manufacturer's certificate of compliance with OBD in-use performance requirements
ANNEX II	In-service conformity
Appendix 1	In-service conformity check
Appendix 2	Statistical procedure for tailpipe emissions in-service conformity testing
Appendix 3	Responsibilities for in-service conformity
ANNEX III	Verifying average exhaust emissions at ambient conditions (Type 1 test)
ANNEX IV	Emissions data required at type-approval for road-worthiness purposes
Appendix 1	Measuring carbon monoxide emissions at idling speeds (Type 2 test)
Appendix 2	Measurement of smoke opacity
ANNEX V	Verifying emissions of crankcase gases (Type 3 test)
ANNEX VI	Determination of evaporative emissions (Type 4 test)
ANNEX VII	Verifying the durability of pollution control devices (Type 5 test)
Appendix 1	Standard Bench Cycle (SBC)
Appendix 2	Standard Diesel Bench Cycle (SDBC)
Appendix 3	Standard Road Cycle (SRC)
ANNEX VIII	Verifying the average exhaust emissions at low ambient temperatures (Type 6 test)
ANNEX IX	Specifications of reference fuels

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ANNEX X	Emissions test procedure for hybrid electric vehicles (HEV)
ANNEX XI	On-board diagnostics (OBD) for motor vehicles
Appendix 1	Functional aspects of OBD systems
Appendix 2	Essential characteristics of the vehicle family
ANNEX XII	Determination of CO ₂ emissions, fuel consumption, electric energy consumption and electric range
ANNEX XIII	EC Type-approval of replacement pollution control devices as separate technical unit
Appendix 1	Model information document
Appendix 2	Model EC type-approval certificate
Appendix 3	Model EC type-approval mark
ANNEX XIV	Access to vehicle OBD and vehicle repair and maintenance information
Appendix 1	Certificate of compliance
ANNEX XV	In-service conformity of vehicles type-approval under Directive 70/220/EC
Appendix 1	In-service conformity check
Appendix 2	Statistical procedure for in-service conformity testing
ANNEX XVI	Requirements for vehicles that use a reagent for the exhaust aftertreatment system
ANNEX XVII	Amendments to Regulation (EC) No 715/2007
ANNEX XVIII	Special Provisions Regarding Annex I to Council Directive 70/156/EEC
ANNEX XIX	Special Provisions Regarding Annex III to Council Directive 70/156/EEC

▼ M8

ANNEX XX	Measurement of net engine power
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▼B*ANNEX I***ADMINISTRATIVE PROVISIONS FOR EC TYPE-APPROVAL**

1. ADDITIONAL REQUIREMENTS FOR GRANTING OF EC TYPE-APPROVAL

▼M3

- 1.1. **Additional requirements for mono fuel gas vehicles, bi-fuel gas vehicles and flex fuel H2NG vehicles.**

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- 1.1.1. For the purposes of section 1.1 the following definitions shall apply:

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- 1.1.1.1. A family means a group of vehicle types fuelled by LPG, NG/biomethane, H2NG, identified by a parent vehicle.

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- 1.1.1.2. A parent vehicle means a vehicle that is selected to act as the vehicle on which the self adaptability of a fuelling system is going to be demonstrated, and to which the members of a family refer. It is possible to have more than one parent vehicle in a family.

- 1.1.1.3. A member of the family means a vehicle that shares the following essential characteristics with its parent:

- (a) It is produced by the same vehicle manufacturer;
- (b) It is subject to the same emission limits;
- (c) If the gas fuelling system has a central metering for the whole engine, it has a certified power output between 0,7 and 1,15 times that of the engine of the parent vehicle;
- (d) If the gas fuelling system has an individual metering per cylinder, it has a certified power output per cylinder between 0,7 and 1,15 times that of the engine of the parent vehicle;
- (e) If fitted with a catalyst system, it has the same type of catalyst i.e. three-way, oxidation, de NO_x;
- (f) It has a gas fuelling system (including the pressure regulator) from the same system manufacturer and of the same type: induction, vapour injection (single point, multipoint), liquid injection (single point, multipoint);
- (g) This gas fuelling system is controlled by an ECU of the same type and technical specification, containing the same software principles and control strategy. The vehicle may have a second ECU compared to the parent vehicle, provided that the ECU is only used to control the injectors, additional shut-off valves and the data acquisition from additional sensors.

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With regard to the requirements referred to in point (c) and (d), in the case where a demonstration shows two gas fuelled vehicles could be members of the same family with the exception of their certified power output, respectively P_1 and P_2 ($P_1 < P_2$), and both are tested as if they were parent vehicles, the family relation will be considered valid for any vehicle with a certified power output between $0,7 \times P_1$ and $1,15 \times P_2$.

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1.1.2. In case of vehicles fuelled by LPG, NG/biomethane, H2NG, EC type-approval is granted subject to the following requirements:

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1.1.2.1. For the type-approval of a parent vehicle, the parent vehicle shall demonstrate its capability to adapt to any fuel composition that may occur across the market. In the case of LPG there are variations in C3/C4 composition. In the case of natural gas there are generally two types of fuel, high calorific fuel (H-gas) and low calorific fuel (L-gas), but with a significant spread within both ranges; they differ significantly in Wobbe index. These variations are reflected in the reference fuels.

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In the case of a flex fuel H2NG vehicle, the composition range may vary from 0 % hydrogen to a maximum percentage of hydrogen within the mixture, which shall be specified by the manufacturer. The parent vehicle shall demonstrate its capability to adapt to any percentage, within the range specified by the manufacturer. It shall also demonstrate its capability to adapt to any NG/biomethane composition that may occur across the market, regardless of the percentage of hydrogen in the mixture.

1.1.2.2. In the case of vehicles fuelled by LPG, NG/biomethane, the parent vehicle shall be tested in the type 1 test on the two extreme gas reference fuels set out in Annex IX. In the case of NG/biomethane, if the transition from one gas fuel to the other gas fuel is, in practice, aided through the use of a switch, this switch shall not be used during type-approval.

In the case of flex fuel H2NG vehicles, the parent vehicle shall be tested in the type 1 test with the following fuel compositions:

- 100 % H-gas.
- 100 % L-gas.
- The mixture of H-gas and the maximum percentage of hydrogen specified by the manufacturer.
- The mixture of L-gas and the maximum percentage of hydrogen specified by the manufacturer.

1.1.2.3. The vehicle is considered to conform if, under the tests and reference fuels mentioned in point 1.1.2.2, the vehicle complies with the emission limits.

1.1.2.4. In the case of vehicles fuelled by LPG or NG/biomethane, the ratio of emission results 'r' shall be determined for each pollutant as follows:

Type of fuel	Reference fuels	Calculation of 'r'
LPG	fuel A	$r = \frac{B}{A}$
	fuel B	
NG/Biomethane	fuel G20	$r = \frac{G25}{G20}$
	fuel G25	

▼ M3

1.1.2.5. In the case of flex fuel H2NG vehicles, two ratios of emission results 'r₁' and 'r₂', shall be determined for each pollutant as follows:

Type of fuel	Reference fuels	Calculation of 'r'
NG/biomethane	fuel G20	$r_1 = \frac{G25}{G20}$
	fuel G25	
H2NG	Mixture of hydrogen and G20 with the maximum percentage of hydrogen specified by the manufacturer	$r_2 = \frac{H2G25}{H2G20}$
	Mixture of hydrogen and G25 with the maximum percentage of hydrogen specified by the manufacturer	

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1.1.3. ► **M3** For the type-approval of a mono- fuel gas vehicle and bi-fuel gas vehicles operating in gas mode, fuelled by LPG or NG/biomethane, as a member of the family, a type 1 test shall be performed with one gas reference fuel. This reference fuel may be either of the gas reference fuels. The vehicle is considered to comply if the following requirements are met: ◀

- (a) the vehicle complies with the definition of a family member as defined in section 1.1.1.3;
- (b) if the test fuel is the reference fuel A for LPG or G20 for NG/Biomethane, the emission result for each pollutant shall be multiplied by the relevant factor 'r' calculated in section 1.1.2.4 if $r > 1$; if $r < 1$, no correction is needed;
- (c) if the test fuel is the reference fuel B for LPG or G25 for NG/Biomethane, the emission result for each pollutant shall be divided by the relevant factor 'r' calculated in section 1.1.2.4 if $r < 1$; if $r > 1$, no correction is needed;
- (d) on the manufacturer's request the type 1 test may be performed on both reference fuels, so that no correction is needed;
- (e) the vehicle shall comply with the emission limits valid for the relevant category for both measured and calculated emissions;
- (f) if repeated tests are made on the same engine the results on reference fuel G20, or A, and those on reference fuel G25, or B, shall first be averaged; the 'r' factor shall then be calculated from these averaged results;
- (g) during the type 1 test the vehicle shall only use petrol for a maximum of 60 seconds when operating in gas mode.

▼ M3

1.1.4. For the type-approval of a flex fuel H2NG vehicle as a member of a family, two type 1 tests shall be performed, the first test with 100 % of either G20 or G25, and the second test with the mixture of hydrogen and the same NG/biomethane fuel used during the first test, with the maximum hydrogen percentage specified by the manufacturer.

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The vehicle tested in accordance with the first paragraph shall be considered as complying if, in addition to requirements set out in points (a), (e) and (g) of point 1.1.3., the following requirements are met:

- (a) if the NG/biomethane fuel is the reference fuel G20, the emission result for each pollutant shall be multiplied by the relevant factors (r_1 for the first test and r_2 for the second test), calculated in section 1.1.2.5, if the relevant factor > 1 ; if the correspondent relevant factor < 1 , no correction is needed;
- (b) if the NG/biomethane fuel is the reference fuel G25, the emission result for each pollutant shall be divided by the correspondent relevant factor (r_1 for the first test and r_2 for the second test) calculated in accordance with point 1.1.2.5, if the correspondent relevant factor < 1 ; if the correspondent relevant factor > 1 , no correction is needed;
- (c) on the manufacturer's request the type 1 test must be performed with the four possible combinations of reference fuels, according to section 1.1.2.5, so that no correction is needed;
- (d) if repeated tests are made on the same engine the results on reference fuel G20, or H2G20, and those on reference fuel G25, or H2G25 with the maximum hydrogen percentage specified by the manufacturer, shall first be averaged; the ' r_1 ' and ' r_2 ' factors shall then be calculated from these averaged results.

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1.2. Additional requirements for flex fuel vehicles

- 1.2.1. For the type-approval of a flex fuel ethanol or biodiesel vehicle, the vehicle manufacturer shall describe the capability of the vehicle to adapt to any mixture of petrol and ethanol fuel (up to an 85 % ethanol blend) or diesel and biodiesel that may occur across the market.
- 1.2.2. For flex fuel vehicles, the transition from one reference fuel to another between the tests shall take place without manual adjustment of the engine settings.

2. ADDITIONAL TECHNICAL REQUIREMENTS AND TESTS

2.1. Small volume manufacturers

- 2.1.1. List of legislative acts referred to in Article 3(3):

Legislative Act	Requirements
The California Code of Regulations, Title 13, Sections 1961(a) and 1961(b)(1)(C)(1) applicable to 2001 and later model year vehicles, 1968.1, 1968.2, 1968.5, 1976 and 1975, published by Barclay's Publishing	Type-approval must be granted under the California Code of Regulations applicable to the most recent model year of light-duty vehicle.

2.2. Inlets to fuel tanks

- 2.2.1. The inlet orifice of the petrol or ethanol tank shall be designed so that it prevents the tank from being filled from a fuel pump delivery nozzle that has an external diameter of 23,6 mm or greater.

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2.2.2. Section 2.2.1 shall not apply to a vehicle for which both of the following conditions are satisfied:

- (a) the vehicle is designed and constructed so that no device designed to control the emission of gaseous pollutants is adversely affected by leaded petrol, and
- (b) the vehicle is conspicuously, legibly and indelibly marked with the symbol for unleaded petrol specified in ISO 2575:2004 in a position immediately visible to a person filling the fuel tank. Additional markings are permitted.

2.2.3. Provision shall be made to prevent excess evaporative emissions and fuel spillage caused by a missing fuel filler cap. This may be achieved by using one of the following:

- (a) an automatically opening and closing, non-removable fuel filler cap,
- (b) design features which avoid excess evaporative emissions in the case of a missing fuel filler cap,
- (c) any other provision which has the same effect. Examples may include, but are not limited to, a tethered filler cap, a chained filler cap or one utilizing the same locking key for the filler cap as for the vehicle's ignition. In this case the key shall be removable from the filler cap only in the locked condition.

2.3. **Provisions for electronic system security**

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2.3.1. Any vehicle with an emission control computer shall include features to prevent modification, except as authorised by the manufacturer. The manufacturer shall authorise modifications if these modifications are necessary for the diagnosis, servicing, inspection, retrofitting or repair of the vehicle. Any reprogrammable computer codes or operating parameter shall be resistant to tampering and afford a level of protection at least as good as the provisions in ISO 15031-7; dated 15 March 2001 (SAE J2186 dated October 1996). Any removable calibration memory chips shall be potted, encased in a sealed container or protected by electronic algorithms and shall not be changeable without the use of specialised tools and procedures. Only features directly associated with emissions calibration or prevention of vehicle theft may be so protected.

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2.3.2. Computer-coded engine operating parameters shall not be changeable without the use of specialized tools and procedures (e. g. soldered or potted computer components or sealed (or soldered) computer enclosures).

2.3.3. In the case of mechanical fuel-injection pumps fitted to compression-ignition engines, manufacturers shall take adequate steps to protect the maximum fuel delivery setting from tampering while a vehicle is in service.

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- 2.3.4. Manufacturers may apply to the approval authority for an exemption to one of the requirements of Section 2.3 for those vehicles which are unlikely to require protection. The criteria that the approval authority shall evaluate in considering an exemption shall include the current availability of performance chips, the high-performance capability of the vehicle and the projected sales volume of the vehicle.
- 2.3.5. Manufacturers using programmable computer code systems (e.g. electrical erasable programmable read-only memory, EEPROM) shall deter unauthorised reprogramming. Manufacturers shall include enhanced tamper-protection strategies and write-protect features requiring electronic access to an off-site computer maintained by the manufacturer', to which independent operators shall also have access using the protection afforded in Section 2.3.1. and Section 2.2. of Annex XIV. Methods giving an adequate level of tamper protection shall be approved by the approval authority.

▼ M8**2.4. Application of tests**

- 2.4.1. Figure I.2.4 illustrates the application of the tests for type-approval of a vehicle. The specific test procedures are described in Annexes II, III, IV, V, VI, VII, VIII, X, XI, XII, XVI⁽¹⁾ and XX.

⁽¹⁾ Specific test procedures for hydrogen and flex fuel biodiesel vehicles will be defined at a later stage.

Figure 1.2.4

Application of test requirements for type-approval and extensions

Vehicle category	Vehicles with positive ignition engines including hybrids									Vehicles with compression ignition engines including hybrids		Pure electric vehicles	Hydrogen Fuel cell vehicles
	Mono fuel				Bi-fuel ⁽¹⁾			Flex-fuel ⁽¹⁾		Flex fuel	Mono fuel		
Reference fuel	Petrol (E5/E10) ⁽⁵⁾	LPG	NG/Biomethane	Hydrogen	Petrol (E5/E10) ⁽⁵⁾	Petrol (E5/E10) ⁽⁵⁾	Petrol (E5/E10) ⁽⁵⁾	Petrol (E5/E10) ⁽⁵⁾	NG/Biomethane	Diesel (B5/B7) ⁽⁵⁾	Diesel (B5/B7) ⁽⁵⁾	—	—
					LPG	NG/Biomethane	Hydrogen	Ethanol (E85)	H ₂ NG	Biodiesel			
Gaseous pollutants (Type 1 test)	Yes	Yes	Yes	Yes ⁽⁴⁾	Yes (both fuels)	Yes (both fuels)	Yes (both fuels) ⁽⁴⁾	Yes (both fuels)	Yes (both fuels)	Yes (B5/B7 only) ⁽²⁾ ⁽⁵⁾	Yes	—	—
Particulate mass and particulate number (Type 1 test)	Yes	—	—	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (both fuels)	—	Yes (B5/B7 only) ⁽²⁾ ⁽⁵⁾	Yes	—	—
Idle emissions (Type 2 test)	Yes	Yes	Yes	—	Yes (both fuels)	Yes (both fuels)	Yes (petrol only)	Yes (both fuels)	Yes (NG/biomethane only)	—	—	—	—
Crankcase emissions (Type 3 test)	Yes	Yes	Yes	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (NG/biomethane only)	—	—	—	—

▼ M8

Vehicle category	Vehicles with positive ignition engines including hybrids									Vehicles with compression ignition engines including hybrids		Pure electric vehicles	Hydrogen Fuel cell vehicles
	Mono fuel			Bi-fuel ⁽¹⁾			Flex-fuel ⁽¹⁾			Flex fuel	Mono fuel		
Evaporative emissions (Type 4 test)	Yes	—	—	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	—	—	—	—	—
Durability (Type 5 test)	Yes	Yes	Yes	Yes	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes (NG/ biomethane only)	Yes (B5/ B7 only) ⁽²⁾ ⁽⁵⁾	Yes	—	—
Low temperature emissions (Type 6 test)	Yes	—	—	—	Yes (petrol only)	Yes (petrol only)	Yes (petrol only)	Yes ⁽³⁾ (both fuels)	—	—	—	—	—
In-service conformity	Yes	Yes	Yes	Yes	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (B5/ B7 only) ⁽²⁾ ⁽⁵⁾	Yes	—	—
On-board diagnostics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	—	—
CO ₂ emissions, fuel consumption, electric energy consumption and electric range	Yes	Yes	Yes	Yes	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (both fuels)	Yes (B5/ B7 only) ⁽²⁾ ⁽⁵⁾	Yes	Yes	Yes

▼ **M8**

Vehicle category	Vehicles with positive ignition engines including hybrids								Vehicles with compression ignition engines including hybrids		Pure electric vehicles	Hydrogen Fuel cell vehicles		
	Mono fuel				Bi-fuel ⁽¹⁾			Flex-fuel ⁽¹⁾		Flex fuel			Mono fuel	
Smoke opacity	—	—	—	—	—	—	—	—	—	—	Yes (B5/B7 only) ⁽²⁾ ⁽⁵⁾	Yes	—	—
Engine power	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

⁽¹⁾ When a bi-fuel vehicle is combined with a flex fuel vehicle, both test requirements are applicable.

⁽²⁾ This provision is temporary, further requirements for biodiesel shall be proposed later on.

⁽³⁾ Test on petrol only before the dates set out in Article 10(6) of Regulation (EC) No 715/2007. The test will be performed on both fuels after these dates. The E75 test reference fuel specified in Annex IX, Section B, shall be used.

⁽⁴⁾ Only NO_x emissions shall be determined when the vehicle is running on hydrogen.

⁽⁵⁾ Upon the choice of the manufacturer vehicles with positive and compression ignition engines may be tested with either E5 or E10 and either B5 or B7 fuels, respectively. However:

— Not later than sixteen months after the dates set out in Article 10(4) of Regulation (EC) No 715/2007, new type -approvals shall only be performed with E10 and B7 fuels,

— Not later than three years after the dates set out in Article 10(5) of Regulation (EC) No 715/2007, all new vehicles shall be type-approved with E10 and B7 fuels.

Explanatory note:

The dates of application of the reference fuels E10 and B7 for all new vehicles have been set out to minimise the test burden. If, however, technical evidence for vehicles certified with E5 or B5 reference fuels showing significantly higher emissions when tested with E10 or B7 is established, the Commission should make a proposal advancing these introduction dates.

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3. EXTENSIONS TO TYPE-APPROVALS

3.1. **Extensions for tailpipe emissions (type 1, type 2 and type 6 tests)**

3.1.1. Vehicles with different reference masses

3.1.1.1. The type-approval shall be extended only to vehicles with a reference mass requiring the use of the next two higher equivalent inertia or any lower equivalent inertia.

3.1.1.2. For category N vehicles, the approval shall be extended only to vehicles with a lower reference mass, if the emissions of the vehicle already approved are within the limits prescribed for the vehicle for which extension of the approval is requested.

3.1.2. Vehicles with different overall transmission ratios

3.1.2.1. The type-approval shall be extended to vehicles with different transmission ratios only under certain conditions.

3.1.2.2. To determine whether type-approval can be extended, for each of the transmission ratios used in the type 1 and type 6 tests, the proportion,

$$E = (V_2 - V_1)/V_1$$

shall be determined where, at an engine speed of 1 000 rpm, V_1 is the speed of the vehicle-type approved and V_2 is the speed of the vehicle type for which extension of the approval is requested.

3.1.2.3. If, for each transmission ratio, $E \leq 8\%$, the extension shall be granted without repeating the type 1 and type 6 tests.

3.1.2.4. If, for at least one transmission ratio, $E > 8\%$, and if, for each gear ratio, $E \leq 13\%$, the type 1 and type 6 tests shall be repeated. The tests may be performed in a laboratory chosen by the manufacturer subject to the approval of the technical service. The report of the tests shall be sent to the technical service responsible for the type-approval tests.

3.1.3. Vehicles with different reference masses and transmission ratios

The type-approval shall be extended to vehicles with different reference masses and transmission ratios, provided that all the conditions prescribed in 3.1.1 and 3.1.2 are fulfilled.

3.1.4. Vehicles with periodically regenerating systems

The type-approval of a vehicle type equipped with a periodically regenerating system shall be extended to other vehicles with periodically regenerating systems, whose parameters described below are identical, or within the stated tolerances. The extension shall only relate to measurements specific to the defined periodically regenerating system.

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3.1.4.1. Identical parameters for extending approval are:

- (1) Engine,
- (2) Combustion process,
- (3) Periodically regenerating system (i.e. catalyst, particulate trap),
- (4) Construction (i.e. type of enclosure, type of precious metal, type of substrate, cell density),
- (5) Type and working principle,
- (6) Dosage and additive system,
- (7) Volume \pm 10 per cent,
- (8) Location (temperature \pm 50 °C at 120 km/h or 5 per cent difference of max. temperature/pressure).

3.1.4.2. Use of Ki factors for vehicles with different reference masses

The Ki factors developed by the procedures in section 3 of Annex 13 of UN/ECE Regulation No 83 for type-approval of a vehicle type with a periodically regenerating system, may be used by other vehicles which meet the criteria referred to in section 3.1.4.1 and have a reference mass within the next two higher equivalent inertia classes or any lower equivalent inertia.

3.1.5. Application of extensions to other vehicles

When an extension has been granted in accordance with 3.1.1 to 3.1.4, such a type-approval shall not be further extended to other vehicles.

3.2. Extensions for evaporative emissions (type 4 test)

3.2.1. The type-approval shall be extended to vehicles equipped with a control system for evaporative emissions which meet the following conditions:

3.2.1.1. The basic principle of fuel/air metering (e.g. single point injection) is the same.

3.2.1.2. The shape of the fuel tank and the material of the fuel tank and liquid fuel hoses is identical.

3.2.1.3. The worst-case vehicle with regard to the cross-section and approximate hose length shall be tested. Whether non-identical vapour/liquid separators are acceptable is decided by the technical service responsible for the type-approval tests.

3.2.1.4. The fuel tank volume is within a range of \pm 10 %.

3.2.1.5. The setting of the fuel tank relief valve is identical.

3.2.1.6. The method of storage of the fuel vapour is identical, i.e. trap form and volume, storage medium, air cleaner (if used for evaporative emission control), etc.

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- 3.2.1.7. The method of purging of the stored vapour is identical (e.g. air flow, start point or purge volume over the preconditioning cycle).
- 3.2.1.8. The method of sealing and venting of the fuel metering system is identical.
- 3.2.2. The type-approval shall be extended to vehicles with:
- 3.2.2.1. different engine sizes;
- 3.2.2.2. different engine powers;
- 3.2.2.3. automatic and manual gearboxes;
- 3.2.2.4. two and four wheel transmissions;
- 3.2.2.5. different body styles; and
- 3.2.2.6. different wheel and tyre sizes.
- 3.3. **Extensions for durability of pollution control devices (type 5 test)**
- 3.3.1. The type-approval shall be extended to different vehicle types, provided that the vehicle, engine or pollution control system parameters specified below are identical or remain within the prescribed tolerances:
- 3.3.1.1. Vehicle:
- Inertia category: the two inertia categories immediately above and any inertia category below.
- Total road load at 80 km/h: + 5 % above and any value below.
- 3.3.1.2. Engine
- (a) engine cylinder capacity ($\pm 15\%$),
- (b) number and control of valves,
- (c) fuel system,
- (d) type of cooling system,
- (e) combustion process.
- 3.3.1.3. Pollution control system parameters:
- (a) Catalytic converters and particulate filters:
- number of catalytic converters, filters and elements,
- size of catalytic converters and filters (volume of monolith $\pm 10\%$),
- type of catalytic activity (oxidizing, three-way, lean NO_x trap, SCR, lean NO_x catalyst or other),
- precious metal load (identical or higher),
- precious metal type and ratio ($\pm 15\%$),
- substrate (structure and material),

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cell density,

temperature variation of no more than 50 K at the inlet of the catalytic converter or filter. This temperature variation shall be checked under stabilized conditions at a speed of 120 km/h and the load setting of the type 1 test.

(b) Air injection:

with or without

type (pulsair, air pumps, other(s))

(c) EGR:

with or without

type (cooled or non cooled, active or passive control, high pressure or low pressure).

3.3.1.4. The durability test may be carried out using a vehicle, which has a different body style, gear box (automatic or manual) and size of the wheels or tyres, from those of the vehicle type for which the type-approval is sought.

3.4. **Extensions for on-board diagnostics**

3.4.1. The type-approval shall be extended to different vehicles with identical engine and emission control systems as defined in Annex XI, Appendix 2. The type-approval shall be extended regardless of the following vehicle characteristics:

(a) engine accessories;

(b) tyres;

(c) equivalent inertia;

(d) cooling system;

(e) overall gear ratio;

(f) transmission type; and

(g) type of bodywork.

3.5. **Extensions for CO₂ emissions and fuel consumption**

3.5.1. Vehicles powered by an internal combustion engine only, except vehicles equipped with a periodically regenerating emission control system.

3.5.1.1. The type-approval shall be extended to vehicles differing with regard to the following characteristics, if the CO₂ emissions measured by the technical service do not exceed the type-approval value by more than 4 % for vehicles of category M and 6 % for vehicles of category N:

— reference mass,

— technically permissible maximum laden mass,

— type of bodywork as defined in Section C of Annex II of Directive 2007/46/EC,

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- overall gear ratios,
- engine equipment and accessories.,

3.5.2. Vehicles powered by an internal combustion engine only and equipped with a periodically regenerating emission control system

3.5.2.1. The type-approval shall be extended to vehicles, differing with regard to the characteristics given in Section 3.5.1.1 above, but not exceeding the family characteristics of UN/ECE Regulation No 101 ⁽¹⁾, Annex 10, if the CO₂ emissions measured by the technical service do not exceed the type approved value by more than 4 % for vehicles of category M and 6 % for vehicles of category N, and where the same Ki factor is applicable.

3.5.2.2. The type-approval shall be extended to vehicles with a different Ki factor, if the CO₂ emissions measured by the technical service do not exceed the type approved value by more than 4 % for vehicles of category M and 6 % for vehicles of category N.

3.5.3. Vehicles powered by an electric power train only

Extensions shall be granted after agreement with the technical service responsible for conducting the tests.

3.5.4. Vehicles powered by a hybrid electric power train

The type-approval shall be extended to vehicles differing with regard to the following characteristics, if the CO₂ emissions and the electric energy consumption measured by the technical service do not exceed the type approved value by more than 4 % for vehicles of category M and 6 % for vehicles of category N:

- reference mass,
- technically permissible maximum laden mass,
- Type of bodywork as defined in Section C of Annex II of Directive 2007/46/EC,
- With respect to a change in any other characteristic extensions may be granted after agreement with the technical service responsible for conducting the tests.,

3.5.5. Extension of type-approval of vehicles of category N within a family:

3.5.5.1. For vehicles of category N that are approved as members of a vehicle family using the procedure in Section 3.6.2, the type-approval shall be extended to vehicles from within the same family only if the technical service estimates that the fuel consumption of the new vehicle does not exceed the fuel consumption of the vehicle on which the family's fuel consumption is based.

Type-approvals may also be extended to vehicles which:

- are up to 110 kg heavier than the family member tested, provided that they are within 220 kg of the lightest member of the family,

⁽¹⁾ OJ L 158, 19.6.2007, p. 34

▼B

— have a lower overall transmission ratio than the family member tested due solely to a change in tyre sizes, and,

— conform with the family in all other respects.,

3.5.5.2. For vehicles of category N that are type-approved as members of a vehicle family using the procedure in point 3.6.3, the type-approval can be extended to vehicles from within the same family without additional testing only if the technical service estimates that the fuel consumption of the new vehicle falls within the limits made up of those two vehicles in the family that have the lowest and the highest fuel consumption, respectively.

3.6. Type-approval of vehicles of category N within a family for fuel consumption and CO₂ emissions

Vehicles of category N shall be type-approved within a family as defined in point 3.6.1 using one of the two alternative methods described in points 3.6.2 and 3.6.3.

3.6.1. N vehicles may be grouped together into a family for the purposes of measurement of fuel consumption and CO₂ emissions if the following parameters are identical or within the specified limits:

3.6.1.1. Identical parameters shall be the following:

— manufacturer and type as defined in section I of Appendix 4,

— engine capacity,

— emission control system type,

— fuel system type as defined in point 1.10.2 of Appendix 4.,

3.6.1.2. The following parameters shall be within the following limits:

— transmission overall ratios (no more than 8 % higher than the lowest) as defined in point 1.13.3 of Appendix 4,

— reference mass (no more than 220 kg lighter than the heaviest),

— frontal area (no more than 15 % smaller than the largest),

— engine power (no more than 10 % less than the highest value).

3.6.2. A vehicle family, as defined in point 3.6.1, may be approved with CO₂ emission and fuel consumption data that are common to all members of the family. The technical service shall select for testing the member of the family which the service considers to have the highest CO₂ emission. The measurements shall be performed as described in Annex XII, and the results according to the method described in section 5.5 of UN/ECE Regulation No 101 shall be used as type-approval values that are common to all members of the family.

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- 3.6.3. Vehicles that are grouped in a family as defined in point 3.6.1 may be approved with individual CO₂ emission and fuel consumption data for each of the family members. The technical service shall select for testing the two vehicles, which the service considers to have the highest and the lowest CO₂ emissions respectively. The measurements shall be performed as described in Annex XII. If the manufacturer's data for these two vehicles falls within the tolerance limits described in section 5.5 of UN/ECE Regulation No 101, the CO₂ emissions declared by the manufacturer for all members of the vehicle family can be used as type-approval values. If the manufacturer's data do not fall within the tolerance limits, the results according to the method described in section 5.5 of UN/ECE Regulation No 101 shall be used as type-approval values and the technical service shall select an appropriate number of other family members for additional tests.

4. CONFORMITY OF PRODUCTION

4.1. Introduction

- 4.1.1. Where applicable the tests of types 1, 2, 3, 4, the test for OBD, the test for CO₂ emissions and fuel consumption and the test for smoke opacity shall be performed, as described in section 2.4. The specific procedures for conformity of production are set out in the sections 4.2 to 4.10.

4.2. Checking the conformity of the vehicle for a type 1 test

- 4.2.1. The type 1 test shall be carried out on a vehicle of the same specification as described in the type-approval certificate. When a type 1 test is to be carried out for a vehicle type-approval that has one or several extensions, the type 1 tests shall be carried out either on the vehicle described in the initial information package or on the vehicle described in the information package relating to the relevant extension.

- 4.2.2. After selection by the approval authority, the manufacturer shall not undertake any adjustment to the vehicles selected.

- 4.2.2.1. Three vehicles shall be selected at random in the series and tested as described in Annex III to this Regulation. The deterioration factors shall be used in the same way. The limit values are set out in Tables 1 and 2 of Annex I to Regulation (EC) No 715/2007.

- 4.2.2.2. If the approval authority is satisfied with the production standard deviation given by the manufacturer in accordance with Annex X to Directive 2007/46/EC, the tests shall be carried out according to Appendix 1 of this Annex.

If the approval authority is not satisfied with the production standard deviation given by the manufacturer in accordance with Annex X to Directive 2007/46/EC, the tests shall be carried out according to Appendix 2 of this Annex.

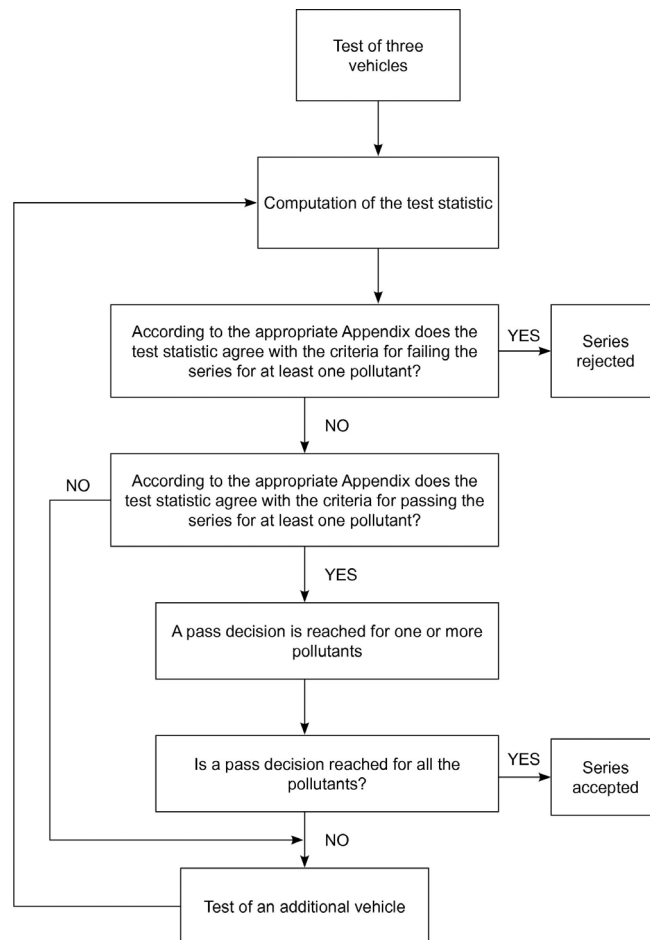
- 4.2.2.3. The production of a series shall be deemed to conform or not to conform on the basis of a sampling test of the vehicles once a pass decision is reached for all the pollutants or a fail decision is reached for one pollutant, according to the test criteria applied in the appropriate appendix.

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When a pass decision has been reached for one pollutant, that decision shall not be changed by any additional tests carried out to reach a decision for the other pollutants.

If no pass decision is reached for all the pollutants and no fail decision is reached for one pollutant, a test shall be carried out on another vehicle (see Figure I.4.2).

Figure I.4.2



4.2.3. Notwithstanding the requirements of Annex III, the tests shall be carried out on vehicles coming straight off the production line.

4.2.3.1. However, at the request of the manufacturer, the tests may be carried out on vehicles which have completed:

- (a) A maximum of 3 000 km for vehicles equipped with a positive ignition engine;
- (b) A maximum of 15 000 km for vehicles equipped with a compression ignition engine.

The running-in procedure shall be conducted by the manufacturer, who shall undertake not to make any adjustments to these vehicles.

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4.2.3.2. If the manufacturer wishes to run in the vehicles, ('x' km, where $x \leq 3\,000$ km for vehicles equipped with a positive ignition engine and $x \leq 15\,000$ km for vehicles equipped with a compression ignition engine), the procedure shall be the following:

- (a) the pollutant emissions (type 1) shall be measured at zero and at 'x' km on the first tested vehicle;
- (b) the evolution coefficient of the emissions between zero and 'x' km shall be calculated for each of the pollutant:

$$\text{Emissions 'x' km/Emissions zero km}$$

This may be less than 1; and

- (c) the other vehicles shall not be run in, but their zero km emissions shall be multiplied by the evolution coefficient. In this case, the values to be taken shall be:
 - (i) the values at 'x' km for the first vehicle;
 - (ii) the values at zero km multiplied by the evolution coefficient for the other vehicles.

4.2.3.3. All these tests shall be conducted with commercial fuel. However, at the manufacturer's request, the reference fuels described in Annex IX may be used.

4.3. **Checking the conformity of the vehicle for CO₂ emissions**

4.3.1. If a vehicle type has had one or several extensions, the tests shall be carried out on the vehicle(s) described in the information package which accompanied the first type-approval application, or on the vehicle described in the information package that accompanied the relevant extension.

4.3.2. If the approval authority is not satisfied with the auditing procedure of the manufacturer, points 3.3 and 3.4 of Annex X to Directive 2007/46/EC shall apply.

4.3.3. For the purpose of this section and Appendices 1 and 2, the term 'pollutant' shall include the regulated pollutants (given in Tables 1 and 2 of Annex I to Regulation (EC) No 715/2007) and the emission of CO₂.

4.3.4. The conformity of the vehicle for CO₂ emissions shall be determined in accordance with the procedure described in point 4.2.2. with the following exceptions:

4.3.4.1. The provisions of Section 4.2.2.1 shall be replaced by the following:

Three vehicles shall be randomly taken in the series and tested as described in Annex XII.

4.3.4.2. The provisions of Section 4.2.3.1 shall be replaced by the following:

However, at the request of the manufacturer, the tests may be carried out on vehicles which have completed a maximum of 15 000 km.

In this case, the running-in procedure shall be conducted by the manufacturer, who shall undertake not to make any adjustments to these vehicles.

▼ B

4.3.4.3. The provisions of Section 4.2.3.2 shall be replaced by the following:

If the manufacturer wishes to run in the vehicles, ('x' km, where $x \leq 15\,000$ km), the procedure shall be the following:

- (a) the pollutant emissions shall be measured at zero and at 'x' km on the first tested vehicle;
- (b) the evolution coefficient of the emissions between zero and 'x' km shall be calculated for each of the pollutant:

$$\text{Emissions 'x' km/Emissions zero km}$$

This may be less than 1; and

- (c) the other vehicles shall not be run in, but their zero km emissions shall be multiplied by the evolution coefficient. In this case, the values to be taken shall be:

- (i) the values at 'x' km for the first vehicle;
- (ii) the values at zero km multiplied by the evolution coefficient for the other vehicles.

4.3.4.4. The provisions of Section 4.2.3.3 shall be replaced by the following:

The reference fuels described in Annex IX of this Regulation, shall be used for testing.

4.3.4.5. When checking the conformity of vehicle for CO₂ emissions, as an alternative to the procedure mentioned in Section 4.3.4.3, the vehicle manufacturer may use a fixed evolution coefficient EC of 0,92 and multiply all values of CO₂ measured at zero km by this factor.

▼ M6

4.3.5. Vehicle fitted with eco-innovations

▼ M9

4.3.5.1. In the case of a vehicle type fitted with one or more eco-innovations, within the meaning of Article 12 of Regulation (EC) No 443/2009 for M₁ vehicles or Article 12 of Regulation (EU) No 510/2011 for N₁ vehicles, the conformity of production shall be demonstrated with respect to the eco-innovations, by performing the tests provided for in the Commission Decision(s) approving the eco-innovation(s) in question.

▼ M6

4.3.5.2. Points 4.3.1, 4.3.2 and 4.3.4 shall apply.

▼ B**4.4. Vehicles powered by an electric power train only**

Measures to ensure the conformity of production with regard to electric energy consumption shall be checked on the basis of the description in the type-approval certificate set out in Appendix 4 to this Annex.

4.4.1. The holder of the approval shall, in particular:

- 4.4.1.1. Ensure the existence of procedures for the effective control of production quality;
- 4.4.1.2. Have access to the equipment necessary for checking conformity with each approved type;
- 4.4.1.3. Ensure that the data concerning the test result are recorded and that the annexed documents are available during a period to be agreed with the administrative service;
- 4.4.1.4. Analyse the results of each type of test so as to monitor and ensure the consistency of the characteristics of the product, taking into account the variations admissible in industrial manufacture;

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- 4.4.1.5. Make sure that for each type of vehicle tests referred to in Annex XII to this Regulation are carried out; notwithstanding the requirements of paragraph 2.3.1.6 of Annex 7 of UN/ECE Regulation No 101, at the request of the manufacturer, the tests shall be carried out on vehicles which have not travelled any distance;
- 4.4.1.6. Make sure that any collections of samples or test pieces demonstrating non-conformity with the type test under consideration is followed by a subsequent sampling and a further test. All necessary steps shall be taken to re-establish the conformity of production.
- 4.4.2. The approval authorities may verify at any time the methods applied in each production unit.
- 4.4.2.1. In every inspection, the records of tests and production monitoring shall be communicated to the visiting inspector.
- 4.4.2.2. The inspector may select at random the samples to be tested in the manufacturer's laboratory. The minimum number of samples shall be determined on the basis of the results of the manufacturer's own checks.
- 4.4.2.3. When the quality standard does not seem satisfactory or when it seems necessary to verify the validity of the tests conducted under Section 4.4.2.2, the inspector shall collect samples to be sent to the technical service which carried out the approval tests.
- 4.4.2.4. The approval authorities may carry out all the tests set out in this Regulation.
- 4.5. Vehicles powered by a hybrid electric power train**
- 4.5.1. Measures to ensure the conformity of production with regard to CO₂ emissions and electric energy consumption from hybrid electric vehicles shall be checked on the basis of the description in the type-approval certificate conforming to the model in Appendix 4.
- 4.5.2. The control of production conformity shall be based on an assessment made by the approval authority of the manufacturer's auditing procedure in order to ensure conformity of the vehicle type with respect to the emission of CO₂ and the electric energy consumption.
- 4.5.3. If the approval authority is not satisfied with the standard of the manufacturer's auditing procedure, it shall require that verification tests be carried out on vehicles in production.
- 4.5.4. Conformity for CO₂ emissions shall be checked using the statistical procedures described in Section 4.3 and Appendices 1 and 2. Vehicles shall be tested according to the procedure referred to in Annex XII.
- 4.6. Checking the conformity of the vehicle for a type 3 test**
- 4.6.1. If a type 3 test is to be carried out, it shall be conducted on all vehicles selected for the type 1 conformity of production test set out in section 4.2. The conditions laid down in Annex V shall apply.
- 4.7. Checking the conformity of the vehicle for a type 4 test**
- 4.7.1. If a type 4 test is to be carried out, it shall be conducted in accordance with Annex VI.

▼ B**4.8. Checking the conformity of the vehicle for On-board Diagnostics (OBD)**

- 4.8.1. If a verification of the performance of the OBD system is to be carried out, it shall be conducted in accordance with the following requirements:
 - 4.8.1.1. When the approval authority determines that the quality of production seems unsatisfactory, a vehicle shall be randomly taken from the series and subjected to the tests described in Appendix 1 to Annex XI.
 - 4.8.1.2. The production shall be deemed to conform if this vehicle meets the requirements of the tests described in Appendix 1 to Annex XI.
 - 4.8.1.3. If the vehicle taken from the series does not satisfy the requirements of section 4.8.1.1, a further random sample of four vehicles shall be taken from the series and subjected to the tests described in Appendix 1 to Annex XI. The tests may be carried out on vehicles which have been run in for no more than 15 000 km.
 - 4.8.1.4. The production shall be deemed to conform if at least 3 vehicles meet the requirements of the tests described in Annex XI, Appendix 1.

▼ M3**4.9. Checking the conformity of a vehicle fuelled by LPG, natural gas or H2NG**

- 4.9.1. Tests for conformity of production may be performed with a commercial fuel of which the C3/C4 ratio lies between those of the reference fuels in the case of LPG, or of which the Wobbe index lies between those of the extreme reference fuels in the case of NG or H2NG. In that case a fuel analysis shall be presented to the approval authority.

▼ B**4.10. Checking the conformity of vehicle for smoke opacity**

- 4.10.1. Conformity of the vehicle with the approved type as regards the emission of pollutants from compression ignition engines shall be verified on the basis of the results listed in the Addendum to the type-approval certificate set out in point 2.4 of Appendix 4.
- 4.10.2. In addition to point 10.1, where a check is carried out on a vehicle taken from the series, the tests shall be carried out as follows:
 - 4.10.2.1 A vehicle which has not been run in shall be subjected to the test under free acceleration described in section 4.3 of Appendix 2 to Annex IV. The vehicle shall be deemed to conform to the approved type if the absorption coefficient determined does not exceed by more than 0.5 m^{-1} the figure shown in the approval mark.
 - 4.10.2.2 If the figure determined in the test referred to in point 4.10.2.1. exceeds by more than 0.5 m^{-1} the figure shown in the approval mark, a vehicle of the type considered or its engine shall be subjected to the test at steady speeds over the full-load curve, as described in section 4.2 of Appendix 2 to Annex IV. The emission levels shall not exceed the limits prescribed in Annex 7 to UN/ECE Regulation No 24 ⁽¹⁾.

⁽¹⁾ OJ L 326, 24.11.2006, p. 1.

▼B*Appendix 1***Verification of conformity of production — First statistical method**

1. The first statistical method shall be used to verify the production conformity for the type 1 test when the manufacturer's production standard deviation is satisfactory. The applicable statistical method is set out in Appendix 1 to UN/ECE Regulation No 83. The exceptions to these procedures are the following:
 - 1.1. In paragraph 3, the reference to paragraph 5.3.1.4 shall be understood as reference to the applicable table of Annex I to Regulation (EC) No 715/2007.
 - 1.2. In paragraph 3, the reference to Figure 2 shall be understood as reference to Figure 1.4.2 of Regulation (EC) No 692/2008.

▼B*Appendix 2***Verification of conformity of production — Second statistical method**

1. The second statistical method shall be used to verify the production conformity requirements for the type 1 test when the manufacturer's evidence of production standard deviation is either unsatisfactory or unavailable. The applicable statistical method is set out in Appendix 2 to UN/ECE Regulation No 83, The exceptions to these procedures are the following:
 - 1.1. In paragraph 3, the reference to paragraph 5.3.1.4 shall be understood as reference to the applicable table of Annex I to Regulation (EC) No 715/2007.

▼B*Appendix 3*

MODEL

INFORMATION DOCUMENT No ...**relating to EC type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information**

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

If the systems, components or separate technical units have electronic controls, information concerning their performance must 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, if marked on the vehicle ⁽¹⁾ ^(a)
- 0.3.1. Location of that marking:
- 0.4. Category of vehicle ^(b):
- 0.5. Name and address of manufacturer:
- 0.8. Name(s) and address(es) of assembly plant(s):
- 0.9. Name and address of the manufacturer's representative (if any)
- 1. GENERAL CONSTRUCTION CHARACTERISTICS OF THE VEHICLE
- 1.1. Photographs and/or drawings of a representative vehicle: ...
- 1.3.3. Powered axles (number, position, interconnection):
- 2. MASSES AND DIMENSIONS ^(c) (in kg and mm)
(Refer to drawing where applicable)

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

^(a) If the means of identification of type contains characters not relevant to describe the vehicle, component or separate technical unit types covered by this information document, such characters shall be represented in the documentation by the symbol.?. (e.g. ABC??123??).

^(b) Classified according to the definitions listed in Annex II, Section A.

^(c) (e) Where there is one version with a normal cab and another with a sleeper cab, both sets of masses and dimensions are to be stated.

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- 2.6. Mass of the vehicle with bodywork and, in the case of the towing vehicle of a category other than M₁, with coupling device, if fitted by the manufacturer, in running order, or mass of the chassis or chassis with cab, without bodywork and/or coupling device if the manufacturer does not fit the bodywork and/or coupling device (including liquids, tools, spare wheel, if fitted, and driver and, for buses and coaches, a crew member if there is a crew seat in the vehicle)^(a) (maximum and minimum for each variant):
- 2.8. Technically permissible maximum laden mass stated by the manufacturer^(b) (*)

▼ M4

- 2.17. Vehicle submitted to multi-stage type-approval (only in the case of incomplete or completed vehicles of category N₁ within the scope of Regulation (EC) No 715/2007): yes/no⁽¹⁾
- 2.17.1. Mass of the base vehicle in running order: kg
- 2.17.2. Default added mass, calculated in accordance with Section 5 of Annex XII to Regulation (EC) No 692/2008: kg

▼ B

3. POWER PLANT^(c) (In the case of a vehicle that can run either on petrol, diesel, etc., or also in combination with another fuel, items shall be repeated (**))
- 3.1. Manufacturer:
- 3.1.1. Manufacturer's engine code as marked on the engine:
- 3.2. Internal combustion engine
- 3.2.1.1. Working principle: positive ignition/compression ignition⁽¹⁾
- four stroke/two stroke/rotary cycle⁽¹⁾
- 3.2.1.2. Number and arrangement of cylinders:
- 3.2.1.2.1. Bore^(d): mm
- 3.2.1.2.2. Stroke^(d): mm
- 3.2.1.2.3. Firing order:
- 3.2.1.3. Engine capacity (s): cm³

^(a) The mass of the driver and, if applicable, of the crew member is assessed at 75 kg (subdivided into 68 kg occupant mass and 7 kg luggage mass according to ISO Standard 2416-1992), the fuel tank is filled to 90 % and the other liquid containing systems (except those for used water) to 100 % of the capacity specified by the manufacturer.

^(b) For trailers or semi-trailers, and for vehicles coupled with a trailer or a semi-trailer, which exert a significant vertical load on the coupling device or the fifth wheel, this load, divided by standard acceleration of gravity, is included in the maximum technical permissible mass.

(*) Please fill in here the upper and lower values for each variant.

^(c) In the case of non-conventional engines and systems, particulars equivalent to those referred to here shall be supplied by the manufacturer.

(**) Vehicles can be fuelled with both petrol and a gaseous fuel but, where the petrol system is fitted for emergency purposes or starting only and of which the petrol tank cannot contain more than 15 litres of petrol, will be regarded for the test as vehicles which can only run a gaseous fuel.

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

^(d) This figure must be rounded off to the nearest tenth of a millimetre.

▼ B

- 3.2.1.4. Volumetric compression ratio ⁽¹⁾
- 3.2.1.5. Drawings of combustion chamber, piston crown and, in the case of positive ignition engine, piston rings:
- 3.2.1.6. Normal engine idling speed ⁽¹⁾ min⁻¹
- 3.2.1.6.1. High engine idling speed ⁽¹⁾ min⁻¹
- 3.2.1.7. Carbon monoxide content by volume in the exhaust gas with the engine idling ⁽¹⁾ as stated by the manufacturer (positive ignition engines only)
- 3.2.1.8. Maximum net power ► **M8** ^(a) ◀ kW at min⁻¹ (manufacturer's declared value)
- 3.2.1.9. Maximum permitted engine speed as prescribed by the manufacturer: min⁻¹
- 3.2.1.10. Maximum net torque ► **M8** ^(a) ◀: Nm at min⁻¹ (manufacturer's declared value)

▼ M3

- 3.2.2. Fuel
- 3.2.2.1. Light-duty vehicles: Diesel/Petrol/LPG/NG or Biomethane/Ethanol (E85) /Biodiesel /Hydrogen/H2NG ⁽²⁾ ⁽³⁾

▼ B

- 3.2.2.2. RON, unleaded:
- 3.2.2.3. Fuel tank inlet: restricted orifice/label ⁽²⁾
- 3.2.2.4. Vehicle fuel type: Mono fuel, Bi fuel, Flex fuel
- 3.2.2.5. Maximum amount of biofuel acceptable in fuel (manufacturer's declared value): % by volume
- 3.2.4. Fuel feed
- 3.2.4.2. By fuel injection (compression ignition only): yes/no ⁽²⁾
- 3.2.4.2.1. System description:
- 3.2.4.2.2. Working principle: direct injection/pre-chamber/swirl chamber ⁽²⁾
- 3.2.4.2.3. Injection pump
- 3.2.4.2.3.1. Make(s):
- 3.2.4.2.3.2. Type(s):
- 3.2.4.2.3.3. Maximum fuel delivery ⁽²⁾ ⁽¹⁾ ... mm³/stroke or cycle at an engine speed of: min⁻¹ or, alternatively, a characteristic diagram:
- 3.2.4.2.3.5. Injection advance curve ⁽¹⁾:
- 3.2.4.2.4. Governor
- 3.2.4.2.4.2. Cut-off point

⁽¹⁾ Specify the tolerance.

^(a) Determined in accordance with the requirements of Annex XX to this Regulation.

⁽²⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

⁽³⁾ Vehicles can be fuelled with both petrol and a gaseous fuel but, where the petrol system is fitted for emergency purposes or starting only and of which the petrol tank cannot contain more than 15 litres of petrol, will be regarded for the test as vehicles which can only run on a gaseous fuel.

▼B

- 3.2.4.2.4.2.1. Cut-off point under load min⁻¹
- 3.2.4.2.4.2.2. Cut-off point without load min⁻¹
- 3.2.4.2.6. Injector(s)
- 3.2.4.2.6.1. Make(s):
- 3.2.4.2.6.2. Type(s):
- 3.2.4.2.7. Cold start system
- 3.2.4.2.7.1. Make(s):
- 3.2.4.2.7.2. Type(s):
- 3.2.4.2.7.3. Description:
- 3.2.4.2.8. Auxiliary starting aid
- 3.2.4.2.8.1. Make(s):
- 3.2.4.2.8.2. Type(s):
- 3.2.4.2.8.3. System description:
- 3.2.4.2.9. Electronic controlled injection: yes/no ⁽¹⁾
- 3.2.4.2.9.1. Make(s):
- 3.2.4.2.9.2. Type(s):
- 3.2.4.2.9.3. Description of the system, in the case of systems other than continuous injection give equivalent details:
- 3.2.4.2.9.3.1. Make and type of the control unit:
- 3.2.4.2.9.3.2. Make and type of the fuel regulator:
- 3.2.4.2.9.3.3. Make and type of air-flow sensor:
- 3.2.4.2.9.3.4. Make and type of fuel distributor:
- 3.2.4.2.9.3.5. Make and type of throttle housing:
- 3.2.4.2.9.3.6. Make and type of water temperature sensor:
- 3.2.4.2.9.3.7. Make and type of air temperature sensor:
- 3.2.4.2.9.3.8. Make and type of air pressure sensor:
- 3.2.4.3. By fuel injection (positive ignition only): yes/no ⁽¹⁾
- 3.2.4.3.1. Working principle: intake manifold (single-/multi-point ⁽¹⁾)/ direct injection/other (specify) ⁽¹⁾
- 3.2.4.3.2. Make(s):
- 3.2.4.3.3. Type(s):
- 3.2.4.3.4. System description, in the case of systems other than continuous injection give equivalent details:
- 3.2.4.3.4.1. Make and type of the control unit:
- 3.2.4.3.4.3. Make and type of air-flow sensor:
- 3.2.4.3.4.6. Make and type of micro switch:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼ B

- 3.2.4.3.4.8. Make and type of throttle housing:
- 3.2.4.3.4.9. Make and type of water temperature sensor:
- 3.2.4.3.4.10. Make and type of air temperature sensor:
- 3.2.4.3.4.11. Make and type of air pressure sensor:
- 3.2.4.3.5. Injectors: opening pressure ⁽¹⁾: kPa or characteristic diagram:
- 3.2.4.3.5.1. Make(s):
- 3.2.4.3.5.2. Type(s):
- 3.2.4.3.6. Injection timing:
- 3.2.4.3.7. Cold start system
- 3.2.4.3.7.1. Operating principle(s):
- 3.2.4.3.7.2. Operating limits/settings ⁽²⁾ ⁽¹⁾:
- 3.2.4.4. Feed pump
- 3.2.4.4.1. Pressure ⁽¹⁾: kPa or characteristic diagram ⁽¹⁾:
- 3.2.5. Electrical system
- 3.2.5.1. Rated voltage: V, positive/negative ground ⁽²⁾
- 3.2.5.2. Generator
- 3.2.5.2.1. Type:
- 3.2.5.2.2. Nominal output: VA
- 3.2.6. Ignition
- 3.2.6.1. Make(s):
- 3.2.6.2. Type(s):
- 3.2.6.3. Working principle:
- 3.2.6.4. Ignition advance curve ⁽¹⁾:
- 3.2.6.5. Static ignition timing ⁽¹⁾: degrees before TDC
- 3.2.7. Cooling system: liquid/air ⁽²⁾
- 3.2.7.1. Nominal setting of the engine temperature control mechanism:
- 3.2.7.2. Liquid
- 3.2.7.2.1. Nature of liquid:
- 3.2.7.2.2. Circulating pump(s):yes/no ⁽²⁾
- 3.2.7.2.3. Characteristics, or
- 3.2.7.2.3.1. Make(s):
- 3.2.7.2.3.2. Type(s):
- 3.2.7.2.4. Drive ratio(s):
- 3.2.7.2.5. Description of the fan and its drive mechanism:

⁽¹⁾ Specify the tolerance.

⁽²⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼ B

- 3.2.7.3. Air
- 3.2.7.3.1. Blower: yes/no ⁽¹⁾
- 3.2.7.3.2. Characteristics: , or
- 3.2.7.3.2.1. Make(s):
- 3.2.7.3.2.2. Type(s):
- 3.2.7.3.3. Drive ratio(s):
- 3.2.8. Intake system
- 3.2.8.1. Pressure charger: yes/no ⁽¹⁾
- 3.2.8.1.1. Make(s):
- 3.2.8.1.2. Type(s):
- 3.2.8.1.3. Description of the system (e.g. maximum charge pressure: kPa, wastegate if applicable):
- 3.2.8.2. Intercooler: yes/no ⁽¹⁾
- 3.2.8.2.1. Type: air-air/air-water ⁽¹⁾
- 3.2.8.3. Intake depression at rated engine speed and at 100 % load (compression ignition engines only)
- Minimum allowable: kPa
- Maximum allowable: kPa
- 3.2.8.4. Description and drawings of the inlet pipes and their accessories (plenum chamber, heating device, additional air intakes, etc.):
- 3.2.8.4.1. Intake manifold description (include drawings and/or photos):
- 3.2.8.4.2. Air filter, drawings: or
- 3.2.8.4.2.1. Make(s):
- 3.2.8.4.2.2. Type(s):
- 3.2.8.4.3. Intake silencer, drawings: or
- 3.2.8.4.3.1. Make(s):
- 3.2.8.4.3.2. Type(s):
- 3.2.9. Exhaust system
- 3.2.9.1. Description and/or drawing of the exhaust manifold:
- 3.2.9.2. Description and/or drawing of the exhaust system:
- 3.2.9.3. Maximum allowable exhaust back pressure at rated engine speed and at 100 % load (compression ignition engines only): kPa
- 3.2.10. Minimum cross-sectional areas of inlet and outlet ports:
- 3.2.11. Valve timing or equivalent data

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼B

- 3.2.11.1. Maximum lift of valves, angles of opening and closing, or timing details of alternative distribution systems, in relation to dead centres. For variable timing system, minimum and maximum timing:
- 3.2.11.2. Reference and/or setting ranges ⁽¹⁾:
- 3.2.12. Measures taken against air pollution
- 3.2.12.1. Device for recycling crankcase gases (description and drawings):
- 3.2.12.2. Additional pollution control devices (if any, and if not covered by another heading)
- 3.2.12.2.1. Catalytic converter: yes/no ⁽¹⁾
- 3.2.12.2.1.1. Number of catalytic converters and elements (provide the information below for each separate unit):
- 3.2.12.2.1.2. Dimensions, shape and volume of the catalytic converter:
- 3.2.12.2.1.3. Type of catalytic action:
- 3.2.12.2.1.4. Total charge of precious metals:
- 3.2.12.2.1.5. Relative concentration:
- 3.2.12.2.1.6. Substrate (structure and material):
- 3.2.12.2.1.7. Cell density:
- 3.2.12.2.1.8. Type of casing for the catalytic converter(s):
- 3.2.12.2.1.9. Location of the catalytic converter(s) (place and reference distance in the exhaust line):
- 3.2.12.2.1.10. Heat shield: yes/no ⁽¹⁾
- 3.2.12.2.1.11. Regeneration systems/method of exhaust after-treatment systems, description:
- 3.2.12.2.1.11.1. The number of Type 1 operating cycles, or equivalent engine test bench cycles, between two cycles where regenerative phases occur under the conditions equivalent to Type 1 test (Distance 'D' in figure 1 in Annex 13 to UN/ECE Regulation 83):
- 3.2.12.2.1.11.2. Description of method employed to determine the number of cycles between two cycles where regenerative phases occur:
- 3.2.12.2.1.11.3. Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure etc.):
- 3.2.12.2.1.11.4. Description of method used to load system in the test procedure described in paragraph 3.1., Annex 13 to UN/ECE Regulation 83:
- 3.2.12.2.1.11.5. Normal operating temperature range (K):
- 3.2.12.2.1.11.6. Consumable reagents (where appropriate):
- 3.2.12.2.1.11.7. Type and concentration of reagent needed for catalytic action (where appropriate):

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼B

- 3.2.12.2.1.11.8. Normal operational temperature range of reagent (where appropriate):
- 3.2.12.2.1.11.9. International standard (where appropriate):
- 3.2.12.2.1.11.10. Frequency of reagent refill: continuous/maintenance ⁽¹⁾ (where appropriate):
- 3.2.12.2.1.12. Make of catalytic converter:
- 3.2.12.2.1.13. Identifying part number:
- 3.2.12.2.2. Oxygen sensor: yes/no ⁽¹⁾
- 3.2.12.2.2.1. Type:
- 3.2.12.2.2.2. Location:
- 3.2.12.2.2.3. Control range:
- 3.2.12.2.2.4. Make of oxygen sensor:
- 3.2.12.2.2.5. Identifying part number:
- 3.2.12.2.3. Air injection: yes/no ⁽¹⁾
- 3.2.12.2.3.1. Type (pulse air, air pump etc.):
- 3.2.12.2.4. Exhaust gas recirculation: yes/no ⁽¹⁾
- 3.2.12.2.4.1. Characteristics (flow rate etc.):
- 3.2.12.2.4.2. Water cooled system: yes/no ⁽¹⁾
- 3.2.12.2.5. Evaporative emissions control system: yes/no ⁽¹⁾
- 3.2.12.2.5.1. Detailed description of the devices and their state of tune:
- 3.2.12.2.5.2. Drawing of the evaporative control system:
- 3.2.12.2.5.3. Drawing of the carbon canister:
- 3.2.12.2.5.4. Mass of dry charcoal: g
- 3.2.12.2.5.5. Schematic drawing of the fuel tank with indication of capacity and material:
- 3.2.12.2.5.6. Drawing of the heat shield between tank and exhaust system:
- 3.2.12.2.6. Particulate trap: yes/no ⁽¹⁾
- 3.2.12.2.6.1. Dimensions, shape and capacity of the particulate trap:
- 3.2.12.2.6.2. Type and design of the particulate trap:
- 3.2.12.2.6.3. Location (reference distance in the exhaust line):
- 3.2.12.2.6.4. Method or system of regeneration, description and/or drawing:
- 3.2.12.2.6.4.1. The number of Type 1 operating cycles, or equivalent engine test bench cycle, between two cycles where regeneration phases occur under the conditions equivalent to Type 1 test (Distance 'D' in figure 1 in Annex 13 to UN/ECE Regulation 83):

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼ B

- 3.2.12.2.6.4.2. Description of method employed to determine the number of cycles between two cycles where regenerative phases occur:
- 3.2.12.2.6.4.3. Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure, etc.):
- 3.2.12.2.6.4.4. Description of method used to load system in the test procedure described in paragraph 3.1., Annex 13 to UN/ECE Regulation 83:
- 3.2.12.2.6.5. Make of particulate trap:
- 3.2.12.2.6.6. Identifying part number:
- 3.2.12.2.7. On-board-diagnostic (OBD) system: (yes/no) ⁽¹⁾
- 3.2.12.2.7.1. Written description and/or drawing of the MI:
- 3.2.12.2.7.2. List and purpose of all components monitored by the OBD system:
- 3.2.12.2.7.3. Written description (general working principles) for:
- 3.2.12.2.7.3.1. Positive-ignition engines ⁽¹⁾
- 3.2.12.2.7.3.1.1. Catalyst monitoring ⁽¹⁾:
- 3.2.12.2.7.3.1.2. Misfire detection ⁽¹⁾:
- 3.2.12.2.7.3.1.3. Oxygen sensor monitoring ⁽¹⁾:
- 3.2.12.2.7.3.1.4. Other components monitored by the OBD system ⁽¹⁾:
- 3.2.12.2.7.3.2. Compression-ignition engines ⁽¹⁾
- 3.2.12.2.7.3.2.1. Catalyst monitoring ⁽¹⁾:
- 3.2.12.2.7.3.2.2. Particulate trap monitoring ⁽¹⁾:
- 3.2.12.2.7.3.2.3. Electronic fuelling system monitoring ⁽¹⁾:
- 3.2.12.2.7.3.2.4. Other components monitored by the OBD system ⁽¹⁾:
- 3.2.12.2.7.4. Criteria for MI activation (fixed number of driving cycles or statistical method):
- 3.2.12.2.7.5. List of all OBD output codes and formats used (with explanation of each):
- 3.2.12.2.7.6. The following additional information shall be provided by the vehicle manufacturer for the purposes of enabling the manufacture of OBD-compatible replacement or service parts and diagnostic tools and test equipment.

The information given in this section shall be repeated in Appendix 5 to this Annex (vehicle OBD information appendix to the EC type-approval certificate):

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼ B

- 3.2.12.2.7.6.1. A description of the type and number of the pre-conditioning cycles used for the original type-approval of the vehicle.

- 3.2.12.2.7.6.2. A description of the type of the OBD demonstration cycle used for the original type-approval of the vehicle for the component monitored by the OBD system.

- 3.2.12.2.7.6.3. A comprehensive document describing all sensed components with the strategy for fault detection and MI activation (fixed number of driving cycles or statistical method), including a list of relevant secondary sensed parameters for each component monitored by the OBD system. A list of all OBD output codes and format used (with an explanation of each) associated with individual emission related power-train components and individual non-emission related components, where monitoring of the component is used to determine MI activation. In particular, a comprehensive explanation for the data given in service \$05 Test ID \$21 to FF and the data given in service \$06 shall be provided. In the case of vehicle types that use a communication link in accordance with ISO 15765-4 'Road vehicles diagnostics on controller area network (CAN) — part 4: requirements for emissions-related systems', a comprehensive explanation for the data given in service \$06 Test ID \$00 to FF, for each OBD monitor ID supported, shall be provided.

- 3.2.12.2.7.6.4. The information required by this section may, for example, be defined by completing a table as follows, which shall be attached to this Annex.

Component	Fault code	Monitoring strategy	Fault detection criteria	MI activation criteria	Secondary parameters	Pre-conditioning	Demonstration test
Catalyst	PO420	Oxygen sensor 1 and 2 signals	Difference between sensor 1 and sensor 2 signals	3 rd cycle	Engine speed, engine load, A/F mode, catalyst temperature	Two Type 1 cycles	Type 1

- 3.2.12.2.8. Other systems (description and operation):

- 3.2.13. Location of the absorption coefficient symbol (compression ignition engines only):

- 3.2.14. Details of any devices designed to influence fuel economy (if not covered by other items):

▼ B

- 3.2.15. LPG fuelling system: yes/no ⁽¹⁾
- 3.2.15.1. EC type-approval number according to Council Directive 70/221/EEC (OJ L 76, 6.4.1970, p. 23) (when the Directive will be amended to cover tanks for gaseous fuels) or approval number of UN/ECE Regulation 67
- 3.2.15.2. Electronic engine management control unit for LPG fuelling
- 3.2.15.2.1. Make(s):
- 3.2.15.2.2. Type(s):
- 3.2.15.2.3. Emission-related adjustment possibilities:
- 3.2.15.3. Further documentation
- 3.2.15.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to LPG or back:
- 3.2.15.3.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.):
- 3.2.15.3.3. Drawing of the symbol:
- 3.2.16. NG fuelling system: yes/no ⁽¹⁾
- 3.2.16.1. EC type-approval number according to Directive 70/221/EEC (when the Directive will be amended to cover tanks for gaseous fuels) or approval number of UN/ECE Regulation 110:
- 3.2.16.2. Electronic engine management control unit for NG fuelling
- 3.2.16.2.1. Make(s):
- 3.2.16.2.2. Type(s):
- 3.2.16.2.3. Emission-related adjustment possibilities:
- 3.2.16.3. Further documentations
- 3.2.16.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to NG or back:
- 3.2.16.3.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.):
- 3.2.16.3.3. Drawing of the symbol:

▼ M3

- 3.2.18. Hydrogen fuelling system: yes/no ⁽¹⁾
- 3.2.18.1. EC type-approval number according to Regulation (EC) No 79/2009:
- 3.2.18.2. Electronic engine management control unit for hydrogen fuelling
- 3.2.18.2.1. Make(s):
- 3.2.18.2.2. Type(s):
- 3.2.18.2.3. Emission-related adjustment possibilities:
- 3.2.18.3. Further documentation
- 3.2.18.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to hydrogen or back:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

▼ M3

- 3.2.18.3.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.):
- 3.2.18.3.3. Drawing of the symbol:
- 3.2.19. H2NG fuelling system: yes/no ⁽¹⁾
- 3.2.19.1. Percentage of hydrogen in the fuel (the maximum specified by the manufacturer):
- 3.2.19.2. EC type-approval number according to UN/ECE Regulation No 110 ⁽²⁾
- 3.2.19.3. Electronic engine management control unit for H2NG fuelling
 - 3.2.19.3.1. Make(s):
 - 3.2.19.3.2. Type(s):
 - 3.2.19.3.3. Emission-related adjustment possibilities:
- 3.2.19.4. Further documentation
 - 3.2.19.4.1. Description of the safeguarding of the catalyst at switch-over from petrol to H2NG or back:
 - 3.2.19.4.2. System lay-out (electrical connections, vacuum connections compensation hoses, etc.):
 - 3.2.19.4.3. Drawing of the symbol:
- 3.3. Electric motor
 - 3.3.1. Type (winding, excitation):

▼ M8

- 3.3.1.1. Maximum hourly output: kW
(manufacturer's declared value)
- 3.3.1.1.1. Maximum net power ^(a) kW
(manufacturer's declared value)
- 3.3.1.1.2. Maximum 30 minutes power (a) kW
(manufacturer's declared value)

▼ M3

- 3.3.1.2. Operating voltage: V
- 3.3.2. Battery
 - 3.3.2.1. Number of cells:
 - 3.3.2.2. Mass: kg
 - 3.3.2.3. Capacity: Ah (Amp-hours)
 - 3.3.2.4. Position:

▼ B

- 3.4. Engines or motor combinations
 - 3.4.1. Hybrid Electric Vehicle: yes/no ⁽¹⁾
 - 3.4.2. Category of Hybrid Electric vehicle
 - Off Vehicle Charging/Not Off Vehicle Charging ⁽¹⁾
 - 3.4.3. Operating mode switch: with/without ⁽¹⁾
 - 3.4.3.1. Selectable modes
 - 3.4.3.1.1. Pure electric: yes/no ⁽¹⁾

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable)

⁽²⁾ OJ L 72, 14.3.2008, p. 113.

▼ B

- 3.4.3.1.2. Pure fuel consuming: yes/no ⁽¹⁾
- 3.4.3.1.3. Hybrid modes: yes/no ⁽¹⁾
(if yes, short description)
- 3.4.4. Description of the energy storage device: (battery, capacitor, flywheel/generator)
 - 3.4.4.1. Make(s):
 - 3.4.4.2. Type(s):
 - 3.4.4.3. Identification number:
 - 3.4.4.4. Kind of electrochemical couple:
 - 3.4.4.5. Energy: (for battery: voltage and capacity Ah in 2 h, for capacitor: J,
 - 3.4.4.6. Charger: on board/external/without ⁽¹⁾
- 3.4.5. Electric machines (describe each type of electric machine separately)
 - 3.4.5.1. Make:
 - 3.4.5.2. Type:
 - 3.4.5.3. Primary use: traction motor/generator
 - 3.4.5.3.1. When used as traction motor: monomotor/multimotors (number):
 - 3.4.5.4. Maximum power: kW
 - 3.4.5.5. Working principle:
 - 3.4.5.5.1. direct current/alternating current/number of phases:
 - 3.4.5.5.2. separate excitation/series/compound ⁽¹⁾
 - 3.4.5.5.3. synchronous/asynchronous ⁽¹⁾
 - 3.4.6. Control unit
 - 3.4.6.1. Make(s):
 - 3.4.6.2. Type(s):
 - 3.4.6.3. Identification number:
 - 3.4.7. Power controller
 - 3.4.7.1. Make:
 - 3.4.7.2. Type:
 - 3.4.7.3. Identification number:

▼ M3

- 3.4.8. Vehicle electric range ... km (in accordance to Annex 9 to UN/ECE Regulation No 101 ⁽²⁾)

▼ B

- 3.4.9. Manufacturer's recommendation for preconditioning:
- 3.5. CO₂ emissions/fuel consumption ^(a) (manufacturer's declared value)
 - 3.5.1. CO₂ mass emissions (provide for each reference fuel tested)
 - 3.5.1.1. CO₂ mass emissions (urban conditions): g/km
 - 3.5.1.2. CO₂ mass emissions (extra-urban conditions): g/km
 - 3.5.1.3. CO₂ mass emissions (combined): g/km

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

⁽²⁾ OJ L 158, 19.6.2007, p. 34.

^(a) Determined in accordance with the requirements of Directive 80/1268/EEC.

▼ B

3.5.2. Fuel consumption (provide for each reference fuel tested)

▼ M33.5.2.1. Fuel consumption (urban conditions) l/100 km
or m³/100 km or kg/100 km ⁽¹⁾3.5.2.2. Fuel consumption (extra-urban conditions) l/100 km
or m³/100 km or kg/100 km ⁽¹⁾3.5.2.3. Fuel consumption (combined) l/100 km or
m³/100 km or kg/100 km ⁽¹⁾**▼ M8**

3.5.3. Electric energy consumption for electric vehicles

▼ M53.5.3.1. Type/Variant/Version of the baseline vehicle as defined in
Article 5 of Implementing Regulation (EU) No 725/2011 ⁽³⁾**▼ M8**3.5.3.1. Electric energy consumption for pure electric vehicles ...
Wh/km**▼ M5**3.5.3.2. Interactions existing between different eco-innovations:
yes/no ⁽²⁾**▼ M8**3.5.3.2. Electric energy consumption for externally chargeable hybrid
electric vehicles3.5.3.2.1. Electric energy consumption (Condition A, combined)
..... Wh/km3.5.3.2.2. Electric energy consumption (Condition B, combined)
..... Wh/km3.5.3.2.3. Electric energy consumption (weighted combined)
..... Wh/km**▼ M5**3.5.3.3. Emissions data related to the use of eco-innovations ⁽⁴⁾ ⁽⁵⁾

Decision approving the eco-innovation ⁽¹⁾	Code of the eco-innovation ⁽²⁾	1. CO ₂ emissions of the baseline vehicle (g/km)	2. CO ₂ emissions of the eco-innovation vehicle (g/km)	3. CO ₂ emissions of the baseline vehicle under type 1 test-cycle ⁽³⁾	4. CO ₂ emissions of the eco-innovation vehicle under type 1 test-cycle (= 3.5.1.3)	5. Usage factor (UF) i.e. temporal share of technology usage in normal operation conditions	CO ₂ emissions savings ((1 - 2) - (3 - 4)) * 5
xxxx/ 201x ⁽¹⁾							
Total CO₂ emissions saving (g/km) ⁽⁴⁾							

⁽¹⁾ Number of the Commission Decision approving the eco-innovation.⁽²⁾ Assigned in the Commission Decision approving the eco-innovation.⁽³⁾ Under agreement of the type-approval authority, if modelling is applied instead of the type 1 test-cycle, this value shall be the one provided by the modelling methodology.⁽⁴⁾ Sum of the emissions saving of each individual eco-innovation.⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).⁽²⁾ If applicable.⁽³⁾ Delete where not applicable.⁽⁴⁾ Repeat the table for each reference fuel tested.⁽⁵⁾ Expand the table if necessary, using one extra row per eco-innovation.

▼ M8**▼ M9**

3.5.6. Vehicle fitted with an eco-innovation within the meaning of Article 12 of Regulation (EC) No 443/2009 for M₁ vehicles or Article 12 of Regulation (EU) No 510/2011 for N₁ vehicles: yes/no ⁽¹⁾.

3.5.6.1. Type/Variant/Version of the baseline vehicle as referred to in Article 5 of Regulation (EU) No 725/2011 for M₁ vehicles or Article 5 of Regulation (EU) No 427/2014 for N₁ vehicles ⁽²⁾.

▼ M6

3.5.6.2. Interactions existing between different eco-innovations: yes/no ⁽¹⁾

3.5.6.3. Emissions data related to the use of eco-innovations ⁽³⁾ ⁽⁴⁾

Decision approving the eco-innovation ⁽¹⁾	Code of the eco-innovation ⁽²⁾	1. CO ₂ emissions of the baseline vehicle (g/km)	2. CO ₂ emissions of the eco-innovation vehicle (g/km)	3. CO ₂ emissions of the baseline vehicle under type 1 test-cycle ⁽³⁾	4. CO ₂ emissions of the eco-innovation vehicle under type 1 test-cycle (= 3.5.1.3)	5. Usage factor (UF) i.e. temporal share of technology usage in normal operation conditions	CO ₂ emissions savings ((1 - 2) - (3 - 4)) * 5
xxxx/201x ⁽¹⁾							
Total CO₂ emissions saving (g/km) ⁽⁴⁾							

⁽¹⁾ Number of the Commission Decision approving the eco-innovation.

⁽²⁾ Assigned in the Commission Decision approving the eco-innovation.

⁽³⁾ Under agreement of the type-approval authority, if modelling is applied instead of the type 1 test-cycle, this value shall be the one provided by the modelling methodology.

⁽⁴⁾ Sum of the emissions saving of each individual eco-innovation.

▼ B

3.6. Temperatures permitted by the manufacturer

3.6.1. Cooling system

3.6.1.1. Liquid cooling

Maximum temperature at outlet: K

3.6.1.2. Air cooling

3.6.1.2.1. Reference point:

3.6.1.2.2. Maximum temperature at reference point: K

3.6.2. Maximum outlet temperature of the inlet intercooler: K

3.6.3. Maximum exhaust temperature at the point in the exhaust pipe(s) adjacent to the outer flange(s) of the exhaust manifold: K

3.6.4. Fuel temperature

Minimum: K

Maximum: K

⁽¹⁾ Delete where not applicable.

⁽²⁾ If applicable.

⁽³⁾ Repeat the table for each reference fuel tested.

⁽⁴⁾ Expand the table if necessary, using one extra row per eco-innovation.

▼ B

- 3.6.5. Lubricant temperature
- Minimum: K
- Maximum: K
- 3.8. Lubrication system
- 3.8.1. Description of the system
- 3.8.1.1. Position of the lubricant reservoir:
- 3.8.1.2. Feed system (by pump/injection into intake/mixing with fuel, etc.)⁽¹⁾
- 3.8.2. Lubricating pump
- 3.8.2.1. Make(s):
- 3.8.2.2. Type(s):
- 3.8.3. Mixture with fuel
- 3.8.3.1. Percentage:
- 3.8.4. Oil cooler: yes/no⁽¹⁾
- 3.8.4.1. Drawing(s):, or
- 3.8.4.1.1. Make(s):
- 3.8.4.1.2. Type(s):
4. TRANSMISSION^(a)
- 4.3. Moment of inertia of engine flywheel:
- 4.3.1. Additional moment of inertia with no gear engaged:
- 4.4. Clutch (type):
- 4.4.1. Maximum torque conversion:
- 4.5. Gearbox
- 4.5.1. Type (manual/automatic/CVT (continuously variable transmission))⁽¹⁾
- 4.6. Gear ratios

Gear	Internal gearbox ratios (ratios of engine to gearbox output shaft revolutions)	Final drive ratio(s) (ratio of gearbox output shaft to driven wheel revolutions)	Total gear ratios
Maximum for CVT			
1			
2			
3			
...			
Minimum for CVT (*)			
Reverse			

(*) CVT — continuously variable transmission.

6. SUSPENSION
- 6.6. Tyres and wheels

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable).

^(a) (v) The specified particulars are to be given for any proposed variants.

▼ B

- 6.6.1. Tyre/wheel combination(s)
- (a) for all tyre options indicate, size designation, load-capacity index, speed category symbol, rolling resistance to ISO 28580 (where applicable)
- (b) for tyres of category Z intended to be fitted on vehicles whose maximum speed exceeds 300 km/h equivalent information shall be provided; for wheels indicate rim size(s) and off-set(s)
- 6.6.1.1. Axles
- 6.6.1.1.1. Axle 1:
- 6.6.1.1.2. Axle 2:
- etc.
- 6.6.2. Upper and lower limits of rolling radii
- 6.6.2.1. Axle 1:
- 6.6.2.2. Axle 2:
- etc.
- 6.6.3. Tyre pressure(s) as recommended by the vehicle manufacturer: kPa
9. BODYWORK
- 9.1. Type of bodywork: (use codes defined in Annex II, section C of Directive 2007/46/EC):
- 9.10.3. Seats
- 9.10.3.1. Number:
16. ACCESS TO VEHICLE REPAIR AND MAINTENANCE INFORMATION
- 16.1. Address of principal website for access to vehicle repair and maintenance information:
- 16.1.1. Date from which it is available (no later than 6 months from the date of type approval):
- 16.2. Terms and conditions of access to website referred to in Section 16.1:
- 16.3. Format of vehicle repair and maintenance information accessible through website referred to in Section 16.1:

▼ B*Appendix to information document***INFORMATION ON TEST CONDITIONS**

1. **Spark plugs**
 - 1.1. Make:
 - 1.2. Type:
 - 1.3. Spark-gap setting:

2. **Ignition coil**
 - 2.1. Make:
 - 2.2. Type:

3. **Lubricant used**
 - 3.1. Make:
 - 3.2. Type:

(state percentage of oil in mixture if lubricant and fuel mixed)

4. **Dynamometer load setting information** (repeat information for each dynamometer test)
 - 4.1. Vehicle bodywork type (variant/version)
 - 4.2. Gearbox type (manual/automatic/CVT)
 - 4.3. Fixed load curve dynamometer setting information (if used)
 - 4.3.1. Alternative dynamometer load setting method used (yes/no)
 - 4.3.2. Inertia mass (kg):
 - 4.3.3. Effective power absorbed at 80km/h including running losses of the vehicle on the dynamometer (kW)
 - 4.3.4. Effective power absorbed at 50km/h including running losses of the vehicle on the dynamometer (kW)
 - 4.4. Adjustable load curve dynamometer setting information (if used)
 - 4.4.1. Coast down information from the test track.
 - 4.4.2. Tyres make and type:
 - 4.4.3. Tyre dimensions (front/rear):
 - 4.4.4. Tyre pressure (front/rear) (kPa):
 - 4.4.5. Vehicle test mass including driver (kg):

▼B

4.4.6. Road coast down data (if used)

V (km/h)	V ₂ (km/h)	V ₁ (km/h)	Mean corrected coast down time (s)
120			
100			
80			
60			
40			
20			

4.4.7. Average corrected road power (if used)

V (km/h)	CPcorrected (kW)
120	
100	
80	
60	
40	
20	

▼B*Appendix 4*

MODEL OF EC TYPE-APPROVAL CERTIFICATE

(Maximum format: A4 (210 × 297 mm))

EC TYPE-APPROVAL CERTIFICATE

Stamp of administration

Communication concerning the:

- EC type-approval ⁽¹⁾,
- extension of EC type-approval ⁽¹⁾,
- refusal of EC type-approval ⁽¹⁾,
- withdrawal of EC type-approval ⁽¹⁾,
- of a type of system/type of a vehicle with regard to a system ⁽¹⁾ with regard to Regulation (EC) No 715/2007 ⁽²⁾ and Regulation (EC) No 692/2008 ⁽³⁾

EC type-approval number:

Reason for extension:

SECTION I

- 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 if marked on the vehicle ⁽⁴⁾
- 0.3.1. Location of that marking:
- 0.4. Category of vehicle ⁽⁵⁾
- 0.5. Name and address of manufacturer:
- 0.8. Name(s) and address(es) of assembly plant(s):
- 0.9. Representative of the manufacturer:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable)

⁽²⁾ OJ L 171, 29.6.2007, p. 1.

⁽³⁾ OJ L 199, 28.7.2008, p. 1

⁽⁴⁾ If the means of identification of type contains characters not relevant to describe the vehicle, component or separate technical unit types covered by this information, such characters shall be represented in the documentation by the symbol '?' (e.g. ABC??123??)

⁽⁵⁾ As defined in Annex II, Section A

▼ B

SECTION II

1. Additional information (where applicable): (see addendum)
2. Technical service responsible for carrying out the tests:
3. Date of test report:
4. Number of test report:
5. Remarks (if any): (see addendum)
6. Place:
7. Date:
8. Signature:

Attachments: Information package.
Test report.

▼B*Addendum to EC type-approval certificate No ...***concerning the type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information according to Regulation (EC) No 715/2007**

1. **Additional information**
 - 1.1. Mass of the vehicle in running order:
 - 1.2. Maximum mass:
 - 1.3. Reference mass:
 - 1.4. Number of seats:
 - 1.6. Type of bodywork:
 - 1.6.1. for M₁, M₂: saloon, hatchback, station wagon, coupé, convertible, multipurpose vehicle ⁽¹⁾
 - 1.6.2. for N₁, N₂: lorry, van ⁽¹⁾
 - 1.7. Drive wheels: front, rear, 4 x 4 ⁽¹⁾
 - 1.8. Pure electric vehicle: yes/no ⁽¹⁾
 - 1.9. Hybrid electric vehicle: yes/no ⁽¹⁾
 - 1.9.1. Category of Hybrid Electric vehicle: Off Vehicle Charging/Not Off Vehicle charging ⁽¹⁾
 - 1.9.2. Operating mode switch: with/without ⁽¹⁾
 - 1.10. Engine identification:
 - 1.10.1. Engine displacement:
 - 1.10.2. Fuel supply system: direct injection/indirect injection ⁽¹⁾
 - 1.10.3. Fuel recommended by the manufacturer:
 - 1.10.4. Maximum power: kW at min'
 - 1.10.5. Pressure charging device: yes/no ⁽¹⁾
 - 1.10.6. Ignition system: compression ignition/positive ignition ⁽¹⁾
 - 1.11. Power train (for pure electric vehicle or hybrid electric vehicle) ⁽¹⁾
 - 1.11.1. Maximum net power: kW, at: to min⁻¹
 - 1.11.2. Maximum thirty minutes power: kW
 - 1.11.3. Maximum net torque: Nm, at min⁻¹

▼M8**▼B**

- 1.12. Traction battery (for pure electric vehicle or hybrid electric vehicle)
 - 1.12.1. Nominal voltage: V
 - 1.12.2. Capacity (2 h rate): Ah
- 1.13. Transmission:,
- 1.13.1. Type of gearbox: manual/automatic/variable transmission ⁽¹⁾

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

▼ B

1.13.2. Number of gear ratios:

1.13.3. Total gear ratios (including the rolling circumferences of the tyres under load): road speeds per 1 000 min⁻¹ (km/h)

First gear: Sixth gear:
 Second gear: Seventh gear:
 Third gear: Eighth gear:
 Fourth gear: Overdrive:
 Fifth gear:

1.13.4. Final drive ratio:

1.14. Tyres:,,

Type: Dimensions:

Rolling circumference under load:

Rolling circumference of tyres used for the Type 1 test

2. Test results

2.1. Tailpipe emissions test results

Emissions classification: Euro 5/Euro 6 ⁽¹⁾

Type 1 test results, where applicable

Type approval number if not parent vehicle ⁽¹⁾:

Type 1 Result	Test	CO (mg/km)	THC (mg/km)	NMHC (mg/km)	NO _x (mg/km)	THC + NO _x (mg/km)	Parti- culates (mg/km)	Particles (#/km)
Measured ⁽ⁱ⁾ ^(iv)	1							
	2							
	3							
Measured mean value (M) ⁽ⁱ⁾ ^(iv)								
Ki ⁽ⁱ⁾ ^(v)						⁽ⁱⁱ⁾		
Mean value calculated with Ki (M.Ki) ^(iv)						⁽ⁱⁱⁱ⁾		
DF ⁽ⁱ⁾ ^(v)								

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

▼ B

Type 1 Result	Test	CO (mg/km)	THC (mg/km)	NMHC (mg/km)	NO _x (mg/km)	THC + NO _x (mg/km)	Parti- culates (mg/km)	Particles (#/km)
Final mean value calculated with Ki and DF (M.Ki.DF) ^(vi)								
Limit value								

⁽ⁱ⁾ Where applicable.

⁽ⁱⁱ⁾ Not applicable.

⁽ⁱⁱⁱ⁾ Mean value calculated by adding mean values (M.Ki) calculated for THC and NO_x.

^(iv) Round to 2 decimal places.

^(v) Round to 4 decimal places.

^(vi) Round to 1 decimal place more than limit value.

Information about regeneration strategy

D — number of operating cycles between 2 cycles where regenerative phases occur:

d — number of operating cycles required for regeneration:

Type 2: %

Type 3:

Type 4: g/test

Type 5: — Durability test: whole vehicle test/bench ageing test/none ⁽¹⁾

— Deterioration factor DF: calculated/assigned ⁽¹⁾

— Specify the values:

▼ M6

Type 6	CO (g/km)	THC (g/km)
Measured value		

- 2.1.1. For bi fuel vehicles, the type 1 table shall be repeated for both fuels. For flex fuel vehicles, when the type 1 test is to be performed on both fuels according to Figure I.2.4 of Annex I to Regulation (EC) No 692/2008, and for vehicles running on LPG or NG/Biomethane, either mono fuel or bi fuel, the table shall be repeated for the different reference gases used in the test, and an additional table shall display the worst results obtained. When applicable, in accordance with sections 1.1.2.4 and 1.1.2.5 of Annex I to Regulation (EC) No 692/2008, it shall be shown if the results are measured or calculated.

▼ B

2.1.2. Written description and/or drawing of the MI:

2.1.3. List and function of all components monitored by the OBD system:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

▼B

- 2.1.4. Written description (general working principles) for:
- 2.1.4.1. Misfire detection ⁽¹⁾:
- 2.1.4.2. Catalyst monitoring ⁽¹⁾:
- 2.1.4.3. Oxygen sensor monitoring ⁽¹⁾:
- 2.1.4.4. Other components monitored by the OBD system ⁽¹⁾:
- 2.1.4.5. Catalyst monitoring ⁽²⁾:
- 2.1.4.6. Particulate trap monitoring ⁽²⁾:
- 2.1.4.7. Electronic fuelling system actuator monitoring ⁽²⁾:
- 2.1.4.8. Other components monitored by the OBD system:
- 2.1.5. Criteria for MI activation (fixed number of driving cycles or statistical method):
- 2.1.6. List of all OBD output codes and formats used (with explanation of each):
- 2.2. Emissions data required for roadworthiness testing

Test	CO value (% vol)	Lambda ⁽¹⁾	Engine speed (min-)	Engine oil temperature (°C)
Low idle test		N/A		
High idle test				

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

- 2.3. Catalytic converters yes/no ⁽³⁾
- 2.3.1. Original equipment catalytic converter tested to all relevant requirements of this Regulation yes/no ⁽³⁾
- 2.4. Smoke opacity test results ⁽³⁾
- 2.4.1. At steady speeds: See technical service test report number:
- 2.4.2. Free acceleration tests
- 2.4.2.1. Measured value of the absorption coefficient: m⁻¹
- 2.4.2.2. Corrected value of the absorption coefficient: m⁻¹
- 2.4.2.3. Location of the absorption coefficient symbol on the vehicle:
- 2.5. CO₂ emissions and fuel consumption test results
- 2.5.1. Internal combustion engine vehicle and Not Externally Chargeable (NOVC) Hybrid Electric Vehicle
- 2.5.1.1. CO₂ mass emissions (provide declared values for each reference fuel tested)
- 2.5.1.1.1. CO₂ mass emissions (urban conditions): g/km
- 2.5.1.1.2. CO₂ mass emissions (extra-urban conditions): g/km
- 2.5.1.1.3. CO₂ mass emissions (combined): g/km
- 2.5.1.2. Fuel consumption (provide declared values for each reference fuel tested)

⁽¹⁾ For vehicles equipped with positive-ignition engines.

⁽²⁾ For compression-ignition engine vehicles

⁽³⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

▼ B

2.5.1.2.1. Fuel consumption (urban conditions): 1/100 km ⁽¹⁾

2.5.1.2.2. Fuel consumption (extra-urban conditions): 1/100 km

2.5.1.2.3. Fuel consumption (combined): 1/100 km ⁽¹⁾

2.5.1.3. For vehicles powered by an internal combustion engine only which are equipped with periodically regenerating systems as defined in paragraph 6 of Article 2 of this Regulation, the test results shall be multiplied by the factor K_i as specified in Annex 10 to UN/ECE Regulation 101.

2.5.1.3.1. Information about regeneration strategy for CO₂ emissions and fuel consumption

D — number of operating cycles between 2 cycles where regenerative phases occur:

d — number of operating cycles required for regeneration:

	urban	extra urban	combined
K_i Values for CO ₂ and fuel consumption ⁽¹⁾			

⁽¹⁾ Round to 4 decimal places.

2.5.2. Pure electric vehicles ⁽²⁾

2.5.2.1. Electric energy consumption (declared value).

2.5.2.1.1. Electric energy consumption: Wh/km

2.5.2.1.2. Total time out of tolerance for the conduct of the cycle: sec

2.5.2.2. Range (declared value): km

2.5.3. Externally chargeable (OVC) Hybrid Electric Vehicle:

2.5.3.1. CO₂ mass emission (Condition A, combined) ⁽³⁾: g/km

2.5.3.2. CO₂ mass emission (Condition B, combined) ⁽³⁾: g/km

2.5.3.3. CO₂ mass emission (weighted, combined) ⁽³⁾: g/km

2.5.3.4. Fuel consumption (Condition A, combined) ⁽³⁾: 1/100 km

2.5.3.5. Fuel consumption (Condition B, combined) ⁽³⁾: 1/100 km

2.5.3.6. Fuel consumption (weighted, combined) ⁽³⁾: 1/100 km

2.5.3.7. Electric energy consumption (Condition A, combined) ⁽³⁾: Wh/km

2.5.3.8. Electric energy consumption (Condition B, combined) ⁽³⁾: Wh/km

⁽¹⁾ For vehicle fuelled with gas the unit is replaced by m³/km.

⁽²⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

⁽³⁾ Measured over the combined cycle, i.e. Part One (urban) and Part Two (extra urban) together

▼ B2.5.3.9. Electric energy consumption (weighted and combined) ⁽¹⁾: Wh/km

2.5.3.10. Pure electric range: km

▼ M62.6. Test results of eco-innovations ⁽²⁾ ⁽³⁾

Decision approving the eco-innovation ⁽¹⁾	Code of the eco-innovation ⁽²⁾	1. CO ₂ emissions of the baseline vehicle (g/km)	2. CO ₂ emissions of the eco-innovation vehicle (g/km)	3. CO ₂ emissions of the baseline vehicle under type 1 test-cycle ⁽³⁾	4. CO ₂ emissions of the eco-innovation vehicle under type 1 test-cycle (= 3.5.1.3)	5. Usage factor (UF) i.e. temporal share of technology usage in normal operation conditions	CO ₂ emissions savings ((1 - 2) - (3 - 4)) * 5
xxxx/201x							
Total CO₂ emissions saving (g/km) ⁽⁴⁾							

⁽¹⁾ Number of the Commission Decision approving the eco-innovation.⁽²⁾ Assigned in the Commission Decision approving the eco-innovation.⁽³⁾ If modelling is applied instead of the type 1 test-cycle, this value shall be the one provided by the modelling methodology.⁽⁴⁾ Sum of the emissions saving of each individual eco-innovation.2.6.1. General code of the eco-innovation(s) ⁽⁴⁾:**▼ B**

3. Vehicle repair information

3.1. Address of website for access to vehicle repair and maintenance information:

3.1.1. Date from which it is available (up to 6 months from the date of type approval):

▼ M1

3.2. Terms and conditions of access (i.e. duration of access, price of access on a hourly, daily, monthly, annual and per-transaction basis) to websites referred to in point 3.1):

⁽¹⁾ Measured over the combined cycle, i.e. Part One (urban) and Part Two (extra urban) together⁽²⁾ Repeat the table for each reference fuel tested.⁽³⁾ Expand the table if necessary, using one extra row per eco-innovation.⁽⁴⁾ The general code of the eco-innovation(s) shall consist of the following elements, each separated by a blank space:

- Code of the type-approval authority as set out in Annex VII to Directive 2007/46/EC;
- Individual code of each eco-innovation fitted in the vehicle, indicated in chronological order of the Commission approval decisions.

(E.g. the general code of three eco-innovations approved chronologically as 10, 15 and 16 and fitted to a vehicle certified by the German type approval authority should be: 'el 10 15 16')

▼ B

- 3.3. Format of vehicle repair and maintenance information accessible through website referred to in Section 3.1:
- 3.4. Manufacturer's certificate on access to vehicle repair and maintenance information provided:

▼ M8

- 4. Power measurement
Maximum engine net power of internal combustion engine, net power and maximum 30 minutes power of electric drive train
 - 4.1. Internal combustion engine net power
 - 4.1.1. Engine speed (rpm)
 - 4.1.2. Measured fuel flow (g/h)
 - 4.1.3. Measured torque (Nm)
 - 4.1.4. Measured power (kW)
 - 4.1.5. Barometric pressure (kPa)
 - 4.1.6. Water vapour pressure (kPa)
 - 4.1.7. Intake air temperature (K)
 - 4.1.8. Power correction factor when applied
 - 4.1.9. Corrected power (kW)
 - 4.1.10. Auxiliary power (kW)
 - 4.1.11. Net power (kW)
 - 4.1.12. Net torque (Nm)
 - 4.1.13. Corrected specific fuel consumption (g/kWh)
 - 4.2. Electric drive train(s):
 - 4.2.1. Declared figures
 - 4.2.2. Maximum net power: kW, at min^{-1}
 - 4.2.3. Maximum net torque: Nm, at min^{-1}
 - 4.2.4. Maximum net torque at zero speed: Nm
 - 4.2.5. Maximum 30 minutes power: kW
 - 4.2.6. Essential characteristics of the electric drive train
 - 4.2.7. Test DC voltage: V
 - 4.2.8. Working principle:
 - 4.2.9. Cooling system:
 - 4.2.10. Motor: liquid/air ⁽¹⁾
 - 4.2.11. Variator: liquid/air ⁽¹⁾
- 5. Remarks:

⁽¹⁾ Delete where not applicable.

▼B*Appendix 5***Vehicle OBD information**

1. The information required in this Appendix shall be provided by the vehicle manufacturer for the purposes of enabling the manufacture of OBD-compatible replacement or service parts and diagnostic tools and test equipment.
2. Upon request, the following information shall be made available to any interested component, diagnostic tools or test equipment manufacturer, on a non-discriminatory basis:
 - 2.1. A description of the type and number of the preconditioning cycles used for the original type-approval of the vehicle;
 - 2.2. A description of the type of the OBD demonstration cycle used for the original type-approval of the vehicle for the component monitored by the OBD system;
 - 2.3. A comprehensive document describing all sensed components with the strategy for fault detection and MI activation (fixed number of driving cycles or statistical method), including a list of relevant secondary sensed parameters for each component monitored by the OBD system and a list of all OBD output codes and format used (with an explanation of each) associated with individual emission-related power-train components and individual non-emission related components, where monitoring of the component is used to determine MI activation. In particular, a comprehensive explanation for the data given in service \$ 05 Test ID \$ 21 to FF and the data given in service \$ 06 shall be provided. In the case of vehicle types that use a communication link in accordance with ISO 15765-4 'Road vehicles — Diagnostics on Controller Area Network (CAN) — Part 4: Requirements for emissions-related systems', a comprehensive explanation for the data given in service \$ 06 Test ID \$ 00 to FF, for each OBD monitor ID supported, shall be provided.

This information may be provided in the form of a table, as follows:

Component	Fault code	Monitoring strategy	Fault detection criteria	MI activation criteria	Secondary parameters	Pre-conditioning	Demonstration test
Catalyst	P0420	Oxygen sensor 1 and 2 signals	Difference between sensor 1 and sensor 2 signals	3rd cycle	Engine speed, engine load, A/F mode, catalyst temperature	Two Type 1 cycles	Type 1

3. **Information required for the manufacture of diagnostic tools**

In order to facilitate the provision of generic diagnostic tools for multi-make repairers, vehicle manufacturers shall make available the information referred to in the points 3.1 to 3.3. through their repair information web-sites. This information shall include all diagnostic tool functions and all the links to repair information and troubleshooting instructions. The access to this information may be subject to the payment of a reasonable fee.

▼B3.1. *Communication Protocol Information*

The following information shall be required indexed against vehicle make, model and variant, or other workable definition such as VIN or vehicle and systems identification:

- (a) Any additional protocol information system necessary to enable complete diagnostics in addition to the standards prescribed in Annex XI Section 4, including any additional hardware or software protocol information, parameter identification, transfer functions, 'keep alive' requirements, or error conditions;
- (b) Details of how to obtain and interpret all fault codes not in accordance with the standards prescribed in Annex XI Section 4;
- (c) A list of all available live data parameters including scaling and access information;
- (d) A list of all available functional tests including device activation or control and the means to implement them;
- (e) Details of how to obtain all component and status information, time stamps, pending DTC and freeze frames;
- (f) Resetting adaptive learning parameters, variant coding and replacement component setup, and customer preferences;
- (g) ECU identification and variant coding;
- (h) Details of how to reset service lights;
- (i) Location of diagnostic connector and connector details;
- (j) Engine code identification.

3.2. *Test and diagnosis of OBD monitored components*

The following information shall be required:

- (a) A description of tests to confirm its functionality, at the component or in the harness
- (b) Test procedure including test parameters and component information
- (c) Connection details including minimum and maximum input and output and driving and loading values
- (d) Values expected under certain driving conditions including idling
- (e) Electrical values for the component in its static and dynamic states
- (f) Failure mode values for each of the above scenarios
- (g) Failure mode diagnostic sequences including fault trees and guided diagnostics elimination.

▼B

3.3. *Data required to perform the repair*

The following information shall be required:

- (a) ECU and component initialisation (in the event of replacements being fitted)
- (b) Initialisation of new or replacement ECU's where relevant using pass-through (re-) programming techniques.

▼ **B**

Appendix 6

EC Type –Approval Certification Numbering System

1. Section 3 of the EC type-approval number issued according to Article 6(1) shall be composed by the number of the implementing regulatory act or the latest amending regulatory act applicable to the EC type-approval. ► **M2** This number shall be followed by one or more characters reflecting the different categories in accordance with Table 1. ◀ These alphabetical characters shall also distinguish the Euro 5 and 6 emission limit values to which the approval was granted.

▼ **M8**

Table 1

Character	Emissions standard	OBD standard	Vehicle category and class	Engine	Implementation date: new types	Implementation date: new vehicles	Last date of registration
A	Euro 5a	Euro 5	M, N ₁ class I	PI, CI	1.9.2009	1.1.2011	31.12.2012
B	Euro 5a	Euro 5	M ₁ to fulfil specific social needs (excluding M ₁ G)	CI	1.9.2009	1.1.2012	31.12.2012
C	Euro 5a	Euro 5	M ₁ G to fulfil specific social needs	CI	1.9.2009	1.1.2012	31.8.2012
D	Euro 5a	Euro 5	N ₁ class II	PI, CI	1.9.2010	1.1.2012	31.12.2012
E	Euro 5a	Euro 5	N ₁ class III, N ₂	PI, CI	1.9.2010	1.1.2012	31.12.2012
F	Euro 5b	Euro 5	M, N ₁ class I	PI, CI	1.9.2011	1.1.2013	31.12.2013
G	Euro 5b	Euro 5	M ₁ to fulfil specific social needs (excluding M ₁ G)	CI	1.9.2011	1.1.2013	31.12.2013
H	Euro 5b	Euro 5	N ₁ class II	PI, CI	1.9.2011	1.1.2013	31.12.2013
I	Euro 5b	Euro 5	N ₁ class III, N ₂	PI, CI	1.9.2011	1.1.2013	31.12.2013
J	Euro 5b	Euro 5+	M, N ₁ class I	PI, CI	1.9.2011	1.1.2014	31.8.2015
K	Euro 5b	Euro 5+	M ₁ to fulfil specific social needs (excluding M ₁ G)	CI	1.9.2011	1.1.2014	31.8.2015
L	Euro 5b	Euro 5+	N ₁ class II	PI, CI	1.9.2011	1.1.2014	31.8.2016
M	Euro 5b	Euro 5+	N ₁ class III, N ₂	PI, CI	1.9.2011	1.1.2014	31.8.2016
N	Euro 6a	Euro 6-	M, N ₁ class I	CI			31.12.2012
O	Euro 6a	Euro 6-	N ₁ class II	CI			31.12.2012
P	Euro 6a	Euro 6-	N ₁ class III, N ₂	CI			31.12.2012

▼M8

Character	Emissions standard	OBD standard	Vehicle category and class	Engine	Implementation date: new types	Implementation date: new vehicles	Last date of registration
Q	Euro 6b	Euro 6-	M, N ₁ class I	CI			31.12.2013
R	Euro 6b	Euro 6-	N ₁ class II	CI			31.12.2013
S	Euro 6b	Euro 6-	N ₁ class III, N ₂	CI			31.12.2013
T	Euro 6b	Euro 6-plus IUPR	M, N ₁ class I	CI			31.8.2015
U	Euro 6b	Euro 6-plus IUPR	N ₁ class II	CI			31.8.2016
V	Euro 6b	Euro 6-plus IUPR	N ₁ class III, N ₂	CI			31.8.2016
W	Euro 6b	Euro 6-1	M, N ₁ class I	PI, CI	1.9.2014	1.9.2015	31.8.2018
X	Euro 6b	Euro 6-1	N ₁ class II	PI, CI	1.9.2015	1.9.2016	31.8.2019
Y	Euro 6b	Euro 6-1	N ₁ class III, N ₂	PI, CI	1.9.2015	1.9.2016	31.8.2019
ZA	Euro 6c	Euro 6-1	M, N ₁ class I	PI, CI			31.8.2018
ZB	Euro 6c	Euro 6-1	N ₁ class II	PI, CI			31.8.2019
ZC	Euro 6c	Euro 6-1	N ₁ class III, N ₂	PI, CI			31.8.2019
ZD	Euro 6c	Euro 6-2	M, N ₁ class I	PI, CI	1.9.2017	1.9.2018	
ZE	Euro 6c	Euro 6-2	N ₁ class II	PI, CI	1.9.2018	1.9.2019	
ZF	Euro 6c	Euro 6-2	N ₁ class III, N ₂	PI, CI	1.9.2018	1.9.2019	
ZX	n.a.	n.a.	All vehicles	Battery full electric	1.9.2009	1.1.2011	
ZY	n.a.	n.a.	All vehicles	Fuel cell full electric	1.9.2009	1.1.2011	

▼ M8

Character	Emissions standard	OBD standard	Vehicle category and class	Engine	Implementation date: new types	Implementation date: new vehicles	Last date of registration
ZZ	n.a	n.a.	All vehicles using certificates according to point 2.1.1 of Annex I	PI, CI	1.9.2009	1.1.2011	

Key:

'Euro 5a' emissions standard = excludes revised measurement procedure for particulate matter, particle number standard and flex fuel vehicle low temperature emission testing with biofuel;
 'Euro 5b' emissions standard = Full Euro 5 emission requirements including revised measurement procedure for particulate matter, particle number standard for CI vehicles and flex fuel vehicle low temperature emission testing with biofuel;
 'Euro 6a' emissions standard = excludes revised measurement procedure for particulate matter, particle number standard and flex fuel vehicle low temperature emission testing with biofuel;
 'Euro 6b' emissions standard = Euro 6 emission requirements including revised measurement procedure for particulate matter, particle number standards (preliminary values for PI vehicles) and flex fuel vehicle low temperature emission testing with biofuel;
 'Euro 6c' emissions standard = Full Euro 6 emission requirements, i.e. Euro 6b emission standard and final particle number standards for PI vehicles and use of E10 and B7 reference fuel (where applicable);
 'Euro 5' OBD standard = Base Euro 5 OBD requirements excluding in use performance ratio (IUPR), NO_x monitoring for petrol vehicles and tightened PM threshold limits for diesel;
 'Euro 5+' OBD standard = includes relaxed in use performance ratio (IUPR), NO_x monitoring for petrol vehicles and tightened PM threshold limits for diesel;
 'Euro 6-' OBD standard = relaxed OBD threshold limits;
 'Euro 6- plus IUPR' OBD standard = includes relaxed OBD threshold limits and relaxed in use performance ratio (IUPR);
 'Euro 6-1' OBD standard = Full Euro 6 OBD requirements but with preliminary OBD threshold limits as defined in point 2.3.4 of Annex XI and partially relaxed IUPR;
 'Euro 6-2' OBD standard = Full Euro 6 OBD requirements but with final OBD threshold limits as defined in point 2.3.3 of Annex XI.

▼ B**2. Examples of type-approval certification numbers.**

- 2.1. An example is provided below of a first approval without any extensions of an Euro 5 light passenger vehicle. The approval was granted to the base regulation and its implementing regulation so the fourth component is 0001. The vehicle is of category M₁ represented by letter A. The approval was issued by the Netherlands:

e4*715/2007*692/2008A*0001*00

- 2.2. This second example shows a fourth approval for the second extension of an Euro 5 light passenger vehicle of category M₁G meeting the special social needs requirements (letter C). The approval was granted to the base regulation and an amending regulation in the year 2009 and was issued by Germany:

e1*715/2007*.../2009C*0004*02

▼ B

Appendix 7

Manufacturer's certificate of compliance with the OBD in-use performance requirements

(Manufacturer):

(Address of the manufacturer):

Certifies that

- The vehicle types listed in attachment to this Certificate are in compliance with the provisions of section 3 of Appendix 1 to Annex XI of Regulation (EC) No 692/2008 relating to the in-use performance of the OBD system under all reasonably foreseeable driving conditions
- The plan(s) describing the detailed technical criteria for incrementing the numerator and denominator of each monitor attached to this Certificate are correct and complete for all types of vehicles to which this Certificate applies.

Done at [..... Place]

On [..... Date]

.....

[Signature of the Manufacturer's Representative]

Annexes:

- List of vehicle types to which this Certificate applies,
- Plan(s) describing the detailed technical criteria for incrementing the numerator and denominator of each monitor, as well as plan(s) for disabling numerators, denominators and general denominator.

▼ M1*ANNEX II***IN-SERVICE CONFORMITY**

1. INTRODUCTION
 - 1.1. This Annex sets out the tailpipe emissions and OBD (inclusive IUPR_M) in-service conformity requirements for vehicles type approved to this Regulation.
2. AUDIT OF IN-SERVICE CONFORMITY
 - 2.1. The audit of in-service conformity by the approval authority shall be conducted on the basis of any relevant information that the manufacturer has, under the same procedures as those for the conformity of production defined in Article 12(1) and (2) of Directive 2007/46/EC and in points 1 and 2 of Annex X to that Directive. Information from approval authority and Member State surveillance testing may complement the in-service monitoring reports supplied by the manufacturer.
 - 2.2. The figure referred to in point 9 of Appendix 2 to this Annex and Figure 4/2 of Appendix 4 to UN/ECE Regulation No 83 (for tailpipe emissions only) illustrates the procedure for in-service conformity checking. The process for in-service conformity is described in Appendix 3 to this Annex.
 - 2.3. As part of the information provided for the in-service conformity control, at the request of the approval authority, the manufacturer shall report to the type-approval authority on warranty claims, warranty repair works and OBD faults recorded at servicing, according to a format agreed at type-approval. The information shall detail the frequency and substance of faults for emissions-related components and systems. The reports shall be filed at least once a year for each vehicle model for the duration of the period defined in Article 9(4) of this Regulation.
 - 2.4. **Parameters defining the tailpipe emissions in-service family**

The in-service family may be defined by basic design parameters which shall be common to vehicles within the family. Accordingly, vehicle types may be considered as belonging to the same in-service family if they have in common, or within the stated tolerances, the following parameters:

 - 2.4.1. combustion process (two stroke, four stroke, rotary);
 - 2.4.2. number of cylinders;
 - 2.4.3. configuration of the cylinder block (in-line, V, radial, horizontally opposed, other. The inclination or orientation of the cylinders is not a criteria);
 - 2.4.4. method of engine fuelling (e.g. indirect or direct injection);
 - 2.4.5. type of cooling system (air, water, oil);
 - 2.4.6. method of aspiration (naturally aspirated, pressure charged);
 - 2.4.7. fuel for which the engine is designed (petrol, diesel, NG, LPG, etc.). Bi fuelled vehicles may be grouped with dedicated fuel vehicles providing one of the fuels is common;

▼ M1

- 2.4.8. type of catalytic converter (three-way catalyst, lean NO_x trap, SCR, lean NO_x catalyst or other(s));
- 2.4.9. type of particulate trap (with or without);
- 2.4.10. exhaust gas recirculation (with or without, cooled or non-cooled); and
- 2.4.11. engine cylinder capacity of the largest engine within the family minus 30 %.

2.5. Information requirements

An audit of in-service conformity will be conducted by the approval authority on the basis of information supplied by the manufacturer. Such information shall include in particular, the following:

- 2.5.1. the name and address of the manufacturer;
- 2.5.2. the name, address, telephone and fax numbers and e-mail address of his authorised representative within the areas covered by the manufacturer's information;
- 2.5.3. the model name(s) of the vehicles included in the manufacturer's information;
- 2.5.4. where appropriate, the list of vehicle types covered within the manufacturer's information, i.e. for tailpipe emissions, the in-service family group in accordance with point 2.4, and for OBD and IUPR_M, the OBD family in accordance with Appendix 2 to Annex XI;
- 2.5.5. the vehicle identification number (VIN) codes applicable to these vehicle types within the family (VIN prefix);
- 2.5.6. the numbers of the type-approvals applicable to these vehicle types within the family, including, where applicable, the numbers of all extensions and field fixes/recalls (re-works);
- 2.5.7. details of extensions, field fixes/recalls to those type-approvals for the vehicles covered within the manufacturer's information (if requested by the approval authority);
- 2.5.8. the period of time over which the manufacturer's information was collected;
- 2.5.9. the vehicle build period covered within the manufacturer's information (e.g. vehicles manufactured during the 2007 calendar year);
- 2.5.10. the manufacturer's in-service conformity checking procedure, including:
 - (i) vehicle location method;
 - (ii) vehicle selection and rejection criteria;
 - (iii) test types and procedures used for the programme;
 - (iv) the manufacturer's acceptance/rejection criteria for the family group;
 - (v) geographical area(s) within which the manufacturer has collected information;
 - (vi) sample size and sampling plan used;

▼ M1

- 2.5.11. the results from the manufacturer's in-service conformity procedure, including:
- (i) identification of the vehicles included in the programme (whether tested or not). The identification shall include the following:
 - model name,
 - vehicle identification number (VIN),
 - vehicle registration number,
 - date of manufacture,
 - region of use (where known),
 - tyres fitted (tailpipe emissions only);
 - (ii) the reason(s) for rejecting a vehicle from the sample;
 - (iii) service history for each vehicle in the sample (including any re-works);
 - (iv) repair history for each vehicle in the sample (where known);
 - (v) test data, including the following:
 - date of test/download,
 - location of test/download,
 - distance indicated on vehicle odometer;
 - (vi) test data for tailpipe emissions only:
 - test fuel specifications (e.g. test reference fuel or market fuel),
 - test conditions (temperature, humidity, dynamometer inertia weight),
 - dynamometer settings (e.g. power setting),
 - test results (from at least three different vehicles per family);
 - (vii) test data for $IUPR_M$ only:
 - all required data downloaded from the vehicle,
 - For each monitor to be reported the in-use-performance ratio $IUPR_M$;
- 2.5.12. records of indication from the OBD system;
- 2.5.13. for $IUPR_M$ sampling, the following:
- The average of in-use-performance ratios $IUPR_M$ of all selected vehicles for each monitor according to points 3.1.4 and 3.1.5 of Appendix 1 to Annex XI,
 - The percentage of selected vehicles, which have an $IUPR_M$ greater or equal to the minimum value applicable to the monitor according to points 3.1.4 and 3.1.5 of Appendix 1 to Annex XI.

▼ M1**3. SELECTION OF VEHICLES FOR IN-SERVICE CONFORMITY**

- 3.1. The information gathered by the manufacturer shall be sufficiently comprehensive to ensure that in-service performance can be assessed for normal conditions of use. The manufacturer's sampling shall be drawn from at least two Member States with substantially different vehicle operating conditions (unless only sold in one Member State). Factors such as differences in fuels, ambient conditions, average road speeds, and urban/highway driving split shall be taken into consideration in the selection of the Member States.

For OBD IUPR_M testing only vehicles fulfilling the criteria of point 2.2.1 of Appendix 1 shall be included in the test sample.

- 3.2. In selecting the Member States for sampling vehicles, the manufacturer may select vehicles from a Member State that is considered to be particularly representative. In this case, the manufacturer shall demonstrate to the approval authority which granted the type approval that the selection is representative (e.g. by the market having the largest annual sales of a vehicle family within the Union). When a family requires more than one sample lot to be tested as defined in point 3.5, the vehicles in the second and third sample lots shall reflect different vehicle operating conditions from those selected for the first sample.

- 3.3. The emissions testing may be done at a test facility which is located in a different market or region from where the vehicles have been selected.

- 3.4. The in-service tailpipe emissions conformity tests by the manufacturer shall be continuously carried out reflecting the production cycle of applicable vehicles types within a given in-service vehicle family. The maximum time period between commencing two in-service conformity checks shall not exceed 18 months. In the case of vehicle types covered by an extension to the type-approval that did not require an emissions test, this period may be extended up to 24 months.

3.5. Sample size

- 3.5.1. When applying the statistical procedure defined in Appendix 2 (i.e. for tailpipe emissions), the number of sample lots shall depend on the annual sales volume of an in-service family in the Union, as defined in the following table:

EU Registrations — per calendar year (for tailpipe emission tests), — of vehicles of an OBD family with IUPR in the sampling period	Number of sample lots
up to 100 000	1
100 001 to 200 000	2
above 200 000	3

▼ **M1**

- 3.5.2. For IUPR, the number of sample lots to be taken is described in the table in point 3.5.1 and is based on the number of vehicles of an OBD family that are approved with IUPR (subject to sampling).

For the first sampling period of an OBD family, all of the vehicle types in the family that are approved with IUPR shall be considered to be subject to sampling. For subsequent sampling periods, only vehicle types which have not been previously tested or are covered by emissions approvals that have been extended since the previous sampling period shall be considered to be subject to sampling.

For families consisting of fewer than 5 000 EU registrations that are subject to sampling within the sampling period the minimum number of vehicles in a sample lot is six. For all other families, the minimum number of vehicles in a sample lot to be sampled is fifteen.

Each sample lot shall adequately represent the sales pattern, i.e. at least high volume vehicle types ($\geq 20\%$ of the family total) shall be represented.

4. On the basis of the audit referred to in Section 2 the approval authority shall adopt one of the following decisions and actions:
- (a) decide that the in-service conformity of a vehicle type, vehicle in-service family or vehicle OBD family is satisfactory and not take any further action;
 - (b) decide that the data provided by the manufacturer is insufficient to reach a decision and request additional information or test data from the manufacturer;
 - (c) decide that based on data from the approval authority or Member State surveillance testing programmes, that information provided by the manufacturer is insufficient to reach a decision and request additional information or test data from the manufacturer;
 - (d) decide that the in-service conformity of a vehicle type, that is part of an in-service family, or of an OBD family, is unsatisfactory and proceed to have such vehicle type or OBD family tested in accordance with Appendix 1.

If according to the IUPR_M audit the test criteria of point 6.1.2 point (a) or (b) of Appendix 1 are met for the vehicles in a sample lot, the type-approval authority must take the further action described in point (d) of this point.

- 4.1. Where type 1 tests are considered necessary to check the conformity of emission control devices with the requirements for their performance while in service, such tests shall be carried out using a test procedure meeting the statistical criteria defined in Appendix 2.
- 4.2. The approval authority, in cooperation with the manufacturer, shall select a sample of vehicles with sufficient mileage whose use under normal conditions can be reasonably assured. The manufacturer shall be consulted on the choice of the vehicles in the sample and allowed to attend the confirmatory checks of the vehicles.
- 4.3. The manufacturer shall be authorised, under the supervision of the approval authority, to carry out checks, even of a destructive nature, on those vehicles with emission levels in excess of the limit values with a view to establishing possible causes of deterioration which cannot be attributed to the manufacturer (e.g. use of leaded petrol before the test date). Where the results of the checks confirm such causes, those test results shall be excluded from the conformity check.

▼ **M1***Appendix 1***In-service conformity check**

1. INTRODUCTION

- 1.1. This Appendix sets out the criteria referred to in Section 4 regarding the selection of vehicles for testing and the procedures for the in-service conformity control.

2. SELECTION CRITERIA

The criteria for acceptance of a selected vehicle are defined for tailpipe emissions in points 2.1 to 2.8 and for IUPR_M in Sections 2.1 to 2.5.

- 2.1. The vehicle shall belong to a vehicle type that is type-approved under this Regulation and covered by a certificate of conformity in accordance with Directive 2007/46/EC. For checking of IUPR_M, the vehicle shall be approved to the OBD standards Euro 5+, Euro 6- plus IUPR or later. It shall be registered and have been used in the Union.

- 2.2. The vehicle shall have been in service for at least 15 000 km or 6 months, whichever the later, and for no more than 100 000 km or 5 years, whichever the sooner.

- 2.2.1. For checking IUPR_M, the test sample shall include only vehicles that:

- (a) have collected sufficient vehicle operation data for the monitor to be tested.

For monitors required to meet the in-use monitor performance ratio and to track and report ratio data pursuant to point 3.6.1 of Appendix 1 to Annex XI, sufficient vehicle operation data shall mean the denominator meets the criteria set forth below. The denominator, as defined in points 3.3 and 3.5 of Appendix 1 to Annex XI, for the monitor to be tested must have a value equal to or greater than one of the following values:

- (i) 75 for evaporative system monitors, secondary air system monitors, and monitors utilising a denominator incremented in accordance with point 3.3.2 points (a), (b) or (c) of Appendix 1 to Annex XI (e.g. cold start monitors, air conditioning system monitors, etc.); or
- (ii) 25 for particulate filter monitors and oxidation catalyst monitors utilising a denominator incremented in accordance with point 3.3.2(d) of Appendix 1 to Annex XI; or
- (iii) 150 for catalyst, oxygen sensor, EGR, VVT, and all other component monitors;
- (b) have not been tampered with or equipped with add-on or modified parts that would cause the OBD system not to comply with the requirements of Annex XI.

- 2.3. There shall be a maintenance record to show that the vehicle has been properly maintained (e.g. has been serviced in accordance with the manufacturer's recommendations).

▼ **M1**

- 2.4. The vehicle shall exhibit no indications of abuse (e. g. racing, overloading, mis-fuelling, or other misuse), or other factors (e. g. tampering) that could affect emission performance. The fault code and mileage information stored in the computer shall be taken into account. A vehicle shall not be selected for testing if the information stored in the computer shows that the vehicle has operated after a fault code was stored and a relatively prompt repair was not carried out.
- 2.5. There shall have been no unauthorised major repair to the engine or major repair of the vehicle.
- 2.6. The lead content and sulphur content of a fuel sample from the vehicle tank shall meet the applicable standards laid down in Directive 98/70/EC of the European Parliament and of the Council ⁽¹⁾ and there shall be no evidence of mis-fuelling. Checks may be done in the tailpipe.
- 2.7. There shall be no indication of any problem that might jeopardise the safety of laboratory personnel.
- 2.8. All anti-pollution system components on the vehicle shall be in conformity with the applicable type-approval.

3. DIAGNOSIS AND MAINTENANCE

Diagnosis and any normal maintenance necessary shall be performed on vehicles accepted for testing, prior to measuring exhaust emissions, in accordance with the procedure laid down in points 3.1 to 3.7.

- 3.1. The following checks shall be carried out: checks on air filter, all drive belts, all fluid levels, radiator cap, all vacuum hoses and electrical wiring related to the antipollution system for integrity; checks on ignition, fuel metering and pollution control device components for maladjustments and/or tampering. All discrepancies shall be recorded.
- 3.2. The OBD system shall be checked for proper functioning. Any malfunction indications in the OBD memory shall be recorded and the requisite repairs shall be carried out. If the OBD malfunction indicator registers a malfunction during a preconditioning cycle, the fault may be identified and repaired. The test may be rerun and the results of that repaired vehicle used.
- 3.3. The ignition system shall be checked and defective components replaced, for example spark plugs, cables, etc.
- 3.4. The compression shall be checked. If the result is unsatisfactory the vehicle shall be rejected.
- 3.5. The engine parameters shall be checked to the manufacturer's specifications and adjusted if necessary.
- 3.6. If the vehicle is within 800 km of a scheduled maintenance service, that service shall be performed according to the manufacturer's instructions. Regardless of odometer reading, the oil and air filter may be changed at the request of the manufacturer.
- 3.7. Upon acceptance of the vehicle, the fuel shall be replaced with appropriate emission test reference fuel, unless the manufacturer accepts the use of market fuel.

⁽¹⁾ OJ L 350, 28.12.1998, p. 58.

▼ M1

4. IN-SERVICE TESTING

- 4.1. When a check on vehicles is deemed necessary, emission tests in accordance with Annex III are performed on pre-conditioned vehicles selected in accordance with the requirements of Sections 2 and 3 of this Appendix. This test shall only include the measurement of particle number emissions for vehicles approved to the Euro 6 emission standards in categories W, X and Y as defined in Table 1 of Appendix 6 to Annex I. Pre-conditioning cycles additional to those specified in points 5.3 of Annex 4 to UN/ECE Regulation No 83 will only be allowed if they are representative of normal driving.
- 4.2. Vehicles equipped with an OBD system may be checked for proper in-service functionality, of the malfunction indication, etc., in relation to levels of emissions (e.g. the malfunction indication limits defined in Annex XI) for the type-approved specifications.
- 4.3. The OBD system may be checked, for example, for levels of emissions above the applicable limit values with no malfunction indication, systematic erroneous activation of the malfunction indication and identified faulty or deteriorated components in the OBD system.
- 4.4. If a component or system operates in a manner not covered by the particulars in the type-approval certificate and/or information package for such vehicle types and such deviation has not been authorised under Article 13(1) or (2) of Directive 2007/46/EC, with no malfunction indication by the OBD, the component or system shall not be replaced prior to emission testing, unless it is determined that the component or system has been tampered with or abused in such a manner that the OBD does not detect the resulting malfunction.

5. EVALUATION OF EMISSION TEST RESULTS

- 5.1. The test results shall be submitted to the evaluation procedure in accordance with Appendix 2.
- 5.2. Test results shall not be multiplied by deterioration factors.

6. PLAN OF REMEDIAL MEASURES

- 6.1. The approval authority shall request the manufacturer to submit a plan of remedial measures to remedy the non-compliance when:
- 6.1.1. For tailpipe emissions, more than one vehicle is found to be an outlying emitter that meets either of the following conditions:
- (a) the conditions set out in point 3.2.3 of Appendix 4 to UN/ECE Regulation No 83 and where both the approval authority and the manufacturer agree that the excess emission is due to the same cause; or
 - (b) the conditions set out in point 3.2.4 of Appendix 4 to UN/ECE Regulation No 83 where the approval authority has determined that the excess emission is due to the same cause.

▼ M1

- 6.1.2. For $IUPR_M$ of a particular monitor M the following statistical conditions are met in a test sample, the size of which is determined according to point 3.5 of this Annex:
- (a) For vehicles certified to a ratio of 0,1 in accordance with point 3.1.5 of Appendix 1 to Annex XI, the data collected from the vehicles indicate for at least one monitor M in the test sample either that the test sample average in-use-performance ratio is less than 0,1 or that 66 % or more of the vehicles in the test sample have an in-use monitor performance ratio of less than 0,1.
 - (b) For vehicles certified to the full ratios in accordance with point 3.1.4 of Appendix 1 to Annex XI, the data collected from the vehicles indicate for at least one monitor M in the test sample either that the test sample average in-use performance ratio in the test sample is less than the value $Test_{min}(M)$ or that 66 % or more of the vehicles in the test sample have an in-use performance ratio of less than $Test_{min}(M)$.

The value of $Test_{min}(M)$ shall be:

- (i) 0,230 if the monitor M is required to have an in-use ratio of 0,26;
- (ii) 0,460 if the monitor M is required to have an in-use ratio of 0,52;
- (iii) 0,297 if the monitor M is required to have an in-use ratio of 0,336;

according to point 3.1.4 of Appendix 1 to Annex XI.

- 6.2. The plan of remedial measures shall be filed with the type-approval authority not later than 60 working days from the date of the notification referred to in point 6.1. The type-approval authority shall within 30 working days declare its approval or disapproval of the plan of remedial measures. However, where the manufacturer can demonstrate, to the satisfaction of the competent approval authority, that further time is required to investigate the non-compliance in order to submit a plan of remedial measures, an extension shall be granted.
- 6.3. The remedial measures shall apply to all vehicles likely to be affected by the same defect. The need to amend the type-approval documents shall be assessed.
- 6.4. The manufacturer shall provide a copy of all communications related to the plan of remedial measures, and shall also maintain a record of the recall campaign, and supply regular status reports to the approval authority.
- 6.5. The plan of remedial measures shall include the requirements specified in points 6.5.1 to 6.5.11. The manufacturer shall assign a unique identifying name or number to the plan of remedial measures.
- 6.5.1. A description of each vehicle type included in the plan of remedial measures.
- 6.5.2. A description of the specific modifications, alterations, repairs, corrections, adjustments or other changes to be made to bring the vehicles into conformity including a brief summary of the data and technical studies which support the decision of the manufacturer as to the particular measures to be taken to correct the non-conformity.
- 6.5.3. A description of the method by which the manufacturer informs the vehicle owners.

▼ M1

- 6.5.4. A description of the proper maintenance or use, if any, which the manufacturer stipulates as a condition of eligibility for repair under the plan of remedial measures, and an explanation of the reasons why the manufacturer imposes any such condition. No maintenance or use conditions may be imposed unless it is demonstrably related to the non-conformity and the remedial measures.
- 6.5.5. A description of the procedure to be followed by vehicle owners to obtain correction of the non-conformity. This description shall include a date after which the remedial measures may be taken, the estimated time for the workshop to perform the repairs and where they can be done. The repair shall be done expediently, within a reasonable time after delivery of the vehicle.
- 6.5.6. A copy of the information transmitted to the vehicle owner.
- 6.5.7. A brief description of the system which the manufacturer uses to assure an adequate supply of component or systems for fulfilling the remedial action. It shall be indicated when there will be an adequate supply of components or systems to initiate the campaign.
- 6.5.8. A copy of all instructions to be sent to those persons who are to perform the repair.
- 6.5.9. A description of the impact of the proposed remedial measures on the emissions, fuel consumption, driveability, and safety of each vehicle type, covered by the plan of remedial measures with data and technical studies which support these conclusions.
- 6.5.10. Any other information, reports or data the type-approval authority may reasonably determine is necessary to evaluate the plan of remedial measures.
- 6.5.11. Where the plan of remedial measures includes a recall, a description of the method for recording the repair shall be submitted to the type-approval authority. If a label is used, an example of it shall be submitted.
- 6.6. The manufacturer may be required to conduct reasonably designed and necessary tests on components and vehicles incorporating a proposed change, repair, or modification to demonstrate the effectiveness of the change, repair, or modification.
- 6.7. The manufacturer is responsible for keeping a record of every vehicle recalled and repaired and the workshop which performed the repair. The type-approval authority shall have access to the record on request for a period of 5 years from the implementation of the plan of remedial measures.
- 6.8. The repair and modification or addition of new equipment shall be recorded in a certificate supplied by the manufacturer to the vehicle owner.

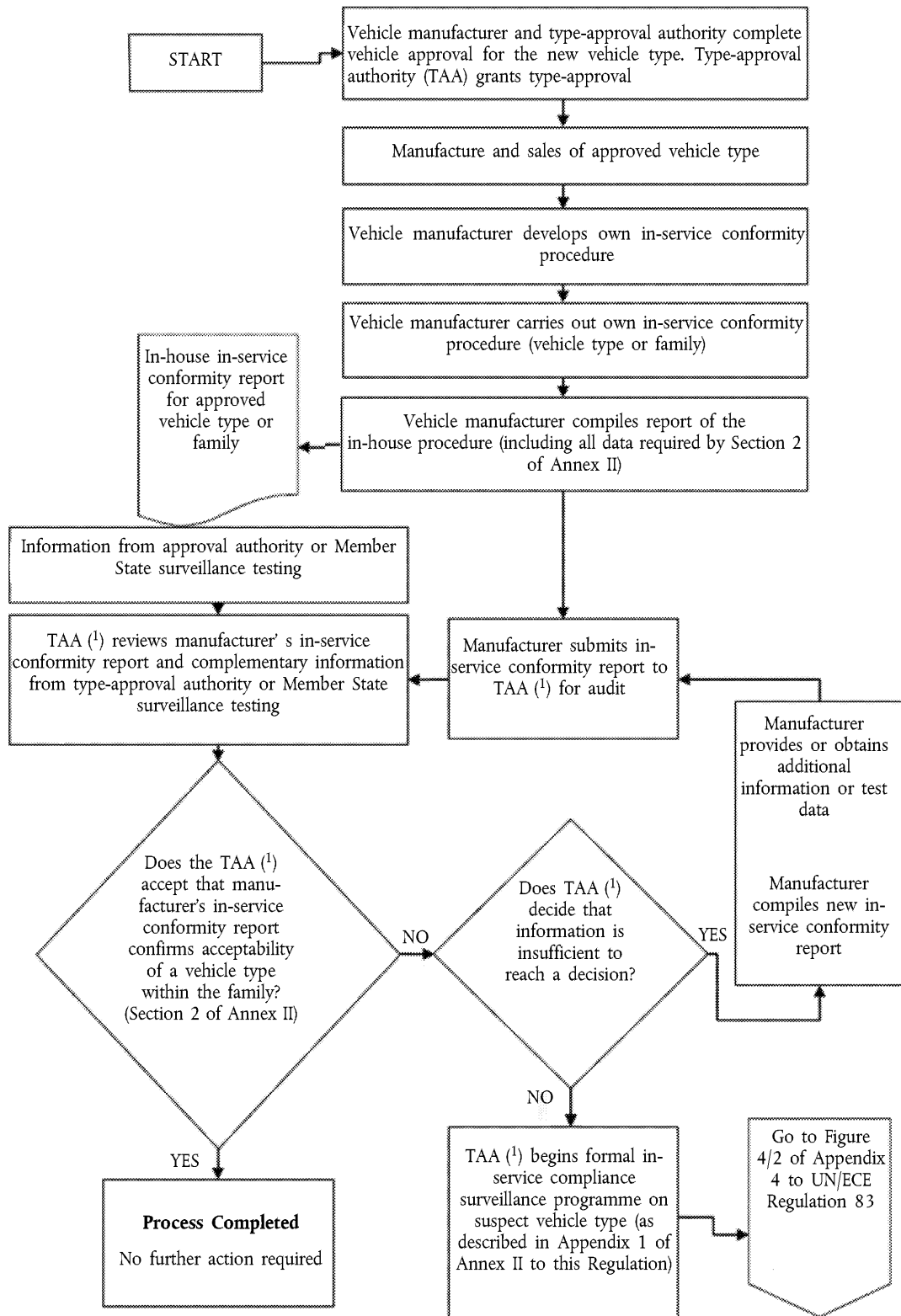
▼ M1*Appendix 2***Statistical procedure for tailpipe emissions in-service conformity testing**

1. This procedure shall be used to verify the in-service conformity requirements for the type 1 test. The applicable statistical method set out in Appendix 4 to UN/ECE Regulation No 83 shall apply, with the exceptions described in the Sections 2 to 9 of this Appendix.
2. Note 1 shall not apply.
3. Point 3.2 shall be understood as follows:

A vehicle is said to be an outlying emitter when the conditions given in point 3.2.2 are met.
4. Point 3.2.1 shall not apply.
5. In point 3.2.2, the reference to row B of the table in point 5.3.1.4 shall be understood as reference to Table 1 of Annex I to Regulation (EC) No 715/2007 for Euro 5 vehicles and to Table 2 of Annex I to Regulation (EC) No 715/2007 for Euro 6 vehicles.
6. In points 3.2.3.2.1 and 3.2.4.2, the reference to Section 6 of Appendix 3 shall be understood as reference to Section 6 of Appendix 1 to Annex II to this Regulation.
7. In notes 2 and 3, the reference to row A of the table in point 5.3.1.4 shall be understood as reference to Table 1 of Annex I to Regulation (EC) No 715/2007 for Euro 5 vehicles and to Table 2 of Annex I to Regulation (EC) No 715/2007 for Euro 6 vehicles.
8. In point 4.2, the reference to point 5.3.1.4 shall be understood as reference to Table 1 of Annex I to Regulation (EC) No 715/2007 for Euro 5 vehicles and Table 2 of Annex I to Regulation (EC) No 715/2007 for Euro 6 vehicles.
9. Figure 4/1 shall be replaced by the following figure:

▼ M1

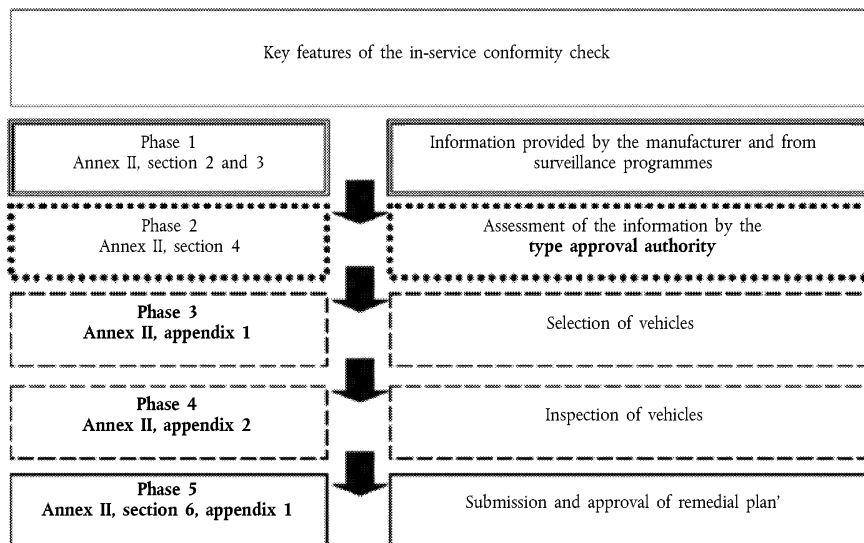
Figure 4/1



(1) In this case, TAA means the approval authority that granted the type-approval according to this Regulation.

▼ **M1***Appendix 3***Responsibilities for in-service conformity**

1. The process of checking in-service conformity check is illustrated in Figure 1.
2. The manufacturer shall compile all the information needed to comply with the requirements of this Annex. The approval authority may also take information from surveillance programmes into consideration.
3. The approval authority shall conduct all the procedures and tests necessary to ensure that the requirements regarding the in-service conformity are met. (Phases 2 to 4).
4. In the event of discrepancies or disagreements in the assessment of information supplied, the approval authority shall request clarification from the technical service that conducted the type-approval test.
5. The manufacturer shall establish and implement a plan of remedial measures. This plan shall be approved by the approval authority before it is implemented (Phase 5).

*Figure 1***Illustration of the in-service conformity process**

▼B*ANNEX III***VERIFYING AVERAGE EXHAUST EMISSIONS AT AMBIENT CONDITIONS**

(TYPE 1 TEST)

1. INTRODUCTION

This Annex describes the procedure for the type 1 test verifying the average exhaust emissions at ambient conditions.

2. GENERAL REQUIREMENTS

2.1. The general requirements shall be those set out in paragraph 5.3.1 of UN/ECE Regulation 83, with the exceptions described in sections 2.2 to 2.5.

2.2. The vehicles that are subject to the test set out in paragraph 5.3.1.1 shall be understood as being all vehicles covered by the scope of this Regulation.

2.3. The pollutants specified in paragraph 5.3.1.2.4 shall be understood as being all those covered by Tables 1 and 2 of Annex 1 of Regulation (EC) No 715/2007.

2.4. The reference to the deterioration factors from paragraph 5.3.6 in paragraph 5.3.1.4 shall be understood as being a reference to the deterioration factors specified in Annex VII to this Regulation.

2.5. The emission limits referred to in paragraph 5.3.1.4 shall be understood as being a reference to the emission limits set out in Table 1 of Annex 1 to Regulation (EC) No 715/2007 for Euro 5 vehicles, and in Table 2 of Annex 1 of Regulation (EC) No 715/2007 for Euro 6 vehicles.

2.6. Requirements for vehicles fuelled by LPG, natural gas or biomethane

2.6.1. The general requirements for testing vehicles fuelled by LPG, natural gas or biomethane shall be those set out in section 1 of Annex 12 to UN/ECE Regulation 83.

3. TECHNICAL REQUIREMENTS

▼M1

3.1. The technical requirements shall be those set out in Annex 4 to UN/ECE Regulation No 83 with the exceptions set out in points 3.2 to 3.12. As from the dates set out in the second sentence of Article 10(6) of Regulation (EC) No 715/2007 the mass of particulate matter (PM) and the number of particles (P) shall be determined according to the emission test procedure set out in Section 6 of Annex 4a to UN/ECE Regulation No 83, series of amendments 05, supplement 07, using the test equipment described in points 4.4 and 4.5 thereof, respectively.

▼B

3.2. The reference fuels specified in paragraph 3.2 shall be understood as being a reference to the appropriate reference fuel specifications in Annex IX to this Regulation.

▼M3

3.3. The exhaust gases mentioned in paragraph 4.3.1.1 shall be understood as including methane, water and hydrogen:

‘... (HFID). It shall be calibrated with propane gas expressed as equivalent to carbon atoms (C₁).

▼ M3

Methane (CH₄) analysis:

The analyser shall be either a gas chromatograph combined with a flame ionisation (FID) type or a flame ionisation (FID) with a non-methane cutter type, calibrated with methane gas expressed as equivalent to carbon atoms (C₁).

Water (H₂O) analysis:

The analyser shall be of the non-dispersive infrared analyzer (NDIR) absorption type. The NDIR shall be calibrated either with water vapour or with propylene (C₃H₆). If the NDIR is calibrated with water vapour, it shall be ensured that no water condensation can occur in tubes and connections during the calibration process. If the NDIR is calibrated with propylene, the manufacturer of the analyzer shall provide the information for converting the concentration of propylene to its corresponding concentration of water vapour. The values for conversion shall be periodically checked by the manufacturer of the analyzer, and at least once per year.

Hydrogen (H₂) analysis:

The analyser shall be of the sector field mass spectrometry type, calibrated with hydrogen.

Nitrogen oxide (NO_x) ...?.

- 3.3.a. The pure gases mentioned in paragraph 4.5.1. shall be understood as including propylene:

‘... propane: (minimum purity 99,5 per cent).

propylene: (minimum purity 99,5 per cent)?.

▼ M8

- 3.4. The hydrocarbons ratios in paragraph 8.2 shall be understood as follows:

For petrol (E5) (C ₁ H _{1,89} O _{0,016})	d = 0,631 g/l
For petrol (E10) (C ₁ H _{1,93} O _{0,033})	d = 0,645 g/l
For diesel (B5) (C ₁ H _{1,86} O _{0,005})	d = 0,622 g/l
For diesel (B7) (C ₁ H _{1,86} O _{0,007})	d = 0,623 g/l
For LPG (C ₁ H _{2,525})	d = 0,649 g/l
For NG/biomethane (CH ₄)	d = 0,714 g/l
For ethanol (E85) (C ₁ H _{2,74} O _{0,385})	d = 0,932 g/l
For ethanol (E75) (C ₁ H _{2,61} O _{0,329})	d = 0,886 g/l
For H ₂ NG	$d = \frac{9,104 \cdot A + 136}{100000 - 0,583A}$ g/l

A being the quantity of NG/biomethane within the H₂NG mixture, expressed in per cent volume.

▼ B

- 3.5. From the relevant dates set out in Article 10(4) and 10(5) of Regulation (EC) No 715/2007, paragraph 4.1.2. of Appendix 3 to Annex 4 shall be understood as follows:

‘Tyres

The choice of tyres shall be based on the rolling resistance. The tyres with the highest rolling resistance shall be chosen, measured according to ISO 28580.

If there are more than three tyre rolling resistances, the tyre with the second highest rolling resistance shall be chosen.

The rolling resistance characteristics of the tyres fitted to production vehicles shall reflect those of the tyres used for type-approval’

▼ B

3.6. Paragraph 2.2.2 of Appendix 5 to Annex 4 shall be understood as covering:

‘ concentrations of CO₂, CO, THC, CH₄ and NO_x ’

3.7. Paragraph 1 of Appendix 8 to Annex 4 shall be amended to read:

‘ ... There is no humidity correction for THC, CH₄ and CO, ’

▼ M3

3.8. The second subparagraph of paragraph 1.3 of Appendix 8 to Annex 4 shall be understood as:

‘... The dilution factor is calculated as follows:

For each reference fuel, except hydrogen

$$DF = \frac{X}{C_{CO_2} + (C_{HC} + C_{CO}) \cdot 10^{-4}}$$

For a fuel of composition C_xH_yO_z, the general formula is:

$$X = 100 \frac{x}{x + \frac{y}{2} + 3,76 \cdot \left(x + \frac{y}{4} - \frac{z}{2}\right)}$$

In particular for H₂NG, the formula is:

$$X = \frac{65,4 \cdot A}{4,922A + 195,84}$$

For hydrogen, the dilution factor is calculated as follows:

$$DF = \frac{X}{C_{H_2O} - C_{H_2O-DA} + C_{H_2} \cdot 10^{-4}}$$

For the reference fuels contained in Annex IX, the values of “X” are as follows:

▼ M8

Fuel	X
Petrol (E5)	13,4
Petrol (E10)	13,4
Diesel (B5)	13,5
Diesel (B7)	13,5
LPG	11,9
NG/biomethane	9,5
Ethanol (E85)	12,5
Ethanol (E75)	12,7

▼ M3

In these equations:

C_{CO₂} = concentration of CO₂ in the diluted exhaust gas contained in the sampling bag, expressed in per cent volume,

C_{HC} = concentration of HC in the diluted exhaust gas contained in the sampling bag, expressed in ppm carbon equivalent,

C_{CO} = concentration of CO in the diluted exhaust gas contained in the sampling bag, expressed in ppm,

C_{H₂O} = concentration of H₂O in the diluted exhaust gas contained in the sampling bag, expressed in per cent volume,

▼M3

$C_{\text{H}_2\text{O-DA}}$ = concentration of H_2O in the air used for dilution, expressed in per cent volume,

C_{H_2} = concentration of hydrogen in the diluted exhaust gas contained in the sampling bag, expressed in ppm,

A = quantity of NG/biomethane within the H2NG mixture, expressed in per cent volume².

▼B

- 3.9. An addition to the requirements of Paragraph 1.3. of Appendix 8 to Annex 4, the following requirements shall apply:

Non-methane hydrocarbon concentration is calculated as follows:

$$C_{\text{NMHC}} = C_{\text{THC}} - (\text{Rf}_{\text{CH}_4} \times C_{\text{CH}_4})$$

where:

C_{NMHC} = corrected concentration of NMHC in the diluted exhaust gas, expressed in ppm carbon equivalent,

C_{THC} = concentration of THC in the diluted exhaust gas, expressed in ppm carbon equivalent and corrected by the amount of THC contained in the dilution air,

C_{CH_4} = concentration of CH_4 in the diluted exhaust gas, expressed in ppm carbon equivalent and corrected by the amount of CH_4 contained in the dilution air,

Rf_{CH_4} = is the FID response factor to methane as defined in paragraph 2.3 of Annex 4-Appendix 6.

- 3.10. Paragraph 1.5.2.3 of Appendix 8 to Annex 4 shall be understood as including the following:

$Q_{\text{THC}} = 0,932$ in the case of ethanol (E85)

$Q_{\text{THC}} = 0,886$ in the case of ethanol (E75)

▼M1**▼B**

- 3.11. References to HC should be understood as references to THC in the following paragraphs:

(a) Paragraph 4.3.1.1;

(b) Paragraph 4.3.2;

(c) Appendix 6 — Paragraph 2.2;

(d) Appendix 8 — Paragraph 1.3;

(e) Appendix 8 — Paragraph 1.5.1.3;

▼B

- (f) Appendix 8 — Paragraph 1.5.2.3;
 - (g) Appendix 8 — Paragraph 2.1.
- 3.12. References to hydrocarbons should be understood as references to total hydrocarbons in the following paragraphs:
- (a) Paragraph 4.3.1.1;
 - (b) Paragraph 4.3.2;
 - (c) Paragraph 7.2.8.
- 3.13. Technical requirements for a vehicle equipped with a periodically regenerating system
- 3.13.1. The technical requirements shall be those set out in section 3 of Annex 13 to UN/ECE Regulation No 83, with the exceptions described in sections 3.13.2 to 3.13.4.
- 3.13.2. The reference to Annex 1, items 4.2.11.2.1.10.1 to 4.2.11.2.1.10.4 or 4.2.11.2.5.4.1 to 4.2.11.2.5.4.4 in section 3.1.3 shall be understood as references to items 3.2.12.2.1.11.1 to 3.2.12.2.1.11.4 or 3.2.12.2.6.4.1 to 3.2.12.2.6.4.4 of Appendix 3 to Annex I of Regulation (EC) No 692/2008.
- 3.13.3. At the request of the manufacturer, the test procedure specific to periodically regenerating systems shall not apply to a regenerative device if the manufacturer provides data to the approval authority that, during cycles where regeneration occurs, emissions remain below the standards given in Table 1 or 2 of Annex I to Regulation (EC) No 715/2007 applied for the concerned vehicle category after agreement of the technical service.
- 3.13.4. For a periodically regenerating device, during cycles where regeneration occurs, emission standards can be exceeded. If a regeneration of a pollution control device occurs at least once per type 1 test and the device has already regenerated at least once during vehicle preparation cycle, it shall be considered as a continuously regenerating system which does not require a special test procedure.

▼M1

- 3.14. As from the dates laid down in Article 2 of Commission Directive 2008/89/EC ⁽¹⁾ the daytime running lamps of the vehicle as defined in Section 2 of UN/ECE Regulation No 48 ⁽²⁾ shall be switched on during the test cycle. The vehicle tested shall be equipped with the daytime running lamp system that has the highest electrical energy consumption among the daytime running lamp systems, which are fitted by the manufacturer to vehicles in the group represented by the type-approved vehicle. The manufacturer shall supply appropriate technical documentation to the type-approval authorities in this respect.

⁽¹⁾ OJ L 257, 25.9.2008, p. 14.

⁽²⁾ OJ L 135, 23.5.2008, p. 1.

▼B*ANNEX IV***EMISSIONS DATA REQUIRED AT TYPE-APPROVAL FOR ROADWORTHINESS PURPOSES***Appendix 1***MEASURING CARBON MONOXIDE EMISSION AT IDLING SPEEDS****(TYPE 2 TEST)****1. INTRODUCTION**

- 1.1. This appendix describes the procedure for the type 2 test, measuring carbon monoxide emissions at idling speeds (normal and high).

2. GENERAL REQUIREMENTS

- 2.1. The general requirements shall be those specified in paragraphs 5.3.7.1 to 5.3.7.4 of UN/ECE Regulation 83, with the exceptions set out in sections 2.2, 2.3 and 2.4.

▼M8

- 2.2. The atomic ratios specified in point 5.3.7.3 shall be understood as follows:

Hcv = Atomic ratio of hydrogen to carbon

— for petrol (E5) 1,89

— for petrol (E10) 1,93

— for LPG 2,53

— for NG/biomethane 4,0

— for ethanol (E85) 2,74

— for ethanol (E75) 2,61

Ocv = Atomic ratio of oxygen to carbon

— for petrol (E5) 0,016

— for petrol (E10) 0,033

— for LPG 0,0

— for NG/biomethane 0,0

— for ethanol (E85) 0,39

— for ethanol (E75) 0,329

▼B

- 2.3. The table in section 2.2 of Appendix 4 to Annex I to this Regulation shall be completed on the basis of the requirements set out in sections 2.2 and 2.4 of this Annex.

- 2.4. The manufacturer shall confirm the accuracy of the Lambda value recorded at the time of type-approval in paragraph 2.1 of this Appendix as being representative of typical production vehicles within 24 months of the date of the granting of type-approval by the technical service. An assessment shall be made on the basis of surveys and studies of production vehicles.

▼B

3. TECHNICAL REQUIREMENTS
 - 3.1. The technical requirements shall be those set out in Annex 5 to UN/ECE Regulation No 83, with the exceptions set out in section 3.2.
 - 3.2. The reference fuels specified in paragraph 2.1 of Annex 5 to UN/ECE Regulation No 83 shall be understood as referring to the appropriate reference fuel specifications in Annex IX to this Regulation.

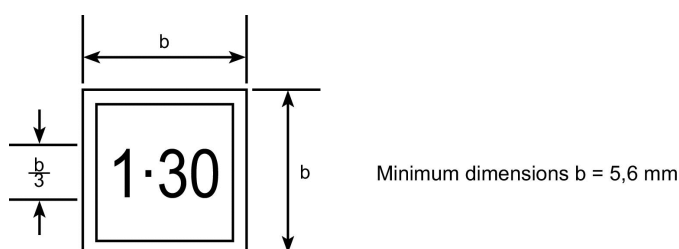
▼B*Appendix 2***MEASUREMENT OF SMOKE OPACITY**

1. INTRODUCTION

- 1.1. This Appendix describes the requirements for measuring the opacity of exhaust emissions.

2. SYMBOL OF THE CORRECTED ABSORPTION COEFFICIENT

- 2.1. A symbol of the corrected absorption coefficient shall be affixed to every vehicle conforming to a vehicle type to which this test applies. The symbol shall be a rectangle surrounding a figure expressing in m^{-1} the corrected absorption coefficient obtained, at the time of approval, from the test under free acceleration. The test method is described in section 4.
- 2.2. The symbol shall be clearly legible and indelible. It shall be fixed in a conspicuous and readily accessible place, the location of which shall be specified in the Addendum to the type-approval certificate shown in Appendix 4 to Annex I.
- 2.3. Figure IV.2.1 gives an example of the symbol.

Figure IV.2.1

The above symbol shows that the corrected absorption coefficient is $1,30 \text{ m}^{-1}$.

3. SPECIFICATIONS AND TESTS

- 3.1. The specifications and tests shall be those set out in Part III, section 24, of UN/ECE Regulation No 24, with the exception to these procedures set out in section 3.2.
- 3.2. The reference to Annex 2 in paragraph 24.1 of UN/ECE Regulation No 24 shall be understood as a reference to Appendix 2 to Annex X to this Regulation.

4. TECHNICAL REQUIREMENTS

- 4.1. The technical requirements shall be those set out in Annexes 4, 5, 7, 8, 9 and 10 to UN/ECE Regulation No 24, with the exceptions set out in sections 4.2., 4.3 and 4.4.
- 4.2. **Test at steady speeds over the full load curve**
- 4.2.1. The references to Annex 1 in paragraph 3.1. of Annex 4 of UN/ECE Regulation No 24 shall be understood as references to Appendix 3 to Annex I to this Regulation.
- 4.2.2. The reference fuel specified in paragraph 3.2 of Annex 4 of UN/ECE Regulation No 24 shall be understood as reference to the reference fuel in Annex IX to this Regulation appropriate to the emission limits against which the vehicle is being type approved.

▼B**4.3. Test under free acceleration**

- 4.3.1. The references to Table 2, Annex 2 in paragraph 2.2 of Annex 5 to UN/ECE Regulation No 24 shall be understood as references to the table under point 2.4.2.1 of Appendix 4 to Annex I to this Regulation.
- 4.3.2. The references to paragraph 7.3 of Annex 1 in paragraph 2.3 of Annex 5 to UN/ECE Regulation No 24 shall be understood as references to Appendix 3 to Annex I to this Regulation.

4.4. 'ECE' method of measuring the net power of C.I. engines

- 4.4.1. The references in paragraph 7 of Annex 10 to UN/ECE Regulation No 24 to the 'Appendix to this Annex' and in paragraphs 7 and 8 of Annex 10 to UN/ECE Regulation No 24 to 'Annex 1' shall be understood as references to Appendix 3 to Annex I to this Regulation.



ANNEX V

VERIFYING EMISSIONS OF CRANKCASE GASES

(TYPE 3 TEST)

1. INTRODUCTION

- 1.1. This Annex describes the procedure for the type 3 test verifying emissions of crankcase gases.

2. GENERAL REQUIREMENTS

- 2.1. The general requirements for conducting the type 3 test shall be those set out in section 2 of Annex 6 to UN/ECE Regulation No 83.

3. TECHNICAL REQUIREMENTS

- 3.1. The technical requirements shall be those set out in section 3 to 6 of Annex 6 to UN/ECE Regulation No 83.

*ANNEX VI***DETERMINATION OF EVAPORATIVE EMISSIONS**

(TYPE 4 TEST)

1. INTRODUCTION
 - 1.1. This Annex describes the procedure for the Type 4 test, which determines the emission of hydrocarbons by evaporation from the fuel systems of vehicles.
2. TECHNICAL REQUIREMENTS
 - 2.1. The technical requirements and specifications shall be those set out in sections 2 to 7 and Appendices 1 and 2 to Annex 7 to UN/ECE Regulation No 83, with the exceptions set out in sections 2.2 and 2.3.
 - 2.2. The reference fuels specified in paragraph 3.2 of Annex 7 to UN/ECE Regulation No 83 shall be understood as reference to the appropriate reference fuel specifications in Annex IX to this Regulation.
 - 2.3. The reference to paragraph 8.2.5 in paragraph 7.5.2 of Annex 7 to UN/ECE Regulation No 83 shall be understood as reference to Section 4 of Annex I to this Regulation.



ANNEX VII

VERIFYING THE DURABILITY OF POLLUTION CONTROL DEVICES

(TYPE 5 TEST)

1. INTRODUCTION

- 1.1. This Annex describes the tests for verifying the durability of pollution control devices. The durability requirements shall be demonstrated using one of the three options set out in points 1.2, 1.3 and 1.4.
- 1.2. The whole vehicle durability test represents an ageing test of 160 000 kilometres driven on a test track, on the road, or on a chassis dynamometer.
- 1.3. The manufacturer may choose to use a bench ageing durability test.
- 1.4. As an alternative to durability testing, a manufacturer may choose to apply the assigned deterioration factors from the following table.

Engine Category	Assigned deterioration factors						
	CO	THC	NMHC	NO _x	HC + NO _x	PM	P
Positive-ignition	1,5	1,3	1,3	1,6	—	1,0	1,0
Compression-ignition (Euro 5)	1,5	—	—	1,1	1,1	1,0	1,0
Compression-ignition (Euro 6) ⁽¹⁾							

⁽¹⁾ Euro 6 deterioration factors to be determined

- 1.5. At the request of the manufacturer, the technical service may carry out the type 1 test before the whole vehicle or bench ageing durability test has been completed using the assigned deterioration factors in the table above. On completion of the whole vehicle or bench ageing durability test, the technical service may then amend the type-approval results recorded in Appendix 4 to Annex I by replacing the assigned deterioration factors in the above table with those measured in the whole vehicle or bench ageing durability test.
- 1.6. In the absence of assigned deterioration factors for Euro 6 compression ignition vehicles, manufacturers shall use the whole vehicle or bench ageing durability test procedures to establish deterioration factors.
- 1.7. Deterioration factors are determined using either the procedures set out in points 1.2 and 1.3 or using the assigned values in the table contained in point 1.4. The deterioration factors are used to establish compliance with the requirements of the appropriate emissions limits set out in Tables 1 and 2 of Annex 1 to Regulation (EC) No 715/2007 during the useful life of the vehicle.
2. TECHNICAL REQUIREMENTS
- 2.1. The technical requirements and specifications shall be those set out in section 2 to 6 of Annex 9 to UN/ECE Regulation No 83, with the exceptions set out in subsections 2.1.1 to 2.1.4.

▼ B

- 2.1.1. As an alternative to the operating cycle described in paragraph 5.1. of Annex 9 of UN/ECE Regulation No 83 for the whole vehicle durability test, the vehicle manufacturer may use Standard Road Cycle (SRC) described in Appendix 3 of this Annex. This test cycle shall be conducted until the vehicle has covered a minimum of 160 000 km.
- 2.1.2. In paragraph 5.3 and paragraph 6 of Annex 9 of UN/ECE Regulation No 83 the reference to 80 000 km shall be understood as reference to 160 000 km.
- 2.1.3. The reference to paragraph 5.3.1.4. in the first section of paragraph 6 of Annex 9 of UN/ECE Regulation No 83 shall be understood as reference to Table 1 of Annex I of the Regulation (EC) No 715/2007 for Euro 5 vehicles and Table 2 of Annex I of the Regulation (EC) No 715/2007 for Euro 6 vehicles.
- 2.1.4. In Section 6 of Annex 9 of UN/ECE Regulation No 83, the sixth subparagraph shall be understood as follows:

A multiplicative exhaust emission deterioration factor shall be calculated for each pollutant as follows:

$$\text{D.E.F.} = \frac{M_{i2}}{M_{i1}}$$

At the request of a manufacturer, an additive exhaust emission deterioration factor shall be calculated for each pollutant as follows:

$$\text{D.E.F.} = M_{i2} - M_{i1}$$

2.2. **Bench Ageing Durability Test**

- 2.2.1. In addition to the technical requirements for the bench ageing test set out in section 1.3, the technical requirements set out in this section shall apply.

The fuel to be used during the test shall be the one specified in paragraph 3 of Annex 9 of Regulation 83.

2.3.1. *Vehicles with Positive Ignition Engines*

- 2.3.1.1. The following bench ageing procedure shall be applicable for positive-ignition vehicles including hybrid vehicles which use a catalyst as the principle after-treatment emission control device.

The bench ageing procedure requires the installation of the catalyst-plus-oxygen sensor system on a catalyst ageing bench.

Ageing on the bench shall be conducted by following the standard bench cycle (SBC) for the period of time calculated from the bench ageing time (BAT) equation. The BAT equation requires, as input, catalyst time-at-temperature data measured on the Standard Road Cycle (SRC), described in Appendix 3 to this Annex.

- 2.3.1.2. Standard bench cycle (SBC). Standard catalyst bench ageing shall be conducted following the SBC. The SBC shall be run for the period of time calculated from the BAT equation. The SBC is described in Appendix 1 of this Annex.

▼B

- 2.3.1.3. Catalyst time-at-temperature data. Catalyst temperature shall be measured during at least two full cycles of the SRC cycle as described in Appendix 3 to this Annex.

Catalyst temperature shall be measured at the highest temperature location in the hottest catalyst on the test vehicle. Alternatively, the temperature may be measured at another location providing that it is adjusted to represent the temperature measured at the hottest location using good engineering judgement.

Catalyst temperature shall be measured at a minimum rate of one hertz (one measurement per second).

The measured catalyst temperature results shall be tabulated into a histogram with temperature groups of no larger than 25 °C.

- 2.3.1.4. Bench-ageing time. Bench ageing time shall be calculated using the bench ageing time (BAT) equation as follows:

t_e for a temperature bin = $t_h e^{(R/Tr)-(R/Tv)}$

Total t_e = Sum of t_e over all the temperature groups

Bench-Ageing Time = A (Total t_e)

Where:

A = 1,1 This value adjusts the catalyst ageing time to account for deterioration from sources other than thermal ageing of the catalyst.

R = Catalyst thermal reactivity = 17 500

t_h = The time (in hours) measured within the prescribed temperature bin of the vehicle's catalyst temperature histogram adjusted to a full useful life basis e.g., if the histogram represented 400 km, and useful life is 160 000 km; all histogram time entries would be multiplied by 400 (160 000/400).

Total t_e = The equivalent time (in hours) to age the catalyst at the temperature of T_r on the catalyst ageing bench using the catalyst ageing cycle to produce the same amount of deterioration experienced by the catalyst due to thermal deactivation over the 160 000 km.

t_e for a bin = The equivalent time (in hours) to age the catalyst at the temperature of T_r on the catalyst ageing bench using the catalyst ageing cycle to produce the same amount of deterioration experienced by the catalyst due to thermal deactivation at the temperature bin of T_v over 160 000 km.

▼ B

T_r	=	The effective reference temperature (in °K) of the catalyst on the catalyst bench run on the bench ageing cycle. The effective temperature is the constant temperature that would result in the same amount of ageing as the various temperatures experienced during the bench ageing cycle.
T_v	=	The mid-point temperature (in °K) of the temperature bin of the vehicle on-road catalyst temperature histogram.

2.3.1.5. Effective reference temperature on the SBC. The effective reference temperature of the standard bench cycle (SBC) shall be determined for the actual catalyst system design and actual ageing bench which will be used using the following procedures:

- (a) Measure time-at-temperature data in the catalyst system on the catalyst ageing bench following the SBC. Catalyst temperature shall be measured at the highest temperature location of the hottest catalyst in the system. Alternatively, the temperature may be measured at another location providing that it is adjusted to represent the temperature measured at the hottest location.

Catalyst temperature shall be measured at a minimum rate of one hertz (one measurement per second) during at least 20 minutes of bench ageing. The measured catalyst temperature results shall be tabulated into a histogram with temperature groups of no larger than 10 °C.

- (b) The BAT equation shall be used to calculate the effective reference temperature by iterative changes to the reference temperature (T_r) until the calculated ageing time equals or exceeds the actual time represented in the catalyst temperature histogram. The resulting temperature is the effective reference temperature on the SBC for that catalyst system and ageing bench.

2.3.1.6. Catalyst Ageing Bench. The catalyst ageing bench shall follow the SBC and deliver the appropriate exhaust flow, exhaust constituents, and exhaust temperature at the face of the catalyst.

All bench ageing equipment and procedures shall record appropriate information (such as measured A/F ratios and time-at-temperature in the catalyst) to assure that sufficient ageing has actually occurred.

2.3.1.7. Required Testing. For calculating deterioration factors at least two Type 1 tests before bench ageing of the emission control hardware and at least two Type 1 tests after the bench-aged emission hardware is reinstalled have to be performed on the test vehicle.

Additional testing may be conducted by the manufacturer. Calculation of the deterioration factors has to be done according to the calculation method as specified in Paragraph 6 of Annex 9 to UN/ECE Regulation No 83 as amended by this Regulation.

▼B2.3.2. *Vehicles with Compression Ignition Engines*

- 2.3.2.1. The following bench ageing procedure is applicable for compression-ignition vehicles including hybrid vehicles.

The bench ageing procedure requires the installation of the after-treatment system on a aftertreatment system ageing bench.

Ageing on the bench is conducted by following the standard diesel bench cycle (SDBC) for the number of regenerations/desulphurisations calculated from the bench ageing duration (BAD) equation.

- 2.3.2.2. Standard Diesel Bench Cycle (SDBC). Standard bench ageing is conducted following the SDBC. The SDBC shall be run for the period of time calculated from the bench ageing duration (BAD) equation. The SDBC is described in Appendix 2 of this Annex.

- 2.3.2.3. Regeneration data. Regeneration intervals shall be measured during at least 10 full cycles of the SRC cycle as described in Appendix 3. As an alternative the intervals from the Ki determination may be used.

If applicable, desulphurisation intervals shall also be considered based on manufacturer's data

- 2.3.2.4. Diesel bench-ageing duration. Bench ageing duration is calculated using the BAD equation as follows:

Bench-Ageing Duration = number of regeneration and/or desulphurisation cycles (whichever is the longer) equivalent to 160 000 km of driving

- 2.3.2.5. Ageing Bench. The ageing bench shall follow the SDBC and deliver appropriate exhaust flow, exhaust constituents, and exhaust temperature to the aftertreatment system inlet.

The manufacturer shall record the number of regenerations/-desulphurisations (if applicable) to assure that sufficient ageing has actually occurred.

- 2.3.2.6. Required Testing. For calculating deterioration factors at least two Type 1 tests before bench ageing of the emission control hardware and at least two Type 1 tests after the bench-aged emission hardware is reinstalled have to be performed. Additional testing may be conducted by the manufacturer. Calculation of the deterioration factors shall be done according to the calculation method set out in Paragraph 6 of Annex 9 to UN/ECE Regulation No 83 and with the additional requirements contained in this Regulation.

▼ B*Appendix 1***Standard Bench Cycle (SBC)****1. Introduction**

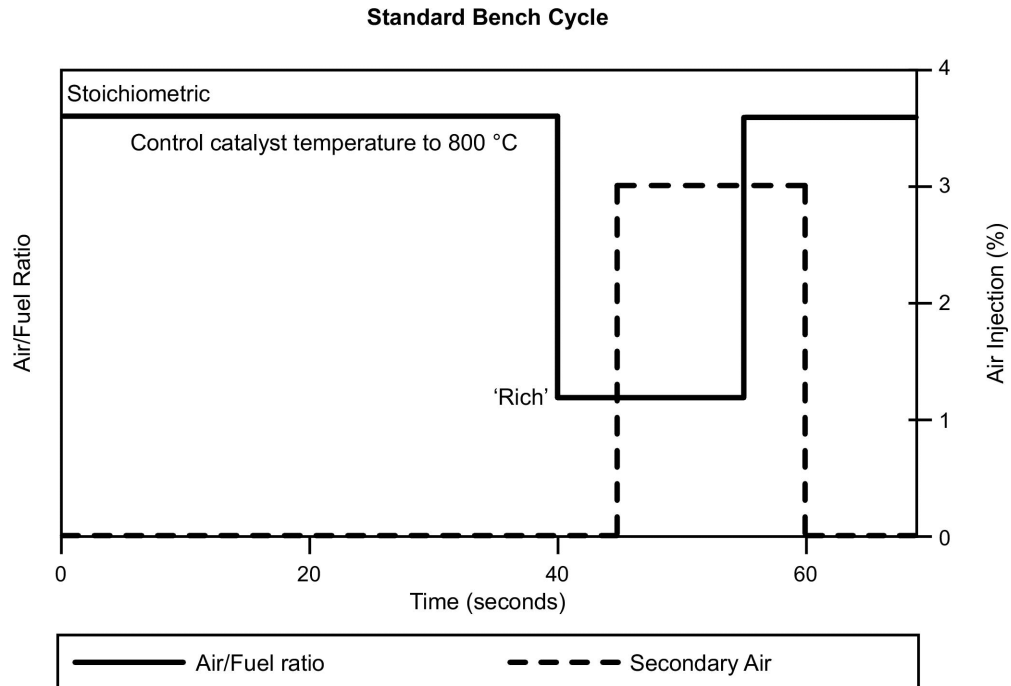
The standard ageing durability procedure consists of ageing a catalyst/oxygen sensor system on an ageing bench which follows the standard bench cycle (SBC) described in this Appendix. The SBC requires use of an ageing bench with an engine as the source of feed gas for the catalyst. The SBC is a 60-second cycle which is repeated as necessary on the ageing bench to conduct ageing for the required period of time. The SBC is defined based on the catalyst temperature, engine air/fuel (A/F) ratio, and the amount of secondary air injection which is added in front of the first catalyst.

2. Catalyst Temperature Control

- 2.1. Catalyst temperature shall be measured in the catalyst bed at the location where the highest temperature occurs in the hottest catalyst. Alternatively, the feed gas temperature may be measured and converted to catalyst bed temperature using a linear transform calculated from correlation data collected on the catalyst design and ageing bench to be used in the ageing process.
- 2.2. Control the catalyst temperature at stoichiometric operation (01 to 40 seconds on the cycle) to a minimum of 800 °C (± 10 °C) by selecting the appropriate engine speed, load, and spark timing for the engine. Control the maximum catalyst temperature that occurs during the cycle to 890 °C (± 10 °C) by selecting the appropriate A/F ratio of the engine during the 'rich' phase described in the table below.
- 2.3. If a low control temperature other than 800 °C is utilized, the high control temperature shall be 90 °C higher than the low control temperature.

Standard Bench Cycle (SBC)

Time (seconds)	Engine Air/Fuel Ratio	Secondary Air Injection
1-40	Stoichiometric with load, spark timing and engine speed controlled to achieve a minimum catalyst temperature of 800 °C	None
41-45	'Rich' (A/F ratio selected to achieve a maximum catalyst temperature over the entire cycle of 890 °C or 90 °C higher than lower control temperature)	None
46-55	'Rich' (A/F ratio selected to achieve a maximum catalyst temperature over the entire cycle of 890 °C or 90 °C higher than lower control temperature)	3 % (± 1 %)
56-60	Stoichiometric with load, spark timing and engine speed controlled to achieve a minimum catalyst temperature of 800 °C	3 % (± 1 %)

▼ B

3. Ageing Bench Equipment and Procedures

- 3.1. Ageing Bench Configuration. The ageing bench shall provide the appropriate exhaust flow rate, temperature, air-fuel ratio, exhaust constituents and secondary air injection at the inlet face of the catalyst.

The standard ageing bench consists of an engine, engine controller, and engine dynamometer. Other configurations may be acceptable (e.g. whole vehicle on a dynamometer, or a burner that provides the correct exhaust conditions), as long as the catalyst inlet conditions and control features specified in this Appendix are met.

A single ageing bench may have the exhaust flow split into several streams providing that each exhaust stream meets the requirements of this appendix. If the bench has more than one exhaust stream, multiple catalyst systems may be aged simultaneously.

- 3.2. Exhaust System Installation. The entire catalyst(s)-plus-oxygen sensor(s) system, together with all exhaust piping which connects these components, will be installed on the bench. For engines with multiple exhaust streams (such as some V6 and V8 engines), each bank of the exhaust system will be installed separately on the bench in parallel.

For exhaust systems that contain multiple in-line catalysts, the entire catalyst system including all catalysts, all oxygen sensors and the associated exhaust piping will be installed as a unit for ageing. Alternatively, each individual catalyst may be separately aged for the appropriate period of time.

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- 3.3. Temperature Measurement. Catalyst temperature shall be measured using a thermocouple placed in the catalyst bed at the location where the highest temperature occurs in the hottest catalyst. Alternatively, the feed gas temperature just before the catalyst inlet face may be measured and converted to catalyst bed temperature using a linear transform calculated from correlation data collected on the catalyst design and ageing bench to be used in the ageing process. The catalyst temperature shall be stored digitally at the speed of 1 hertz (one measurement per second).
- 3.4. Air/Fuel Measurement. Provisions shall be made for the measurement of the air/fuel (A/F) ratio (such as a wide-range oxygen sensor) as close as possible to the catalyst inlet and outlet flanges. The information from these sensors shall be stored digitally at the speed of 1 hertz (one measurement per second).
- 3.5. Exhaust Flow Balance. Provisions shall be made to assure that the proper amount of exhaust (measured in grams/second at stoichiometry, with a tolerance of ± 5 grams/second) flows through each catalyst system that is being aged on the bench.

The proper flow rate is determined based upon the exhaust flow that would occur in the original vehicle's engine at the steady state engine speed and load selected for the bench ageing in Paragraph 3.6. of this Appendix.

- 3.6. Setup. The engine speed, load, and spark timing are selected to achieve a catalyst bed temperature of 800 °C (± 10 °C) at steady-state stoichiometric operation.

The air injection system is set to provide the necessary air flow to produce 3,0 % oxygen ($\pm 0,1$ %) in the steady-state stoichiometric exhaust stream just in front of the first catalyst. A typical reading at the upstream A/F measurement point (required in paragraph 5) is lambda 1,16 (which is approximately 3 % oxygen).

With the air injection on, set the 'Rich' A/F ratio to produce a catalyst bed temperature of 890 °C (± 10 °C). A typical A/F value for this step is lambda 0,94 (approximately 2 % CO).

- 3.7. Ageing Cycle. The standard bench ageing procedures use the standard bench cycle (SBC). The SBC is repeated until the amount of ageing calculated from the bench ageing time equation (BAT) is achieved.
- 3.8. Quality Assurance. The temperatures and A/F ratio in paragraphs 3.3. and 3.4. of this appendix shall be reviewed periodically (at least every 50 hours) during ageing. Necessary adjustments shall be made to assure that the SBC is being appropriately followed throughout the ageing process.

After the ageing has been completed, the catalyst time-at-temperature collected during the ageing process shall be tabulated into a histogram with temperature groups of no larger than 10 °C. The BAT equation and the calculated effective reference temperature for the ageing cycle according to Paragraph 2.3.1.4 of Annex VII will be used to determine if the appropriate amount of thermal ageing of the catalyst has in fact occurred. Bench ageing will be extended if the thermal effect of the calculated ageing time is not at least 95 % of the target thermal ageing.

▼ B

3.9. Startup and Shutdown. Care should be taken to assure that the maximum catalyst temperature for rapid deterioration (e.g., 1 050 °C) does not occur during startup or shutdown. Special low temperature startup and shutdown procedures may be used to alleviate this concern.

4. Experimentally Determining the R-Factor for Bench Ageing Durability Procedures

4.1. The R-Factor is the catalyst thermal reactivity coefficient used in the bench ageing time (BAT) equation. Manufacturers may determine the value of R experimentally using the following procedures.

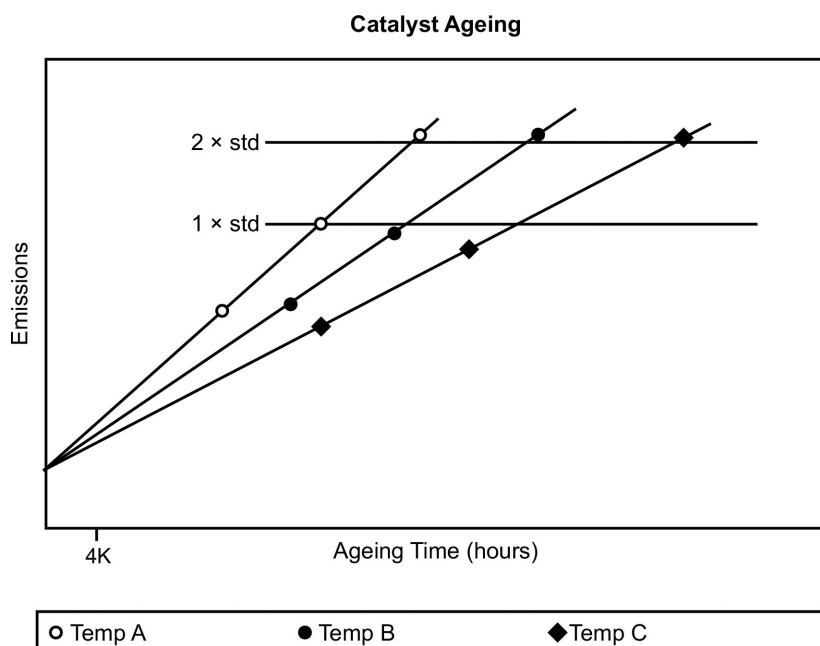
4.1.1. Using the applicable bench cycle and ageing bench hardware, age several catalysts (minimum of 3 of the same catalyst design) at different control temperatures between the normal operating temperature and the damage limit temperature. Measure emissions (or catalyst inefficiency (1-catalyst efficiency)) for each exhaust constituent. Assure that the final testing yields data between one- and two-times the emission standard.

4.1.2. Estimate the value of R and calculate the effective reference temperature (T_r) for the bench ageing cycle for each control temperature according to Paragraph 2.4.4 of Annex VII.

4.1.3. Plot emissions (or catalyst inefficiency) versus ageing time for each catalyst. Calculate the least-squared best-fit line through the data. For the data set to be useful for this purpose the data should have an approximately common intercept between 0 and 6 400 km. See the following graph for an example.

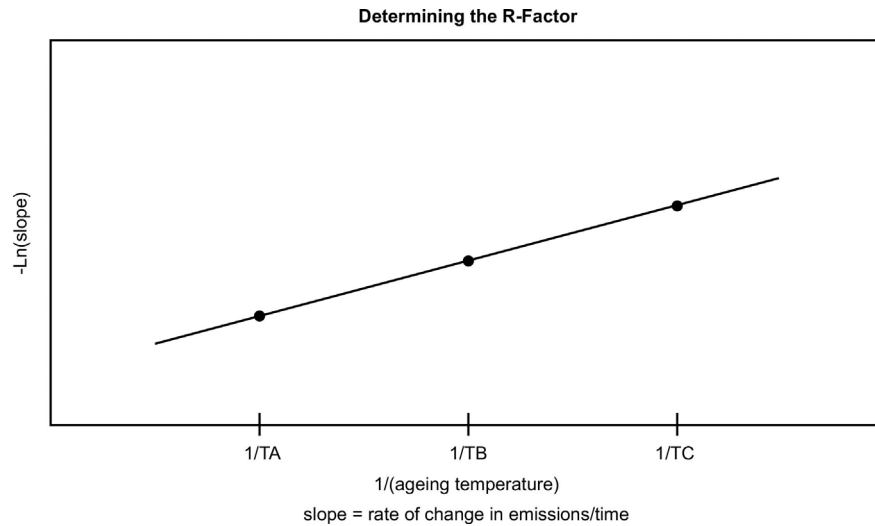
4.1.4. Calculate the slope of the best-fit line for each ageing temperature.

4.1.5. Plot the natural log (\ln) of the slope of each best-fit line (determined in step 4.1.4.) along the vertical axis, versus the inverse of ageing temperature ($1/(\text{ageing temperature, deg K})$) along the horizontal axis. Calculate the least squared best-fit lines through the data. The slope of the line is the R-factor. See the following graph for an example.



▼ B

- 4.1.6. Compare the R-factor to the initial value that was used in Step 4.1.2. If the calculated R-factor differs from the initial value by more than 5 %, choose a new R-factor that is between the initial and calculated values, and then repeat Steps 2-6 to derive a new R-factor. Repeat this process until the calculated R-factor is within 5 % of the initially assumed R-factor.
- 4.1.7. Compare the R-factor determined separately for each exhaust constituent. Use the lowest R-factor (worst case) for the BAT equation.



*Appendix 2***Standard Diesel Bench Cycle (SDBC)****1. Introduction**

For particulate filters, the number of regenerations is critical to the ageing process. For systems that require desulphurisation cycles (e.g. NO_x storage catalysts), this process is also significant.

The standard diesel bench ageing durability procedure consists of ageing an aftertreatment system on an ageing bench which follows the standard bench cycle (SDBC) described in this Appendix. The SDBC requires use of an ageing bench with an engine as the source of feed gas for the system.

During the SDBC, the regeneration/desulphurisation strategies of the system shall remain in normal operating condition.

2. The Standard Diesel Bench Cycle reproduces the engine speed and load conditions that are encountered in the SRC cycle as appropriate to the period for which durability is to be determined. In order to accelerate the process of ageing, the engine settings on the test bench may be modified to reduce the system loading times. For example the fuel injection timing or EGR strategy may be modified.

3. Ageing Bench Equipment and Procedures

- 3.1. The standard ageing bench consists of an engine, engine controller, and engine dynamometer. Other configurations may be acceptable (e.g. whole vehicle on a dynamometer, or a burner that provides the correct exhaust conditions), as long as the aftertreatment system inlet conditions and control features specified in this Appendix are met.

A single ageing bench may have the exhaust flow split into several streams providing that each exhaust stream meets the requirements of this appendix. If the bench has more than one exhaust stream, multiple aftertreatment systems may be aged simultaneously.

- 3.2. Exhaust System Installation. The entire aftertreatment system, together with all exhaust piping which connects these components, will be installed on the bench. For engines with multiple exhaust streams (such as some V6 and V8 engines), each bank of the exhaust system will be installed separately on the bench.

The entire aftertreatment system will be installed as a unit for ageing. Alternatively, each individual component may be separately aged for the appropriate period of time.

▼B*Appendix 3***Standard Road Cycle (SRC)****Introduction**

The standard road cycle (SRC) is a kilometre accumulation cycle. The vehicle may be run on a test track or on a kilometre accumulation dynamometer.

The cycle consists of 7 laps of a 6 km course. The length of the lap may be changed to accommodate the length of the mileage accumulation test track.

Standard Road cycle

Lap	Description	Typical acceleration rate m/s ²
1	(start engine) idle 10 seconds	0
1	Moderate acceleration to 48 km/h	1,79
1	Cruise at 48 km/h for 1/4 lap	0
1	Moderate deceleration to 32 km/h	- 2,23
1	Moderate acceleration to 48 km/h	1,79
1	Cruise at 48 km/h for 1/4 lap	0
1	Moderate deceleration to stop	- 2,23
1	Idle 5 seconds	0
1	Moderate acceleration to 56 km/h	1,79
1	Cruise at 56 km/h for 1/4 lap	0
1	Moderate deceleration to 40 km/h	- 2,23
1	Moderate acceleration to 56 km/h	1,79
1	Cruise at 56 km/h for 1/4 lap	0
1	Moderate deceleration to stop	- 2,23
2	idle 10 seconds	0
2	Moderate acceleration to 64 km/h	1,34
2	Cruise at 64 km/h for 1/4 lap	0
2	Moderate deceleration to 48 km/h	- 2,23
2	Moderate acceleration to 64 km/h	1,34
2	Cruise at 64 km/h for 1/4 lap	0
2	Moderate deceleration to stop	- 2,23
2	Idle 5 seconds	0
2	Moderate acceleration to 72 km/h	1,34

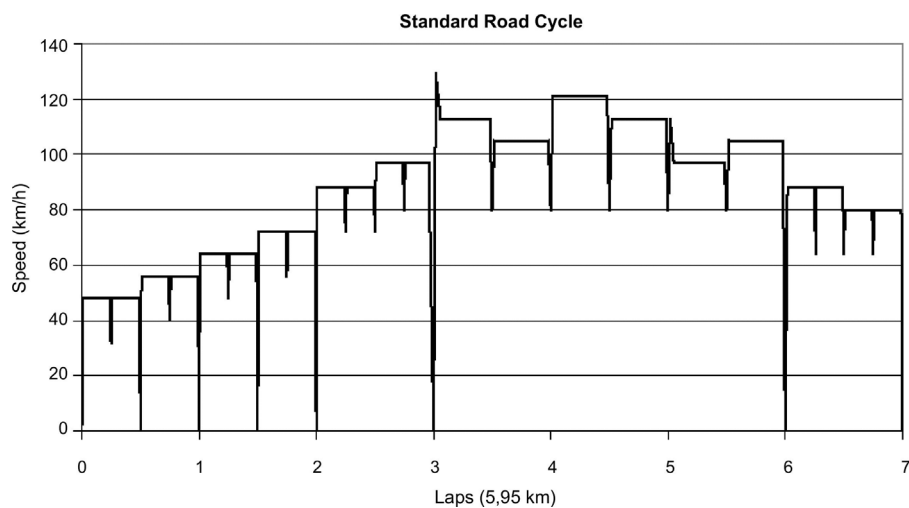
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Lap	Description	Typical acceleration rate m/s ²
2	Cruise at 72 km/h for 1/4 lap	0
2	Moderate deceleration to 56 km/h	- 2,23
2	Moderate acceleration to 72 km/h	1,34
2	Cruise at 72 km/h for 1/4 lap	0
2	Moderate deceleration to stop	- 2,23
3	idle 10 seconds	0
3	Hard acceleration to 88 km/h	1,79
3	Cruise at 88 km/h for 1/4 lap	0
3	Moderate deceleration to 72 km/h	- 2,23
3	Moderate acceleration to 88 km/h	0,89
3	Cruise at 88 km/h for 1/4 lap	0
3	Moderate deceleration to 72 km/h	- 2,23
3	Moderate acceleration to 97 km/h	0,89
3	Cruise at 97 km/h for 1/4 lap	0
3	Moderate deceleration to 80 km/h	- 2,23
3	Moderate acceleration to 97 km/h	0,89
3	Cruise at 97 km/h for 1/4 lap	0
3	Moderate deceleration to stop	- 1,79
4	idle 10 seconds	0
4	Hard acceleration to 129 km/h	1,34
4	Coastdown to 113 km/h	- 0,45
4	Cruise at 113 km/h for 1/2 lap	0
4	Moderate deceleration to 80 km/h	- 1,34
4	Moderate acceleration to 105 km/h	0,89
4	Cruise at 105 km/h for 1/2 lap	0
4	Moderate deceleration to 80 km/h	- 1,34
5	Moderate acceleration to 121 km/h	0,45
5	Cruise at 121 km/h for 1/2 lap	0
5	Moderate deceleration to 80 km/h	- 1,34
5	Light acceleration to 113 km/h	0,45
5	Cruise at 113 km/h for 1/2 lap	0
5	Moderate deceleration to 80 km/h	- 1,34

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Lap	Description	Typical acceleration rate m/s ²
6	Moderate acceleration to 113 km/h	0,89
6	Coastdown to 97 km/h	- 0,45
6	Cruise at 97 km/h for 1/2 lap	0
6	Moderate deceleration to 80 km/h	- 1,79
6	Moderate acceleration to 104 km/h	0,45
6	Cruise at 104 km/h for 1/2 lap	0
6	Moderate deceleration to stop	- 1,79
7	idle 45 seconds	0
7	Hard acceleration to 88 km/h	1,79
7	Cruise at 88 km/h for 1/4 lap	0
7	Moderate deceleration to 64 km/h	- 2,23
7	Moderate acceleration to 88 km/h	0,89
7	Cruise at 88 km/h for 1/4 lap	0
7	Moderate deceleration to 64 km/h	- 2,23
7	Moderate acceleration to 80 km/h	0,89
7	Cruise at 80 km/h for 1/4 lap	0
7	Moderate deceleration to 64 km/h	- 2,23
7	Moderate acceleration to 80 km/h	0,89
7	Cruise at 80 km/h for 1/4 lap	0
7	Moderate deceleration to stop	- 2,23

The standard road cycle is represented graphically in the following figure:



▼B*ANNEX VIII***VERIFYING THE AVERAGE EMISSIONS AT LOW AMBIENT TEMPERATURES**

(TYPE 6 TEST)

1. INTRODUCTION

- 1.1. This Annex describes the equipment required and the procedure for the Type 6 test in order to verify the emissions at cold temperatures.

2. GENERAL REQUIREMENTS

- 2.1. The general requirements for the Type 6 test are those set out in paragraph 5.3.5.1.1 to 5.3.5.3.2 of UN/ECE Regulation 83 with the exceptions specified below.
- 2.2. The reference to 'hydrocarbons' in 5.3.5.1.4 of UN/ECE Regulation 83 shall be read as 'total hydrocarbons'

▼M1

- 2.3. The limit values referred to in point 5.3.5.2 of UN/ECE Regulation No 83 relate to the limit values set out in Annex 1, Table 4, to Regulation (EC) No 715/2007.

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3. TECHNICAL REQUIREMENTS

- 3.1. The technical requirements and specifications are those set out in section 2 to 6 of Annex 8 to UN/ECE Regulation No 83 with the exceptions described in the following sections.
- 3.2. The reference to paragraph 3. of Annex 10 in paragraph 3.4.1. of Annex 8 to UN/ECE Regulation No 83 shall be understood as reference to to Section B of Annex IX to this Regulation.
- 3.3. The references to 'hydrocarbons' shall be read as 'total hydrocarbons' in the following sections of Annex 8 to UN/ECE Regulation No 83:

Paragraph 2.4.1

Paragraph 5.1.1



ANNEX IX

SPECIFICATIONS OF REFERENCE FUELS

A. REFERENCE FUELS

1. Technical data on fuels for testing vehicles with positive-ignition engines

Type: Petrol (E5)

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Research octane number, RON		95,0	—	EN 25164 prEN ISO 5164
Motor octane number, MON		85,0	—	EN 25163 prEN ISO 5163
Density at 15 °C	kg/m ³	743	756	EN ISO 3675 EN ISO 12185
Vapour pressure	kPa	56,0	60,0	EN ISO 13016-1 (DVPE)
Water content	% v/v		0,015	ASTM E 1064
Distillation:				
— Evaporated at 70 °C,	% v/v	24,0	44,0	EN-ISO 3405
— evaporated at 100 °C,	% v/v	48,0	60,0	EN-ISO 3405
— evaporated at 150 °C,	% v/v	82,0	90,0	EN-ISO 3405
— final boiling point,	°C	190	210	EN-ISO 3405
Residue	% v/v	—	2,0	EN-ISO 3405
Hydrocarbon analysis:				
— olefins,	% v/v	3,0	13,0	ASTM D 1319
— aromatics,	% v/v	29,0	35,0	ASTM D 1319
— benzene,	% v/v	—	1,0	EN 12177
— saturates,	% v/v	Report		ASTM 1319
Carbon/hydrogen ratio		Report		
Carbon/oxygen ratio		Report		
Induction period ⁽²⁾	minutes	480	—	EN-ISO 7536
Oxygen content ⁽³⁾	% m/m	Report		EN 1601
Existent gum	mg/ml	—	0,04	EN-ISO 6246
Sulphur content ⁽⁴⁾	mg/kg	—	10	EN ISO 20846 EN ISO 20884
Copper corrosion		—	Class 1	EN-ISO 2160

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Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Lead content	mg/l	—	5	EN 237
Phosphorus content ⁽⁵⁾	mg/l	—	1,3	ASTM D 3231
Ethanol ⁽³⁾	% v/v	4,7	5,3	EN 1601 EN 13132

(1) The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products — Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

(2) The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilise refinery gasoline streams, but detergent/dispersive additives and solvent oils shall not be added.

(3) Ethanol meeting the specification of EN 15376 is the only oxygenate that shall be intentionally added to the reference fuel.

(4) The actual sulphur content of the fuel used for the Type 1 test shall be reported.

(5) There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

▼ M8

Type: Petrol (E10):

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Research octane number, RON ⁽³⁾		95,0	98,0	EN ISO 5164
Motor octane number, MON ⁽³⁾		85,0	89,0	EN ISO 5163
Density at 15 °C	kg/m ³	743,0	756,0	EN ISO 12185
Vapour pressure (DVPE)	kPa	56,0	60,0	EN 13016-1
Water content		max 0,05 % v/v Appearance at – 7 °C: clear and bright		EN 12937
Distillation:				
— evaporated at 70 °C	% v/v	34,0	46,0	EN ISO 3405
— evaporated at 100 °C	% v/v	54,0	62,0	EN ISO 3405
— evaporated at 150 °C	% v/v	86,0	94,0	EN ISO 3405
— final boiling point	°C	170	195	EN ISO 3405
Residue	% v/v	—	2,0	EN ISO 3405
Hydrocarbon analysis:				
— olefins	% v/v	6,0	13,0	EN 22854
— aromatics	% v/v	25,0	32,0	EN 22854
— benzene	% v/v	—	1,00	EN 22854 EN 238

▼ **M8**

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
— saturates	% v/v	report		EN 22854
Carbon/hydrogen ratio		report		
Carbon/oxygen ratio		report		
Induction Period ⁽⁴⁾	minutes	480	—	EN ISO 7536
Oxygen content ⁽⁵⁾	% m/m	3,3	3,7	EN 22854
Solvent washed gum (Existent gum content)	mg/100 ml	—	4	EN ISO 6246
Sulphur content ⁽⁶⁾	mg/kg	—	10	EN ISO 20846 EN ISO 20884
Copper corrosion 3 hrs, 50 °C		—	class 1	EN ISO 2160
Lead content	mg/l	—	5	EN 237
Phosphorus content ⁽⁷⁾	mg/l	—	1,3	ASTM D 3231
Ethanol ⁽⁵⁾	% v/v	9,0	10,0	EN 22854

⁽¹⁾ The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products - Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

⁽²⁾ Equivalent EN/ISO methods will be adopted when issued for properties listed above.

⁽³⁾ A correction factor of 0,2 for MON and RON shall be subtracted for the calculation of the final result in accordance with EN 228:2008.

⁽⁴⁾ The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilise refinery gasoline streams, but detergent/dispersive additives and solvent oils shall not be added.

⁽⁵⁾ Ethanol is the only oxygenate that shall be intentionally added to the reference fuel. The Ethanol used shall conform to EN 15376.

⁽⁶⁾ The actual sulphur content of the fuel used for the Type 1 test shall be reported.

⁽⁷⁾ There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

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Type: Ethanol (E85)

Parameter	Unit	Limits ⁽¹⁾		Test method ⁽²⁾
		Minimum	Maximum	
Research octane number, RON		95	—	EN ISO 5164
Motor octane number, MON		85	—	EN ISO 5163
Density at 15 °C	kg/m ³	Report		ISO 3675
Vapour pressure	kPa	40	60	EN ISO 13016-1 (DVPE)
Sulphur content ⁽³⁾ ⁽⁴⁾	mg/kg	—	10	EN ISO 20846 EN ISO 20884
Oxidation stability	minutes	360		EN ISO 7536
Existent gum content (solvent washed)	mg/100- ml	—	5	EN-ISO 6246

▼B

Parameter	Unit	Limits ⁽¹⁾		Test method ⁽²⁾
		Minimum	Maximum	
Appearance This shall be determined at ambient temperature or 15 °C whichever is higher.		Clear and bright, visibly free of suspended or precipitated contaminants		Visual inspection
Ethanol and higher alcohols ⁽⁷⁾	% (V/V)	83	85	EN 1601 EN 13132 EN 14517
Higher alcohols (C3-C8)	% (V/V)	—	2	
Methanol	% (V/V)		0,5	
Petrol ⁽⁵⁾	% (V/V)	Balance		EN 228
Phosphorus	mg/l	0,3 ⁽⁶⁾		ASTM D 3231
Water content	% (V/V)		0,3	ASTM E 1064
Inorganic chloride content	mg/l		1	ISO 6227
pHe		6,5	9	ASTM D 6423
Copper strip corrosion (3h at 50 °C)	Rating	Class 1		EN ISO 2160
Acidity, (as acetic acid CH ₃ COOH)	% (m/m) (mg/l)	—	0,005-40	ASTM D 1613
Carbon/hydrogen ratio		report		
Carbon/oxygen ration		report		

(1) The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products — Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

(2) In cases of dispute, the procedures for resolving the dispute and interpretation of the results based on test method precision, described in EN ISO 4259 shall be used.

(3) In cases of national dispute concerning sulphur content, either EN ISO 20846 or EN ISO 20884 shall be called up similar to the reference in the national annex of EN 228.

(4) The actual sulphur content of the fuel used for the Type 1 test shall be reported.

(5) The unleaded petrol content can be determined as 100 minus the sum of the percentage content of water and alcohols

(6) There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

(7) Ethanol to meet specification of EN 15376 is the only oxygenate that shall be intentionally added to this reference fuel.

Type: LPG

Parameter	Unit	Fuel A	Fuel B	Test method
Composition:				ISO 7941
C ₃ -content	% vol	30 ± 2	85 ± 2	
C ₄ -content	% vol	Balance	Balance	
< C ₃ , > C ₄	% vol	Maximum 2	Maximum 2	

▼ **B**

Parameter	Unit	Fuel A	Fuel B	Test method
Olefins	% vol	Maximum 12	Maximum 15	
Evaporation residue	mg/kg	Maximum 50	Maximum 50	prEN 15470
Water at 0 °C		Free	Free	prEN 15469
Total sulphur content	mg/kg	Maximum 10	Maximum 10	ASTM 6667
Hydrogen sulphide		None	None	ISO 8819
Copper strip corrosion	Rating	Class 1	Class 1	ISO 6251 (1)
Odour		Characteristic	Characteristic	
Motor octane number		Minimum 89	Minimum 89	EN 589 Annex B

(1) This method may not accurately determine the presence of corrosive materials if the sample contains corrosion inhibitors or other chemicals which diminish the corrosivity of the sample to the copper strip. Therefore, the addition of such compounds for the sole purpose of biasing the test method is prohibited.

Type: NG/Biomethane

Characteristics	Units	Basis	Limits		Test method
			minimum	maximum	

Reference fuel G20

Composition:					
Methane	% mole	100	99	100	ISO 6974
Balance (1)	% mole	—	—	1	ISO 6974
N ₂	% mole				ISO 6974
Sulphur content	mg/m ³ (2)	—	—	10	ISO 6326-5
Wobbe Index (net)	MJ/m ³ (3)	48,2	47,2	49,2	

Reference fuel G25

Composition:					
Methane	% mole	86	84	88	ISO 6974
Balance (1)	% mole	—	—	1	ISO 6974
N ₂	% mole	14	12	16	ISO 6974
Sulphur content	mg/m ³ (2)	—	—	10	ISO 6326-5
Wobbe Index (net)	MJ/m ³ (3)	39,4	38,2	40,6	

(1) Inerts (different from N₂) + C₂ + C₂₊.

(2) Value to be determined at 293,2 K (20 °C) and 101,3 kPa.

(3) Value to be determined at 273,2 K (0 °C) and 101,3 kPa.

▼ M3

Type: Hydrogen for internal combustion engines

Characteristics	Units	Limits		Test method
		minimum	maximum	
Hydrogen purity	% mole	98	100	ISO 14687-1
Total hydrocarbon	µmol/mol	0	100	ISO 14687-1
Water ⁽¹⁾	µmol/mol	0	⁽²⁾	ISO 14687-1
Oxygen	µmol/mol	0	⁽²⁾	ISO 14687-1
Argon	µmol/mol	0	⁽²⁾	ISO 14687-1
Nitrogen	µmol/mol	0	⁽²⁾	ISO 14687-1
CO	µmol/mol	0	1	ISO 14687-1
Sulphur	µmol/mol	0	2	ISO 14687-1
Permanent particulates ⁽³⁾				ISO 14687-1

⁽¹⁾ Not to be condensed.⁽²⁾ Combined water, oxygen, nitrogen and argon: 1,900 µmol/mol.⁽³⁾ The hydrogen shall not contain dust, sand, dirt, gums, oils, or other substances in an amount sufficient to damage the fuelling station equipment of the vehicle (engine) being fuelled.

Type: Hydrogen for fuel cell vehicles

Characteristics	Units	Limits		Test method
		minimum	maximum	
Hydrogen fuel ⁽¹⁾	% mole	99,99	100	ISO 14687-2
Total gases ⁽²⁾	µmol/mol	0	100	
Total hydrocarbon	µmol/mol	0	2	ISO 14687-2
Water	µmol/mol	0	5	ISO 14687-2
Oxygen	µmol/mol	0	5	ISO 14687-2
Helium (He), Nitrogen (N ₂), Argon (Ar)	µmol/mol	0	100	ISO 14687-2
CO ₂	µmol/mol	0	2	ISO 14687-2
CO	µmol/mol	0	0,2	ISO 14687-2
Total sulphur compounds	µmol/mol	0	0,004	ISO 14687-2
Formaldehyde (HCHO)	µmol/mol	0	0,01	ISO 14687-2
Formic acid (HCOOH)	µmol/mol	0	0,2	ISO 14687-2
Ammonia (NH ₃)	µmol/mol	0	0,1	ISO 14687-2
Total halogenated compounds	µmol/mol	0	0,05	ISO 14687-2
Particulates size	µm	0	10	ISO 14687-2
Particulates concentration	µg/l	0	1	ISO 14687-2

⁽¹⁾ The hydrogen fuel index is determined by subtracting the total content of non-hydrogen gaseous constituents listed in the table (Total gases), expressed in mole percent, from 100 mole percent. It is less than the sum of the maximum allowable limits of all non-hydrogen constituents shown in the Table.⁽²⁾ The value of total gases is summation of the values of the non-hydrogen constituents listed in the table, except the particulates.

▼M3

Type: H2NG

The hydrogen and the NG/biomethane fuels composing a H2NG mixture, must comply separately with their corresponding characteristics, expressed in this Annex.

▼B

2. **Technical data on fuels for testing vehicles with compression ignition engines**

Type: Diesel (B5)

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Cetane number ⁽²⁾		52,0	54,0	EN-ISO 5165
Density at 15 °C	kg/m ³	833	837	EN-ISO 3675
Distillation:				
— 50 % point	°C	245	—	EN-ISO 3405
— 95 % point	°C	345	350	EN-ISO 3405
— final boiling point	°C	—	370	EN-ISO 3405
Flash point	°C	55	—	EN 22719
CFPP	°C	—	- 5	EN 116
Viscosity at 40 °C	mm ² /s	2,3	3,3	EN-ISO 3104
Polycyclic aromatic hydrocarbons	% m/m	2,0	6,0	EN 12916
Sulphur content ⁽³⁾	mg/kg	—	10	EN ISO 20846/EN ISO 20884
Copper corrosion		—	Class 1	EN-ISO 2160
Conradson carbon residue (10 % DR)	% m/m	—	0,2	EN-ISO10370
Ash content	% m/m	—	0,01	EN-ISO 6245
Water content	% m/m	—	0,02	EN-ISO12937
Neutralisation (strong acid) number	mg KOH/g	—	0,02	ASTM D 974
Oxidation stability ⁽⁴⁾	mg/ml	—	0,025	EN-ISO12205
Lubricity (HFRR wear scan diameter at 60 °C)	µm	—	400	EN ISO 12156
Oxidation stability at 110 °C ⁽⁴⁾ ⁽⁶⁾	h	20,0		EN 14112

▼ B

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
FAME ⁽⁵⁾	% v/v	4,5	5,5	EN 14078

⁽¹⁾ The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products — Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

⁽²⁾ The range for cetane number is not in accordance with the requirements of a minimum range of 4R. However, in the case of a dispute between fuel supplier and fuel user, the terms of ISO 4259 may be used to resolve such disputes provided replicate measurements, of sufficient number to archive the necessary precision, are made in preference to single determinations.

⁽³⁾ The actual sulphur content of the fuel used for the Type 1 test shall be reported.

⁽⁴⁾ Even though oxidation stability is controlled, it is likely that shelf life will be limited. Advice shall be sought from the supplier as to storage conditions and life.

⁽⁵⁾ FAME content to meet the specification of EN 14214.

⁽⁶⁾ Oxidation stability can be demonstrated by EN-ISO12205 or by EN 14112. This requirement shall be reviewed based on CEN/TC19 evaluations of oxidative stability performance and test limits.

▼ M8

Type: Diesel (B7):

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Cetane Index		46,0		EN ISO 4264
Cetane number ⁽²⁾		52,0	56,0	EN ISO 5165
Density at 15 °C	kg/m ³	833,0	837,0	EN ISO 12185
Distillation:				
— 50 % point	°C	245,0	—	EN ISO 3405
— 95 % point	°C	345,0	360,0	EN ISO 3405
— final boiling point	°C	—	370,0	EN ISO 3405
Flash point	°C	55	—	EN ISO 2719
Cloud point	°C	—	- 10	EN 23015
Viscosity at 40 °C	mm ² /s	2,30	3,30	EN ISO 3104
Polycyclic aromatic hydrocarbons	% m/m	2,0	4,0	EN 12916
Sulphur content	mg/kg	—	10,0	EN ISO 20846 EN ISO 20884
Copper corrosion 3 hrs, 50 °C		—	Class 1	EN ISO 2160
Conradson carbon residue (10 % DR)	% m/m	—	0,20	EN ISO 10370
Ash content	% m/m	—	0,010	EN ISO 6245
Total contamination	mg/kg	—	24	EN 12662
Water content	mg/kg	—	200	EN ISO 12937

▼ **M8**

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Acid number	mg KOH/g	—	0,10	EN ISO 6618
Lubricity (HFRR wear scan diameter at 60 °C)	µm	—	400	EN ISO 12156
Oxidation stability at 110 °C ⁽³⁾	h	20,0		EN 15751
FAME ⁽⁴⁾	% v/v	6,0	7,0	EN 14078

⁽¹⁾ The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products – Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

⁽²⁾ The range for cetane number is not in accordance with the requirements of a minimum range of 4R. However, in the case of a dispute between fuel supplier and fuel user, the terms of ISO 4259 may be used to resolve such disputes provided replicate measurements, of sufficient number to archive the necessary precision, are made in preference to single determinations.

⁽³⁾ Even though oxidation stability is controlled, it is likely that shelf life will be limited. Advice shall be sought from the supplier as to storage conditions and life.

⁽⁴⁾ FAME content to meet the specification of EN 14214.

▼ **B**

B. REFERENCE FUELS FOR TESTING EMISSIONS AT LOW AMBIENT TEMPERATURES — TYPE 6 TEST

Type: Petrol (E5)

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Research octane number, RON		95,0	—	EN 25164 prEN ISO 5164
Motor octane number, MON		85,0	—	EN 25163 prEN ISO 5163
Density at 15 °C	kg/m ³	743	756	ISO 3675 EN ISO 12185
Vapour pressure	kPa	56,0	95,0	EN ISO 13016-1 (DVPE)
Water content	% v/v		0,015	ASTM E 1064
Distillation:				
— evaporated at 70 °C	% v/v	24,0	44,0	EN-ISO 3405
— evaporated at 100 °C	% v/v	50,0	60,0	EN-ISO 3405
— evaporated at 150 °C	% v/v	82,0	90,0	EN-ISO 3405
— final boiling point	°C	190	210	EN-ISO 3405

▼ **B**

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Residue	% v/v	—	2,0	EN-ISO 3405
Hydrocarbon analysis:				
— olefins	% v/v	3,0	13,0	ASTM D 1319
— aromatics	% v/v	29,0	35,0	ASTM D 1319
— benzene	% v/v	—	1,0	EN 12177
— saturates	% v/v	Report		ASTM D 1319
Carbon/hydrogen ratio		Report		
Carbon/oxygen ratio		Report		
Induction period ⁽²⁾	minutes	480	—	EN-ISO 7536
Oxygen content ⁽³⁾	% m/m	Report		EN 1601
Existent gum	mg/ml	—	0,04	EN-ISO 6246
Sulphur content ⁽⁴⁾	mg/kg	—	10	EN ISO 20846 EN ISO 20884
Copper corrosion		—	Class 1	EN-ISO 2160
Lead content	mg/l	—	5	EN 237
Phosphorus content ⁽⁵⁾	mg/l	—	1,3	ASTM D 3231
Ethanol ⁽³⁾	% v/v	4,7	5,3	EN 1601 EN 13132

⁽¹⁾ The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum — products Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

⁽²⁾ The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilise refinery gasoline streams, but detergent/dispersive additives and solvent oils shall not be added.

⁽³⁾ Ethanol to meet specification of EN 15376 is the only oxygenate that shall be intentionally added to this reference fuel.

⁽⁴⁾ The actual sulphur content of the fuel used for the Type 6 test shall be reported.

⁽⁵⁾ There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

▼ **M8**

Type: Petrol (E10):

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Research octane number, RON ⁽³⁾		95,0	98,0	EN ISO 5164
Motor octane number, MON ⁽³⁾		85,0	89,0	EN ISO 5163

▼M8

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Density at 15 °C	kg/m ³	743,0	756,0	EN ISO 12185
Vapour pressure (DVPE)	kPa	56,0	95,0	EN 13016-1
Water content		max 0,05 % v/v Appearance at – 7 °C: clear and bright		EN 12937
Distillation:				
— evaporated at 70 °C	% v/v	34,0	46,0	EN ISO 3405
— evaporated at 100 °C	% v/v	54,0	62,0	EN ISO 3405
— evaporated at 150 °C	% v/v	86,0	94,0	EN ISO 3405
— final boiling point	°C	170	195	EN ISO 3405
Residue	% v/v	—	2,0	EN ISO 3405
Hydrocarbon analysis:				
— olefins	% v/v	6,0	13,0	EN 22854
— aromatics	% v/v	25,0	32,0	EN 22854
— benzene	% v/v	—	1,00	EN 22854 EN 238
— saturates	% v/v	report		EN 22854
Carbon/hydrogen ratio		report		
Carbon/oxygen ratio		report		
Induction Period ⁽⁴⁾	minutes	480	—	EN ISO 7536
Oxygen content ⁽⁵⁾	% m/m	3,3	3,7	EN 22854
Solvent washed gum (Existent gum content)	mg/100 ml	—	4	EN ISO 6246
Sulphur content ⁽⁶⁾	mg/kg	—	10	EN ISO 20846 EN ISO 20884
Copper corrosion 3 hrs, 50 °C		—	class 1	EN ISO 2160
Lead content	mg/l	—	5	EN 237

▼ **M8**

Parameter	Unit	Limits ⁽¹⁾		Test method
		Minimum	Maximum	
Phosphorus content ⁽⁷⁾	mg/l	—	1,3	ASTM D 3231
Ethanol ⁽⁵⁾	% v/v	9,0	10,0	EN 22854

⁽¹⁾ The values quoted in the specifications are 'true values'. In establishment of their limit values the terms of ISO 4259 Petroleum products - Determination and application of precision data in relation to methods of test have been applied and in fixing a minimum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility). Notwithstanding this measure, which is necessary for technical reasons, the manufacturer of fuels shall nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits. Should it be necessary to clarify whether a fuel meets the requirements of the specifications, the terms of ISO 4259 shall be applied.

⁽²⁾ Equivalent EN/ISO methods will be adopted when issued for properties listed above.

⁽³⁾ A correction factor of 0,2 for MON and RON shall be subtracted for the calculation of the final result in accordance with EN 228:2008.

⁽⁴⁾ The fuel may contain oxidation inhibitors and metal deactivators normally used to stabilise refinery gasoline streams, but detergent/dispersive additives and solvent oils shall not be added.

⁽⁵⁾ Ethanol is the only oxygenate that shall be intentionally added to the reference fuel. The ethanol used shall conform to EN 15376.

⁽⁶⁾ The actual sulphur content of the fuel used for the Type 6 test shall be reported.

⁽⁷⁾ There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

▼ **B**

Type: Ethanol (E75)

▼ **M1**

Parameter	Unit	Limits ⁽¹⁾		Test method ⁽²⁾
		Minimum	Maximum	
Research octane number, RON		95	—	EN ISO 5164
Motor octane number, MON		85	—	EN ISO 5163
Density at 15 °C	kg/m ³	report		EN ISO 12185
Vapour pressure	kPa	50	60	EN ISO 13016-1 (DVPE)
Sulphur content ⁽³⁾ ⁽⁴⁾	mg/kg	—	10	EN ISO 20846 EN ISO 20884
Oxidation stability	minutes	360	—	EN ISO 7536
Existent gum content (solvent washed)	mg/100-ml	—	4	EN ISO 6246
Appearance shall be determined at ambient temperature or 15 °C whichever is higher		Clear and bright, visibly free of suspended or precipitated contaminants		Visual inspection
Ethanol and higher alcohols ⁽⁷⁾	% (V/V)	70	80	EN 1601 EN 13132 EN 14517
Higher alcohols (C ₃ – C ₈)	% (V/V)	—	2	
Methanol		—	0,5	
Petrol ⁽⁵⁾	% (V/V)	Balance		EN 228
Phosphorus	mg/l	0,30 ⁽⁶⁾		EN 15487 ASTM D 3231

▼ **M1**

Parameter	Unit	Limits ⁽¹⁾		Test method ⁽²⁾
		Minimum	Maximum	
Water content	% (V/V)	—	0,3	ASTM E 1064 EN 15489
Inorganic chloride content	mg/l	—	1	ISO 6227 — EN 15492
pHe		6,50	9	ASTM D 6423 EN 15490
Copper strip corrosion (3h at 50 °C)	Rating	Class 1		EN ISO 2160
Acidity (as acetic acid CH ₃ COOH)	% (m/m)		0,005	ASTM D1613 EN 15491
	mg/l		40	
Carbon/hydrogen ration		report		
Carbon/oxygen ration		report		

⁽¹⁾ The values referred to in the specifications are 'true values'. When establishing the value limits, the terms of ISO 4259 Petroleum products — Determination and application of precision data in relation to methods of test were applied. When fixing a minimum value, a minimum difference of 2R above zero was taken into account. When fixing a maximum and minimum value, the minimum difference used was 4R (R = reproducibility). Notwithstanding this procedure, which is necessary for technical reasons, fuel manufacturers shall aim for a zero value where the stipulated maximum value is 2R and for the mean value for quotations of maximum and minimum limits. Where it is necessary to clarify whether fuel meets the requirements of the specifications, the ISO 4259 terms shall be applied.

⁽²⁾ In cases of dispute, the procedures for resolving the dispute and interpretation of the results based on test method precision, described in EN ISO 4259 shall be used.

⁽³⁾ In cases of national dispute concerning sulphur content, either EN ISO 20846 or EN ISO 20884 shall be called up similar to the reference in the national annex of EN 228.

⁽⁴⁾ The actual sulphur content of the fuel used for the Type 6 test shall be reported.

⁽⁵⁾ The unleaded petrol content may be determined as 100 minus the sum of the percentage content of water and alcohols.

⁽⁶⁾ There shall be no intentional addition of compounds containing phosphorus, iron, manganese, or lead to this reference fuel.

⁽⁷⁾ Ethanol to meet specification of EN 15376 is the only oxygenate that shall be intentionally added to this reference fuel.

*ANNEX X***EMISSIONS TEST PROCEDURE FOR HYBRID ELECTRIC VEHICLES (HEV)**

1. INTRODUCTION

- 1.1. This annex sets out the additional specific provisions regarding type-approval of a hybrid electric vehicle (HEV).

2. TECHNICAL REQUIREMENTS

- 2.1. The technical requirements and specifications shall be those set out in Annex 14 to UN/ECE Regulation No 83 with the exceptions described in the following section.
- 2.2. The references to paragraph 5.3.1.4 in sections 3.1.2.6, 3.1.3.5, 3.2.2.7 and 3.2.3.5 of Annex 14 of UN/ECE Regulation No 83 shall be understood as references to Table 1 of Annex I of Regulation (EC) No 715/2007 for Euro 5 vehicles and Table 2 of Annex I of the Regulation (EC) No 715/2007 for Euro 6 vehicles.



ANNEX XI

ON-BOARD DIAGNOSTICS (OBD) FOR MOTOR VEHICLES

1. INTRODUCTION

- 1.1. This Annex sets out the functional aspects of on-board diagnostic (OBD) systems for the control of emissions from motor vehicles.

2. REQUIREMENTS AND TESTS

- 2.1. The requirements and tests for OBD systems are those specified in Section 3 of Annex 11 to UN/ECE Regulation 83. The exceptions to these requirements as well as additional requirements are described in the following sections.
- 2.2. The durability distance mentioned in section 3.1 and 3.3.1 of Annex 11 to UN/ECE Regulation 83 shall be understood as reference to the requirements of Annex VII to this Regulation.
- 2.3. The threshold limits specified in section 3.3.2 of Annex 11 to UN/ECE Regulation 83 shall be understood as reference to the tables below:
- 2.3.1. The OBD thresholds limits for vehicles that are type approved according to the emission limits set out in Table 1 of Annex I of the Regulation (EC) No 715/2007 are contained in the following table.

Euro 5 OBD threshold limits

Category	Class	Reference mass (RW) (kg)	Mass of carbon monoxide		Mass of non-methane hydrocarbons		Mass of oxides of nitrogen		Mass of particulates	
			(CO) (mg/km)		(NMHC) (mg/km)		(NO _x) (mg/km)		(PM) (mg/km)	
			PI	CI	PI	CI	PI	CI	PI ⁽¹⁾	CI ⁽²⁾
M	—	All	1 900	1 900	250	320	300	540	50	50
N ₁ ⁽³⁾	I	RW ≤ 1 305	1 900	1 900	250	320	300	540	50	50
	II	1 305 < RW ≤ 1 760	3 400	2 400	330	360	375	705	50	50
	III	1 760 < RW	4 300	2 800	400	400	410	840	50	50
N ₂	—	All	4 300	2 800	400	400	410	840	50	50

Key: PI = Positive Ignition, CI = Compression Ignition

⁽¹⁾ Positive ignition particulate mass standards apply only to vehicles with direct injection engines

⁽²⁾ Until the dates set out in Article 17 a PM threshold limit of 80 mg/km shall apply to vehicles of categories M and N with a reference mass greater than 1 760 kg

⁽³⁾ Includes M₁ vehicles that meet the 'special social needs' definition of Regulation (EC) No 715/2007

- 2.3.2. The OBD thresholds limits for compression ignition vehicles that comply with the Euro 6 emission limit values set out in Table 2 of Annex 1 of the Regulation (EC) No 715/2007 and type-approved before the dates given in Article 10(4) of Regulation (EC) No 715/2007 are contained in the following table. These threshold limits shall cease to apply from the dates set out in Article 10(5) of Regulation (EC) No 715/2007 for new vehicles to be registered, sold or entered into service.

▼ B

Interim Euro 6 OBD threshold limits

Category	Class	Reference mass (RW) (kg)	Mass of carbon monoxide	Mass of non-methane hydrocarbons	Mass of oxides of nitrogen	Mass of particulates
			(CO) (mg/km)	(NMHC) (mg/km)	(NO _x) (mg/km)	(PM) (mg/km)
			CI	CI	CI	CI
M	—	All	1900	320	240	50
N ₁	I	RW ≤ 1 305	1900	320	240	50
	II	1 305 < RW ≤ 1 760	2 400	360	315	50
	III	1 760 < RW	2 800	400	375	50
N ₂	—	All	2 800	400	375	50

Key: CI = Compression Ignition

▼ M2

2.3.3. The OBD thresholds limits for vehicles that are type approved according to the Euro 6 emission limits set out in Table 2 of Annex I to Regulation (EC) No 715/2007 from three years after the dates given in Article 10(4) and 10(5) of that Regulation are given in the following table:

▼ M8

Final Euro 6 OBD threshold limits

Category	Class	Reference mass (RM) (kg)	Mass of carbon monoxide		Mass of non-methane hydrocarbons		Mass of oxides of nitrogen		Mass of particulate matter ⁽¹⁾		Number of particles ⁽¹⁾	
			(CO) (mg/km)	(CO) (mg/km)	(NMHC) (mg/km)	(NMHC) (mg/km)	(NO _x) (mg/km)	(NO _x) (mg/km)	(PM) (mg/km)	(PM) (mg/km)	(PN) (#/km)	(PN) (#/km)
			PI	CI	PI	CI	PI	CI	CI	PI	CI	PI
M	—	All	1 900	1 750	170	290	90	140	12	12		
N ₁	I	RM ≤ 1 305	1 900	1 750	170	290	90	140	12	12		
	II	1 305 < RM ≤ 1 760	3 400	2 200	225	320	110	180	12	12		
	III	1 760 < RM	4 300	2 500	270	350	120	220	12	12		
N ₂	—	All	4 300	2 500	270	350	120	220	12	12		

Key: PI = Positive Ignition, CI = Compression Ignition.

⁽¹⁾ Positive ignition particulate mass and number limits apply only to vehicles with direct injection engines.

▼ M2

Explanatory note:

The OBD thresholds set out in the table are subject to a review to be conducted by the Commission by 1 September 2014. Where the thresholds appear to be not technically feasible, their values or the mandatory date of application are to be amended accordingly, considering the effects of other new requirements and tests that will be introduced for Euro 6 vehicles. Where the review shows an environmental need as well as technical feasibility and a net monetised benefit, more stringent values need to be adopted and OBD threshold limits for particle numbers or, where applicable, other regulated pollutants introduced. In doing so, appropriate lead time for introducing the technical developments has to be given to the industry.

▼ M2

- 2.3.4. Until three years after the dates specified in Article 10(4) and (5) of Regulation (EC) No 715/2007 for new type approvals and new vehicles respectively, the following OBD threshold limits shall be applied to vehicles that are type approved according to the Euro 6 emission limits set out in Table 2 of Annex I to Regulation (EC) No 715/2007, upon the choice of the manufacturer:

▼ M8**Preliminary Euro 6 OBD threshold limits**

Category	Class	Reference mass (RM) (kg)	Mass of carbon monoxide		Mass of non-methane hydrocarbons		Mass of oxides of nitrogen		Mass of particulate matter (!)	
			(CO) (mg/km)		(NMHC) (mg/km)		(NOx) (mg/km)		(PM) (mg/km)	
			PI	CI	PI	CI	PI	CI	CI	PI
M	—	All	1 900	1 750	170	290	150	180	25	25
N ₁	I	RM ≤ 1 305	1 900	1 750	170	290	150	180	25	25
	II	1 305 < RM ≤ 1 760	3 400	2 200	225	320	190	220	25	25
	III	1 760 < RM	4 300	2 500	270	350	210	280	30	30
N ₂	—	All	4 300	2 500	270	350	210	280	30	30

Key: PI = Positive Ignition, CI = Compression Ignition

(!) Positive ignition particulate mass limits apply only to vehicles with direct injection engines.

▼ M2

- 2.4. In addition to the provisions of section 3.2.1 of Annex 11 to UN/ECE Regulation 83 the manufacturer may temporarily disable the OBD system in the following conditions:

- (a) For flex fuel or mono/bi fuel gas vehicles during 1 minute after re-fuelling to allow for the recognition of fuel quality and composition by the ECU;
- (b) For bi fuel vehicles during 5 seconds after fuel switching to allow for readjusting engine parameters.

The manufacturer may deviate from these time limits if it can demonstrate that stabilisation of the fuelling system after re-fuelling or fuel switching takes longer for justified technical reasons. In any case, the OBD system shall be re-enabled as soon as either the fuel quality and composition is recognised or the engine parameters are readjusted.

▼ M8

- 2.5. Section 3.3.3.1 of Annex 11 to UNECE Regulation No 83 shall be understood as:

The OBD system shall monitor the reduction in the efficiency of the catalytic converter with respect to emissions of NMHC and NOx. Manufacturers may monitor the front catalyst alone or in combination with the next catalyst(s) downstream. Each monitored catalyst or catalyst combination shall be considered malfunctioning when the emissions exceed the NMHC or NOx threshold limits provided for in Section 2.3 of this Annex. By way of derogation, the requirement of monitoring the reduction in the efficiency of the catalytic converter with respect to NOx emissions shall only apply as from the dates set out in Article 17.

▼B

- 2.6. Section 3.3.3.3 of Annex 11 to UN/ECE Regulation 83 shall mean that the deterioration of all oxygen sensors fitted and used for monitoring malfunctions of the catalytic converter according to the requirements of this Annex shall be monitored.
- 2.7. In addition to the requirements of section 3.3.3 of Annex 11 to UN/ECE Regulation 83, for direct injection positive ignition engines any malfunction, which may lead to emissions exceeding the particulate threshold limits provided for by section 2.3 of this Annex and which has to be monitored according to the requirements of this Annex for compression ignition engines, shall be monitored.
- 2.8. In addition to the requirements of section 3.3.4 of Annex 11 to UN/ECE Regulation 83, malfunctions and the reduction in efficiency of the EGR system shall be monitored.
- 2.9. In addition to the requirements of section 3.3.4 of Annex 11 to UN/ECE Regulation 83, malfunctions and the reduction in efficiency of a NO_x aftertreatment system using a reagent and the reagent dosing sub-system shall be monitored.
- 2.10. In addition to the requirements of section 3.3.4 of Annex 11 to UN/ECE Regulation 83, malfunctions and the reduction in efficiency of NO_x aftertreatment not using a reagent shall be monitored.
- 2.11. In addition to the requirements of section 6.3.2 of Appendix 1 to Annex 11 to UN/ECE Regulation 83, the manufacturer shall demonstrate that malfunctions of the EGR flow and cooler are detected by the OBD system during its approval test.
- 2.12. References to 'HC' (hydrocarbons) shall be read as 'NMHC' (non-methane hydrocarbons) in section 6.4.1.2 of Appendix 1 to Annex 11 to UN/ECE Regulation 83.
- 2.13. In addition to the requirements of section 6.5.1.3 of Appendix 1 to Annex 11 of UN/ECE Regulation 83, all data required to be stored in relation to OBD in-use performance according to the provisions of section 3.6 of Appendix 1 of this Annex shall be available through the serial data port on the standardised data link connector according to the specifications given in section 6.5.3 of Appendix 1 to Annex 11 of UN/ECE Regulation 83.

▼M2

- 2.14. Contrary to point 3.3.5 of Annex 11 to UN/ECE Regulation No 83, the following devices shall be monitored for total failure or removal if the latter resulted in exceeding the applicable emission limits:
- as from 1 September 2011, a particulate trap fitted to compression ignition engines as a separate unit or integrated into a combined emission control device,
 - for vehicles certified against either the OBD threshold limits shown in the tables set out in point 2.3.3 or 2.3.4, a NO_x aftertreatment system fitted to compression ignition engines as a separate unit or integrated into a combined emission control device,
 - for vehicles certified against either the OBD threshold limits shown in the tables set out in point 2.3.3 or 2.3.4, a diesel oxidation catalyst (DOC) fitted to compression ignition engines as a separate unit or integrated into a combined emission control device.

▼ M2

The devices referred to in the first paragraph shall also be monitored for any failure that would result in exceeding the applicable OBD threshold limits.

▼ B

3. ADMINISTRATIVE PROVISIONS FOR DEFICIENCIES OF OBD SYSTEMS

3.1. In considering the request for granting type-approval to a vehicle with a deficiency or deficiencies as set out in Article 6(2), the approval authority shall determine whether compliance with the requirements of this Annex is infeasible or unreasonable.

3.2. The approval authority shall take into consideration data from the manufacturer that details such factors as, but not limited to, technical feasibility, lead time and production cycles including phase-in or phase-out of engines or vehicle designs and programmed upgrades of computers, the extent to which the resultant OBD system will be effective in complying with the requirements of this Regulation and that the manufacturer has demonstrated an acceptable level of effort toward compliance with the requirements of this Regulation.

▼ M1

3.3. The approval authority shall not accept any deficiency request that includes the complete lack of a required diagnostic monitor or of mandated recording and reporting of data related to a monitor.

▼ B

3.4. The approval authority will not accept any deficiency request that does not respect the OBD threshold limits in Section 2.3.

3.5. In determining the identified order of deficiencies, deficiencies relating to sections 3.3.3.1, 3.3.3.2 and 3.3.3.3 of Annex 11 of UN/ECE Regulation 83 for positive-ignition engines and sections 3.3.4.1, 3.3.4.2 and 3.3.4.3 of Annex 11 of UN/ECE Regulation 83 for compression-ignition engines shall be identified first.

3.6. Prior to or at the time of type-approval, no deficiency shall be granted in respect of the requirements of section 6.5, except section 6.5.3.4 of Appendix 1 to Annex 11 of UN/ECE Regulation 83.

3.6. Deficiency period

3.6.1. A deficiency may be carried-over for a period of two years after the date of type-approval of the vehicle type unless it can be adequately demonstrated that substantial vehicle hardware modifications and additional lead-time beyond two years would be necessary to correct the deficiency. In such a case, the deficiency may be carried-over for a period not exceeding three years.

3.6.2. A manufacturer may request that the approval authority grant a deficiency retrospectively when such a deficiency is discovered after the original type-approval. In this case, the deficiency may be carried-over for a period of two years after the date of notification to the approval authority unless it can be adequately demonstrated that substantial vehicle hardware modifications and additional lead-time beyond two years would be necessary to correct the deficiency. In such a case, the deficiency may be carried-over for a period not exceeding three years.

▼B

- 3.7. The approval authority shall notify its decision in granting a deficiency request in accordance with Article 6(2).
4. ACCESS TO OBD INFORMATION
- 4.1. Requirements for access to OBD information are specified in section 5 of Annex 11 to UN/ECE Regulation 83. The exceptions to these requirements are described in the following sections.
- 4.2. References to Appendix 1 of Annex 2 to UN/ECE Regulation 83 shall be understood as references to Appendix 5 to Annex I to this Regulation.
- 4.3. References to section 4.2.11.2.7.6 of Annex 1 to UN/ECE Regulation 83 shall be understood as references to 3.2.12.2.7.6 of Appendix 3 to Annex I to this Regulation.
- 4.4. References to 'contracting parties' shall be understood as references to 'member states'.
- 4.5. References to approval granted under Regulation 83 shall be understood as references to type-approval granted under this Regulation and Council Directive 70/220/EEC ⁽¹⁾.
- 4.6. UN/ECE type-approval shall be understood as EC type-approval.

⁽¹⁾ OJ L 76, 6.4.1971, p. 1.

*Appendix 1***FUNCTIONAL ASPECTS OF ON-BOARD DIAGNOSTIC (OBD) SYSTEMS**

1. INTRODUCTION

- 1.1. This Appendix describes the procedure of the test according to section 2 of this Annex.

2. TECHNICAL REQUIREMENTS

- 2.1. The technical requirements and specifications shall be those set out in Appendix 1 to Annex 11 to UN/ECE Regulation No 83 with the exceptions and additional requirements as described in the following sections.
- 2.2. The references to the OBD threshold limits set out in paragraph 3.3.2 to Annex 11 of UN/ECE Regulation 83 shall be understood as references to the limits set out in section 2.3 of this Annex.
- 2.3. The reference fuels specified in paragraph 3.2 of Appendix 1 of Annex 11 of UN/ECE Regulation No 83 shall be understood as reference to the appropriate reference fuel specifications in Annex IX to this Regulation.
- 2.4. The reference to Annex 11 in paragraph 6.5.1.4 of Appendix 1 of Annex 11 of UN/ECE Regulation No 83 shall be understood as reference to Annex XI to this Regulation.
- 2.5. For vehicles approved to Euro 6 limit values contained in Table 2 of Annex 1 of Regulation (EC) No 715/2007, Section 6.5.3.1 of Appendix 1 of Annex 11 of UN/ECE Regulation 83 shall be replaced by:

‘For emissions-related diagnostics, the following standard shall be used as the on-board to off-board communications link:

ISO 15765-4 “Road vehicles — Diagnostics on Controller Area Network (CAN) — Part 4: Requirements for emissions-related systems” dated 10 January 2005’

3. IN-USE PERFORMANCE

3.1. **General Requirements**

- 3.1.1. Each monitor of the OBD system shall be executed at least once per driving cycle in which the monitoring conditions as specified in section 3.2 are met. Manufacturers may not use the calculated ratio (or any element thereof) or any other indication of monitor frequency as a monitoring condition for any monitor.

▼ B

- 3.1.2. The in-use performance ratio (IUPR) of a specific monitor M of the OBD system referred to in Article 5(3) shall be:

$$\text{IUPR}_M = \text{Numerator}_M / \text{Denominator}_M$$

- 3.1.3. Comparison of Numerator and Denominator gives an indication of how often a specific monitor is operating relative to vehicle operation. To ensure all manufacturers are tracking IUPR_M in the same manner, detailed requirements are given for defining and incrementing these counters.

- 3.1.4. If, according to the requirements of this Annex, the vehicle is equipped with a specific monitor M, IUPR_M shall be greater or equal to the following minimum values:

(i) 0,260 for secondary air system monitors and other cold start related monitors

(ii) 0,520 for evaporative emission purge control monitors

(iii) 0,336 for all other monitors

- 3.1.5. Vehicles shall comply with the requirements of section 3.1.4 for a mileage of at least 160 000 km. By way of derogation, vehicles type approved, registered, sold or entered into service before the relevant dates given in Article 10(4), (5) of Regulation (EC) No 715/2007, shall have an IUPR_M greater or equal 0,1 for all monitors M. **► M2** For new type approvals and new vehicles the monitor required by point 2.9 of this Annex shall have an IUPR greater or equal to 0,1 until three years after the dates specified in Article 10(4) and (5) of Regulation (EC) No 715/2007 respectively. ◀

- 3.1.6. The requirements of this section are deemed to be met for a particular monitor M, if for all vehicles of a particular OBD family manufactured in a particular calendar year the following statistical conditions hold:

(a) The average IUPR_M is equal or above the minimum value applicable to the monitor

(b) More than 50 % of all vehicles have an IUPR_M equal or above the minimum value applicable to the monitor.

▼ M1

- 3.1.7. The manufacturer shall demonstrate to the approval authority and, upon request, to the Commission that these statistical conditions are satisfied for all monitors required to be reported by the OBD system according to point 3.6 of this Appendix not later than 18 months after the entry onto the market of the first vehicle type with IUPR in an OBD family and every 18 months thereafter. For this purpose, for OBD families consisting of more than 1 000 registrations in the Union, that are subject to sampling within the sampling period, the process described in Annex II shall be used without prejudice to the provisions of point 3.1.9 of this Appendix.

▼ M1

In addition to the requirements set out in Annex II and regardless of the result of the audit described in Section 2 of Annex II, the authority granting the approval shall apply the in-service conformity check for IUPR described in Appendix 1 to Annex II in an appropriate number of randomly determined cases. 'In an appropriate number of randomly determined cases' means, that this measure has a dissuasive effect on non-compliance with the requirements of Section 3 of this Annex or the provision of manipulated, false or non-representative data for the audit. If no special circumstances apply and can be demonstrated by the type-approval authorities, random application of the in-service conformity check to 5 % of the type approved OBD families shall be considered as sufficient for compliance with this requirement. For this purpose, type-approval authorities may find arrangements with the manufacturer for the reduction of double testing of a given OBD family as long as these arrangements do not harm the dissuasive effect of the type-approval authority's own in-service conformity check on non-compliance with the requirements of Section 3 of this Annex. Data collected by Member States during surveillance testing programmes may be used for in-service conformity checks. Upon request, type-approval authorities shall provide data on the audits and random in-service conformity checks performed, including the methodology used for identifying those cases, which are made subject to the random in-service conformity check, to the Commission and other type-approval authorities.

- 3.1.8. For the entire test sample of vehicles the manufacturer must report to the relevant authorities all of the in-use performance data to be reported by the OBD system according to point 3.6 of this Appendix in conjunction with an identification of the vehicle being tested and the methodology used for the selection of the tested vehicles from the fleet. Upon request, the type-approval authority granting the approval shall make these data and the results of the statistical evaluation available to the Commission and other approval authorities.

▼ B

- 3.1.9. Public authorities and their delegates may pursue further tests on vehicles or collect appropriate data recorded by vehicles to verify compliance with the requirements of this Annex.

▼ M1

- 3.1.10. Non-compliance with the requirements of point 3.1.6 established by tests described in points 3.1.7 or 3.1.9 shall be considered as an infringement subject to the penalties set out in Article 13 of Regulation (EC) No 715/2007. This reference does not limit the application of such penalties to other infringements of other provisions of Regulation (EC) No 715/2007 or this Regulation, which do not explicitly refer to Article 13 of Regulation (EC) No 715/2007.

▼ B

3.2. **Numerator_M**

- 3.2.1. The numerator of a specific monitor is a counter measuring the number of times a vehicle has been operated such that all monitoring conditions necessary for the specific monitor to detect a malfunction in order to warn the driver, as they have been implemented by the manufacturer, have been encountered. The numerator shall not be incremented more than once per driving cycle, unless there is reasoned technical justification.

▼ B**3.3. Denominator_M**

3.3.1. The purpose of the denominator is to provide a counter indicating the number of vehicle driving events, taking into account special conditions for a specific monitor. The denominator shall be incremented at least once per driving cycle, if during this driving cycle such conditions are met and the general denominator is incremented as specified in section 3.5 unless the denominator is disabled according to section 3.7 of this Appendix.

3.3.2. In addition to the requirements of section 3.3.1:

- (a) Secondary air system monitor denominator(s) shall be incremented if the commanded 'on' operation of the secondary air system occurs for a time greater than or equal to 10 seconds. For purposes of determining this commanded 'on' time, the OBD system may not include time during intrusive operation of the secondary air system solely for the purposes of monitoring;
- (b) Denominators of monitors of systems only active during cold start shall be incremented if the component or strategy is commanded 'on' for a time greater than or equal to 10 seconds;
- (c) The denominator(s) for monitors of Variable Valve Timing (VVT) and/or control systems shall be incremented if the component is commanded to function (e.g., commanded 'on', 'open', 'closed', 'locked', etc.) on two or more occasions during the driving cycle or for a time greater than or equal to 10 seconds, whichever occurs first;
- (d) For the following monitors, the denominator(s) shall be incremented by one if, in addition to meeting the requirements of this section on at least one driving cycle, at least 800 cumulative kilometres of vehicle operation have been experienced since the last time the denominator was incremented:
 - (i) Diesel oxidation catalyst
 - (ii) Diesel particulate filter;

▼ M1

- (e) Without prejudice to requirements for the increment of denominators of other monitors the denominators of monitors of the following components shall be incremented if and only if the driving cycle started with a cold start:
 - (i) liquid (oil, engine coolant, fuel, SCR reagent) temperature sensors;
 - (ii) clean air (ambient air, intake air, charge air, inlet manifold) temperature sensors;
 - (iii) exhaust (EGR recirculation/cooling, exhaust gas turbo-charging, catalyst) temperature sensors;
- (f) The denominators of monitors of the boost pressure control system shall be incremented if the all of the following conditions are met:
 - (i) the general denominator conditions are fulfilled;
 - (ii) the boost pressure control system is active for a time greater than or equal to 15 seconds.

▼B

3.3.3. For hybrid vehicles, vehicles that employ alternative engine start hardware or strategies (e.g. integrated starter and generators), or alternative fuel vehicles (e.g. dedicated, bi-fuel, or dual-fuel applications), the manufacturer may request the approval of the approval authority to use alternative criteria to those set forth in this section for incrementing the denominator. In general, the approval authority shall not approve alternative criteria for vehicles that only employ engine shut off at or near idle/vehicle stop conditions. Approval by the approval authority of the alternative criteria shall be based on the equivalence of the alternative criteria to determine the amount of vehicle operation relative to the measure of conventional vehicle operation in accordance with the criteria in this section.

3.4. **Ignition Cycle Counter**

3.4.1. The ignition cycle counter indicates the number of ignition cycles a vehicle has experienced. The ignition cycle counter may not be incremented more than once per driving cycle.

3.5. **General Denominator**

3.5.1. The general denominator is a counter measuring the number of times a vehicle has been operated. It shall be incremented within 10 seconds, if and only if, the following criteria are satisfied on a single driving cycle:

- Cumulative time since engine start is greater than or equal to 600 seconds while at an elevation of less than 2 440 m above sea level and at an ambient temperature of greater than or equal to $-7\text{ }^{\circ}\text{C}$.
- Cumulative vehicle operation at or above 40 km/h occurs for greater than or equal to 300 seconds while at an elevation of less than 2 440 m above sea level and at an ambient temperature of greater than or equal to $-7\text{ }^{\circ}\text{C}$.
- Continuous vehicle operation at idle (i.e. accelerator pedal released by driver and vehicle speed less than or equal to 1,6 km/h) for greater than or equal to 30 seconds while at an elevation of less than 2 440 m above sea level and at an ambient temperature of greater than or equal to $-7\text{ }^{\circ}\text{C}$.

3.6. **Reporting and increasing counters**

3.6.1. The OBD system shall report in accordance with the ISO 15031-5 specifications the ignition cycle counter and general denominator as well as separate numerators and denominators for the following monitors, if their presence on the vehicle is required by this Annex:

- Catalysts (each bank to be reported separately),
- Oxygen/exhaust gas sensors, including secondary oxygen sensors (each sensor to be reported separately),
- Evaporative system,
- EGR system,
- VVT system,

▼ B

- Secondary air system,
- Particulate filter,
- NO_x aftertreatment system (e.g. NO_x adsorber, NO_x reagent/catalyst system),
- Boost pressure control system,

▼ M1

- 3.6.2. For specific components or systems that have multiple monitors, which are required to be reported by this point (e.g. oxygen sensor bank 1 may have multiple monitors for sensor response or other sensor characteristics), the OBD system shall separately track numerators and denominators for each of the specific monitors except those monitoring for short circuit or open circuit failures and report only the corresponding numerator and denominator for the specific monitor that has the lowest numerical ratio. If two or more specific monitors have identical ratios, the corresponding numerator and denominator for the specific monitor that has the highest denominator shall be reported for the specific component.

▼ B

- 3.6.3. All counters, when incremented, shall be incremented by an integer of one.
- 3.6.4. The minimum value of each counter is 0, the maximum value shall not be less than 65 535, notwithstanding any other requirements on standardised storage and reporting of the OBD system.
- 3.6.5. If either the numerator or denominator for a specific monitor reaches its maximum value, both counters for that specific monitor shall be divided by two before being incremented again according to the provisions set in sections 3.2 and 3.3. If the ignition cycle counter or the general denominator reaches its maximum value, the respective counter shall change to zero at its next increment according to the provisions set in sections 3.4 and 3.5, respectively.
- 3.6.6. Each counter shall be reset to zero only when a non-volatile memory reset occurs (e.g. reprogramming event, etc.) or, if the numbers are stored in keep-alive memory (KAM), when KAM is lost due to an interruption in electrical power to the control module (e.g. battery disconnect, etc.).
- 3.6.7. The manufacturer shall take measures to ensure that the values of numerator and denominator can not be reset or modified, except in cases provided for explicitly in this section.

3.7. Disablement of Numerators and Denominators and of the General Denominator

- 3.7.1. Within 10 seconds of a malfunction being detected, which disables a monitor required to meet the monitoring conditions of this Annex (i.e. a pending or confirmed code is stored), the OBD system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is disabled. When the malfunction is no longer detected (i.e., the pending code is erased through self-clearing or through a scan tool command), incrementing of all corresponding numerators and denominators shall resume within 10 seconds.

▼B

- 3.7.2. Within 10 seconds of the start of a power take-off operation (PTO) operation that disables a monitor required to meet the monitoring conditions of this Annex, the OBD system shall disable further incrementing of the corresponding numerator and denominator for each monitor that is disabled. When the PTO operation ends, incrementing of all corresponding numerators and denominators shall resume within 10 seconds.
- 3.7.3. The OBD system shall disable further incrementing of the numerator and denominator of a specific monitor within 10 seconds, if a malfunction of any component used to determine the criteria within the definition of the specific monitor's denominator (i.e. vehicle speed, ambient temperature, elevation, idle operation, engine cold start, or time of operation) has been detected and the corresponding pending fault code has been stored. Incrementing of the numerator and denominator shall resume within 10 seconds when the malfunction is no longer present (e.g. pending code erased through self-clearing or by a scan tool command).
- 3.7.4. The OBD system shall disable further incrementing of the general denominator within 10 seconds, if a malfunction has been detected of any component used to determine whether the criteria in section 3.5 are satisfied (i.e. vehicle speed, ambient temperature, elevation, idle operation, or time of operation) and the corresponding pending fault code has been stored. The general denominator may not be disabled from incrementing for any other condition. Incrementing of the general denominator shall resume within 10 seconds when the malfunction is no longer present (e.g., pending code erased through self-clearing or by a scan tool command).

*Appendix 2***ESSENTIAL CHARACTERISTICS OF THE VEHICLE FAMILY**

1. PARAMETERS DEFINING THE OBD FAMILY
 - 1.1. The OBD family means a manufacturer's grouping of vehicles which, through their design, are expected to have similar exhaust emission and OBD system characteristics. Each engine of this family shall comply with the requirements of this Regulation.
 - 1.2. The OBD family may be defined by basic design parameters which shall be common to vehicles within the family. In some cases there may be interaction of parameters. These effects shall also be taken into consideration to ensure that only vehicles with similar exhaust emission characteristics are included within an OBD family.
2. To this end, those vehicle types whose parameters described below are identical are considered to belong to the same engine/emission control/-OBD system combination.

Engine:

- combustion process (i.e. positive-ignition/compression-ignition, two stroke/four stroke/rotary),
- method of engine fuelling (i.e. single or multi-point fuel injection),
- fuel type (i.e. petrol, diesel, flex fuel petrol/ethanol, flex fuel diesel/-biodiesel, NG/biomethane, LPG, bi fuel petrol/NG/biomethane, bi fuel petrol/LPG),

Emission control system:

- type of catalytic converter (i. e. oxidation, three-way, heated catalyst, SCR, other),
- type of particulate trap,
- secondary air injection (i.e. with or without),
- exhaust gas recirculation (i.e. with or without),

OBD parts and functioning:

- the methods of OBD functional monitoring, malfunction detection and malfunction indication to the vehicle driver.

▼ B*ANNEX XII***▼ M3****DETERMINATION OF CO₂ EMISSIONS, FUEL CONSUMPTION, ELECTRIC ENERGY CONSUMPTION AND ELECTRIC RANGE****▼ B**

1. INTRODUCTION

▼ M3

This Annex sets out the requirements for the measurement of CO₂ emissions, fuel consumption, electric energy consumption and electric range.

▼ B

2. GENERAL REQUIREMENTS

2.1. The general specifications for conducting the tests and interpreting the results shall be those set out in Section 5 of UN/ECE Regulation 101 with the exceptions specified below.

2.2. Test fuel

2.2.1. The appropriate reference fuels as defined in Annex IX of this Regulation shall be used for testing.

▼ M8

2.2.2. For LPG and NG, the fuel to be used must be the one chosen by the manufacturer for the measurement of the net power in accordance with Annex XX to this Regulation. The chosen fuel shall be specified in the information document set out in Appendix 3 of Annex I to this Regulation.

2.3. Point 5.2.4 of UNECE Regulation No 101 shall be understood as:

(1) density: measured on the test fuel according to ISO 3675 or an equivalent method. For petrol, diesel, biodiesel and ethanol (E85 end E75), the density measured at 15 °C will be used; for LPG and natural gas/biomethane a reference density shall be used, as follows:

0,538 kg/litre for LPG,

0,654 kg/m³ for NG (mean value of G20 and G23 reference fuels at 15 °C.)

(2) hydrogen-carbon-oxygen ratio: the following fixed values shall be used:

C₁H_{1,89}O_{0,016} for petrol (E5),

C₁H_{1,93}O_{0,033} for petrol (E10),

C₁H_{1,86}O_{0,005} for diesel (B5),

C₁H_{1,86}O_{0,007} for diesel (B7),

C₁H_{2,525} for LPG (liquefied petroleum gas),

CH₄ for NG (natural gas) and biomethane,

C₁H_{2,74}O_{0,385} for ethanol (E85),

C₁H_{2,61}O_{0,329} for ethanol (E75).

▼ B

3. TECHNICAL REQUIREMENTS

▼ M3

3.1. The technical requirements and specifications for the measurement of CO₂ emissions, fuel consumption, electric energy consumption and electric range shall be those set out in Annexes 6 to 10 to UN/ECE Regulation 101 with the exceptions specified below.

▼ B

3.2. In Annex 6, section 1.3.5 of UN/ECE Regulation 101 the tyres used shall meet the same selection criteria as those specified for the type 1 emissions test, set out in Annex III section 3.5 of this Regulation.

▼M8

3.3. In Annex 6 of UN/ECE Regulation 101, section 1.4.3 shall be replaced by the following:

1.4.3. The fuel consumption, expressed in litres per 100 km (in the case of petrol (E5/E10), LPG, ethanol (E85) and diesel (B5/B7)), in m³ per 100 km (in the case of NG/biomethane and H₂NG) or in kg per 100 km (in the case of hydrogen) is calculated by means of the following formulae:

(a) for vehicles with a positive ignition engine fuelled with petrol (E5):

$$FC = (0,118/D) \cdot [(0,848 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

(b) for vehicles with a positive ignition engine fuelled with petrol (E10):

$$FC = (0,120/D) \cdot [(0,830 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

(c) for vehicles with a positive ignition engine fuelled with LPG:

$$FC_{norm} = (0,1212/0,538) \cdot [(0,825 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

If the composition of the fuel used for the test differs from the composition that is assumed for the calculation of the normalised consumption, on the manufacturer's request a correction factor *cf* may be applied, as follows:

$$FC_{norm} = (0,1212/0,538) \cdot (cf) \cdot [(0,825 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

The correction factor *cf*, which may be applied, is determined as follows:

$$cf = 0,825 + 0,0693n_{actual}$$

where:

n_{actual} = the actual H/C ratio of the fuel used

(d) for vehicles with a positive ignition engine fuelled with NG/biomethane:

$$FC_{norm} = (0,1336/0,654) \cdot [(0,749 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

(e) for vehicles with a positive ignition engine fuelled with ethanol (E85):

$$FC = (0,1742/D) \cdot [(0,574 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

(f) for vehicles with a compression ignition engine fuelled with diesel (B5):

$$FC = (0,116/D) \cdot [(0,861 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

(g) for vehicles with a compression ignition engine fuelled with diesel (B7):

$$FC = (0,116/D) \cdot [(0,859 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

▼ **M8**

(h) for vehicles with a positive ignition engine fuelled by H₂NG:

$$FC = \frac{910,4 \cdot A + 13600}{44,655 \cdot A^2 + 667,08 \cdot A} \left(\frac{7,848 \cdot A}{9,104 \cdot A + 136} \cdot HC + 0,429 \cdot CO + 0,273 \cdot CO_2 \right)$$

(i) for vehicles fuelled by gaseous hydrogen:

$$FC = 0,024 \cdot \frac{V}{d} \cdot \left[\frac{1}{Z_2} \cdot \frac{p_2}{T_2} - \frac{1}{Z_1} \cdot \frac{p_1}{T_1} \right]$$

Under previous agreement with the type-approval authority, and for vehicles fuelled either by gaseous or liquid hydrogen, the manufacturer may choose as alternative to the method above, either the formula

$$FC = 0,1 \cdot (0,1119 \cdot H_2O + H_2)$$

or a method according to standard protocols such as SAE J2572.

In these formulae:

FC = the fuel consumption in litre per 100 km (in the case of petrol, ethanol, LPG, diesel or biodiesel) in m³ per 100 km (in the case of natural gas and H₂NG) or in kg per 100 km in the case of hydrogen.

HC = the measured emission of hydrocarbons in g/km

CO = the measured emission of carbon monoxide in g/km

CO₂ = the measured emission of carbon dioxide in g/km

H₂O = the measured emission of H₂O in g/km

H₂ = the measured emission of H₂ in g/km

A = quantity of NG/biomethane within the H₂NG mixture, expressed in per cent volume

D = the density of the test fuel.

In the case of gaseous fuels D is the density at 15 °C.

d = the theoretical distance covered by a vehicle tested under the type 1 test in km.

p₁ = pressure in gaseous fuel tank before the operating cycle in Pa;

p₂ = pressure in gaseous fuel tank after the operating cycle in Pa;

T₁ = temperature in gaseous fuel tank before the operating cycle in K.

T₂ = temperature in gaseous fuel tank after the operating cycle in K.

Z₁ = compressibility factor of the gaseous fuel at p₁ and T₁

Z₂ = compressibility factor of the gaseous fuel at p₂ and T₂

V = inner volume of the gaseous fuel tank in m³

▼ **M8**

The compressibility factor shall be obtained from the following table:

T(k) p(bar)	33	53	73	93	113	133	153	173	193	213	233	248	263	278	293	308	323	338	353
5	0,8589	0,9651	0,9888	0,9970	1,0004	1,0019	1,0026	1,0029	1,0030	1,0028	1,0035	1,0034	1,0033	1,0032	1,0031	1,0030	1,0029	1,0028	1,0027
100	1,0508	0,9221	0,9911	1,0422	1,0659	1,0757	1,0788	1,0785	1,0765	1,0705	1,0712	1,0687	1,0663	1,0640	1,0617	1,0595	1,0574	1,0554	1,0535
200	1,8854	1,4158	1,2779	1,2334	1,2131	1,1990	1,1868	1,1757	1,1653	1,1468	1,1475	1,1413	1,1355	1,1300	1,1249	1,1201	1,1156	1,1113	1,1073
300	2,6477	1,8906	1,6038	1,4696	1,3951	1,3471	1,3123	1,2851	1,2628	1,2276	1,2282	1,2173	1,2073	1,1982	1,1897	1,1819	1,1747	1,1680	1,1617
400	3,3652	2,3384	1,9225	1,7107	1,5860	1,5039	1,4453	1,4006	1,3651	1,3111	1,3118	1,2956	1,2811	1,2679	1,2558	1,2448	1,2347	1,2253	1,2166
500	4,0509	2,7646	2,2292	1,9472	1,7764	1,6623	1,5804	1,5183	1,4693	1,3962	1,3968	1,3752	1,3559	1,3385	1,3227	1,3083	1,2952	1,2830	1,2718
600	4,7119	3,1739	2,5247	2,1771	1,9633	1,8190	1,7150	1,6361	1,5739	1,4817	1,4823	1,4552	1,4311	1,4094	1,3899	1,3721	1,3559	1,3410	1,3272
700	5,3519	3,5697	2,8104	2,4003	2,1458	1,9730	1,8479	1,7528	1,6779	1,5669	1,5675	1,5350	1,5062	1,4803	1,4570	1,4358	1,4165	1,3988	1,3826
800	5,9730	3,9541	3,0877	2,6172	2,3239	2,1238	1,9785	1,8679	1,7807	1,6515	1,6521	1,6143	1,5808	1,5508	1,5237	1,4992	1,4769	1,4565	1,4377
900	6,5759	4,3287	3,3577	2,8286	2,4978	2,2714	2,1067	1,9811	1,8820	1,7352	1,7358	1,6929	1,6548	1,6207	1,5900	1,5623	1,5370	1,5138	1,4926

In the case that the needed input values for p and T are not indicated in the table, the compressibility factor shall be obtained by linear interpolation between the compressibility factors indicated in the table, choosing the ones that are the closest to the sought value.

▼ B

- 3.4. In Annex 8 of UN/ECE Regulation 101, references to Annex 4 shall be understood as reference to Appendix 4 of Annex I of this Regulation.

▼ M1

- 3.5. During the test cycle used for determining the CO₂ emissions and fuel consumption of the vehicle the provision of point 3.14 of Annex III shall apply.

▼ M6

4. TYPE-APPROVAL OF VEHICLES FITTED WITH ECO-INNOVATIONS

▼ M9

- 4.1. According to Article 11(1) of Regulation (EU) No 725/2011 for M₁ vehicles and Article 11(1) of Regulation (EU) No 427/2014 for N₁ vehicles, a manufacturer wishing to benefit from a reduction of its average specific CO₂ emissions, as result of the savings achieved by one or more eco-innovations fitted in a vehicle, shall apply to an approval authority for an EC type-approval certificate of the vehicle fitted with the eco-innovation.

- 4.2. The CO₂ emissions savings from the vehicle fitted with an eco-innovation shall, for the purpose of type approval, be determined using the procedure and testing methodology specified in the Commission Decision approving the eco-innovation, in accordance with Article 10 of Regulation (EU) No 725/2011 for M₁ vehicles, or Article 10 of Regulation (EU) No 427/2014 for N₁ vehicles.

▼ M6

- 4.3. The performance of the necessary tests for the determination of the CO₂ emissions savings achieved by the eco-innovations shall be considered without prejudice to the demonstration of compliance of the eco-innovations with the technical prescriptions laid down in Directive 2007/46/EC, if applicable.

▼ M9

- 4.4. The type approval shall not be granted if the eco-innovation vehicle does not show a minimum of 1 g CO₂/km of emissions reduction with respect to the baseline vehicle, as referred to in article 5 of Regulation (EU) No 725/2011 for M₁ vehicles, or Article 5 of Regulation (EU) No 427/2014 for N₁ vehicles.

▼ M4

5. DETERMINATION OF CO₂ EMISSIONS AND FUEL CONSUMPTION FROM N₁ VEHICLES SUBMITTED TO MULTI-STAGE TYPE-APPROVAL

- 5.1. For the purpose of determining the CO₂ emissions and fuel consumption of a vehicle submitted to multi-stage type-approval, as defined in Article 3(7) of Directive 2007/46/EC, the base vehicle, as defined in Article 3(18) of that Directive, shall be tested in accordance with points 2 and 3 of this Annex.

- 5.2. The reference mass to be used for the testing shall be the one resulting from the following formula:

$$RM = RM_{Base_Vehicle} + DAM$$

In this formula:

RM = reference mass to be used for the testing in kg

RM_{Base_Vehicle} = reference mass of the base vehicle, as defined in Article 3(3) of Regulation (EC) No 715/2007, in kg

▼ **M4**

DAM = default added mass, calculated in accordance with the formula set out in point 5.3, corresponding to the estimated weight of the bodywork fitted to the base vehicle, in kg.

- 5.3. The default added mass shall be calculated according to the following formula:

$$DAM: a \times (TPMLM - RM_{Base_Vehicle})$$

In this formula:

DAM = default added mass in kg
a = multiplying factor, calculated in accordance with the formula set out in point 5.4
TPMLM = technically permissible maximum laden mass, stated by the manufacturer of the base vehicle, in kg
RM_{Base_Vehicle} = reference mass of the base vehicle, as defined in Article 3(3) of Regulation (EC) No 715/2007, in kg.

- 5.4. The multiplying factor shall be calculated according to the following formula:

$$a = 3,162 \cdot 10^{-7} RM_{Base_vehicle}^2 - 5,823396 \cdot 10^{-4} RM_{Base_vehicle} + 0,4284491516$$

In this formula:

a = multiplying factor
RM_{Base_Vehicle} = reference mass of the base vehicle, as defined in Article 3(3) of Regulation (EC) No 715/2007, in kg.

- 5.5. The manufacturer of the base vehicle is responsible for the correct application of the requirements laid down in points 5.1 to 5.4.
- 5.6. The manufacturer of the completed vehicle shall include, in the certificate of conformity, the information concerning the base vehicle, in accordance with Annex IX to Directive 2007/46/EC.
- 5.7. In the case of vehicles submitted to individual vehicle approval, the individual approval certificate shall include the following information:
- the CO₂ emissions measured according to the methodology set out in points 5.1 to 5.4;
 - the mass of the completed vehicle in running order;
 - the identification code corresponding to the type, variant and version of the base vehicle;
 - the type-approval number of the base vehicle, including the extension number;
 - the name and address of the manufacturer of the base vehicle;
 - the mass of the base vehicle in running order.
- 5.8. The procedure set out in points 5.1 to 5.7 shall apply to base vehicles of category N₁, as defined in point 1.2.1 of Part A of Annex II to Directive 2007/46/EC, included in the scope of Regulation (EC) No 715/2007.

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

1. INTRODUCTION

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

2. GENERAL REQUIREMENTS

2.1. **Marking**

Original replacement pollution control devices shall bear at least the following identifications:

- (a) the vehicle 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 point 2.3.

2.2. **Documentation**

Original replacement pollution control devices shall be accompanied by the following information:

- (a) the vehicle 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 point 2.3;
- (c) the vehicles for which the original replacement pollution control device is of a type covered by point 2.3 of the Addendum to 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, where necessary.

This information shall be available in the product catalogue distributed to points of sale by the vehicle manufacturer.

- 2.3. The vehicle manufacturer shall provide to the technical service and/or 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,
- (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 vehicle type(s).

▼B

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 or letter(s) 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

▼M7**▼B**

25. for Croatia
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 715/2007 or this Regulation on the date EC type-approval for a separate technical unit was granted. For this Regulation, the sequence number is 00.

▼B

- 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. Appendix 3 to this Annex gives example of the EC type- approval mark.
4. TECHNICAL REQUIREMENTS
- 4.1. The requirements for the type-approval of replacement pollution control devices shall be those of Section 5 of UN/ECE Regulation 103 with the exceptions set out in sections 4.1.1 to 4.1.4.
- 4.1.1. The terms ‘catalytic converter’ and ‘converter’ used in section 5 of UN/ECE Regulation 103 shall be understood to mean ‘pollution control device’
- 4.1.2. The regulated pollutants referred to throughout section 5.2.3 of UN/ECE Regulation 103 shall be replaced by all the pollutants specified in Annex 1, Tables 1 and 2 of Regulation (EC) No 715/2007 for replacement pollution control devices intended to be fitted to vehicles type approved to Regulation (EC) No 715/2007.
- 4.1.3. For replacement pollution control devices standards intended to be fitted to vehicles type approved to Regulation (EC) No 715/2007, the durability requirements and associated deterioration factors specified in section 5 of UN/ECE Regulation 103, shall refer to those specified in Annex VII of this Regulation.
- 4.1.4. Reference to Appendix 1 of the type-approval communication in section 5.5.3 of UN/ECE Regulation 103 shall be understood as reference to the addendum to the EC type-approval certificate on vehicle OBD information (Appendix 5 to Annex I).
- 4.2. For vehicles with positive-ignition engines, if the THC and NMHC emissions measured during the demonstration test of a new original equipment catalytic converter, under paragraph 5.2.1 of UN/ECE Regulation 103, are higher than the values measured during the type-approval of the vehicle, the difference shall be added to the OBD threshold limits. The OBD threshold limits are specified in either:
- (a) point 3.3.2 of Annex 11 to UN/ECE Regulation 83 for replacement parts intended to be fitted on vehicles type-approved to Directive 70/220/EEC; or
- (b) point 2.3 of Annex XI of this Regulation for replacement parts intended to be fitted on vehicles type-approved to Regulation (EC) No 715/2007.
- 4.3. The revised OBD threshold limits will apply during the tests of OBD compatibility set out in paragraphs 5.5 to 5.5.5 of UN/ECE Regulation 103. In particular, when the exceedance allowed in paragraph 1 of Appendix 1 to Annex 11 to UN/ECE Regulation 83 is applied.

▼B**4.4. Requirements for replacement periodically regenerating systems***4.4.1. Requirements regarding emissions*

4.4.1.1. The vehicle(s) indicated in Article 11(3), equipped with a replacement periodically regenerating system of the type for which approval is requested, shall be subject to the tests described in Section 3 of Annex 13 of UN/ECE Regulation 83, in order to compare its performance with the same vehicle equipped with the original periodically regenerating system.

4.4.2. Determination of the basis for comparison

4.4.2.1. The vehicle shall be fitted with a new original periodically regenerating system. The emissions performance of this system shall be determined following the test procedure set out in section 3 of Annex 13 of UN/ECE Regulation 83.

4.4.2.2. Upon request of the applicant for the approval of the replacement component, the approval authority shall make available on a non-discriminatory basis, the information referred to in points 3.2.12.2.1.11.1 and 3.2.12.2.6.4.1 of the information document contained in Appendix 3 to Annex I to this Regulation for each vehicle tested.

4.4.3. Exhaust gas test with a replacement periodically regeneration system

4.4.3.1. The original equipment periodically regenerating system of the test vehicle(s) shall be replaced by the replacement periodically regenerating system. The emissions performance of this system shall be determined following the test procedure set out in paragraph 3 Annex 13 of UN/ECE Regulation 83.

4.4.3.2. To determine the D-factor of the replacement periodically regenerating system, any of the engine bench methods referred to in paragraph 3 of Annex 13 of UN/ECE Regulation 83 may be used.

4.4.4. Other requirements

The requirements of paragraphs 5.2.3, 5.3, 5.4 and 5.5 of UN/ECE Regulation 103 shall apply to replacement periodically regenerating systems. In these paragraphs the words 'catalytic converter' shall be understood to mean 'periodically regenerating system'. In addition the exceptions made to these paragraphs in section 4.1 of this annex shall also apply to periodically regenerating systems.

5. DOCUMENTATION

5.1. Each replacement pollution control device shall be clearly and indelibly marked with the manufacturer's name or trade mark and accompanied by the following information:

(a) the vehicles (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;

(b) installation instructions, where necessary.

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

▼B

6. CONFORMITY OF PRODUCTION
- 6.1. Measures to ensure the conformity of production shall be taken in accordance with the provisions laid down in Article 12 of Directive 2007/46/EC.
- 6.2. **Special provisions**
- 6.2.1. The checks referred to in point 2.2 of Annex X to Directive 2007/46/EC shall include compliance with the characteristics as defined under point 8 of Article 2 of this Regulation.
- 6.2.2. For the application of Article 12(2) of Directive 2007/46/EC, the tests described in section 4.4.1 of this Annex and section 5.2 of UN/ECE Regulation No 103 (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, if applicable, must be supplied in triplicate and include a list of contents. Any drawings must be supplied in appropriate scale and sufficient detail on size A4 or on a folder of A4 format. Photographs, if any, must show sufficient detail.

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

0. GENERAL
 - 0.1. Make (trade name of manufacturer):
 - 0.2. Type:
 - 0.2.1. Commercial name(s), if available:
 - 0.5. Name and address of manufacturer:
Name and address of authorised representative, if any:
 - 0.7. In the case of components and separate technical units, location and method of affixing of the EC approval mark:
 - 0.8. Address(es) of assembly plant(s):
1. DESCRIPTION OF THE DEVICE
 - 1.1. Make and type of the replacement pollution control device:
 - 1.2. Drawings of the replacement pollution control device, identifying in particular all the characteristics referred to under point 8 of Article 2 of [this Regulation]:
 - 1.3. Description of the 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. Is the replacement pollution control device intended to be compatible with OBD requirements (Yes/No) ⁽¹⁾
 - 1.4. Description and drawings showing the position of the replacement pollution control device relative to the engine exhaust manifold(s):

⁽¹⁾ Delete where not applicable



Appendix 2

MODEL EC TYPE-APPROVAL CERTIFICATE

(Maximum format: A4 (210 mm × 297 mm))

EC TYPE-APPROVAL CERTIFICATE

Stamp of administration

Communication concerning the:

- EC type-approval ⁽¹⁾,
- extension of EC type-approval ⁽¹⁾,
- refusal of EC type-approval ⁽¹⁾,
- withdrawal of EC type-approval ⁽¹⁾,

of a type of component/separate technical unit ⁽¹⁾

with regard to Regulation (EC) No 715/2007, as implemented by Regulation (EC) No 692/2008.

Regulation (EC) No 715/2007 or Regulation (EC) No 692/2008 as last amended by

EC type-approval number:

Reason for extension:

SECTION I

- 0.1. Make (trade name of manufacturer):
- 0.2. Type:
- 0.3. Means of identification of type if marked on the component/separate technical unit ⁽²⁾:
- 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 (if any):

⁽¹⁾ Delete where not applicable

⁽²⁾ 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??).

▼B

SECTION II

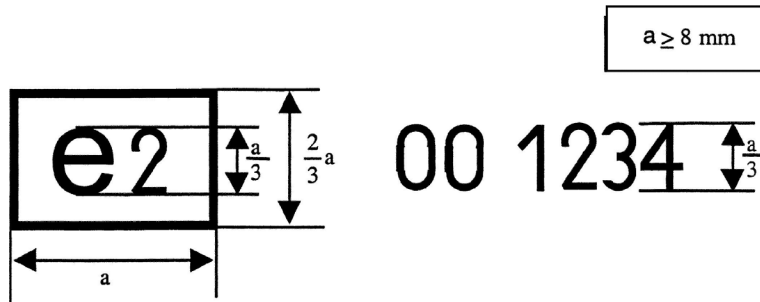
1. Additional information
 - 1.1. Make and type of the replacement pollution control device:
 - 1.2. Vehicle type(s) for which the pollution control device type qualifies as replacement part:
 - 1.3. Type(s) of vehicles) on which the replacement pollution control device has been tested:
 - 1.3.1. Has the replacement pollution control device demonstrated compatibility with OBD requirements (yes/no) ⁽¹⁾:
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.

⁽¹⁾ Delete where not applicable

▼ B*Appendix 3***Example of the EC type-approval marks**

(see point 5.2 of this Annex)



The above approval mark affixed to a component of a replacement pollution control device shows that the type concerned has been approved in France (e 2), pursuant to this Regulation. The first two digits of the approval number (00) indicate that this part was approved according to this Regulation. The following four digits (1234) are those allocated by the approval authority to the replacement pollution control device as the base approval number.

▼B*ANNEX XIV***Access to vehicle OBD and vehicle repair and maintenance information**

1. INTRODUCTION
 - 1.1. This Annex lays down technical requirements for the accessibility of vehicle OBD and vehicle repair and maintenance information.

2. REQUIREMENTS
 - 2.1. Vehicle OBD and vehicle repair and maintenance information available through websites shall follow the technical specifications of OASIS Document SC2-D5, Format of Automotive Repair Information, version 1.0, 28 May 2003 ⁽¹⁾ and of Sections 3.2, 3.5, (excluding 3.5.2), 3.6, 3.7 and 3.8 of OASIS Document SC1-D2, Autorepair Requirements Specification, version 6.1, dated 10.1.2003 ⁽²⁾, using only open text and graphic formats or formats which can be viewed and printed using only standard software plug-ins that are freely available, easy to install, and which run under computer operating systems commonly in use. Where possible, keywords in the meta data shall conform to ISO 15031-2. Such information shall be always available, except as required for web-site maintenance purposes. Those requiring the right to duplicate or re-publish the information should negotiate directly with the manufacturer concerned. Information for training material shall also be available, but may be presented through other media than web-sites.

▼M1

Information on all parts of the vehicle, with which the vehicle, as identified by the vehicle identification number (VIN) and any additional criteria such as wheelbase, engine output, trim level or options, is equipped by the vehicle manufacturer and which can be replaced by spare parts offered by the vehicle manufacturer to its authorised repairers or dealers or third parties by means of reference to original equipment (OE) parts number, shall be made available in a database easily accessible to independent operators.

This database shall comprise the VIN, OE parts numbers, OE naming of the parts, validity attributes (valid-from and valid-to dates), fitting attributes and where applicable structuring characteristics.

The information on the database shall be regularly updated. The updates shall include in particular all modifications to individual vehicles after their production if this information is available to authorised dealers.

- 2.2. Access to vehicle security features used by authorised dealers and repair shops shall be made available to independent operators under protection of security technology according to the following requirements:
 - (i) data shall be exchanged ensuring confidentiality, integrity and protection against replay;

 - (ii) the standard [https/ssl-tls](https://ssl-tls) (RFC4346) shall be used;

⁽¹⁾ Available at: <http://www.oasis-open.org/committees/download.php/2412/Draft%20Committee%20Specification.pdf>

⁽²⁾ Available at: <http://lists.oasis-open.org/archives/autorepair/200302/pdf00005.pdf>

▼ M1

- (iii) security certificates in accordance with ISO 20828 shall be used for mutual authentication of independent operators and manufacturers;
- (iv) the independent operator's private key shall be protected by secure hardware.

The Forum on Access to Vehicle Information provided for by paragraph 9 of Article 13 will specify the parameters for fulfilling these requirements according to the state-of-the-art.

The independent operator shall be approved and authorised for this purpose on the basis of documents demonstrating that they pursue a legitimate business activity and have not been convicted of relevant criminal activity.

- 2.3. Reprogramming of control units of vehicles manufactured later than 31 August 2010 shall be conducted in accordance with either ISO 22900 or SAE J2534, regardless of the date of type approval. For the validation of the compatibility of the manufacturer-specific application and the vehicle communication interfaces (VCI) complying to ISO 22900 or SAE J2534, the manufacturer shall offer either a validation of independently developed VCIs or the information, and loan of any special hardware, required for a VCI manufacturer to conduct such validation himself. The conditions of Article 7(1) of Regulation (EC) No 715/2007 apply to fees for such validation or information and hardware.

For vehicles manufactured before 1 September 2010 the manufacturer may offer either full reprogramming in accordance with ISO 22900 or SAE J2534 or reprogramming via the sale or lease of its own proprietary tool. In the latter case independent operators must get access in a non-discriminatory, prompt and proportionate way, and the tool must be provided in a usable form. The provisions of Article 7 of Regulation (EC) No 715/2007 shall apply to fees for the access to these tools.

▼ B

- 2.4. All emission-related fault codes shall be consistent with Appendix 1 to Annex XI.
- 2.5. For access to any vehicle OBD and vehicle repair and maintenance information other than that relating to secure areas of the vehicle, registration requirements for use of the manufacturer's web site by an independent operator shall require only such information as is necessary to confirm how payment for the information is to be made. For information concerning access to secure areas of the vehicle, the independent operator shall present a certificate in accordance with ISO 20828 to identify himself and the organisation to which he belongs and the manufacturer shall respond with his own certificate in accordance with ISO 20828 to confirm to the independent operator that he is accessing a legitimate site of the intended manufacturer. Both parties shall keep a log of any such transactions indicating the vehicles and changes made to them under this provision.

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- 2.6. In the event that vehicle OBD and vehicle repair and maintenance information available on a manufacturer's website does not contain specific relevant information to permit the proper design and manufacture of alternative fuels retrofit systems, then any interested alternative fuels retrofit system manufacturer shall be able to access the information required in paragraphs 0, 2, and 3 of Appendix 3 to Annex 1 by contacting the manufacturer directly with such a request. Contact details for that purpose shall be clearly indicated on the manufacturer's website and the information shall be provided within 30 days. Such information need only be provided for alternative fuels retrofit systems that are subject to UN/ECE Regulation 115 or for alternative fuels retrofit components that form part of systems subject to UN/ECE Regulation 115, and need only be provided in response to a request that clearly specifies the exact specification of the vehicle model for which the information is required and that specifically confirms that the information is required for the development of alternative fuels retrofit systems or components subject to UN/ECE Regulation 115.
- 2.7. Manufacturers shall indicate in their repair information websites the type-approval number by model.

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- 2.8. Manufacturers shall establish fees for hourly, daily, monthly, annual and per-transaction access to their repair and maintenance information websites, which are reasonable and proportionate.



Appendix 1

Manufacturer's Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information

(Manufacturer):

(Address of the manufacturer):

Certifies that

it provides access to vehicle OBD and vehicle repair and maintenance information in compliance with the provisions of:

- Article 6 of Regulation (EC) No 715/2007;
- Articles 4(6) and 13 of Regulation (EC) No 692/2008;
- Annex I, section 2.3.1 and 2.3.5 of Regulation (EC) No 692/2008;
- Annex I, Appendix 3, section 16 of Regulation (EC) No 692/2008;
- Annex I, Appendix 5 of Regulation (EC) No 692/2008;
- Annex XI, section 4 of Regulation (EC) No 692/2008; and
- Annex XIV of Regulation (EC) No 692/2008

with respect to the vehicle types listed in attachment to this Certificate.

The principal website address through which the relevant information may be accessed and which are hereby certified to be in compliance with the above provisions are listed in an attachment to this Certificate along with the contact details of the responsible manufacturer's representative whose signature is below.

Where applicable: The manufacturer hereby also certifies that it has complied with the obligation in Article 13(5) of this Regulation to provide the relevant information for previous approvals of these vehicle types no later than 6 months after the date of type-approval.

Done at [..... Place]

On [..... Date]

.....
[Signature of the Manufacturer's Representative]

Annexes:

- Website Addresses
- Contact Details

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Annex I

to

Manufacturer's Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information

Website addresses referred to by this Certificate:

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Annex II

to

Manufacturer's Certificate on Access to Vehicle OBD and Vehicle Repair and Maintenance Information

Contact details of the manufacturer's representative referred to by this Certificate:

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ANNEX XV

**IN-SERVICE CONFORMITY OF VEHICLES TYPE-APPROVED UNDER
DIRECTIVE 70/220/EEC**

1. CONFORMITY OF IN-SERVICE VEHICLES

1.1. An audit of in-service conformity shall be conducted by the approval authority on the basis of any relevant information in possession of the manufacturer, under procedures similar to those defined in Article 10(1) and (2) and in points 1 and 2 of Annex X to Directive 70/156/EEC.

1.2. The Figure referred to under point 4 of Appendix 2 to this Annex and Figure 4/2 of Appendix 4 to UN/ECE Regulation 83 illustrate the procedure for in-service conformity checking.

1.3. **Parameters defining the in-service family**

The in-service family may be defined by basic design parameters which shall be common to vehicles within the family. Accordingly, those vehicle types which have in common, or within the stated tolerances, at least the parameters set out in points 1.3.1 to 1.3.11, can be considered as belonging to the same in-service family.

1.3.1. combustion process (two stroke, four stroke, rotary).

1.3.2. number of cylinders.

1.3.3. configuration of the cylinder block (in-line, V, radial, horizontally opposed, other). The inclination or orientation of the cylinders is not a criteria).

1.3.4. method of engine fuelling (e.g. indirect or direct injection).

1.3.5. type of cooling system (air, water, oil).

1.3.6. method of aspiration (naturally aspirated, pressure charged).

1.3.7. fuel for which the engine is designed (petrol, diesel, NG, LPG, etc.). Bi fuelled vehicles may be grouped with dedicated fuel vehicles providing one of the fuels is common.

1.3.8. type of catalytic converter (three-way catalyst or other(s)).

1.3.9. type of particulate trap (with or without).

1.3.10. exhaust gas recirculation (with or without).

1.3.11. engine cylinder capacity of the largest engine within the family minus 30 %.

1.4. An audit of in-service conformity shall be conducted by the approval authority on the basis of information supplied by the manufacturer. Such information shall include, but is not limited to, the following:

1.4.1. the name and address of the manufacturer;

1.4.2. the name, address, telephone and fax numbers and e-mail address of his authorised representative within the areas covered by the manufacturer's information;

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- 1.4.3. the model name(s) of the vehicles included in the manufacturer's information;
- 1.4.4. where appropriate, the list of vehicle types covered within the manufacturer's information, i.e. the in-service family group in accordance with section 1.3;
- 1.4.5. the vehicle identification number (VIN) codes applicable to these vehicle types within the in-service family (VIN prefix);
- 1.4.6. the numbers of the type-approvals applicable to these vehicle types within the in-service family, including, where applicable, the numbers of all extensions and field fixes/recalls (re-works);
- 1.4.7. details of extensions, field fixes/recalls to those type-approvals for the vehicles covered within the manufacturer's information (if requested by the approval authority);
- 1.4.8. the period of time over which the manufacturer's information was collected;
- 1.4.9. the vehicle build period covered within the manufacturer's information (e.g. vehicles manufactured during the 2001 calendar year);
- 1.4.10. the manufacturer's in-service conformity checking procedure, including:
 - (a) vehicle location method;
 - (b) vehicle selection and rejection criteria;
 - (c) test types and procedures used for the programme;
 - (d) the manufacturer's acceptance/rejection criteria for the in-service family group;
 - (e) geographical area(s) within which the manufacturer has collected information;
 - (f) sample size and sampling plan used;
- 1.4.11. the results from the manufacturer's in-service conformity procedure, including:
 - (a) identification of the vehicles included in the programme (whether tested or not). That identification shall include:
 - model name,
 - vehicle identification number (VIN),
 - vehicle registration number,
 - date of manufacture,
 - region of use (where known),
 - tyres fitted,
 - (b) the reason(s) for rejecting a vehicle from the sample;
 - (c) service history for each vehicle in the sample (including any re-works);
 - (d) repair history for each vehicle in the sample (where known);

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- (e) test data, including:
- date of test,
 - location of test,
 - distance indicated on vehicle odometer,
 - test fuel specifications (e.g. test reference fuel or market fuel),
 - test conditions (temperature, humidity, dynamometer inertia weight),
 - dynamometer settings (e.g. power setting),
 - test results (from at least three different vehicles per family),

1.4.12. records of indication from the OBD system.

2. The information gathered by the manufacturer shall be sufficiently comprehensive to ensure that in-service performance can be assessed for normal conditions of use as defined in section 1 and in a way representative of the manufacturer's geographic penetration.

For the purpose of this Regulation, the manufacturer shall not be obliged to carry out an audit of in-service conformity for a vehicle type if he can demonstrate to the satisfaction of the approval authority that the annual sales of that vehicle type in the Community are less than 5 000 per annum.

3. On the basis of the audit referred to in Section 1.2 the approval authority shall adopt one of the following decisions and actions:
- (a) decide that the in-service conformity of a vehicle type or a vehicle in-service family is satisfactory and not take any further action;
 - (b) decide that the data provided by the manufacturer is insufficient to reach a decision and request additional information or test data from the manufacturer;
 - (c) decide that the in-service conformity of a vehicle type, that is part of an in-service family, is unsatisfactory and proceed to have such vehicle type tested in accordance with Appendix 1 to Annex I.

Where the manufacturer has been permitted not to carry out an audit for a particular vehicle type in accordance with Section 2, the approval authority may proceed to have such vehicle types tested in accordance with Appendix 1 to Annex I.

- 3.1. Where type 1 tests are considered necessary to check the conformity of emission control devices with the requirements for their performance while in service, such tests shall be carried out using a test procedure meeting the statistical criteria defined in Appendix 2 to this Annex.
- 3.2. The approval authority, in cooperation with the manufacturer, shall select a sample of vehicles with sufficient mileage whose use under normal conditions can be reasonably assured. The manufacturer shall be consulted on the choice of the vehicles in the sample and be allowed to attend the confirmatory checks of the vehicles.

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- 3.3. The manufacturer shall be authorized, under the supervision of the approval authority, to carry out checks, even of a destructive nature, on those vehicles with emission levels in excess of the limit values with a view to establishing possible causes of deterioration which cannot be attributed to the manufacturer himself. Where the results of the checks confirm such causes, those test results are excluded from the conformity check.
- 3.4. Where the approval authority is not satisfied with the results of the tests in accordance with the criteria defined in Appendix 2, the remedial measures referred to in Article 11(2) and in Annex X to Directive 70/156/EEC are extended to vehicles in service belonging to the same vehicle type which are likely to be affected with the same defects in accordance with section 6 of Appendix 1.

The plan of remedial measures presented by the manufacturer shall be approved by the approval authority. The manufacturer is responsible for the execution of the remedial plan as approved.

The approval authority shall notify its decision to all Member States within 30 days. The Member States may require that the same plan of remedial measures be applied to all vehicles of the same type registered in their territory.

- 3.5. If a Member State has established that a vehicle type does not conform to the applicable requirements of Appendix 1 to this Annex, it shall notify without delay the Member State which granted the original type-approval in accordance with the requirements of Article 11(3) of Directive 70/156/EEC.

After that notification and subject to the provision of Article 11(6) of Directive 70/156/EEC, the competent authority of the Member State which granted the original type-approval shall inform the manufacturer that a vehicle type fails to satisfy the requirements of these provisions and that certain measures are expected of the manufacturer. The manufacturer shall submit to the authority, within two months after this notification, a plan of measures to overcome the defects, the substance of which should correspond to the requirements of sections 6.1 to 6.8 of Appendix 1. The competent authority which granted the original type-approval shall, within two months, consult the manufacturer in order to secure agreement on a plan of measures and on carrying out the plan. If the competent authority which granted the original type-approval establishes that no agreement can be reached, the procedure pursuant to Article 11(3) and (4) of Directive 70/156/EEC shall be initiated.

▼B*Appendix 1***In-service conformity check**

1. INTRODUCTION

This Appendix sets out the criteria for the in-service conformity control of vehicles type-approved under Directive 70/220/EEC.

2. SELECTION CRITERIA

The criteria for acceptance of a selected vehicle are defined in sections 2.1 to 2.8. Information shall be collected by the approval authority by vehicle examination and an interview with the owner/driver.

2.1. The vehicle shall belong to a vehicle type that is type-approved under Directive 70/220/EEC and covered by a certificate of conformity in accordance with Directive 70/156/EEC. The vehicle shall be registered and used in the European Community.

2.2. The vehicle shall have been in service for at least 15 000 km or 6 months, whichever is the later, and for no more than 100 000 km or 5 years, whichever is the sooner.

2.3. There shall be a maintenance record to show that the vehicle has been properly maintained, e. g. has been serviced in accordance with the manufacturer's recommendations.

2.4. The vehicle shall exhibit no indications of abuse (e. g. racing, overloading, misfuelling, or other misuse), or other factors (e. g. tampering) that could affect emission performance. In the case of vehicles fitted with an OBD system, the fault code and mileage information stored in the computer are taken into account. A vehicle shall not be selected for testing if the information stored in the computer shows that the vehicle has operated after a fault code was stored and a relatively prompt repair was not carried out.

2.5. There shall have been no unauthorized major repair to the engine or major repair of the vehicle.

2.6. The lead content and sulphur content of a fuel sample from the vehicle tank shall meet the applicable standards laid down in Directive 98/70/EC of the European Parliament and of the Council ⁽¹⁾ and there shall be no evidence of misfuelling. Checks may be done in the tailpipe etc.

2.7. There shall be no indication of any problem that might jeopardize the safety of laboratory personnel.

2.8. All anti-pollution system components on the vehicle shall be in conformity with the applicable type-approval.

3. DIAGNOSIS AND MAINTENANCE

Diagnosis and any normal maintenance necessary shall be performed on vehicles accepted for testing, prior to measuring exhaust emissions, in accordance with the procedure laid down in section 3.1 to 3.7.

⁽¹⁾ OJ L 350, 28.12.1998, p. 58.

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- 3.1. The following checks shall be carried out: checks on air filter, all drive belts, all fluid levels, radiator cap, all vacuum hoses and electrical wiring related to the antipollution system for integrity; checks on ignition, fuel metering and pollution control device components for maladjustments and/or tampering. All discrepancies shall be recorded.
- 3.2. The OBD system shall be checked for proper functioning. Any malfunction indications in the OBD memory shall be recorded and the requisite repairs shall be carried out. If the OBD malfunction indicator registers a malfunction during a preconditioning cycle, the fault may be identified and repaired. The test may be re-run and the results of that repaired vehicle used.
- 3.3. The ignition system shall be checked and defective components replaced, for example spark plugs, cables, etc.
- 3.4. The compression shall be checked. If the result is unsatisfactory the vehicle shall be rejected.
- 3.5. The engine parameters shall be checked to the manufacturer's specifications and adjusted if necessary.
- 3.6. If the vehicle is within 800 km of a scheduled maintenance service, that service shall be performed according to the manufacturer's instructions. Regardless of odometer reading, the oil and air filter may be changed at the request of the manufacturer.
- 3.7. Upon acceptance of the vehicle, the fuel shall be replaced with appropriate emission test reference fuel, unless the manufacturer accepts the use of market fuel.
4. IN-SERVICE TESTING
 - 4.1. When a check on vehicles is deemed necessary, emission tests in accordance with Annex III to Directive 70/220/EEC shall be performed on pre-conditioned vehicles selected in accordance with the requirements of sections 2 and 3 of this Appendix.
 - 4.2. Vehicles equipped with an OBD system may be checked for proper in-service functionality of the malfunction indication, etc., in relation to levels of emissions (e. g. the malfunction indication limits defined in Annex XI to Directive 70/220/EEC) for the type-approved specifications.
 - 4.3. The OBD system may be checked, for example, for levels of emissions above the applicable limit values with no malfunction indication, systematic erroneous activation of the malfunction indication and identified faulty or deteriorated components in the OBD system.
 - 4.4. If a component or system operates in a manner not covered by the particulars in the type-approval certificate and/or information package for such vehicle types and such deviation has not been authorized under Article 5(3) or (4) of Directive 70/156/EEC, with no malfunction indication by the OBD, the component or system shall not be replaced prior to emission testing, unless it is determined that the component or system has been tampered with or abused in such a manner that the OBD does not detect the resulting malfunction.

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5. EVALUATION OF RESULTS
 - 5.1. The test results are submitted to the evaluation procedure in accordance with Appendix 2 to this Annex.
 - 5.2. Test results shall not be multiplied by deterioration factors.
6. PLAN OF REMEDIAL MEASURES
 - 6.1. The approval authority shall request the manufacturer to submit a plan of remedial measures to remedy the non-compliance when more than one vehicle is found to be an outlying emitter that meets either of the following conditions:
 - (a) meets the conditions set out in section 3.2.3 of Appendix 4 to UN/ECE Regulation 83 and both the type-approval authority and the manufacturer agree that the excess emission is due to the same cause, or
 - (b) meets the conditions set out in section 3.2.4 of Appendix 4 to UN/ECE Regulation 83 and the type-approval authority has determined that the excess emission is due to the same cause.
 - 6.2. The plan of remedial measures shall be filed with the approval authority not later than 60 working days from the date of the notification referred to in section 6.1. The approval authority shall within 30 working days declare its approval or disapproval of the plan of remedial measures. However, where the manufacturer can demonstrate, to the satisfaction of the competent approval authority, that further time is required to investigate the non-compliance in order to submit a plan of remedial measures, an extension is granted.
 - 6.3. The remedial measures shall apply to all vehicles likely to be affected by the same defect. The need to amend the type-approval documents shall be assessed.
 - 6.4. The manufacturer shall provide a copy of all communications related to the plan of remedial measures, and shall also maintain a record of the recall campaign, and supply regular status reports to the approval authority.
 - 6.5. The plan of remedial measures shall include the requirements set out in points 6.5.1 to 6.5.11. The manufacturer shall assign a unique identifying name or number to the plan of remedial measures.
 - 6.5.1. A description of each vehicle type included in the plan of remedial measures.
 - 6.5.2. A description of the specific modifications, alterations, repairs, corrections, adjustments, or other changes to be made to bring the vehicles into conformity including a brief summary of the data and technical studies which support the manufacturer's decision as to the particular measures to be taken to correct the non-conformity.
 - 6.5.3. A description of the method by which the manufacturer informs the vehicle owners.

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- 6.5.4. A description of the proper maintenance or use, if any, which the manufacturer stipulates as a condition of eligibility for repair under the plan of remedial measures, and an explanation of the manufacturer's reasons for imposing any such condition. No maintenance or use conditions may be imposed unless it is demonstrably related to the non-conformity and the remedial measures.
- 6.5.5. A description of the procedure to be followed by vehicle owners to obtain correction of the non-conformity. This shall include a date after which the remedial measures may be taken, the estimated time for the workshop to perform the repairs and where they can be done. The repair shall be done expediently, within a reasonable time after delivery of the vehicle.
- 6.5.6. A copy of the information transmitted to the vehicle owner.
- 6.5.7. A brief description of the system which the manufacturer uses to assure an adequate supply of component or systems for fulfilling the remedial action. It shall be indicated when there will be an adequate supply of components or systems to initiate the campaign.
- 6.5.8. A copy of all instructions to be sent to those persons who are to perform the repair.
- 6.5.9. A description of the impact of the proposed remedial measures on the emissions, fuel consumption, driveability, and safety of each vehicle type, covered by the plan of remedial measures with data, technical studies, etc. which support these conclusions.
- 6.5.10. Any other information, reports or data the approval authority may reasonably determine is necessary to evaluate the plan of remedial measures.
- 6.5.11. Where the plan of remedial measures includes a recall, a description of the method for recording the repair shall be submitted to the approval authority. If a label is used, an example of it shall be submitted.
- 6.6. The manufacturer may be required to conduct reasonably designed and necessary tests on components and vehicles incorporating a proposed change, repair, or modification to demonstrate the effectiveness of the change, repair, or modification.
- 6.7. The manufacturer shall be responsible for keeping a record of every vehicle recalled and repaired and the workshop which performed the repair. The approval authority shall have access to the record on request for a period of 5 years from the implementation of the plan of remedial measures.
- 6.8. The repair and/or modification or addition of new equipment shall be recorded in a certificate supplied by the manufacturer to the vehicle owner.

*Appendix 2***Statistical procedure for in-service conformity testing**

1. This procedure shall be used to verify the in-service conformity requirements for the type 1 test. The applicable statistical method shall be the one set out in Appendix 4 to UN/ECE Regulation No 83, with the exceptions set out in sections 2, 3 and 4.
2. Footnote 1 shall not apply.
3. In paragraphs 3.2.3.2.1 and 3.2.4.2 of Appendix 4 to UN/ECE Regulation No 83, the reference to paragraph 6 of Appendix 3 shall be understood as reference to Section 6 of Appendix 1 to Annex XV to this Regulation.
4. In Figure 4/1. of Appendix 4 to UN/ECE Regulation No 83, the following shall apply:
 - (a) the references to paragraph 8.2.1 shall be understood as reference to Section 1.1 of Annex XV to this Regulation;
 - (b) the reference to Appendix 3 shall be understood as reference to Appendix 1 of Annex XV to this Regulation;
 - (c) footnote 1 shall be understood as follows: In this case, TAA means the approval authority that granted the type-approval according to Directive 70/220/EC.

*ANNEX XVI***REQUIREMENTS FOR VEHICLES THAT USE A REAGENT FOR THE EXHAUST AFTERTREATMENT SYSTEM**

1. INTRODUCTION

This Annex sets out the requirements for vehicles that rely on the use of a reagent for the aftertreatment system in order to reduce emissions.

2. REAGENT INDICATION

- 2.1. The vehicle shall include a specific indicator on the dashboard that informs the driver of low levels of reagent in the reagent storage tank and of when the reagent tank becomes empty.

3. DRIVER WARNING SYSTEM

- 3.1. The vehicle shall include a warning system consisting of visual alarms that informs the driver when the reagent level is low, that the tank soon needs to be refilled, or the reagent is not of a quality specified by the manufacturer. The warning system may also include an audible component to alert the driver.

- 3.2. The warning system shall escalate in intensity as the reagent approaches empty. It shall culminate in a driver notification that can not be easily defeated or ignored. It shall not be possible to turn off the system until the reagent has been replenished.

- 3.3. The visual warning shall display a message indicating a low level of reagent. The warning shall not be the same as the warning used for the purposes of OBD or other engine maintenance. The warning shall be sufficiently clear for the driver to understand that the reagent level is low (e.g. 'urea level low', 'AdBlue level low', or 'reagent low').

- 3.4. The warning system does not initially need to be continuously activated, however the warning shall escalate so that it becomes continuous as the level of the reagent approaches the point where the driver inducement system in Section 8 comes into effect. An explicit warning shall be displayed (e.g. 'fill up urea', 'fill up AdBlue', or 'fill up reagent'). The continuous warning system may be temporarily interrupted by other warning signals providing important safety related messages.

- 3.5. The warning system shall activate at a distance equivalent to a driving range of at least 2 400 km in advance to the reagent tank becoming empty.

4. IDENTIFICATION OF INCORRECT REAGENT

- 4.1. The vehicle shall include a means of determining that a reagent corresponding to the characteristics declared by the manufacturer and recorded in Appendix 3 to Annex I to this Regulation is present on the vehicle.

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- 4.2. If the reagent in the storage tank does not correspond to the minimum requirements declared by the manufacturer the driver warning system in section 3 shall be activated and shall display a message indicating an appropriate warning (e.g. 'incorrect urea detected', 'incorrect AdBlue detected', or 'incorrect reagent detected'). If the reagent quality is not rectified within 50 km of the activation of the warning system then the driver inducement requirements of section 8 shall apply.
5. REAGENT CONSUMPTION MONITORING
- 5.1. The vehicle shall include a means of determining reagent consumption and providing off-board access to consumption information.
- 5.2. Average reagent consumption and average demanded reagent consumption by the engine system shall be available via the serial port of the standard diagnostic connector. Data shall be available over the previous complete 2 400 km period of vehicle operation.
- 5.3. In order to monitor reagent consumption, at least the following parameters within the vehicle shall be monitored:
- (a) the level of reagent in the on-vehicle storage tank;
 - (b) the flow of reagent or injection of reagent as close as technically possible to the point of injection into an exhaust aftertreatment system.
- 5.4. A deviation of more than 50 % between the average reagent consumption and the average demanded reagent consumption by the engine system over a period of 30 minutes of vehicle operation, shall result in the activation of the driver warning system in section 3, which shall display a message indicating an appropriate warning (e.g. 'urea dosing malfunction', 'AdBlue dosing malfunction', or 'reagent dosing malfunction'). If the reagent consumption is not rectified within 50 km of the activation of the warning system then the driver inducement requirements of section 8 shall apply.
- 5.5. In the case of interruption in reagent dosing activity the driver warning system as referred to in section 3 shall be activated, which shall display a message indicating an appropriate warning. This activation shall not be required where the interruption is demanded by the engine ECU because the vehicle operating conditions are such that the vehicle's emission performance does not require reagent dosing, provided that the manufacturer has clearly informed the approval authority when such operating conditions apply. If the reagent dosing is not rectified within 50 km of the activation of the warning system then the driver inducement requirements of section 8 shall apply.
6. MONITORING NO_x EMISSIONS
- 6.1. As an alternative to the monitoring requirements in section 4 and 5 manufacturers may use exhaust gas sensors directly to sense excess NO_x levels in the exhaust.

▼ M2

- 6.2. The manufacturer shall demonstrate that use of the sensors referred to in point 6.1 and any other sensors on the vehicle, results in the activation of the driver warning system as referred to in point 3, the display of a message indicating an appropriate warning (e.g. ‘emissions too high — check urea’, ‘emissions too high — check AdBlue’, ‘emissions too high — check reagent’), and the driver inducement system as referred to in point 8.3, when the situations referred to in points 4.2, 5.4 or 5.5 occur.

For the purposes of this point these situations are presumed to occur:

- in the case of vehicles approved to the Euro 5 emission limits of Table 1 of Annex I to Regulation (EC) No 715/2007, if the applicable NO_x emission limit of that table multiplied by a factor of 1,5, is exceeded,
- in the case of vehicles approved to the Euro 6 emission limits of Table 2 of Annex I to Regulation (EC) No 715/2007, if the applicable NO_x OBD threshold limit of the tables set out in points 2.3.2, 2.3.3 or 2.3.4 of Annex XI is exceeded.

NO_x emissions during the test to demonstrate compliance with these requirements shall be no more than 20 % higher than the values referred to in the second paragraph.

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7. STORAGE OF FAILURE INFORMATION

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- 7.1. Where reference is made to this point, non-erasable Parameter Identifiers (PID) shall be stored identifying the reason for and the distance travelled by the vehicle during the inducement system activation. The vehicle shall retain a record of the PID for at least 800 days or 30 000 km of vehicle operation. The PID shall be made available via the serial port of a standard diagnostic connector upon request of a generic scan tool according to the provisions of point 6.5.3.1 of Appendix 1 to Annex 11 to UN/ECE Regulation No 83 and point 2.5 of Appendix 1 to Annex XI to this Regulation. From the dates referred to in Article 17, the information stored in the PID shall be linked to the period of cumulated vehicle operation, during which it has occurred, with an accuracy of not less than 300 days or 10 000 km.

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- 7.2. Malfunctions in the reagent dosing system attributed to technical failures (e.g. mechanical or electrical faults) shall also be subject to the OBD requirements in Annex XI.

8. DRIVER INDUCEMENT SYSTEM

- 8.1. The vehicle shall include a driver inducement system to ensure that the vehicle operates with a functioning emissions control system at all times. The inducement system shall be designed so as to ensure that the vehicle can not operate with an empty reagent tank.
- 8.2. The inducement system shall activate at the latest when the level of reagent in the tank reaches a level equivalent to the average driving range of the vehicle with a complete tank of fuel. The system shall also activate when the failures in sections 4, 5 or 6 have occurred, depending on the NO_x monitoring approach. The detection of an empty reagent tank and the failures mentioned in sections 4, 5 or 6 shall result in the failure information storage requirements of section 7 coming into effect.

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- 8.3. The manufacturer shall select which type of inducement system to install. The options for a system are described in following points 8.3.1, 8.3.2, 8.3.3 and 8.3.4.
- 8.3.1. A ‘no engine restart after countdown’ approach allows a countdown of restarts or distance remaining once the inducement system activates. Engine restarts initiated by the vehicle control system, such as start-stop systems, are not included in this countdown. Engine restarts shall be prevented immediately after the reagent tank becomes empty or a distance equivalent to a complete tank of fuel has been exceeded since the activation of the inducement system, whichever occurs earlier.
- 8.3.2. A ‘no start after refuelling’ system results in a vehicle being unable to start after re-fuelling if the inducement system has activated.
- 8.3.3. A ‘fuel-lockout’ approach prevents the vehicle from being refuelled by locking the fuel filler system after the inducement system activates. The lockout system shall be robust to prevent it being tampered with.
- 8.3.4. A ‘performance restriction’ approach restricts the speed of the vehicle after the inducement system activates. The level of speed limitation shall be noticeable to the driver and significantly reduce the maximum speed of the vehicle. Such limitation shall enter into operation gradually or after an engine start. Shortly before engine restarts are prevented, the speed of the vehicle shall not exceed 50 km/h. Engine restarts shall be prevented immediately after the reagent tank becomes empty or a distance equivalent to a complete tank of fuel has been exceeded since the activation of inducement system, whichever occurs earlier.
- 8.4. Once the inducement system has fully activated and disabled the vehicle, the inducement system shall only be deactivated if the quantity of reagent added to the vehicle is equivalent to 2 400 km average driving range, or the failures specified in sections 4, 5, or 6 have been rectified. After a repair has been carried out to correct a fault where the OBD system has been triggered under point 7.2, the inducement system may be reinitialised via the OBD serial port (e.g. by a generic scan tool) to enable the vehicle to be restarted for self-diagnosis purposes. The vehicle shall operate for a maximum of 50 km to enable the success of the repair to be validated. The inducement system shall be fully reactivated if the fault persists after this validation.
- 8.5. The driver warning system referred to in section 3 shall display a message indicating clearly:
- (a) the number of remaining restarts and/or the remaining distance; and
 - (b) the conditions under which the vehicle can be restarted.
- 8.6. The driver inducement system shall be deactivated when the conditions for its activation have ceased to exist. The driver inducement system shall not be automatically deactivated without the reason for its activation having been remedied.
- 8.7. Detailed written information fully describing the functional operation characteristics of the driver inducement system shall be provided to the approval authority at the time of approval.

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- 8.8. As part of the application for type-approval under this Regulation, the manufacturer shall demonstrate the operation of the driver warning and inducement systems.

9. INFORMATION REQUIREMENTS

- 9.1. The manufacturer shall provide all owners of new vehicles written information about the emission control system. This information shall state that if the vehicle emission control system is not functioning correctly, the driver shall be informed of a problem by the driver warning system and that the driver inducement system shall consequently result in the vehicle being unable to start.
- 9.2. The instructions shall indicate requirements for the proper use and maintenance of vehicles, including the proper use of consumable reagents.
- 9.3. The instructions shall specify if consumable reagents have to be refilled by the vehicle operator between normal maintenance intervals. They shall indicate how the driver should refill the reagent tank. The information shall also indicate a likely rate of reagent consumption for that type of vehicle and how often it should be replenished.
- 9.4. The instructions shall specify that use of, and refilling of, a required reagent of the correct specifications is mandatory for the vehicle to comply with the certificate of conformity issued for that vehicle type.
- 9.5. The instructions shall state that it may be a criminal offence to use a vehicle that does not consume any reagent if it is required for the reduction of emissions.
- 9.6. The instructions shall explain how the warning system and driver inducement systems work. In addition, the consequences of ignoring the warning system and not replenishing the reagent shall be explained.

10. OPERATING CONDITIONS OF THE AFTERTREATMENT SYSTEM

Manufacturers shall ensure that the emission control system retains its emission control function during all ambient conditions regularly found in the European Union, especially at low ambient temperatures. This includes taking measures to prevent the complete freezing of the reagent during parking times of up to 7 days at 258 K (– 15 °C) with the reagent tank 50 % full. If the reagent has frozen, the manufacturer shall ensure that reagent shall be available for use within 20 minutes of the vehicle starting at 258 K (– 15 °C) measured inside the reagent tank, so as to ensure correct operation of the emission control system.

*ANNEX XVII***AMENDMENTS TO REGULATION (EC) No 715/2007**

Regulation (EC) No 715/2007 is amended as follows:

1. The following paragraph 6 shall be added to Article 10:

‘6. The 5,0 mg/km emission limit for mass of particulate matter referred to in Tables 1 and 2 of Annex I shall be effective from the applicable dates set out in paragraphs 1, 2 and 3.

The 4,5 mg/km emission limit for mass of particulate matter and the particle number limit referred to in Tables 1 and 2 of Annex I shall be effective from 1 September 2011 for the type-approval on new types of vehicles and from 1 January 2013 for all new vehicles sold, registered or put into service in the Community.’

2. Tables 1 and 2 of Annex I are replaced by the following tables:

Table 1
Euro 5 Emission Limits

Category		Class	Reference mass (RM) (kg)	Limit values													
				Mass of carbon monoxide (CO)		Mass of total hydrocarbons (THC)		Mass of non-methane hydrocarbons (NMHC)		Mass of oxides of nitrogen (NO _x)		Combined mass of hydrocarbons and oxides of nitrogen (THC + NO _x)		Mass of particulate matter ⁽¹⁾ (PM)		Number of particles ⁽²⁾ (P)	
				L ₁ (mg/km)		L ₂ (mg/km)		L ₃ (mg/km)		L ₄ (mg/km)		L ₂ + L ₄ (mg/km)		L ₅ (mg/km)		L ₆ (#/km)	
			PI	CI	PI	CI	PI	CI	PI	CI	PI	CI	PI ⁽³⁾	CI	PI	CI	
M	—	All	1 000	500	100	—	68	—	60	180	—	230	5,0/4,5	5,0/4,5	—	6,0 × 10 ¹¹	
N ₁	I	RM ≤ 1 305	1 000	500	100	—	68	—	60	180	—	230	5,0/4,5	5,0/4,5	—	6,0 × 10 ¹¹	
	II	1 305 < RM ≤ 1 760	1 810	630	130	—	90	—	75	235	—	295	5,0/4,5	5,0/4,5	—	6,0 × 10 ¹¹	
	III	1 760 < RM	2 270	740	160	—	108	—	82	280	—	350	5,0/4,5	5,0/4,5	—	6,0 × 10 ¹¹	
N ₂	—	All	2 270	740	160	—	108	—	82	280	—	350	5,0/4,5	5,0/4,5	—	6,0 × 10 ¹¹	

Key: PI = Positive Ignition, CI = Compression Ignition

⁽¹⁾ A revised measurement procedure shall be introduced before the application of the 4,5 mg/km limit value.

⁽²⁾ A new measurement procedure shall be introduced before the application of the limit value.

⁽³⁾ Positive ignition particulate mass standards shall apply only to vehicles with direct injection engines.

Table 2
Euro 6 Emission Limits

Category	Class	Reference mass (RM) (kg)	Limit values													
			Mass of carbon monoxide (CO)		Mass of total hydrocarbons (THC)		Mass of non-methane hydrocarbons (NMHC)		Mass of oxides of nitrogen (NO _x)		Combined mass of hydrocarbons and oxides of nitrogen (THC + NO _x)		Mass of particulate matter ⁽¹⁾ (PM)		Number of particles ⁽²⁾ (P)	
			L ₁ (mg/km)		L ₂ (mg/km)		L ₃ (mg/km)		L ₄ (mg/km)		L ₂ + L ₄ (mg/km)		L ₅ (mg/km)		L ₆ (#/km)	
			PI	CI	PI	CI	PI	CI	PI	CI	PI	CI	PI ⁽³⁾	CI	PI ⁽⁴⁾	CI ⁽⁵⁾
M	—	All	1 000	500	100	—	68	—	60	80	—	170	5,0/4,5	5,0/4,5		6,0 × 10 ¹¹
N ₁	I	RM ≤ 1 305	1 000	500	100	—	68	—	60	80	—	170	5,0/4,5	5,0/4,5		6,0 × 10 ¹¹
	II	1 305 < RM ≤ 1 760	1 810	630	130	—	90	—	75	105	—	195	5,0/4,5	5,0/4,5		6,0 × 10 ¹¹
	III	1 760 < RM	2 270	740	160	—	108	—	82	125	—	215	5,0/4,5	5,0/4,5		6,0 × 10 ¹¹
N ₂	—	All	2 270	740	160	—	108	—	82	125	—	215	5,0/4,5	5,0/4,5		6,0 × 10 ¹¹

Key: PI = Positive Ignition, CI = Compression Ignition

⁽¹⁾ A revised measurement procedure shall be introduced before the application of the 4,5 mg/km limit value.

⁽²⁾ A number standard is to be defined for this stage for positive ignition vehicles.

⁽³⁾ Positive ignition particulate mass standards shall apply only to vehicles with direct injection engines.

⁽⁴⁾ A number standard shall be defined before 1 September 2014.⁷

⁽⁵⁾ A new measurement procedure shall be introduced before the application of the limit value.



ANNEX XVIII

SPECIAL PROVISIONS REGARDING ANNEX I TO COUNCIL DIRECTIVE 70/156/EEC

- 3.2.1.1. Working principle: positive ignition/compression ignition ⁽¹⁾
Four stroke/two stroke/rotary cycle ⁽¹⁾
- 3.2.2. Fuel: Diesel/Petrol/LPG/NG-Biomethane/Ethanol(E85)/Bio-diesel/Hydrogen Four stroke/two stroke/rotary cycle ⁽¹⁾
- 3.2.2.4. Vehicle fuel type: Mono fuel, Bi fuel, Flex fuel Four stroke/two stroke/rotary cycle ⁽¹⁾
- 3.2.2.5. Maximum amount of biofuel acceptable in fuel (manufacturer's declared value): % by volume²
- 3.2.4.2.3.3. Maximum fuel delivery Four stroke/two stroke/rotary cycle ⁽¹⁾ ⁽²⁾: mm³/stroke or cycle at an engine speed of: min⁻¹ or, alternatively, a characteristic diagram:
- 3.2.4.2.9. Electronic controlled injection: yes/no ⁽¹⁾
- 3.2.4.2.9.2. Type(s):
- 3.2.4.2.9.3. Description of the system, in the case of systems other than continuous injection give equivalent details:
- 3.2.4.2.9.3.1. Make and type of the control unit:
- 3.2.4.2.9.3.2. Make and type of the fuel regulator:
- 3.2.4.2.9.3.3. Make and type of air-flow sensor:
- 3.2.4.2.9.3.4. Make and type of fuel distributor:
- 3.2.4.2.9.3.5. Make and type of throttle housing:
- 3.2.4.2.9.3.6. Make and type of water temperature sensor:
- 3.2.4.2.9.3.7. Make and type of air temperature sensor:
- 3.2.4.2.9.3.8. Make and type of air pressure sensor:
- 3.2.4.3.4. System description, in the case of systems other than continuous injection give equivalent details:
- 3.2.4.3.4.1. Make and type of the control unit:
- 3.2.4.3.4.3. Make and type of air-flow sensor:
- 3.2.4.3.4.6. Make and type of micro switch:
- 3.2.4.3.4.8. Make and type of throttle housing:
- 3.2.4.3.4.9. Make and type of water temperature sensor:
- 3.2.4.3.4.10. Make and type of air temperature sensor:
- 3.2.4.3.4.11. Make and type of air pressure sensor:
- 3.2.4.3.5.1. Make(s):

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

⁽²⁾ Specify the tolerance.

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- 3.2.4.3.5.2. Type(s):
- 3.2.8.2.1. Type: air-air/air-water⁽¹⁾
- 3.2.8.3. Intake depression at rated engine speed and at 100 % load (compression ignition engines only)
- Minimum allowable: kPa
- Maximum allowable: kPa
- 3.2.9.3. Maximum allowable exhaust back pressure at rated engine speed and at 100 % load (compression ignition engines only): kPa
- 3.2.11.1. Maximum lift of valves, angles of opening and closing, or timing details of alternative distribution systems, in relation to dead centres. For variable timing system, minimum and maximum timing:
- 3.2.12.2. Additional pollution control devices (if any, and if not covered by another heading)
- 3.2.12.2.1.1. Number of catalytic converters and elements (provide the information below for each separate unit):
- 3.2.12.2.1.1.1. Regeneration systems/method of exhaust after-treatment systems, description:
- 3.2.12.2.1.1.1.1. The number of Type 1 operating cycles, or equivalent engine test bench cycles, between two cycles where regenerative phases occur under the conditions equivalent to Type 1 test (Distance 'D' in figure 1 in Annex 13 to UN/ECE Regulation 83):
- 3.2.12.2.1.1.1.2. Description of method employed to determine the number of cycles between two cycles where regenerative phases occur:
- 3.2.12.2.1.1.1.3. Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure etc.):
- 3.2.12.2.1.1.1.4. Description of method used to load system in the test procedure described in paragraph 3.1., Annex 13 to UN/ECE Regulation 83:
- 3.2.12.2.1.1.1.5. Normal operating temperature range (K):
- 3.2.12.2.1.1.1.6. Consumable reagents (where appropriate):
- 3.2.12.2.1.1.1.7. Type and concentration of reagent needed for catalytic action (where appropriate):
- 3.2.12.2.1.1.1.8. Normal operational temperature range of reagent (where appropriate):
- 3.2.12.2.1.1.1.9. International standard (where appropriate):
- 3.2.12.2.1.1.1.10. Frequency of reagent refill: continuous/maintenance⁽¹⁾ (where appropriate)
- 3.2.12.2.1.1.2. Make of catalytic converter:
- 3.2.12.2.1.1.3. Identifying part number:
- 3.2.12.2.2.4. Make of oxygen sensor:
- 3.2.12.2.2.5. Identifying part number:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

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- 3.2.12.2.4.2. Water cooled system: yes/no ⁽¹⁾
- 3.2.12.2.6.4.1. The number of Type 1 operating cycles, or equivalent engine test bench cycle, between two cycles where regeneration phases occur under the conditions equivalent to Type 1 test (Distance 'D' in figure 1 in Annex 13 to UN/ECE Regulation 83):
- 3.2.12.2.6.4.2. Description of method employed to determine the number of cycles between two cycles where regenerative phases occur:
- 3.2.12.2.6.4.3. Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure, etc.):
- 3.2.12.2.6.4.4. Description of method used to load system in the test procedure described in paragraph 3.1., Annex 13 to UN/ECE Regulation 83:
- 3.2.12.2.6.5. Make of particulate trap:
- 3.2.12.2.6.6. Identifying part number:
- 3.2.12.2.7.6. The following additional information shall be provided by the vehicle manufacturer for the purposes of enabling the manufacture of OBD- compatible replacement or service parts and diagnostic tools and test equipment.
- 3.2.12.2.7.6.1. A description of the type and number of the pre-conditioning cycles used for the original type-approval of the vehicle.
- 3.2.12.2.7.6.2. A description of the type of the OBD demonstration cycle used for the original type-approval of the vehicle for the component monitored by the OBD system.
- 3.2.12.2.7.6.3. A comprehensive document describing all sensed components with the strategy for fault detection and MI activation (fixed number of driving cycles or statistical method), including a list of relevant secondary sensed parameters for each component monitored by the OBD system. A list of all OBD output codes and format used (with an explanation of each) associated with individual emission related power-train components and individual non-emission related components, where monitoring of the component is used to determine MI activation. In particular, a comprehensive explanation for the data given in service \$05 Test ID \$21 to FF and the data given in service \$06 shall be provided. In the case of vehicle types that use a communication link in accordance with ISO 15765-4 'Road vehicles diagnostics on controller area network (CAN) — part 4: requirements for emissions-related systems', a comprehensive explanation for the data given in service \$06 Test ID \$00 to FF, for each OBD monitor ID supported, shall be provided.

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

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3.2.12.2.7.6.4. The information required by this section may, be defined by completing a table as follows,

Component	Fault code	Monitoring strategy	Fault detection criteria	MI activation criteria	Secondary parameters	Pre-conditioning	Demonstration test
Catalyst	PO420	Oxygen sensor 1 and 2 signals	Difference between sensor 1 and sensor 2 signals	3rd cycle	Engine speed, engine load, A/F mode, catalyst temperature	Two Type 1 cycles	Type 1

3.2.15.1. EC type-approval number according to Council Directive 70/221/EEC (OJ L 76, 6.4.1970, p. 23) (when the Directive will be amended to cover tanks for gaseous fuels) or approval number of UN/ECE Regulation 67'

3.2.16.1. EC type-approval number according to Directive 70/221/EEC (when the Directive will be amended to cover tanks for gaseous fuels) or approval number of UN/ECE Regulation 110:

3.4. Engines or motor combinations

3.4.1. Hybrid Electric Vehicle: yes/no ⁽¹⁾

3.4.2. Category of Hybrid Electric vehicle

Off Vehicle Charging/Not Off Vehicle Charging ⁽¹⁾

3.4.3. Operating mode switch: with/without ⁽¹⁾

3.4.3.1. Selectable modes

3.4.3.1.1. Pure electric: yes/no ⁽¹⁾

3.4.3.1.2. Pure fuel consuming: yes/no ⁽¹⁾

3.4.3.1.3. Hybrid modes: yes/no ⁽¹⁾

(if yes, short description)

3.4.4. Description of the energy storage device: (battery, capacitor, flywheel/generator)

3.4.4.1. Make(s):

3.4.4.2. Type(s):

3.4.4.3. Identification number:

3.4.4.4. Kind of electrochemical couple:

3.4.4.5. Energy: (for battery: voltage and capacity Ah in 2 h, for capacitor: J,)

3.4.4.6. Charger: on board/external/without ⁽¹⁾

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)

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- 3.4.5. Electric machines (describe each type of electric machine separately)
- 3.4.5.1. Make:
- 3.4.5.2. Type:
- 3.4.5.3. Primary use: traction motor/generator
- 3.4.5.3.1. When used as traction motor: monomotor/multimotors (number):
- 3.4.5.4. Maximum power: kW
- 3.4.5.5. Working principle:
- 3.4.5.5.1. direct current/alternating current/number of phases:
- 3.4.5.5.2. separate excitation/series/compound ⁽¹⁾
- 3.4.5.5.3. synchronous/asynchronous ⁽¹⁾
- 3.4.6. Control unit
- 3.4.6.1. Make(s):
- 3.4.6.2. Type(s):
- 3.4.6.3. Identification number:
- 3.4.7. Power controller
- 3.4.7.1. Make:
- 3.4.7.2. Type:
- 3.4.7.6.3. Identification number:

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- 3.4.8. Vehicle electric range km (according to Annex 9 to UN/ECE Regulation No 101)

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- 3.4.9. Manufacturer's recommendation for preconditioning:
- 3.5.2. Fuel consumption (provide for each reference fuel tested)
- 6.6.1. Tyre/wheel combination(s)
- (a) for all tyre options indicate size designation, load-capacity index, speed category symbol, rolling resistance to ISO 28580 (where applicable)
- (b) for tyres of category Z intended to be fitted on vehicles whose maximum speed exceeds 300 km/h equivalent information shall be provided; for wheels indicate rim size(s) and off-set(s)
- 9.1. Type of bodywork: (use codes defined in Annex II, section C):
16. Access to vehicle repair and maintenance information
- 16.1. Address of principal website for access to vehicle repair and maintenance information:
- 16.1.1. Date from which it is available (no later than 6 months from the date of type approval):
- 16.2. Terms and conditions of access to website referred to in Section 16.1:
- 16.3. Format of vehicle repair and maintenance information accessible through website referred to in Section 16.1:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable.)



ANNEX XIX

**SPECIAL PROVISIONS REGARDING ANNEX III TO COUNCIL
DIRECTIVE 70/156/EEC**

- 3.2.1.1. Working principle: positive ignition/compression ignition ⁽¹⁾
Four stroke/two stroke/rotary cycle ⁽¹⁾
- 3.2.2. Fuel: Diesel/Petrol/LPG/NG-Biomethane/Ethanol(E85)/Biodiesel/
Hydrogen ⁽¹⁾
- 3.2.2.4. Vehicle fuel type: Mono fuel, Bi fuel, Flex fuel ⁽¹⁾
- 3.2.2.5. Maximum amount of biofuel acceptable in fuel (manufacturer's
declared value): % by volume
- 3.2.12.2. Additional pollution control devices (if any, and if not covered by
another heading)
- 3.4. Engines or motor combinations
- 3.4.1. Hybrid Electric Vehicle: yes/no ⁽¹⁾
- 3.4.2. Category of Hybrid Electric vehicle
Off Vehicle Charging/Not Off Vehicle Charging ⁽¹⁾
- 6.6.1. Tyre/wheel combination(s)
- (a) for all tyre options indicate size designation, load-capacity index,
speed category symbol, rolling resistance to ISO 28580 (where
applicable)
- (b) for tyres of category Z intended to be fitted on vehicles whose
maximum speed exceeds 300 km/h equivalent information shall
be provided; for wheels indicate rim size(s) and off-set(s)
- 9.1. Type of bodywork: (use codes defined in section C of
Annex II):
16. Access to vehicle repair and maintenance information
- 16.1. Address of principal website for access to vehicle repair and main-
tenance information:

⁽¹⁾ Delete where not applicable (there are cases where nothing needs to be deleted when more than one entry is applicable)

▼M8*ANNEX XX***MEASUREMENT OF NET ENGINE POWER, NET POWER AND THE
MAXIMUM 30 MINUTES POWER OF ELECTRIC DRIVE TRAIN****1. INTRODUCTION**

This Annex sets out requirements for measuring net engine power, net power and the maximum 30 minutes power of electric drive train.

2. GENERAL SPECIFICATIONS

2.1 The general specifications for conducting the tests and interpreting the results are those set out in paragraph 5 of UNECE Regulation No 85 ⁽¹⁾, with the exceptions specified in this Annex.

2.2 Test fuel

Paragraphs 5.2.3.1., 5.2.3.2.1., 5.2.3.3.1., and 5.2.3.4. of UNECE Regulation No 85 shall be understood as follows:

The fuel used shall be the one available on the market. In any case of dispute, the fuel shall be the appropriate reference fuel specified in Annex IX to the Regulation (EC) No 692/2008.

2.3 Power correction factors

By way of derogation from paragraph 5.1 of Annex V to UNECE Regulation No 85, when a turbo-charged engine is fitted with a system which allows compensating the ambient conditions temperature and altitude, at the request of the manufacturer, the correction factors α_a or α_d shall be set to the value of 1.

⁽¹⁾ OJ L 326, 24.11.2006, p. 55.