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Subject:	COMMISSION REGULATION (EU) No .../.. of XXX amending, for the purposes of adapting to technical progress as regards emission limits, Directive 2007/46/EC of the European Parliament and of the Council, Regulation (EC) No 595/2009 of the European Parliament and of the Council and Commission Regulation (EU) No 582/2011 (Text with EEA relevance)

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Delegations will find attached document [D028214/02](#).

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Encl.: [D028214/02](#)



Brussels, **XXX**  
D028214/02  
[...] (2013) **XXX** draft

**COMMISSION REGULATION (EU) No .../..**

**of **XXX****

**amending, for the purposes of adapting to technical progress as regards emission limits,  
Directive 2007/46/EC of the European Parliament and of the Council, Regulation (EC)  
No 595/2009 of the European Parliament and of the Council and Commission  
Regulation (EU) No 582/2011**

**(Text with EEA relevance)**

**COMMISSION REGULATION (EU) No .../..**

**of XXX**

**amending, for the purposes of adapting to technical progress as regards emission limits, Directive 2007/46/EC of the European Parliament and of the Council, Regulation (EC) No 595/2009 of the European Parliament and of the Council and Commission Regulation (EU) No 582/2011**

**(Text with EEA relevance)**

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union,

Having regard to 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) <sup>(1)</sup>, and in particular paragraphs (2), (6) and (7) of Article 39 thereof.

Having regard to Regulation (EC) No 595/2009 of the European Parliament and of the Council of 18 June 2009 on type-approval of motor vehicles and engines with respect to emissions from heavy duty vehicles (Euro VI) and on access to vehicle repair and maintenance information and amending Regulation (EC) No 715/2007 and Directive 2007/46/EC and repealing Directives 80/1269/EEC, 2005/55/EC and 2005/78/EC <sup>(2)</sup>, and in particular Article 4(3), Article 5(4), Article 6(2) and Article 12 thereof,

Whereas:

- (1) Regulation (EC) No 595/2009 establishes emission limits and common technical requirements for the type-approval of motor vehicles and replacement parts with regard to their emissions, laying down rules for in-service conformity, on-board diagnostic (OBD) systems and measurement of fuel consumption.
- (2) In order to rise the level of environmental performance of the vehicles, a particulate number limit for positive ignition engines should be introduced.
- (3) The legislation on type-approval of motor vehicles and engines with respect to emissions from heavy-duty vehicles (Euro VI) needs to be adapted to technical progress. Therefore, the requirements for type-approval and in-service conformity of engines and vehicles using dual-fuel technologies need to be provided for. Additional matters relating to the type-approval of engines using gaseous fuels should also be addressed.

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<sup>1</sup> OJ L 263, 9.10.2007, p.1.

<sup>2</sup> OJ L 188, 18.7.2009, p. 1.

- (4) Commission Regulation (EU) No 582/2011<sup>3</sup> requires that the on-board diagnostic (OBD) threshold limit (OTL) for carbon monoxide emissions be specified.
- (5) In the case of heavy-duty vehicles with a technically permissible maximum laden mass not exceeding 7,5 tons, it is appropriate to allow that OBD systems fitted into those vehicles be partially developed in accordance with the OBD rules applicable to light-duty vehicles, without undermining their level of environmental performance.
- (6) Regulation (EU) No 582/2011 refers repeatedly to the regulations of the United Nations Economic Commission for Europe (UNECE), and in particular to UNECE Regulation No 49<sup>4</sup>, regarding the technical requirements to be followed at type-approval and in-service conformity by Member States, manufacturers and technical services. Since a 06 series of amendments of UNECE Regulation No 49 has been adopted by the World Forum for Harmonization of Vehicle Regulations (WP.29), it is necessary to update the references of Euro VI to UNECE Regulation No 49.
- (7) Some additional requirements need to be laid down in order to ensure the equivalence between an EC type-approval and the type-approval provided for by UNECE Regulation No 49.
- (8) The oil temperature of the engine must be expressed in Kelvin. It is therefore necessary to amend Annex VIII to Directive 2007/46/EC.
- (9) Directive 2007/46/EC, Regulation (EC) No 595/2009 and Regulation (EU) No 582/2011 should therefore be amended accordingly.
- (10) In order to provide Member States and manufacturers with sufficient leadtime for the adaptation of their respective information systems, it is appropriate to delay the application of the amendments related to the certificate of conformity.
- (11) The measures provided for in this Regulation are in accordance with the opinion of the Technical Committee - Motor Vehicles,

HAS ADOPTED THIS REGULATION:

*Article 1*

Annexes I, III, IV and IX to Directive 2007/46/EC are amended in accordance with Annex I to this Regulation.

*Article 2*

Annex I to Regulation (EC) No 595/2009 is replaced by the text in Annex II to this Regulation.

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<sup>3</sup> Commission Regulation (EU) No 582/2011 of 25 May 2011 implementing and amending Regulation (EC) No 595/2009 of the European Parliament and of the Council with respect to emissions from heavy duty vehicles (Euro VI) and amending Annexes I and III to Directive 2007/46/EC of the European Parliament and of the Council (OJ L 167, 25.6.2011, p. 1).

<sup>4</sup> OJ L 171, 24.6.2013, p.1.

### Article 3

Regulation (EU) No 582/2011 is amended as follows:

- (1) Article 2 is amended as follows:
  - (a) point 9 is replaced by the following:
    - '(9) 'qualified deteriorated component or system' (hereinafter 'QDC') means a component or system that has been intentionally deteriorated such as by accelerated ageing or by having been manipulated in a controlled manner and which has been accepted by the approval authority in accordance with the provisions set out in Annex 9B to UN/ECE Regulation No 49 for use when demonstrating the OBD performance of the engine system;';
  - (b) points 19 and 20 are replaced by the following:
    - '(19) 'Wobbe index (lower  $W_l$  or upper  $W_u$ )' means the ratio of the corresponding calorific value of a gas per unit volume and the square root of its relative density under the same reference conditions:

$$W = \frac{H_{gas}}{\sqrt{\frac{\rho_{gas}}{\rho_{air}}}}$$

Which can also be expressed as

$$W = H_{gas} \times \sqrt{\rho_{air} / \rho_{gas}}$$

- (20) 'λ-shift factor' (hereinafter 'Sλ') means an expression, specified in Section A.5.5.1. of Appendix 5 of Annex 4 to UNECE Regulation No 49, that describes the required flexibility of the engine management system regarding a change of excess-air-ratio λ if the engine is fuelled with a gas composition different from pure methane;';
- (c) the following points 45 to 56 are added:
  - (45) 'diesel mode' means the normal operating mode of a dual-fuel engine during which the engine does not use any gaseous fuel for any engine operating condition;
  - (46) 'dual-fuel engine' means an engine system that is designed to simultaneously operate with diesel fuel and a gaseous fuel, both fuels being metered separately, where the consumed amount of one of the fuels relative to the other one may vary depending on the operation;
  - (47) 'dual-fuel mode' means the normal operating mode of a dual-fuel engine during which the engine simultaneously uses diesel fuel and a gaseous fuel at some engine operating conditions;

- (48) 'dual-fuel vehicle' means a vehicle that is powered by a dual-fuel engine and that supplies the fuels used by the engine from separate on-board storage systems;
- (49) 'service mode' means a special mode of a dual-fuel engine that is activated for the purpose of repairing, or of moving the vehicle from the traffic when operation in the dual-fuel mode is not possible;
- (50) 'Gas Energy Ratio (GER)' means in case of a dual-fuel engine, the energy content of the gaseous fuel divided by the energy content of both fuels (diesel and gaseous), expressed as a percentage, the energy content of the fuels being defined as the lower heating value;
- (51) 'average gas ratio' means the average Gas Energy Ratio calculated over a driving cycle;
- (52) 'type 1A dual-fuel engine' means a dual-fuel engine that operates over the hot part of the WHTC test-cycle with an average gas ratio that is not lower than 90 per cent ( $GER_{\text{WHTC}} \geq 90 \%$ ), and that does not idle using exclusively diesel fuel, and that has no diesel mode;
- (53) 'type 1B dual-fuel engine' means a dual-fuel engine that operates over the hot part of the WHTC test-cycle with an average gas ratio that is not lower than 90 per cent ( $GER_{\text{WHTC}} \geq 90 \%$ ), and that does not idle using exclusively diesel fuel in dual-fuel mode, and that has a diesel mode;
- (54) 'type 2A dual-fuel engine' means a dual-fuel engine that operates over the hot part of the WHTC test-cycle with an average gas ratio between 10 per cent and 90 per cent ( $10 \% < GER_{\text{WHTC}} < 90 \%$ ) and that has no diesel mode or that operates over the hot part of the WHTC test-cycle with an average gas ratio that is not lower than 90 per cent ( $GER_{\text{WHTC}} \geq 90 \%$ ), but that idles using exclusively diesel fuel, and that has no diesel mode;
- (55) 'type 2B dual-fuel engine' means a dual-fuel engine that operates over the hot part of the WHTC test-cycle with an average gas ratio between 10 per cent and 90 per cent ( $10 \% < GER_{\text{WHTC}} < 90 \%$ ) and that has a diesel mode or that operates over the hot part of the WHTC test-cycle with an average gas ratio that is not lower than 90 per cent ( $GER_{\text{WHTC}} \geq 90 \%$ ), but that can idle using exclusively diesel fuel in dual-fuel mode, and that has a diesel mode;
- (56) 'type 3B dual-fuel engine' means a dual-fuel engine that operates over the hot part of the WHTC test-cycle with an average gas ratio that does not exceed 10 per cent ( $GER_{\text{WHTC}} \leq 10\%$ ) and that has a diesel mode.';
- (2) in Article 3, paragraph 1 is replaced by the following:
1. In order to receive an EC type-approval of an engine system or engine family as a separate technical unit, EC type-approval of a vehicle with an approved engine system with regard to emissions and vehicle repair and maintenance information, or an EC type-approval of a vehicle with regard to emissions and vehicle repair and maintenance information, the manufacturer shall, in accordance with the provisions of Annex I, demonstrate that the vehicles or engine systems are subject to the tests and comply with the requirements set

out in Articles 4 and 14 and in Annexes III to VIII, X, XIII, XIV and XVII. The manufacturer shall also ensure compliance with the specifications of reference fuels set out in Annex IX. In the case of dual-fuel engines and vehicles, the manufacturer shall, in addition, comply with the requirements set out in Annex XVIII.';

(3) in Article 3, paragraphs 2 to 6 are replaced by the following:

- ‘2. In order to receive an EC type-approval of a vehicle with an approved engine system with regard to emissions and vehicle repair and maintenance information, or an EC type-approval of a vehicle with regard to emissions and vehicle repair and maintenance information the manufacturer shall ensure compliance with the installation requirements set out in Section 4 of Annex I and, in the case of dual-fuel vehicles, with the additional installation requirements set out in Section 6 of Annex XVIII.
3. In order to receive an extension of the EC-type-approval of a vehicle with regard to emissions and vehicle repair and maintenance information type-approved under this Regulation with a reference mass exceeding 2380 kg but not exceeding 2610 kg, the manufacturer shall meet the requirements set out in Section 5 of Annex VIII.
4. The provisions for alternative type-approval specified in point 2.4.1 of Annex X and point 2.1. of Annex XIII shall not apply for the purpose of an EC-type-approval of an engine system or engine family as a separate technical unit. Those provisions shall not apply to dual-fuel engines and vehicles either.
5. Any engine system and any element of design liable to affect the emission of gaseous and particulate pollutants shall be designed, constructed, assembled and installed so as to enable the engine, in normal use, to comply with the provisions of Regulation (EC) No 595/2009 and those of this Regulation. The manufacturer shall also ensure compliance with the off-cycle requirements set out in Article 14 and Annex VI to this Regulation. In the case of dual-fuel engines and vehicles, the provisions of Annex XVIII shall also apply.
6. In order to receive an EC type-approval of an engine system or engine family as a separate technical unit or an EC type-approval of a vehicle with regard to emissions and vehicle repair and maintenance information for the purposes of obtaining universal fuel-range type-approval, a restricted fuel-range type-approval or a fuel-specific type-approval, the manufacturer shall ensure compliance with the requirements set out in Section 1 of Annex I.';

(4) in Article 5(4), the following point (j) is added:

'(j) where appropriate, the documentation packages necessary for the correct installation of the engine type-approved as a separate technical unit.';

(5) Article 6 is amended as follows:

(a) the following paragraph 1a is inserted:

- '1a. As an alternative to the procedure provided for in paragraph 1, the approval authority shall grant an EC type-approval of an engine system or engine family as a separate technical unit if all the following conditions are fulfilled:
- (a) a type-approval of an engine system or engine family as separate technical unit has already been granted in accordance with the UNECE Regulation No 49 at the moment of the application for EC type-approval;
  - (b) the requirements set out in Article 2a to 2f of this Regulation on access to vehicle OBD and vehicle repair and maintenance information and applicable to the engine system or engine family are met;
  - (c) the requirements set out in point 6.2 of Annex X to this Regulation are met during the transitional period specified in Article 4(7);
  - (d) all other exceptions set out in points 3.1 and 5.1 of Annex VII to this Regulation, points 2.1 and 6.1 of Annex X to this Regulation, points 2, 4.1, 5.1, 7.1, 8.1 and 10 of Annex XIII to this Regulation, and point 1 of Appendix 6 to Annex XIII to this Regulation apply.';
- (b) paragraph 2 is replaced by the following:
- '2. When granting an EC type-approval under paragraphs 1 and 1a, the approval authority shall issue an EC type-approval certificate using the model set out in Appendix 5 to Annex I.';
- (6) Article 8 is amended as follows:
- (a) the following paragraph 1a is inserted:
- '1a. As an alternative to the procedure provided for in paragraph 1, the approval authority shall grant an EC type-approval of a vehicle with an approved engine system with regard to emissions and access to vehicle repair and maintenance information if all the following conditions are fulfilled:
- (a) a type-approval of a vehicle with an approved engine system has already been granted in accordance with the UNECE Regulation No 49 at the moment of the application for EC type-approval;
  - (b) the requirements set out in Article 2a to 2f of this Regulation on access to vehicle OBD and vehicle repair and maintenance information are met;
  - (c) the requirements in point 6.2 of Annex X to this Regulation are met during the transitional period specified in Article 4(7);
  - (d) all other exceptions set out in points 3.1 and 5.1 of Annex VII to this Regulation, points 2.1 and 6.1 of Annex X to this Regulation, points 2, 4.1, 5.1, 7.1, 8.1 and 10 of Annex XIII to this Regulation, and point 1 of Appendix 6 to Annex XIII to this Regulation apply.';
- (b) paragraph 2 is replaced by the following:



- '2. When granting an EC type-approval under paragraphs 1 and 1a, the approval authority shall issue an EC type-approval certificate using the model set out in Appendix 6 to Annex I.');
- (7) Article 10 is amended as follows:
- (a) the following paragraph 1a is inserted:
- '1a. As an alternative to the procedure provided for in paragraph 1, the approval authority shall grant an EC type-approval of a vehicle with regard to emissions and access to vehicle repair and maintenance information if all the following conditions are fulfilled:
- (a) a type-approval of a vehicle has already been granted in accordance with the UNECE Regulation No 49 at the moment of the application for EC type-approval;
- (b) the requirements set out in Article 2a to 2f of this Regulation on access to vehicle OBD and vehicle repair and maintenance information are met;
- (c) the requirements set out in point 6.2 of Annex X to this Regulation are met during the transitional period specified in Article 4(7);
- (d) all other exceptions set out in points 3.1 and 5.1 of Annex VII to this Regulation, points 2.1 and 6.1 of Annex X to this Regulation, points 2, 4.1, 5.1, 7.1, 8.1 and 10 of Annex XIII to this Regulation, and point 1 of Appendix 6 to Annex XIII to this Regulation apply.';
- (b) paragraph 2 is replaced by the following:
- '2. When granting an EC type-approval under paragraphs 1 and 1a, the approval authority shall issue an EC type-approval certificate using the model set out in Appendix 7 to Annex I.');
- (8) in Article 16(5), the second subparagraph is replaced by the following:
- 'The test conditions shall comply with the requirements set out in Section 6 of Annex 4 to UNECE Regulation No 49.';
- (9) Annexes I, II and IV to XIV are amended in accordance with Annex III to this Regulation.
- (10) Annex III is replaced by the text in Annex IV to this Regulation.
- (11) Annex XVIII is added, the text of which is set out in Annex V to this Regulation.

#### *Article 4*

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

It shall apply from 1 January 2014 with the exception of point 4 of Annex I, which shall apply from 1 July 2014.

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

Done at Brussels,

*For the Commission,  
On behalf of the President  
[...]  
Member of the Commission*

## ANNEX I

Annexes I, III, VIII and IX to Directive 2007/46/EC are amended as follows:

(1) Annex I is amended as follows:

(a) point 3.2.1.1 is replaced by the following:

'3.2.1.1. Working principle: positive ignition/compression ignition/dual-fuel<sup>(1)</sup>

Cycle: four stroke / two stroke/ rotary <sup>(1)</sup>';

(b) the following points 3.2.1.1.1 and 3.2.1.1.2 are inserted after point 3.2.1.1:

'3.2.1.1.1. Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B <sup>(1)</sup><sup>(x1)</sup>

3.2.1.1.2. Gas energy ratio over the hot part of the WHTC test-cycle: .....%';

(c) the following point 3.2.1.6.2 is inserted after point 3.2.1.6.1:

'3.2.1.6.2. Idle on diesel: yes/no <sup>(1)</sup><sup>(x1)</sup> ';

(d) points 3.2.2.1 and 3.2.2.2 are replaced by the following:

'3.2.2.1. Light-duty vehicles: Diesel/Petrol/LPG/NG or Biomethane/Ethanol (E85)/Biodiesel/Hydrogen/H2NG <sup>(1)</sup><sup>(6)</sup>

3.2.2.2. Heavy duty vehicles Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/ Ethanol (ED95)/Ethanol (E85)/LNG/LNG<sub>20</sub>/ <sup>(1)</sup><sup>(6)</sup>';

(e) point 3.2.4.2. is replaced by the following:

'3.2.4.2. By fuel injection (compression ignition or dual-fuel only): yes/no <sup>(1)</sup>';

(f) point 3.2.9.2.1. is replaced by the following:

'3.2.9.2.1. (Euro VI only) Description and/or drawing of the elements of the exhaust system that are part of the engine system';

(g) points 3.2.9.7 and 3.2.9.7.1 are replaced by the following:

'3.2.9.7. Complete exhaust system volume: ..... dm<sup>3</sup>

3.2.9.7.1. (Euro VI only) Acceptable exhaust system volume: ..... dm<sup>3</sup>;

(h) the following point 3.2.9.7.2 is inserted after point 3.2.9.7.1:

'3.2.9.7.2. (EURO VI only) Volume of the exhaust system that is part of the engine system: .....dm<sup>3</sup>;

(i) points 3.2.12.2.7.0.7 and 3.2.12.2.7.0.8 are deleted;

(j) point 3.2.12.2.7.6.5 is replaced by the following:

'3.2.12.2.7.6.5.(Euro VI only) OBD Communication protocol standard: <sup>(8)</sup>;

(k) the following points 3.2.12.2.7.8 to 3.2.12.2.7.8.3 are inserted after point 3.2.12.2.7.7.1:

'3.2.12.2.7.8.(EURO VI only) OBD components on-board the vehicle

3.2.12.2.7.8.0. Alternative approval as provided for in point 2.4.1 of Annex X to Regulation (EU) No 582/2011: yes/no <sup>(1)</sup>

3.2.12.2.7.8.1. List of OBD components on-board the vehicle

3.2.12.2.7.8.2. Written description and/or drawing of the MI <sup>(10)</sup>

3.2.12.2.7.8.3. Written description and/or drawing of the OBD off-board communication interface <sup>(10)</sup> ';

(l) point 3.2.12.2.8.2 is replaced by the following:

'3.2.12.2.8.2. Driver inducement system';

(m) the following points 3.2.12.2.8.2.1 and 3.2.12.2.8.2.2 are inserted after point 3.2.12.2.8.2:

'3.2.12.2.8.2.1 (Euro VI only) Engine with permanent deactivation of the driver inducement, for use by the rescue services or in vehicles specified in point (b) of Article 2(3) of this Directive: yes/no <sup>(1)</sup>

3.2.12.2.8.2.2. Activation of the creep mode

'disable after restart'/'disable after fuelling'/'disable after parking <sup>(1)</sup><sup>(8)</sup>;

(n) the following points 3.2.12.2.8.3.1 and 3.2.12.2.8.3.2 are inserted after point 3.2.12.2.8.3:

'3.2.12.2.8.3.1.(Euro VI only) List of the OBD engine families within the engine family considered when ensuring the correct operation of NO<sub>x</sub> control measures (when applicable)

3.2.12.2.8.3.2. (Euro VI only) Number of the OBD engine family the parent engine / the engine member belongs to';

(o) point 3.2.12.2.8.4 is deleted.

(p) point 3.2.12.2.8.8 and 3.2.12.2.8.8.1 are replaced by the following:

3.2.12.2.8.8. (EURO VI only) Components on-board the vehicle of the systems ensuring the correct operation of NO<sub>x</sub> control measures

3.2.12.2.8.8.1. List of components on-board the vehicle of the systems ensuring the correct operation of NO<sub>x</sub> control measures';

(q) point 3.2.12.2.8.8.3 is replaced by the following:

'3.2.12.2.8.8.3. Written description and/or drawing of the warning signal (<sup>10</sup>)';

(r) the following points 3.2.12.2.8.8.4 and 3.2.12.2.8.8.5 are inserted after point 3.2.12.2.8.8.3:

'3.2.12.2.8.8.4. Alternative approval provided for in point 2.1 of Annex XIII to Regulation (EU) No 582/2011: yes/no (<sup>1</sup>)

3.2.12.2.8.8.5. Heated/non-heated reagent tank and dosing system (see paragraph 2.4 of Annex 11 to UNECE Regulation No 49)';

(s) point 3.2.17 is replaced by the following:

'3.2.17. Specific information related to gas and dual-fuel engines for heavy-duty vehicles (in the case of systems laid out in a different manner, supply equivalent information)(if applicable)';

(t) the following points 3.2.17.9 to 3.2.19.4.3 are inserted after point 3.2.17.8.2:

'3.2.17.9. When appropriate, manufacturer reference of the documentation for installing the dual-fuel engine in a vehicle (<sup>x1</sup>)

3.2.18. Hydrogen fuelling system: yes/no (<sup>1</sup>)

3.2.18.1. EC type-approval number in accordance with 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: .....

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 <sup>(1)</sup>
- 3.2.19.1. Percentage of hydrogen in the fuel (the maximum specified by the manufacturer):  
.....
- 3.2.19.2. EC type-approval number in accordance with UNECE Regulation No 110.....
- 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: .....’;
- (u) point 3.4.8 is replaced by the following:  
‘3.4.8. Vehicle electric range...km (in accordance with Annex 9 to UNECE Regulation No 101)’;
- (v) points 3.5.2.1, 3.5.2.2 and 3.5.2.3. are replaced by the following:  
‘3.5.2.1. Fuel consumption (urban conditions) ..... l/100 km or m<sup>3</sup>/100 km or kg/100 km <sup>(1)</sup>
- 3.5.2.2. Fuel consumption (extra-urban conditions) ..... l/100 km or m<sup>3</sup>/100 km or kg/100 km (1)
- 3.5.2.3. Fuel consumption (combined) ..... l/100 km or m<sup>3</sup>/100 km or kg/100 km <sup>(1)</sup>’;
- (w) the following points 3.5.3 to 3.5.3.2.3 are inserted after point 3.5.2.3:  
‘3.5.3. Electric energy consumption for electric vehicles
- 3.5.3.1. Electric energy consumption for pure electric vehicles.....Wh/km
- 3.5.3.2. Electric energy consumption for externally chargeable hybrid electric vehicles

3.5.3.2.1. Electric energy consumption (Condition A, combined).....Wh/km

3.5.3.2.2. Electric energy consumption (Condition B, combined).....Wh/km

3.5.3.2.3. Electric energy consumption (weighted combined).....Wh/km';

(x) points 3.5.4.1 and 3.5.4.2 are replaced by the following:

'3.5.4.1. CO<sub>2</sub> mass emissions WHSC test (<sup>x3</sup>): ..... g/kWh

3.5.4.2. CO<sub>2</sub> mass emissions WHSC test in diesel mode (<sup>x2</sup>): .....g/kWh';

(y) the following points 3.5.4.3 to 3.5.4.6 are inserted after point 3.5.4.2:

'3.5.4.3. CO<sub>2</sub> mass emissions WHSC test in dual-fuel mode (<sup>x1</sup>): .....g/kWh

3.5.4.4. CO<sub>2</sub> mass emissions WHTC test (<sup>x3</sup>)(<sup>9</sup>): .....g/kWh

3.5.4.5. CO<sub>2</sub> mass emissions WHTC test in diesel mode (<sup>x2</sup>)(<sup>9</sup>): .....g/kWh

3.5.4.6. CO<sub>2</sub> mass emissions WHTC test in dual-fuel mode (<sup>x1</sup>)(<sup>9</sup>): .....g/kWh';

(z) points 3.5.5.1 and 3.5.5.2 are replaced by the following:

'3.5.5.1. Fuel consumption WHSC test (<sup>x3</sup>): ..... g/kWh

3.5.5.2. Fuel consumption WHSC test in diesel mode (<sup>x2</sup>): ..... g/kWh';

(aa) the following points 3.5.5.3 to 3.5.5.6 are inserted after point 3.5.5.2:

'3.5.5.3. Fuel consumption WHSC test in in dual-fuel mode (<sup>x1</sup>): .....g/kWh

3.5.5.4. Fuel consumption WHTC test (<sup>9</sup>)(<sup>x3</sup>): .....g/kWh

3.5.5.5. Fuel consumption WHTC test in diesel mode (<sup>9</sup>)(<sup>x2</sup>): .....g/kWh

3.5.5.6. Fuel consumption WHTC test in dual-fuel mode (<sup>9</sup>)(<sup>x1</sup>): .....g/kWh';

(ab) the following explanatory notes are inserted:

'(8) To be documented in case of a single OBD engine family and if not already included in the documentation package(s) referred to in point 3.2.12.2.7.0.4.

(9) Value for the combined WHTC including cold and hot part in accordance with Annex VIII to Regulation (EU) No 582/2011.

(10) To be documented if not already included in the documentation referred to in point 3.2.12.2.7.0.5.';

(ac) the following explanatory notes are added:

'<sup>(x)</sup> Dual-fuel engines.

'<sup>(x1)</sup> In case of a dual-fuel engine or vehicle.

'<sup>(x2)</sup> In the case of Type 1B, Type 2B, and Type 3B of dual-fuel engines.

'<sup>(x3)</sup> Except for dual-fuel engines or vehicles.'

(2) in Annex III, Part I, A, is amended as follows:

(a) point 3.2.1.1 is replaced by the following:

'3.2.1.1. Working principle: positive ignition/compression ignition/dual-fuel<sup>(1)</sup>  
Cycle four stroke/two stroke/rotary<sup>(1)</sup>';

(b) the following points 3.2.1.1.1 and 3.2.1.1.2 are inserted after point 3.2.1.1:

'3.2.1.1.1. Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B <sup>(1)</sup><sup>(x1)</sup>

3.2.1.1.2. Gas Energy Ratio over the hot part of the WHTC test-cycle: .....%';

(c) the following point 3.2.1.6.2 is inserted after point 3.2.1.6.1:

'3.2.1.6.2. Idle on diesel: yes/no <sup>(1)</sup><sup>(x1)</sup>';

(d) point 3.2.2.2 is replaced by the following:

'3.2.2.2. Heavy duty vehicles Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol  
(ED95)/Ethanol (E85)/ LNG/LNG<sub>20</sub> <sup>(1)</sup><sup>(6)</sup>';

(e) point 3.2.4.2 is replaced by the following:

'3.2.4.2. By fuel injection (compression ignition or dual-fuel only): yes/no <sup>(1)</sup>';

(f) points 3.2.12.2.7.0.7 and 3.2.12.2.7.0.8 are deleted;

(g) point 3.2.12.2.7.6.5 is replaced by the following:

'3.2.12.2.7.6.5.(Euro VI only) OBD Communication protocol standard: <sup>(8)</sup>';

(h) the following points 3.2.12.2.7.8. to 3.2.12.2.7.8.3. are inserted after point 3.2.12.2.7.7.1.:

'3.2.12.2.7.8. (EURO VI only) OBD components on-board the vehicle

3.2.12.2.7.8.1. List of OBD components on-board the vehicle



3.2.12.2.7.8.2. Written description and/or drawing of the MI <sup>(10)</sup>

3.2.12.2.7.8.3. Written description and/or drawing of the OBD off-board communication interface <sup>(10)</sup>;

(i) point 3.2.12.2.8.2 is replaced by the following:

'3.2.12.2.8.2. Driver inducement system';

(j) the following point 3.2.12.2.8.2.1 is inserted after point 3.2.12.2.8.2:

'3.2.12.2.8.2.1.(Euro VI only) Engine with permanent deactivation of the driver inducement, for use by the rescue services or in vehicles specified in point (b) of Article 2(3) of this Directive : yes/no <sup>(1)</sup>;

(k) points 3.5.4.1 and 3.5.4.2 are replaced by the following:

'3.5.4.1. CO<sub>2</sub> mass emissions WHSC test <sup>(x3)</sup>: ..... g/kWh

3.5.4.2. CO<sub>2</sub> mass emissions WHSC test in diesel mode <sup>(x2)</sup>: ..... g/kWh';

(l) the following points 3.5.4.3 to 3.5.4.6 are inserted after point 3.5.4.2:

'3.5.4.3. CO<sub>2</sub> mass emissions WHSC test in dual-fuel mode <sup>(x1)</sup>: .....g/kWh

3.5.4.4. CO<sub>2</sub> mass emissions WHTC test <sup>(9)(x3)</sup>: .....g/kWh

3.5.4.5. CO<sub>2</sub> mass emissions WHTC test in diesel mode <sup>(9)(x2)</sup>: .....g/kWh

3.5.4.6. CO<sub>2</sub> mass emissions WHTC test in dual-fuel mode <sup>(9)(x1)</sup>: .....g/kWh';

(m) points 3.5.5.1 and 3.5.5.2 are replaced by the following:

'3.5.5.1. Fuel consumption WHSC test <sup>(x3)</sup>: ..... g/kWh

3.5.5.2. Fuel consumption WHSC test in diesel mode <sup>(x2)</sup>: ..... g/kWh';

(n) the following points 3.5.5.3 to 3.5.5.6 are inserted after point 3.5.5.2:

'3.5.5.3. Fuel consumption WHSC test in dual-fuel mode <sup>(x1)</sup>: .....g/kWh

3.5.5.4. Fuel consumption WHTC test <sup>(9)(x3)</sup> : .....g/kWh

3.5.5.5. Fuel consumption WHTC test in diesel mode <sup>(9)(x2)</sup>: .....g/kWh

3.5.5.6. Fuel consumption WHTC test in dual-fuel mode <sup>(9)(x1)</sup>: .....g/kWh';

(3) Annex VIII is amended as follows:

(a) point 2.1.2 is replaced by the following:

2.1.2. Type 2 test <sup>(b)</sup><sup>(c)</sup>(emissions data required at type-approval for roadworthiness purposes)

Type 2, low idle test:

Variant/Version:	...	...	...
CO (% vol.)	...	...	...
Engine speed (min <sup>-1</sup> )	...	...	...
Engine oil temperature (K)	...	...	...

Type 2, high idle test:

Variant/Version:	...	...	...
CO (% vol.)	...	...	...
Lambda Value	...	...	...
Engine speed (min <sup>-1</sup> )	...	...	...
Engine oil temperature (K)	...	...	...

;

(b) point 2.2.4. is replaced by the following:

2.2.4. Idle test <sup>(1)</sup>

Variant/Version:	...	...	...
CO (% vol.)	...	...	...
Lambda Value <sup>(1)</sup>	...	...	...
Engine speed (min <sup>-1</sup> )	...	...	...
Engine oil temperature (K)	...	...	...

;

(4) Annex IX is amended as follows:

(a) Part I, Side 2 – Vehicle category M<sub>1</sub> (complete and completed vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6(<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): .....

Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>: ..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub> : ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(b) Part I, Side 2 – Vehicle category M<sub>2</sub> (complete and completed vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>: ..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(c) Part I, Side 2 – Vehicle category M<sub>3</sub> (complete and completed vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: ESC

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: WHSC (EURO VI)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

(d) Part I, Side 2 – Vehicle category N<sub>1</sub> (complete and completed vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(e) Part I, Side 2 – Vehicle category N<sub>2</sub> (complete and completed vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m-1)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(f) Part I, Side 2 – Vehicle category N<sub>3</sub> (complete and completed vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: ESC

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: WHSC (EURO VI)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>: ..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(g) Part II, Side 2 – Vehicle category M<sub>1</sub> (incomplete vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

(h) Part II, Side 2 – Vehicle category M<sub>2</sub> (incomplete vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) Points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) The following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) Point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):



Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

(i) Part II, Side 2 – Vehicle category M<sub>3</sub> (incomplete vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: ESC

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: WHSC (EURO VI)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

(j) Part II, Side 2 – Vehicle category N<sub>1</sub> (incomplete vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates:.....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(k) Part II, Side 2 – Vehicle category N<sub>2</sub> (incomplete vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: Type I or ESC (<sup>1</sup>)

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: Type I (Euro 5 or 6 (<sup>1</sup>)) or WHSC (EURO VI) (<sup>1</sup>)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>: ..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(l) Part II, Side 2 – Vehicle category N<sub>3</sub> (incomplete vehicles) of the template of the EC certificate of conformity, is amended as follows:

(i) points 26 and 26.1 are replaced by the following:

'26. Fuel: Diesel/petrol/LPG/CNG-Biomethane/LNG/Ethanol/Biodiesel/Hydrogen (<sup>1</sup>)

26.1. Mono fuel/Bi fuel/Flex fuel/Dual-fuel (<sup>1</sup>);

(ii) the following point 26.2 is inserted after point 26.1:

'26.2. (Dual-fuel only) Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (<sup>1</sup>);

(iii) point 48 is replaced by the following:

'48. Exhaust emissions (<sup>m</sup>)(<sup>m1</sup>)(<sup>m2</sup>):

Number of the base regulatory act and latest amending regulatory act applicable: .....

1.1. test procedure: ESC

CO:..... HC:..... NO<sub>x</sub>:..... HC + NO<sub>x</sub>: ..... Particulates: .....

Smoke opacity (ELR): ..... (m<sup>-1</sup>)

1.2. test procedure: WHSC (EURO VI)

CO: ..... THC: ..... NMHC: ..... NO<sub>x</sub>: ..... THC + NO<sub>x</sub>: ..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....

2.1. test procedure: ETC (if applicable)

CO:..... NO<sub>x</sub>:..... NMHC:..... THC:..... CH<sub>4</sub>:..... Particulates: .....

2.2. test procedure: WHTC (EURO VI)

CO: ..... NO<sub>x</sub>: ..... NMHC: ..... THC: ..... CH<sub>4</sub>:..... NH<sub>3</sub>: ..... Particulates (mass): ..... Particles (number): .....';

(m) the explanatory note relating to Annex IX (<sup>m</sup>) is replaced by the following:

'(<sup>m</sup>) Repeat for the various fuels that can be used. Vehicles that can be fuelled with both petrol and gaseous fuel but in which the petrol system is fitted for emergency purposes or for starting only and the petrol tank of which cannot contain more than 15 litres of petrol will be regarded as vehicles that can only run on a gaseous fuel.'

(n) the following explanatory notes relating to Annex IX (<sup>m1</sup>) and (<sup>m2</sup>) are inserted after note (<sup>m</sup>):

'(<sup>m1</sup>) In case of EURO VI dual-fuel engines and vehicles, repeat as appropriate.

'(<sup>m2</sup>) Solely emissions assessed in accordance with the applicable regulatory act or acts shall be stated'.

## ANNEX II

### 'ANNEX I

#### Euro VI Emission Limits

	Limit values							
	CO (mg/kWh)	THC (mg/kWh)	NMHC (mg/kWh)	CH <sub>4</sub> (mg/kWh)	NO <sub>x</sub> <sup>(1)</sup> (mg/kWh)	NH <sub>3</sub> (ppm)	PM mass (mg/kWh)	PM number (#/kWh)
WHSC (CI)	1500	130			400	10	10	8,0 x 10 <sup>11</sup>
WHTC (CI)	4000	160			460	10	10	6,0 x 10 <sup>11</sup>
WHTC (PI)	4000		160	500	460	10	10	<sup>(2)</sup> 6,0 x 10 <sup>11</sup>

Note:

PI = Positive Ignition.

CI = Compression Ignition.

<sup>(1)</sup> The admissible level of NO<sub>2</sub> component in the NO<sub>x</sub> limit value may be determined at a later stage.

<sup>(2)</sup> The limit value shall apply as from the dates set out in row B of table 1 of Appendix 9 of Annex I to Regulation (EC) No 582/2011.

!

### ANNEX III

Annexes I, II and IV to XIV to Regulation (EU) No 582/2011 are amended as follows:

(1) Annex I is amended as follows

(a) point 1.1.1 is replaced by the following:

'1.1.1. The parent engine shall meet the requirements of this Regulation on the appropriate reference fuels specified in Annex IX. Specific requirements shall apply to engines fuelled with natural gas/biomethane, including dual-fuel engines, as laid down in point 1.1.3';

(b) point 1.1.3 is replaced by the following:

'1.1.3. In the case of natural gas/biomethane fuelled engines, including dual-fuel engines, the manufacturer shall demonstrate the parent engines capability to adapt to any natural gas/biomethane composition that may occur across the market. This demonstration shall be carried out in accordance with this Section and, in the case of dual-fuel engines, also in accordance with the additional provisions regarding the fuel adaptation procedure set out in paragraph 6.4 of Annex 15 to UNECE Regulation No 49.

In the case of compressed natural gas/biomethane (CNG) 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 their energy content expressed by the Wobbe Index and in their  $\lambda$ -shift factor ( $S_\lambda$ ). Natural gases with a  $\lambda$ -shift factor between 0.89 and 1.08 ( $0.89 \leq S_\lambda \leq 1.08$ ) are considered to belong to H-range, while natural gases with a  $\lambda$ -shift factor between 1.08 and 1.19 ( $1.08 \leq S_\lambda \leq 1.19$ ) are considered to belong to L-range. The composition of the reference fuels reflects the extreme variations of  $S_\lambda$ .

The parent engine shall meet the requirements of this Regulation on the reference fuels  $G_R$  (fuel 1) and  $G_{25}$  (fuel 2), as specified in Annex IX, without any manual readjustment to the engine fuelling system between the two tests (self-adaptation is required). One adaptation run over one WHTC hot cycle without measurement is permitted after the change of the fuel. After the adaptation run, the engine shall be cooled down in accordance with paragraph 7.6.1 of Annex 4 to UNECE Regulation No 49.

In the case of liquefied natural gas/biomethane (LNG) the parent engine shall meet the requirements of this Regulation on the reference fuels  $G_R$  (fuel 1) and  $G_{20}$  (fuel 2), as specified in Annex IX, without any manual readjustment to the engine fuelling system between the two tests (self-adaptation is required). One adaptation run over one WHTC hot cycle without measurement is permitted after the change of the fuel.

After the adaptation run, the engine shall be cooled down in accordance with paragraph 7.6.1 of Annex 4 to UN/ECE Regulation No 49.;

(c) point 1.1.4 is replaced by the following:

'1.1.4. In the case of an engine fuelled with CNG which is self-adaptive for the range of H-gases on the one hand and the range of L-gases on the other hand, and which switches between the H-range and the L-range by means of a switch, the parent engine shall be tested on the relevant reference fuel as specified in Annex IX for each range, at each position of the switch. The fuels are  $G_R$  (fuel 1) and  $G_{23}$  (fuel 3) for the H-range of gases and  $G_{25}$  (fuel 2) and  $G_{23}$  (fuel 3) for the L-range of gases. The parent engine shall meet the requirements of this Regulation at both positions of the switch without any readjustment to the fuelling between the two tests at each position of the switch. One adaptation run over one WHTC hot cycle without measurement is permitted after the change of the fuel. After the adaptation run the engine shall be cooled down in accordance with paragraph 7.6.1 of Annex 4 to UNECE Regulation No 49.;

(d) points 1.1.5 and 1.1.6 are replaced by the following:

'1.1.5. In the case of natural gas/biomethane engines, the ratio of the emission results "r" shall be determined for each pollutant as follows:

$$r = \frac{\text{emission result on reference fuel 2}}{\text{emission result on reference fuel 1}}$$

or,

$$r_a = \frac{\text{emission result on reference fuel 2}}{\text{emission result on reference fuel 3}}$$

and,

$$r_b = \frac{\text{emission result on reference fuel 2}}{\text{emission result on reference fuel 3}}$$

1.1.6. In the case of LPG the manufacturer shall demonstrate the parent engines capability to adapt to any fuel composition that may occur across the market.

In the case of LPG there are variations in  $C_3/C_4$  composition. These variations are reflected in the reference fuels. The parent engine shall meet the emission requirements on the reference fuels A and B as specified in Annex IX without any readjustment to the fuelling between the two tests. One adaptation run over one WHTC hot cycle without measurement is permitted after the change of the fuel.

After the adaptation run the engine shall be cooled down in accordance with paragraph 7.6.1 of Annex 4 to UNECE Regulation No 49.';

(e) points 1.2 and 1.2.1 are replaced by the following:

'1.2. Requirements on restricted fuel range type-approval in case of engines fuelled with natural gas/biomethane or LPG, including dual-fuel engines

A restricted fuel range type-approval shall be granted subject to the requirements specified in points 1.2.1 to 1.2.2.2.

1.2.1. Exhaust emissions type-approval of an engine running on CNG and laid out for operation on either the range of H-gases or on the range of L-gases.

The parent engine shall be tested on the relevant reference fuel, as specified in Annex IX, for the relevant range. The fuels are  $G_R$  (fuel 1) and  $G_{23}$  (fuel 3) for the H-range of gases and  $G_{25}$  (fuel 2) and  $G_{23}$  (fuel 3) for the L-range of gases. The parent engine shall meet the requirements of this Regulation without any readjustment to the fuelling between the two tests. One adaptation run over one WHTC hot cycle without measurement is permitted after the change of the fuel. After the adaptation run the engine shall be cooled down in accordance with paragraph 7.6.1 of Annex 4 to UNECE Regulation No 49.';

(f) points 1.2.2, 1.2.2.1. and 1.2.2.2 are replaced by the following:

'1.2.2. Exhaust emissions type-approval of an engine running on natural gas/biomethane or LPG and designed for operation on one specific fuel composition.

The parent engine shall meet the emission requirements on the reference fuels  $G_R$  and  $G_{25}$  in the case of CNG, on the reference fuels  $G_R$  and  $G_{20}$  in the case of LNG, or on the reference fuels A and B in the case of LPG, as specified in Annex IX. Fine-tuning of the fuelling system is allowed between the tests. This fine-tuning will consist of a recalibration of the fuelling database, without any alteration to either the basic control strategy or the basic structure of the database. If necessary, the exchange of parts that are directly related to the amount of fuel flow such as injector nozzles is allowed.

1.2.2.1. In the case of CNG, at the manufacturer's request the engine may be tested on the reference fuels  $G_R$  and  $G_{23}$ , or on the reference fuels  $G_{25}$  and  $G_{23}$ , in which case the type-approval is only valid for the H-range or the L-range of gases respectively.

1.2.2.2. On delivery to the customer the engine shall bear a label as specified in point 3.3 stating for which fuel-range composition the engine has been calibrated.';

(g) the following points 1.3 to 1.3.3 are inserted after point 1.2.2.2:



1.3. Requirements on fuel-specific type-approval

1.3.1. A fuel specific type-approval may be granted for LNG fuelled engines, including dual-fuel engines, labelled with an approval mark containing the letters “LNG<sub>20</sub>” in accordance with point 3.1 of this Annex.

1.3.2. The manufacturer can only apply for a fuel specific type-approval in the case of the engine being calibrated for a specific LNG gas composition resulting in a  $\lambda$ -shift factor not differing by more than 3 per cent from the  $\lambda$ -shift factor of the G<sub>20</sub> fuel specified in Annex IX, and the ethane content of which does not exceed 1.5 per cent.

1.3.3. In the case of a dual-fuel engine family where the engines are calibrated for a specific LNG gas composition resulting in a  $\lambda$ -shift factor not differing by more than 3 per cent from the  $\lambda$ -shift factor of the G<sub>20</sub> fuel specified in Annex IX, and the ethane content of which does not exceed 1.5 per cent, the parent engine shall only be tested on the G<sub>20</sub> reference gas fuel, as specified in Annex IX.;

(h) points 3.1 and 3.2 are replaced by the following:

3.1. In the case of an engine type-approved as a separate technical unit or a vehicle type-approved with regard to emissions and access to vehicle repair and maintenance information, the engine shall bear:

- (a) the trademark or trade name of the manufacturer of the engine;
- (b) the manufacturer's commercial description of the engine;
- (c) in case of a natural gas/biomethane engine one of the following markings to be placed after the EC type-approval mark:
  - (i) H in case of the engine being approved and calibrated for the H-range of gases;
  - (ii) L in case of the engine being approved and calibrated for the L-range of gases;
  - (iii) HL in case of the engine being approved and calibrated for both the H-range and L-range of gases;
  - (iv) H<sub>t</sub> in case of the engine being approved and calibrated for a specific gas composition in the H-range of gases and transformable to another specific gas in the H-range of gases by fine tuning of the engine fuelling;
  - (v) L<sub>t</sub> in case of the engine being approved and calibrated for a specific gas composition in the L-range of gases and transformable to another specific gas in the L-range of gases after fine tuning of the engine fuelling;

- (vi)  $HL_t$  in the case of the engine being approved and calibrated for a specific gas composition in either the H-range or the L-range of gases and transformable to another specific gas in either the H-range or the L-range of gases by fine tuning of the engine fuelling;
  - (vii)  $CNG_{fr}$  in all other cases where the engine is fuelled with CNG/biomethane and designed for operation on one restricted gas fuel range composition;
  - (viii)  $LNG_{fr}$  in the cases where the engine is fuelled with LNG and designed for operation on one restricted gas fuel range composition;
  - (ix)  $LPG_{fr}$  in the cases where the engine is fuelled with LPG and designed for operation on one restricted gas fuel range composition;
  - (x)  $LNG_{20}$  in case of the engine being approved and calibrated for a specific LNG composition resulting in a  $\lambda$ -shift factor not differing by more than 3 per cent the  $\lambda$ -shift factor of the  $G_{20}$  gas specified in Annex IX, and the ethane content of which does not exceed 1.5 per cent;
  - (xi) LNG in case of the engine being approved and calibrated for any other LNG composition;
- (d) for dual-fuel engines, the approval mark shall contain a series of digits after the national symbol, the purpose of which is to distinguish for which dual-fuel engine type and with which range of gases the approval has been granted. The series of digits will be constituted of two digits identifying the dual-fuel engine type as defined in Article 2, followed by the letter or letters specified in point (c) of this point, corresponding to the natural gas/biomethane composition used by the engine. The two digits identifying the dual-fuel engine types as defined in Article 2 are the following:
- (i) 1A for dual-fuel engines of Type 1A;
  - (ii) 1B for dual-fuel engines of Type 1B;
  - (iii) 2A for dual-fuel engines of Type 2A;
  - (iv) 2B for dual-fuel engines of Type 2B;
  - (v) 3B for dual-fuel engines of Type 3B;
- (e) for diesel fuelled CI engines, the approval mark shall contain the letter "D" after the national symbol;
- (f) for ethanol (ED95) fuelled CI engines the approval mark shall contain the letters "ED" after the national symbol;

- (g) for ethanol (E85) fuelled PI engines the approval mark shall contain "E85" after the national symbol;
  - (h) for petrol fuelled PI engines the approval mark shall contain the letter "P" after the national symbol.
- 3.2. Every engine type approved under this Regulation as a separate technical unit shall bear an EC type-approval mark. This mark shall consist of:'
- (i) points 3.2.2 and 3.2.3 are replaced by the following:
    - '3.2.2. 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 letter indicating the emission stage for which the EC type-approval has been granted.
    - 3.2.3. The EC type-approval mark shall be affixed to the engine in such a way as to be indelible and clearly legible. It shall be visible when the engine is installed on the vehicle and shall be affixed to a part necessary for normal engine operation and not normally requiring replacement during engine life.
- In addition to the marking on the engine, the EC approval mark may also be retrievable via the instrument cluster. It shall then be readily available for inspection and the access instructions included in the user manual of the vehicle.';
- (j) point 3.3 is replaced by the following:
    - '3.3. Labels for natural gas/biomethane and LPG fuelled engines
- In the case of natural gas/biomethane and LPG fuelled engines with a restricted fuel-range type-approval, the following labels containing information provided in point 3.3.1 shall be affixed.';
- (k) in Point 4.2., point (c) is added:
    - '(c) the installation of a dual-fuel engine type-approved as a separate technical unit on a vehicle shall, in addition, meet the specific installation requirements set out in paragraph 6 of Annex 15 to UNECE Regulation No 49 and the manufacturer's installation requirements set out in Section 7 of Annex XVIII to this Regulation.'
  - (l) point 5.2.1 is replaced by the following:
    - '5.2.1. For the purpose of in-service testing, the calculated load (engine torque as a percentage of maximum torque and the maximum torque available at the current engine speed), the engine speed, the engine coolant temperature, the instantaneous fuel consumption, and the reference maximum engine torque as a function of engine

speed shall be made available by the ECU in real time and at a frequency of at least 1 Hz, as mandatory data stream information.';

(m) point 5.3.4 is replaced by the following:

'5.3.4. In the case where the engine under test does not match the requirements set out in Annex XIV concerning auxiliaries, the measured torque shall be corrected in accordance with the correction method set out in Annex 4 to UNECE Regulation No 49.';

(n) points 6.1. and 6.2. are replaced by the following:

**'6.1. Parameters defining the engine family**

The engine family, as determined by the engine manufacturer, shall comply with paragraph 5.2 of Annex 4 to UNECE Regulation No 49, and, in the case of dual-fuel engines and vehicles, with paragraph 3.1 of Annex 15 to UNECE Regulation No 49.

**6.2. Choice of the parent engine**

The parent engine of the family shall be selected in accordance with the requirements set out in paragraph 5.2.4 of Annex 4 to UNECE Regulation No 49 and, in the case of dual-fuel engines and vehicles, with paragraph 3.1.2 of Annex 15 to UNECE Regulation No 49.';

(o) the following points 6.4 to 6.4.3 are added:

**'6.4. Extension to include a new engine system into an engine-family**

6.4.1. At the request of the manufacturer and upon approval of the approval authority, a new engine system may be included as a member of a certified engine family if the criteria referred to in point 6.1 are met.

6.4.2. Where the elements of design of the parent engine system correspond to those of the new engine system in accordance with point 6.2 or, in the case of a dual-fuel engine, in accordance with paragraph 3.1.2 of Annex 15 to UNECE Regulation No 49, the parent engine system shall remain unchanged and the manufacturer shall modify the information document specified in Annex I.

6.4.3. Where the elements of design of the new engine system do not correspond to the parent engine system in accordance with point 6.4.2, but is representative of the whole family, the new engine system shall become the new parent engine. In this case, it shall be demonstrated that the new elements of design comply with the provisions of this Regulation and the information document specified in Annex I shall be modified.';

(p) points 7.2.3.3 to 7.2.3.6 are replaced by the following:

7.2.3.3. For diesel, ethanol (ED95), petrol, E85, LNG<sub>20</sub>, LNG and LPG fuelled engines, including dual-fuel engines, all those tests may be conducted with the applicable market fuels. However, at the manufacturer's request, the reference fuels specified in Annex IX may be used. This implies tests, as described in Section 1 of this Annex, with at least two of the reference fuels for each LPG or LNG engine, including dual-fuel engines.

7.2.3.4. For CNG engines, including dual-fuel engines, all those tests may be conducted with market fuel in the following way:

- (a) for H marked engines with a market fuel within the H-range ( $0.89 \leq S\lambda \leq 1.00$ );
- (b) for L marked engines with a market fuel within the L-range ( $1.00 \leq S\lambda \leq 1.19$ );
- (c) for HL marked engines with a market fuel within the extreme range of the  $\lambda$ -shift factor ( $0.89 \leq S\lambda \leq 1.19$ ).

However, at the manufacturer's request, the reference fuels specified in Annex IX may be used. This implies tests as described in Section 1 of this Annex.

7.2.3.5. Non-compliance of gas and dual-fuel engines

In the case of a dispute caused by the non-compliance of gas fuelled engines, including dual-fuel engines, when using a market fuel, the tests shall be performed with each reference fuel on which the parent engine has been tested, and with the possible additional third fuel as referred to in points 1.1.4.1 and 1.2.1.1 on which the parent engine may have been tested. Where applicable, the result shall be converted by a calculation applying the relevant factors «r», «r<sub>a</sub>» or «r<sub>b</sub>» as described in points 1.1.5, 1.1.6.1 and 1.2.1.2. If r, r<sub>a</sub> or r<sub>b</sub> are less than 1, no correction shall take place. The measured results and, where applicable, the calculated results shall demonstrate that the engine meets the limit values with all relevant fuels (for example, fuels 1, 2 and fuel 3 in the case of natural gas engines and fuels A and B in the case of LPG engines).

7.2.3.6. Tests for conformity of production of a gas fuelled engine laid out for operation on one specific fuel composition in accordance with Section 1.2.2 of this Annex shall be performed on the fuel for which the engine has been calibrated.';

(q) Points 7.3.1, 7.3.2 and 7.3.3 are replaced by the following:

7.3.1. When the approval authority determines that the quality of production seems unsatisfactory, it may request a verification of the conformity of production of the OBD system. Such verification shall be carried out in accordance with the following:

An engine shall be randomly taken from series production and subjected to the tests described in Annex 9B to UNECE Regulation No 49. A dual-fuel engine shall be

operated in dual-fuel mode and, where applicable, in diesel mode. The tests may be carried out on an engine that has been run-in up to a maximum of 125 hours.

7.3.2. The production is deemed to be in conformity if this engine complies with the requirements of the tests prescribed in Annex 9B to UNECE Regulation No 49 and, in the case of dual-fuel engines, complies with the additional requirements set out in paragraph 7 of Annex 15 to UNECE Regulation No 49.

7.3.3. If the engine taken from the series production does not comply with the requirements set out in point 7.3.2, a further random sample of four engines shall be taken from the series production and subjected to the tests referred to in point 7.3.1';

(r) point 7.4.4 is replaced by the following:

'7.4.4. In the case where the test equipment does not comply with the requirements specified in Annex XIV concerning auxiliaries, the measured torque shall be corrected in accordance with the correction method set out in Annex 4 to UNECE Regulation No 49.';

(s) in point 8.1., the first paragraph is replaced by the following:

'The documentation package required by Articles 5, 7 and 9 enabling the approval authority to evaluate the emission control strategies and the systems on-board the vehicle and engine to ensure the correct operation of NO<sub>x</sub> control measures, as well as the documentation packages required by Annex VI (off-cycle emissions), Annex X (OBD) and Annex XVIII (dual-fuel engines) shall be made available in the two following parts:';

(t) point 8.3 is replaced by the following:

'8.3. The extended documentation package shall include the following information:

- (a) information on the operation of all AES and BES, including a description of the parameters that are modified by any AES and the boundary conditions under which the AES operate, and indication of which AES and BES are likely to be active under the conditions of the test procedures set out in Annex VI;
- (b) a description of the fuel system control logic, timing strategies and switch points during all modes of operation;
- (c) a full description of the inducement system required by Annex XIII, including the associated monitoring strategies;
- (d) the description of the anti-tampering measures considered in point (b) of Article 5(4) and in point (a) of Article 7(4).';

(u) in Appendix 1, points 1.1 and 1.2 are replaced by the following:

1.1. In paragraph A.1.3. of Appendix 1 to UNECE Regulation No 49, the reference to paragraph 5.3 shall be understood as reference to the table of Annex I to Regulation (EC) No 595/2009.

1.2. In paragraph A.1.3 of Appendix 1 to UNECE Regulation No 49, the reference to Figure 1 in paragraph 8.3 shall be understood as reference to Figure 1 of Annex I to this Regulation.';

(v) in Appendix 2, point 1.1 is replaced by the following:

1.1. In paragraph A.2.3 of Appendix 2 to UNECE Regulation No 49, the reference to paragraph 5.3 shall be understood as reference to the table of Annex I to Regulation (EC) No 595/2009.';

(w) in Appendix 3, points 1.1, 1.2 and 1.3 are replaced by the following:

1.1. In paragraph A.3.3 of Appendix 3 to UNECE Regulation No 49, the reference to paragraph 5.3 shall be understood as reference to the table of Annex I to Regulation (EC) No 595/2009.

1.2. In paragraph A.3.3 of Appendix 3 to UNECE Regulation No 49, the reference to Figure 1 in paragraph 8.3 shall be understood as reference to Figure 1 of Annex I to this Regulation.

1.3. In paragraph A.3.5 of Appendix 3 to UNECE Regulation No 49, the reference to paragraph 8.3.2 shall be understood as reference to point 7.2.2 of this Annex.';

(x) in Appendix 4, the table in Part 1 is amended as follows:

(i) row 3.2.1.1 is replaced by the following:

‘

3.2.1.1.	Working principle: positive ignition/compression ignition/dual-fuel <sup>(1)</sup> Cycle four stroke / two stroke/ rotary <sup>(1)</sup> :	
----------	---	--

‘;

(ii) the following rows 3.2.1.1.1 and 3.2.1.1.2 are inserted after row 3.2.1.1:

‘

3.2.1.1.1.	Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B <sup>(1)</sup> <sup>(d1)</sup>					
------------	--	--	--	--	--	--

3.2.1.1.2.	Gas Energy Ratio over the hot part of the WHTC test-cycle: .....% <sup>(d1)</sup>						
------------	--	--	--	--	--	--	--

‘;

(iii) the following row 3.2.1.6.2 is inserted after row 3.2.1.6.1:

‘

3.2.1.6.2.	Idle on Diesel: yes/no <sup>(1)</sup> ( <sup>d1</sup> )						
------------	---	--	--	--	--	--	--

‘;

(iv) row 3.2.2.2 is replaced by the following:

‘

3.2.2.2.	Heavy duty vehicles Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol (ED95)/Ethanol (E85)/ LNG/LNG <sub>20</sub> <sup>(1)</sup> ( <sup>6</sup> )						
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‘;

(v) row 3.2.4.2 is replaced by the following:

‘

3.2.4.2.	By fuel injection (compression ignition or dual fuel only): yes/no <sup>(1)</sup>						
----------	---	--	--	--	--	--	--

‘;

(vi) row 3.2.9.7 is deleted.

(vii) row 3.2.9.7.1 is replaced by the following:

‘

3.2.9.7.1.	Acceptable exhaust system volume (vehicle and engine system):.....dm <sup>3</sup>						
------------	---	--	--	--	--	--	--

‘;

(viii) the following row 3.2.9.7.2 is inserted after row 3.2.9.7.1:

‘

3.2.9.7.2.	Volume of the exhaust system that is part of the engine						
------------	---	--	--	--	--	--	--



	system:.....dm <sup>3</sup>						
--	-----------------------------	--	--	--	--	--	--

‘;

(ix) the following row 3.2.12.2.7.8.0 is inserted after row 3.2.12.2.7.7.1:

‘

3.2.12.2.7.8.0.	Alternative approval as provided for in point 2.4.1 of Annex X to Regulation (EU) No 582/2011 used: yes/no <sup>(1)</sup>						
-----------------	---	--	--	--	--	--	--

‘;

(x) row 3.2.12.2.8 is replaced by the following:

‘

3.2.12.2.8.	Other systems (description and operation)						
-------------	---	--	--	--	--	--	--

‘;

(xi) row 3.2.12.2.8.2 is replaced by the following:

‘

3.2.12.2.8.2.	Driver inducement system						
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‘;

(xii) the following rows 3.2.12.2.8.2.1 and 3.2.12.2.8.2.2 are inserted after row 3.2.12.2.8.2:

‘

3.2.12.2.8.2.1.	Engine with permanent deactivation of the driver inducement, for use by the rescue services or in vehicles specified in point (b) of Article 2(3) of Directive 2007/46/EC: yes/no <sup>(1)</sup>						
3.2.12.2.8.2.2.	Activation of the creep mode ‘disable after restart’/‘disable after fuelling’/‘disable after parking’ <sup>(7)</sup> <sup>(1)</sup>						

‘;

(xiii) the following rows 3.2.12.2.8.3.1 and 3.2.12.2.8.3.2 are inserted after row 3.2.12.2.8.3:

‘

3.2.12.2.8.3.1.	List of the OBD engine families within the engine family considered when ensuring the correct operation of NO <sub>x</sub> control measures (where applicable)	OBD engine family 1:..... OBD engine family 2:..... Etc...
3.2.12.2.8.3.2.	Number of the OBD engine family the parent engine / the engine member belongs to	

‘;

(xiv) row 3.2.12.2.8.4 is deleted.

(xv) row 3.2.12.2.8.5 is replaced by the following:

‘

3.2.12.2.8.5.	Reference number of the OBD engine family considered when ensuring the correct operation of NO <sub>x</sub> control measures the parent engine/the engine member belongs to	
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‘;

(xvi) the following rows 3.2.12.2.8.8.4 and 3.2.12.2.8.8.5 are inserted after row 3.2.12.2.8.7:

‘

3.2.12.2.8.8.4.	Alternative approval as provided for in point 2.1 of Annex XIII to Regulation (EU) No 582/2011 used: yes/no <sup>(1)</sup>	
3.2.12.2.8.8.5.	Heated/non-heated reagent tank and dosing system (see paragraph 2.4 of Annex 11 to UNECE Regulation No 49)	

‘;

(xvii) row 3.2.17 is replaced by the following:

‘

3.2.17.	Specific information related to gas and dual fuel engines for heavy-duty vehicles (in the case of systems laid out in a different manner, supply equivalent information)(where applicable)	
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‘;

(xviii) the following row 3.2.17.9 is inserted after row 3.2.17.8.1.1:

‘

3.2.17.9.	Where appropriate, manufacturer reference of the documentation for installing the dual-fuel engine in a vehicle <sup>(d1)</sup>						
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‘;

(xix) rows 3.5.4.1 and 3.5.4.2 are replaced by the following:

‘

3.5.4.1.	CO <sub>2</sub> mass emissions WHSC test <sup>(d3)</sup> :.....g/kWh						
3.5.4.2.	CO <sub>2</sub> mass emissions WHSC test in diesel mode <sup>(d2)</sup> : .....g/kWh						

‘;

(xx) the following rows 3.5.4.3 to 3.5.4.6 are inserted after row 3.5.4.2:

‘

3.5.4.3.	CO <sub>2</sub> mass emissions WHSC test in dual-fuel mode <sup>(d1)</sup> : ...g/kWh						
3.5.4.4.	CO <sub>2</sub> mass emissions WHTC test <sup>(5)</sup> <sup>(d3)</sup> :..... g/kWh						
3.5.4.5.	CO <sub>2</sub> mass emissions WHTC test in diesel mode <sup>(5)</sup> <sup>(d2)</sup> : ... g/kWh						
3.5.4.6.	CO <sub>2</sub> mass emissions WHTC test in dual-fuel mode <sup>(5)</sup> <sup>(d1)</sup> :...g/kWh						

‘;

(xxi) rows 3.5.5.1 and 3.5.5.2 are replaced by the following:

‘

3.5.5.1.	Fuel consumption WHSC test <sup>(d3)</sup> :..... g/kWh						
3.5.5.2.	Fuel consumption WHSC test in diesel mode <sup>(d2)</sup> : ..... g/kWh						

‘;

(xxii) the following rows 3.5.5.3 to 3.5.5.6 are inserted after row 3.5.5.2:

‘

3.5.5.3	Fuel consumption WHSC test in dual-fuel mode <sup>(d1)</sup> : .....						
---------	--	--	--	--	--	--	--

	g/kWh					
3.5.5.4.	Fuel consumption WHTC test <sup>(5)</sup> ( <sup>d3</sup> )..... g/kWh					
3.5.5.5.	Fuel consumption WHTC test in diesel mode <sup>(5)</sup> ( <sup>d2</sup> ): ..... g/kWh					
3.5.5.6.	Fuel consumption WHTC test in dual-fuel mode <sup>(5)</sup> ( <sup>d1</sup> ): ..... g/kWh					

‘;

(y) in Appendix 4, the table in Part 2 is amended as follows:

(i) the following row 3.2.2.4.1 is inserted after row 3.2.2.3:

‘

3.2.2.4.1.	Dual-fuel vehicle: yes/no <sup>(1)</sup>	
------------	--	--

‘;

(ii) rows 3.2.9.7 and 3.2.9.7.1 are replaced by the following:

‘

3.2.9.7.	Complete exhaust system volume (vehicle and engine system): ..... dm <sup>3</sup>	
3.2.9.7.1.	Acceptable exhaust system volume (vehicle and engine system): ..... dm <sup>3</sup>	

‘;

(iii) rows 3.2.12.2.7.0 to 3.2.12.2.7.4 are deleted.

(iv) The following rows 3.2.12.2.7.8 to 3.2.12.2.7.8.3 are inserted after row 3.2.12.2.7:

‘

3.2.12.2.7.8.	OBD components on-board the vehicle	
3.2.12.2.7.8.0.	Alternative approval as provided for in point 2.4.1 of Annex X to Regulation (EU) No 582/2011 used. yes/no <sup>(1)</sup>	
3.2.12.2.7.8.1.	List of OBD components on-board the vehicle	

3.2.12.2.7.8.2.	Written description and/or drawing of the MI <sup>(6)</sup>						
3.2.12.2.7.8.3.	Written description and/or drawing of the OBD off-board communication interface <sup>(6)</sup>						

‘;

(v) row 3.2.12.2.8 is replaced by the following:

‘

3.2.12.2.8.	Other systems (description and operation)						
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‘;

(vi) rows 3.2.12.2.8.1 and 3.2.12.2.8.2 are replaced by the following:

‘

3.2.12.2.8.1.	Systems to ensure the correct operation of NO <sub>x</sub> control measures						
3.2.12.2.8.2.	Driver inducement system						

‘;

(vii) the following rows 3.2.12.2.8.2.1 and 3.2.12.2.8.2.2 are inserted after row 3.2.12.2.8.2:

‘

3.2.12.2.8.2.1.	Engine with permanent deactivation of the driver inducement, for use by the rescue services or in vehicles specified in point (b) of Article 2(3) of Directive 2007/46/EC: yes/no <sup>(1)</sup>						
3.2.12.2.8.2.2.	Activation of the creep mode ‘disable after restart’/‘disable after fuelling’/‘disable after parking’ <sup>(7)</sup> <sup>(1)</sup>						

‘;

(viii) rows 3.2.12.2.8.4 and 3.2.12.2.8.5 are deleted.

(ix) the following rows 3.2.12.2.8.8 to 3.2.12.2.8.8.5 are inserted after row 3.2.12.2.8.5:

‘

3.2.12.2.8.8.	Components on-board the vehicle of the systems ensuring the correct operation of NO <sub>x</sub> control measures	
3.2.12.2.8.8.1.	List of components on-board the vehicle of the systems ensuring the correct operation of NO <sub>x</sub> control measures	
3.2.12.2.8.8.2.	Where appropriate, manufacturer reference of the documentation package related to the installation on the vehicle of the system ensuring the correct operation of NO <sub>x</sub> control measures of an approved engine	
3.2.12.2.8.8.3.	Written description and/or drawing of the warning signal <sup>(6)</sup>	
3.2.12.2.8.8.4.	Alternative approval as provided for in point 2.1. of Annex XIII to Regulation (EU) No 582/2011 used: yes/no <sup>(1)</sup>	
3.2.12.2.8.8.5.	Heated/non heated reagent tank and dosing system (see paragraph 2.4 of Annex 11 to UNECE Regulation No 49)	

‘;

(z) in Appendix 4, the Appendix to the information document is amended as follows:

(i) Table 1 is replaced by the following:

‘

Equipment	Idle	Low Speed	High Speed	Preferred Speed <sup>(2)</sup>	n95h
P <sub>a</sub> Auxiliaries/equipment required according to UNECE Reg. 49, annex 4, appendix 6					
P <sub>b</sub> Auxiliaries/equipment not required according to UNECE Reg. 49, annex 4, appendix 6					

‘;

(ii) in point 5.1, the title is replaced by the following:

'5.1. Engine test speeds for emissions test in accordance with Annex III to Regulation (EU) No 582/2011 <sup>(9)</sup>(<sup>d5</sup>)';

(iii) in point 5.2, the title is replaced by the following:

5.2. Declared values for power test in accordance with Annex XIV to Regulation (EU) No 582/2011 <sup>(d5)</sup>;

(aa) in Appendix 5, the Addendum to EC type-approval certificate is amended as follows:

(i) point 1.1.5 is replaced by the following:

'1.1.5. Category of engine: Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol (ED95)/ Ethanol (E85)/LNG/LNG<sub>20</sub> <sup>(1)</sup>;

(ii) the following point 1.1.5.1 is inserted after point 1.1.5:

'1.1.5.1. Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B <sup>(1)</sup><sup>(d1)</sup>;

(iii) point 1.4 is replaced by the following:

'1.4. Emission levels of the engine/parent engine <sup>(1)</sup>

Deterioration Factor (DF): calculated/fixed <sup>(1)</sup>

Specify the DF values and the emissions on the WHSC (if applicable) and WHTC tests in the table below';

(iv) Table 4 is replaced by the following:

Table 4 – WHSC test

WHSC test (if applicable) <sup>(10)</sup> <sup>(d5)</sup>							
DF	CO	THC	NMHC <sup>(d4)</sup>	NO <sub>x</sub>	PM Mass	NH <sub>3</sub>	PM Number
Mult/add <sup>(1)</sup>							
Emissions	CO (mg/kWh)	THC (mg/kWh)	NMHC <sup>(d4)</sup> (mg/kWh)	NO <sub>x</sub> (mg/kWh)	PM Mass (mg/kWh)	NH <sub>3</sub> ppm	PM Number (#/kWh)
Test result							
Calculated with DF							
CO <sub>2</sub> mass emission: .....g/kWh							
Fuel consumption .....g/kWh							

‘;

(v) Table 5 is replaced by the following:

‘

Table 5 – WHTC Test

WHTC test <sup>(10)</sup> ( <sup>d5</sup> )								
DF	CO	THC	NMHC ( <sup>d4</sup> )	CH <sub>4</sub> ( <sup>d4</sup> )	NO <sub>x</sub>	PM Mass	NH <sub>3</sub>	PM Number
Mult/add <sup>(1)</sup>								
Emissions	CO (mg/kWh)	THC (mg/kWh)	NMHC ( <sup>d4</sup> ) (mg/kWh)	CH <sub>4</sub> ( <sup>d4</sup> ) (mg/kWh)	NO <sub>x</sub> (mg/kWh)	PM Mass (mg/kWh)	NH <sub>3</sub> ppm	PM Number (#/kWh)
Cold start								
Hot start w/o regeneration								
Hot start with regeneration <sup>(1)</sup>								
k <sub>r,u</sub> (mult/add) <sup>(1)</sup>								
k <sub>r,d</sub> (mult/add) <sup>(1)</sup>								
Weighted test result								
Final test result with DF								
CO <sub>2</sub> mass emission:.....g/kWh								
Fuel consumption: .....g/kWh								

‘;

(ab) in Appendix 7, the Addendum to EC type-approval certificate is amended as follows:

(i) point 1.1.5 is replaced by the following:

'1.1.5. Category of engine: Diesel/Petrol/LPG/NG-H/NG-L/NG-HL/Ethanol (ED95)/Ethanol (E85)/LNG/LNG<sub>20</sub> <sup>(1)</sup>’;



(ii) the following point 1.1.5.1 is inserted after point 1.1.5.:

'1.1.5.1.Type of dual-fuel engine: Type 1A/Type 1B/Type 2A/Type 2B/Type 3B (1)(d1)';

(iii) point 1.4 is replaced by the following:

'1.4. Emission levels of the engine/parent engine(1)

Deterioration Factor (DF): calculated/fixe(1)

Specify the DF values and the emissions on the WHSC (if applicable) and WHTC tests in the table below';

(iv) Table 4 is replaced by the following:

Table 4 - WHSC test

WHSC test (if applicable)(10)(d5)							
DF	CO	THC	NMHC (d4)	NOx	PM Mass	NH3	PM Number
Mult/add(1)							
Emissions	CO (mg/kWh)	THC (mg/kWh)	NMHC (d4) (mg/kWh)	NOx (mg/kWh)	PM Mass (mg/kWh)	NH3 ppm	PM Number (#/kWh)
Test result							
Calculated with DF							
CO2 mass emission: .....g/kWh							
Fuel consumption: .....g/kWh							

;

(v) Table 5 is replaced by the following:

Table 5 - WHTC test

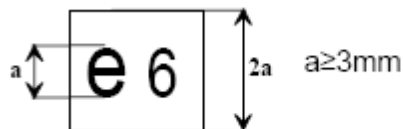
WHTC test <sup>(10)</sup> ( <sup>d5</sup> )								
DF	CO	THC	NMHC ( <sup>d4</sup> )	CH <sub>4</sub> ( <sup>d4</sup> )	NO <sub>x</sub>	PM Mass	NH <sub>3</sub>	PM Number
Mult/add ( <sup>1</sup> )								
Emissions	CO (mg/kWh)	THC (mg/kWh)	NMHC ( <sup>d4</sup> ) (mg/kWh)	CH <sub>4</sub> ( <sup>d4</sup> ) (mg/kWh)	NO <sub>x</sub> (mg/kWh)	PM Mass (mg/kWh)	NH <sub>3</sub> ppm	PM Number (#/kWh)
Cold start								
Hot start w/o regeneration								
Hot start with regeneration( <sup>1</sup> )								
k <sub>r,u</sub> (mult/add)( <sup>1</sup> )								
k <sub>r,d</sub> (mult/add)( <sup>1</sup> )								
Weighted test result								
Final test result with DF								
CO <sub>2</sub> mass emission:.....g/kWh								
Fuel consumption: .....g/kWh								

;

(ac) Appendix 8 is replaced by the following:

'Appendix 8

Example of EC type-approval mark



2B HL C 0123

The approval mark in this Appendix affixed to an engine approved as a separate technical unit shows that the type concerned is a 2B dual-fuel, designed for operation on both the H-range and the L-range of gases, that has been approved in Belgium (e6) according to the emission stage C, as set out in Appendix 9 of this Annex.

’;

(ad) in Appendix 9, Table 1 is replaced by the following:

‘

Character	NO <sub>x</sub> OTL <sup>(1)</sup>	PM OTL <sup>(2)</sup>	Reagent quality and consumption	Implementation dates: new types	Implementation dates: all vehicles	Last date of registration
A	Row "phase-in period" of tables 1 and 2	Performance. Monitoring <sup>(3)</sup>	Phase in <sup>(4)</sup>	31.12.2012	31.12.2013	31.08.2015
B	Row "phase-in period" of tables 1 and 2	Row "phase-in period" of table 1	Phase in <sup>(4)</sup>	1.9.2014	1.9.2015	30.12.2016
C	Row "general requirements" of tables 1 and 2	Row "general requirements" of table 1	General <sup>(5)</sup>	31.12.2015	31.12.2016	

’;

(ae) Appendix 10 is amended as follows:

(i) the explanatory note <sup>(5)</sup> is replaced by the following:

‘<sup>(5)</sup> Value for the combined WHTC including cold and hot part in accordance with Annex VIII to this Regulation’;

(ii) the following explanatory note <sup>(10)</sup> is inserted:

‘<sup>(10)</sup> In the case of engines included in points 1.1.3. and 1.1.6. of Annex I to this Regulation, repeat the information for all fuels tested, where applicable.’;

(iii) the following explanatory notes <sup>(d)</sup> to <sup>(d5)</sup> are inserted after explanatory note <sup>(b)</sup>:

‘<sup>(d)</sup> Dual-fuel engines

<sup>(d1)</sup> In case of a dual-fuel engine or vehicle.

<sup>(d2)</sup> In the case of dual-fuel engines of Type 1B, Type 2B and Type 3B.

<sup>(d3)</sup> Except for dual-fuel engines or vehicles.

(<sup>d4</sup>) In the cases laid down in Table 1 of Annex 15 to UNECE Regulation No 49 for dual-fuel, and in Annex I to Regulation (EU) No 595/2009 for positive ignition engines.

(<sup>d5</sup>) In the case of dual-fuel engines of Type 1B, Type 2B, and Type 3B, repeat the information in both dual-fuel and diesel mode.';

(2) Annex II is amended as follows

(a) the following points 2.7 to 2.7.1.2 are added after point 2.6:

'2.7 Dual-fuel engines or vehicles

2.7.1. Dual-fuel engines and vehicles shall comply with the following additional requirements:

2.7.1.1. A PEMS tests shall be performed in dual-fuel mode.

2.7.1.2. In the case of Type 1B, Type 2B and Type 3B dual-fuel engines, an additional PEMS test shall be performed in Diesel mode on the same engine and vehicle immediately after, or before, a PEMS test is performed in dual-fuel mode.

In that case, the pass or fail decision of the lot considered in the statistical procedure specified in this Annex shall be based on the following:

(a) a pass decision is reached for an individual vehicle if both the PEMS test in dual-fuel mode and the PEMS test in Diesel mode have concluded a pass;

(b) a fail decision is reached for an individual vehicle if either the PEMS test in dual-fuel mode or the PEMS test in Diesel mode has concluded a fail.';

(b) point 4.6.6 is replaced by the following:

'4.6.6. The electrical power to the PEMS system shall be supplied by an external power supply unit, and not from a source that draws its energy either directly or indirectly from the engine under test, except in the cases set out in points 4.6.6.1 and 4.6.6.2';

(c) The following points 4.6.6.1. and 4.6.6.2. are inserted after point 4.6.6.:

4.6.6.1. As an alternative to point 4.6.6, the electrical power to the PEMS system may be supplied by the internal electrical system of the vehicle as long as the power demand for the test equipment does not increase the output from the engine by more than 1% of its maximum power and measures are taken to prevent excessive discharge of the battery when the engine is not running or idling.

4.6.6.2. In case of a dispute the results of measurements performed with a PEMS system powered by an external power supply shall prevail over the results acquired in accordance with the alternative method provided for in point 4.6.6.1';

(d) points 5.1.2 and 5.1.2.1 are replaced by the following:

5.1.2. Torque signal

5.1.2.1. The conformity of the torque signal calculated by the PEMS equipment from the ECU data-stream information required by point 5.2.1 of Annex I shall be verified at full load.';

(e) the following point 5.1.2.1.1 is inserted after point 5.1.2.1:

5.1.2.1.1. The method used to check this conformity is described in Appendix 4.';

(f) the following point 5.1.2.4 is added after point 5.1.2.3:

5.1.2.4. Dual-fuel engines and vehicles shall, in addition, comply with the requirements and exceptions related to the torque correction set out in paragraph 10.2.2. of Annex 15 to UNECE Regulation No 49';

(g) the following points 6.3.1 and 6.3.2. are inserted after point 6.3:

6.3.1. In the case of a type 2A and type 2B dual-fuel vehicle operating in dual-fuel mode, the emission limit applicable for applying the conformity factors used when performing a PEMS test shall be determined on the basis of the actual GER calculated from the fuel consumption measured over the on-road test.

6.3.2. As an alternative point 6.3.1., in absence of a robust way to measure the gas or the diesel fuel consumption during the PEMS test, the manufacturer is allowed to use the GER<sub>WHTC</sub> determined on the hot part of the WHTC';

(h) Appendix 1 is amended as follows:

(i) in point 2.2, the footnote <sup>(4)</sup> is replaced by the following:

<sup>(4)</sup> The recorded value shall be either (a) the net brake engine torque in accordance with point 2.4.4 of this Appendix or (b) the net brake engine torque calculated from the torque values in accordance with point 2.4.4 of this Appendix.';

(ii) point 2.4.4 is replaced by the following:

2.4.4. *Connection with the vehicle ECU*

A data logger shall be used to record the engine parameters listed in Table 1. This data logger can make use of the Control Area Network (CAN) bus of the

vehicle to access the ECU data specified in Table 1 of Appendix 5 of Annex 9B to UNECE Regulation No 49 and broadcasted on the CAN according to standard protocols, such as SAE J1939, J1708 or ISO 15765-4. It may calculate the net brake engine torque or perform unit conversions.';

- (iii) in point 2.4.5, the second paragraph is replaced by the following:

'The sample probe shall be installed in the exhaust pipe in accordance with the requirements set out in paragraph 9.3.10 of Annex 4 to UNECE Regulation No 49.';

- (iv) point 2.5.3 is replaced by the following:

*2.5.3. Checking and calibrating the analysers*

The zero and span calibration and the linearity checks of the analysers shall be performed using calibration gases meeting the requirements set out in paragraph 9.3.3 of Annex 4 to UNECE Regulation No 49. A linearity check shall have been performed within three months before the actual test.';

- (v) point 2.7.1 is replaced by the following:

*2.7.1. Checking of the analysers*

The zero, span and linearity checks of the analysers as described in point 2.5.3. shall be performed using calibration gases meeting the requirements set out in paragraph 9.3.3 of Annex 4 to UNECE Regulation No 49.';

- (vi) in point 2.7.5, the first paragraph is replaced by the following:

'If drift correction is applied in accordance with point 2.7.4, the corrected concentration value shall be calculated in accordance with paragraph 8.6.1 of Annex 4 to UNECE Regulation No 49.';

- (vii) point 3.1.1 is replaced by the following:

*3.1.1. Gas analysers data*

The data from the gas analysers shall be properly aligned using the procedure laid down in paragraph 9.3.5 of Annex 4 to UNECE Regulation No 49.';

- (viii) in point 3.2.1, the first paragraph is replaced by the following:

'The consistency of the data (exhaust mass flow measured by the EFM and gas concentrations) shall be verified using a correlation between the measured fuel flow from the ECU and the fuel flow calculated using the formula in paragraph 8.4.1.6 of Annex 4 to UNECE Regulation No 49. A linear regression shall be

performed for the measured and calculated fuel rate values. The method of least squares shall be used with the best fit equation having the form:';

(ix) in point 3.2.3, point (a) is replaced by the following:

'(a) the fuel consumption calculated from the emissions data (gas analyser concentrations and exhaust mass flow data), in accordance with the formula provided for in point 8.4.1.6 of Annex 4 to UNECE Regulation No 49;';

(x) point 3.3 is replaced by the following:

### **3.3. Dry-Wet correction**

If the concentration is measured on a dry basis, it shall be converted to a wet basis in accordance with the formula provided for in paragraph 8.1. of Annex 4 to UNECE Regulation No 49.';

(xi) point 3.5 is replaced by the following:

### **3.5. Calculation of the instantaneous gaseous emissions**

The mass emissions shall be determined as described in paragraph 8.4.2.3 of Annex 4 to UNECE Regulation No 49.';

(xii) in point 4.1, the fourth paragraph is replaced by the following:

'The mass emissions (mg/window) shall be determined as described in paragraph 8.4.2.3 of Annex 4 to UNECE Regulation No 49.';

(i) Appendix 2 is amended as follows:

(i) in point 2.2, the first paragraph is replaced by the following:

'The gases shall be analysed using the technologies specified in paragraph 9.3.2 of Annex 4 to UNECE Regulation No 49.';

(ii) points 2.3 and 2.4. are replaced by the following:

### **2.3. Sampling of gaseous emissions**

The sampling probes shall meet the requirements set out in paragraphs A.2.1.2 and A.2.1.3 of Appendix 2 to Annex 4 to UNECE Regulation No 49. The sampling line shall be heated to 190 °C (+/- 10 °C).

### **2.4. Other instruments**

The measuring instruments shall satisfy the requirements set out in Table 7 and paragraph 9.3.1 of Annex 4 to UNECE Regulation No 49.';

(j) in Appendix 3, points 1.1, 1.2 and 1.3 are replaced by the following:

1.1. Calibration gases

The PEMS gas analysers shall be calibrated using gases in accordance with the requirements set out in paragraph 9.3.3 of Annex 4 to UNECE Regulation No 49.

1.2. Leakage test

The PEMS leakage tests shall be conducted in accordance with the requirements set out in paragraph 9.3.4 of Annex 4 to UNECE Regulation No 49.

1.3. Response time check of the analytical system

The response time check of the PEMS analytical system shall be conducted in accordance with the requirements set out in paragraph 9.3.5 of Annex 4 to UNECE Regulation No 49.'.

(3) Annex IV is amended as follows:

(a) point 1.1 is replaced by the following:

1.1. This Annex sets out the procedure for measuring carbon monoxide emissions at idling speeds (normal and high) for positive ignition engines installed in vehicles of category M<sub>1</sub> with a technically permissible maximum laden mass not exceeding 7,5 tonnes, as well as in vehicles of categories M<sub>2</sub> and N<sub>1</sub>.';

(b) the following point 1.2 is inserted after point 1.1:

1.2. This Annex does not apply to dual-fuel engines and vehicles.';

(4) Annex V is amended as follows:

(a) points 3.1 and 3.1.1 are replaced by the following:

3.1. Point 3.1.1. and 3.1.2. shall apply to compression-ignition engines, dual-fuel engines and to positive-ignition engines fuelled with natural gas/biomethane or LPG.

3.1.1. Engines equipped with turbochargers, pumps, blowers, or superchargers for air induction may discharge crankcase emissions to the ambient atmosphere if the emissions are added to the exhaust emissions (either physically or mathematically) during all emission testing in accordance with paragraph 6.10 of Annex 4 to UNECE Regulation No 49.';



(b) point 3.2.1 is replaced by the following:

'3.2.1. The pressure in the crankcase shall be measured over the emission test cycles at an appropriate location. It shall be measured at the dip-stick hole with an inclined-tube manometer.';

(c) the following points 3.2.1.1 and 3.2.1.2 are inserted after point 3.2.1:

3.2.1.1. The pressure in the intake manifold shall be measured to within  $\pm 1$  kPa.

3.2.1.2. The pressure measured in the crankcase shall be measured to within  $\pm 0,01$  kPa.';

(5) Annex VI is amended as follows:

(a) point 3.1 is replaced by the following:

'3.1. The general requirements shall be those set out in paragraph 4 of Annex 10 to UNECE Regulation No 49.';

(b) the following point 3.2 is inserted:

'3.2. In the case of dual-fuel engines, adaptive strategies are allowed provided that all of the following conditions are met:

(a) the engine always remains in the dual-fuel type that has been declared for type-approval;

(b) in case of a Type 2 dual-fuel engine, the resulting difference between the highest and the lowest  $GER_{WHTC}$  within the family shall never exceed the percentage specified in paragraph 3.1.1 of Annex 15 to UNECE Regulation No 49;

(c) these strategies are declared and satisfy the requirements set out in this Annex.';

(c) points 4.1 and 4.1.1 are replaced by the following:

'4.1. The performance requirements shall be those set out in paragraph 5 of Annex 10 to UNECE Regulation No. 49, with the exceptions provided for in point 4.1.1 of this Regulation.

4.1.1 Point (a) of paragraph 5.1.2 of Annex 10 to UNECE Regulation No 49 shall be understood as follows:

(a) its operation is substantially included in the applicable type-approval tests, including the off-cycle test procedures provided for in paragraph 6 of Annex

VI to this Regulation and the in-service provisions set out in Article 12 of this Regulation.';

(d) points 4.1.2 to 4.1.4 are deleted.

(e) points 6 to 6.1.1 are replaced by the following:

'6. Off-Cycle Laboratory testing and in-use vehicle testing at Type-Approval

6.1. The off-cycle test procedure during type-approval shall follow the off-cycle laboratory testing and in-use vehicle testing of engines at type-approval as described in paragraph 7 of Annex 10 to UNECE Regulation No 49 with the exception provided for in point 6.1.1.

6.1.1. The first subparagraph of paragraph 7.3 of Annex 10 to UNECE Regulation No 49 shall be understood as follows:

'In-use testing

A PEMS demonstration test shall be performed at type-approval by testing the parent engine in a vehicle using the procedure described in Appendix 1 of this Annex.'

';

(f) points 6.1.2 to 6.1.6 are deleted;

(g) the following points 6.2, 6.2.1 and 6.3 are added after point 6.1.1:

'6.2. Dual-fuel engines and vehicles

The PEMS demonstration test at type-approval required by Annex 10 to UNECE Regulation No 49 shall be performed by testing the parent engine of a dual-fuel engine family when operating in dual-fuel mode.

6.2.1. In the case of Type 1B, Type 2B and Type 3B dual-fuel engines, an additional PEMS test shall be performed in diesel mode on the same engine and vehicle immediately after or before the PEMS demonstration test performed in dual-fuel mode.

In that case, certification can only be granted if both the PEMS demonstration test in dual-fuel mode and the PEMS demonstration test in diesel mode have concluded to a pass.

6.3. Additional requirements with respect to in-use vehicle testing will be specified at a later stage in accordance with Article 14(3) of this Regulation.';

(h) Section 7 is replaced by the following:

'7. STATEMENT OF OFF-CYCLE EMISSION COMPLIANCE

7.1. The statement of off-cycle emission compliance shall be drawn up in accordance with paragraph 10 of Annex 10 to UNECE Regulation No 49, with the exception set out in point 7.1.1.

7.1.1. The first subparagraph of paragraph 10 of Annex 10 to UNECE Regulation No 49 shall be understood as follows:

‘Statement of off-cycle emission compliance

In the application for type-approval, the manufacturer shall provide a statement that the engine family or vehicle complies with the requirements set out in this Regulation limiting off-cycle emissions. In addition to this statement, compliance with the applicable emission limits and in-use requirements shall be verified through additional tests.’

’;

(i) Section 8 is replaced by the following:

'8. Documentation

Paragraph 11 of Annex 10 to UNECE Regulation No 49 shall be understood as follows:

The Approval Authority shall require that the manufacturer provides a documentation package. This should describe any element of design and emission control strategy of the engine system and the means by which it controls its output variables, whether that control is direct or indirect.

The information shall include a full description of the emission control strategy. In addition, this could include information on the operation of all AES and BES, including a description of the parameters that are modified by any AES and the boundary conditions under which the AES operate, and indication of which AES and BES are likely to be active under the conditions of the test procedures in this annex.

This documentation package shall be provided in accordance with the provisions of Section 8 of Annex I to this Regulation’;

(j) Sections 9 and 10 are deleted;

(6) Annex VII is amended as follows:

(a) the following point 1.3 is inserted after point 1.2:

- '1.3 In the case of dual-fuel engines, paragraph 6.5 of Annex 15 to UNECE Regulation No 49 shall also apply.';
- (b) point 2.1 is replaced by the following:
- '2.1. The selection of the engines shall be carried out in accordance with paragraph 2 of Annex 7 to UNECE Regulation No 49.';
- (c) points 2.2 to 2.3.1 are deleted;
- (d) point 3.1 is replaced by the following:
- '3.1. The requirements for the establishment of useful life deterioration factors shall be those set out in paragraph 3 of Annex 7 to UNECE Regulation No 49, with the exceptions provided for in points 3.1.1 to 3.1.6.';
- (e) the following points 3.1.1 to 3.1.6 are inserted after point 3.1:
- '3.1.1.Paragraph 3.2.1.3 of Annex 7 to UNECE Regulation No 49 shall be understood as follows:
- '3.2.1.3.The emission values at the start point and at the useful life end point calculated in accordance with paragraph 3.5.2 shall meet the limit values specified in the table of Annex I to Regulation (EC) No 595/2009, but individual emission results from the test points may exceed those limit values.'
- 3.1.2.Paragraph 3.2.1.9 of Annex 7 to UNECE Regulation No 49 shall be understood as follows:
- '3.2.1.9.The service accumulation schedule may be shortened by accelerated ageing on a fuel consumption basis. This shall be based on the ratio between the typical in-use fuel consumption and the fuel consumption on the ageing cycle. The service accumulation schedule shall not be reduced by more than 30 per cent, even if fuel consumption on the ageing cycle exceeds the typical in-use fuel consumption by more than 30 per cent.'
- 3.1.3.Paragraph 3.5.1 of Annex 7 to UNECE Regulation No 49 shall be understood as follows:
- '3.5.1. For each pollutant measured on the hot WHTC and WHSC tests at each test point during the service accumulation schedule, a “best fit” linear regression analysis shall be made on the basis of all test results. The results of each test for each pollutant shall be expressed to the same number of decimal places as the limit value for that pollutant, as shown in the table of Annex I to Regulation (EC) No 595/2009, plus one additional decimal place. In accordance with paragraph 3.2.1.4 of Annex 7 to Regulation UNECE No 49, if it has been

agreed that only one test cycle (hot WHTC or WHSC) be run at each test point and the other test cycle (hot WHTC or WHSC) run only at the beginning and at the end of the service accumulation schedule, the regression analysis shall be made only on the basis of the test results from the test cycle run at each test point.

At the request of the manufacturer and with the prior approval of the approval authority a non-linear regression shall be permitted.

3.1.4.Paragraph 3.7.1 of Annex 7 to UN/ECE Regulation No 49 shall be understood as follows:

'3.7.1. The engines shall meet the respective emission limits for each pollutant, as given in the table of Annex I to Regulation (EC) No 595/2009, after application of the deterioration factors to the test result as measured in accordance with Annex III ( $e_{\text{gas}}$ ,  $e_{\text{PM}}$ ). Depending on the type of deterioration factor (DF), the following provisions shall apply:

(a) multiplicative: ( $e_{\text{gas}}$  or  $e_{\text{PM}}$ ) \* DF  $\leq$  emission limit

(b) additive: ( $e_{\text{gas}}$  or  $e_{\text{PM}}$ ) + DF  $\leq$  emission limit'

3.1.5.Paragraph 3.8.1 of Annex 7 to UNECE Regulation No 49 shall be understood as follows:

'3.8.1. Conformity of production for emissions compliance shall be checked on the basis of the requirements set out in Section 7 of Annex I to this Regulation.'

3.1.6.Paragraph 3.8.3 of Annex 7 to UNECE Regulation No 49 shall be understood as follows:

'3.8.3. For the purposes of type-approval, only the deterioration factors provided for in paragraphs 3.5 or 3.6 of Annex 7 to UNECE Regulation No 49 shall be specified in points 1.4.1 and 1.4.2 of the Addendum to Appendix 5 and in points 1.4.1 and 1.4.2 of the Addendum to Appendix 7 of Annex I to this Regulation.'

;

(f) point 3.2 is replaced by the following:

'3.2. The use of market fuels is allowed for conducting the service accumulation schedule. A reference fuel shall be used to carry out the emission test.';

(g) points 3.2.1 to 3.8.3 are deleted;

(h) Point 4 is replaced by the following:

#### '4. MAINTENANCE

The requirements on maintenance shall be those set out in paragraph 4 of Annex 7 to UNECE Regulation No 49.';

(i) points 4.1.1 to 4.4.2 are deleted.

(7) Annex VIII is amended as follows:

(a) point 2.1 is replaced by the following:

'2.1. The general requirements shall be those set out in paragraph 2 of Annex 12 to UNECE Regulation No 49.';

(b) point 2.2 is deleted;

(c) points 3.1 and 3.1.1 are replaced by the following:

'3.1. The requirements for the determination of CO<sub>2</sub> emissions shall be those set out in paragraph 3 of Annex 12 to UNECE Regulation No 49, with the exception provided for in point 3.1.1.

3.1.1.Paragraph 3.1 and Appendix 1 of Annex 12 to UNECE Regulation No 49 shall not apply to dual-fuel engines and vehicles. Paragraph 10.3 of Annex 15 to UNECE Regulation No 49, which provides additional dual-fuel specific CO<sub>2</sub> determination requirements, shall apply instead.';

(d) points 3.1.2 to 3.3.2 are deleted;

(e) point 4.1 is replaced by the following:

'4.1. The requirements for the determination of fuel consumption shall be those set out in paragraph 4 of Annex 12 to UNECE Regulation No 49.';

(f) points 4.2 to 4.4.2 are deleted;

(g) the following points 5 to 5.3 are added:

'5. Provisions on CO<sub>2</sub> emissions and fuel consumption for extension of an EC type-approval for a vehicle type-approved under Regulation (EC) No 595/2009 and this Regulation with a reference mass exceeding 2.380 kg but not exceeding 2.610 kg.

5.1. The provisions on CO<sub>2</sub> emissions and fuel consumption for extension of a type-approval for a vehicle type-approved under this Regulation with a reference mass exceeding 2.380 kg but not exceeding 2.610 kg, shall be those set out in Appendix 1 of Annex 12 to UNECE Regulation No 49, with the exceptions provided for in points 5.1.1 and 5.1.2 of this Regulation.

5.1.1.Paragraph A.1.1.1 of Appendix 1 of Annex 12 to UNECE Regulation No 49 shall be understood as follows:

'A.1.1.1.This Appendix sets out the provisions and test procedures for reporting CO<sub>2</sub> emissions and fuel consumption for extension of an ECtype-approval for a vehicle type-approved under Regulation (EC) No 595/2009 and this Regulation, to a vehicle with a reference mass exceeding 2.380 kg but not exceeding 2.610 kg.'

5.1.2.Paragraph A.1.2.1 of Appendix 1 of Annex 12 to UNECE Regulation No 49 shall be understood as follows:

'A.1.2.1.In order to receive an extension of an EC type-approval for a vehicle in respect of its engine type-approved under Regulation (EC) No 595/2009 and this Regulation to a vehicle with a reference mass exceeding 2.380 kg but not exceeding 2.610 kg, the manufacturer shall meet the requirements of UNECE Regulation No 101, with the exceptions provided for in paragraphs A.1.2.1.2 and A.1.2.1.3.'

5.2. Extension of a type-approval under this Section shall not be possible for dual-fuel vehicles.';

(h) Appendix 1 is deleted;

(8) Annex IX is amended as follows:

(a) in the section corresponding to technical data on fuels for testing compression-ignition engines, the title is replaced by the following:

'Technical data on fuels for testing compression ignition and dual-fuel engines';

(b) in the section corresponding to technical data on fuels for testing positive-ignition engines, the title is replaced by the following:

'Technical data on fuels for testing positive ignition and dual-fuel engines';

(c) the table corresponding to the fuel type Natural gas/Biomethane is replaced by the following:

,

Type: Natural gas/biomethane

Characteristics	Units	Basis	Limits		Test method
			minimum	maximum	

<b>Reference fuel G<sub>R</sub></b>					
Composition:					
Methane		87	84	89	
Ethane		13	11	15	
Balance <sup>(1)</sup>	% mole	—	—	1	ISO 6974
Sulphur content	mg/m <sup>3</sup> <sup>(2)</sup>	—		10	ISO 6326-5
Notes:					
<sup>(1)</sup> Inerts + C <sub>2+</sub>					
<sup>(2)</sup> Value to be determined at standard conditions 293,2 K (20 °C) and 101,3 kPa.					
<b>Reference fuel G<sub>23</sub></b>					
Composition:					
Methane		92,5	91,5	93,5	
Balance <sup>(1)</sup>	% mole	—	—	1	ISO 6974
N <sub>2</sub>	% mole	7,5	6,5	8,5	
Sulphur content	mg/m <sup>3</sup> <sup>(2)</sup>	—	—	10	ISO 6326-5
Notes:					
<sup>(1)</sup> Inerts (different from N <sub>2</sub> ) + C <sub>2+</sub> C <sub>2+</sub>					
<sup>(2)</sup> Value to be determined at 293,2 K (20 °C) and 101,3 kPa.					
<b>Reference fuel G<sub>25</sub></b>					
Composition:					
Methane	% mole	86	84	88	
Balance <sup>(1)</sup>	% mole	—	—	1	ISO 6974
N <sub>2</sub>	% mole	14	12	16	
Sulphur content	mg/m <sup>3</sup> <sup>(2)</sup>	—	—	10	ISO 6326-5
Notes:					
<sup>(1)</sup> Inerts (different from N <sub>2</sub> ) + C <sub>2+</sub> C <sub>2+</sub>					
<sup>(2)</sup> Value to be determined at 293,2 K (20 °C) and 101,3 kPa.					



Reference fuel G <sub>20</sub>					
Composition:					
Methane	% mole	100	99	100	ISO 6974
Balance <sup>(1)</sup>	% mole	—	—	1	ISO 6974
N <sub>2</sub>	% mole				ISO 6974
Sulphur content	mg/m <sup>3</sup> <sup>(2)</sup>	—	—	10	ISO 6326-5
Wobbe Index (net)	MJ/m <sup>3</sup> <sup>(3)</sup>	48.2	47.2	49.2	
Notes:					
<sup>(1)</sup> Inerts (different from N <sub>2</sub> ) + C <sub>2</sub> + C <sub>2+</sub> .					
<sup>(2)</sup> Value to be determined at 293,2 K (20 °C) and 101,3 kPa.					
<sup>(3)</sup> Value to be determined at 273,2 K (0 °C) and 101,3 kPa.					

‘;

(9) Annex X is amended as follows:

(a) point 2.1. is replaced by the following:

‘2.1. The general requirements shall be those set out in paragraph 2 of Annex 9A to UNECE Regulation No 49, with the exceptions provided for in point 2.2.1 of this Regulation’;

(b) the following point 2.1.1 is inserted after point 2.1:

‘2.1.1. Paragraphs 2.3.2.1 and 2.3.2.2 of Annex 9A to UNECE Regulation No 49 shall be understood as follows:

‘2.3.2.1. The performance of the particulate after treatment device, including the filtration and continuous regeneration processes, shall be monitored against the OBD threshold limit specified in Table 1 of this Annex.

2.3.2.2. Before the dates specified in Article 4(8) of this Regulation and in the case of a wall-flow diesel particulate filter (DPF), the manufacturer may choose to apply the performance monitoring requirements set out in Appendix 8 of Annex 9B to UNECE Regulation No 49 instead of the requirements set out in paragraph 2.3.2.1, if he can demonstrate with technical documentation that in case of deterioration there is a positive correlation between the loss of filtration efficiency and the loss of pressure drop (delta pressure) across the DPF under the operating conditions of the engine specified in the tests described in Appendix 8 of Annex 9B to UNECE Regulation No 49.’

’;

- (c) point 2.2 is replaced by the following:

‘2.2. The Commission shall conduct a review of the monitoring requirements set out in point 2.3.2.1 of Annex 9A to UNECE Regulation No 49 by 31 December 2012. In case the technical non-feasibility of the respective requirements by the dates specified in Article 4(8) of this Regulation is demonstrated, the Commission shall make a proposal for amending those dates accordingly.’;

- (d) points 2.3 to 2.3.3.4 are deleted;

- (e) point 2.4.1 is replaced by the following:

‘2.4.1. If requested by the manufacturer, for vehicles of categories M<sub>2</sub> and N<sub>1</sub>, for vehicles of categories M<sub>1</sub> and N<sub>2</sub> with a technically permissible maximum laden mass not exceeding 7,5 tonnes, and for vehicles of category M<sub>3</sub> Class I, Class II and Class A and Class B as defined in Annex I to Directive 2001/85/EC with a permissible mass not exceeding 7,5 tonnes, compliance with the requirements set out in Annex XI to Regulation (EC) No 692/2008 shall be considered equivalent to the compliance with this Annex, in accordance with the following equivalences:’;

- (f) the following points 2.4.1.1 to 2.4.1.b.2 are inserted after point 2.4.1:

‘2.4.1.1. The OBD standard Euro 6 – plus IUPR in table 1 of Appendix 6 of Annex I to Regulation (EC) No 692/2008 shall be considered equivalent to the character A of table 1 of Appendix 9 of Annex I to this Regulation.

2.4.1.2. The OBD standard Euro 6 – 1 in table 1 of Appendix 6 of Annex I to Regulation (EC) No 692/2008 shall be considered equivalent to the character B of table 1 of Appendix 9 of Annex I to this Regulation.

2.4.1.3. The OBD standard Euro 6 – 2 in table 1 of Appendix 6 of Annex I to Regulation (EC) No 692/2008 shall be considered equivalent to the character C of table 1 of Appendix 9 of Annex I to this Regulation.’;

2.4.1.a. If such alternative approval is used, the information related to OBD systems in points 3.2.12.2.7.1 to 3.2.12.2.7.4 of Part 2 of Appendix 4 to Annex I is replaced by the information in point 3.2.12.2.7 of Appendix 3 to Annex I to Regulation (EC) No 692/2008.’;

2.4.1.b. The equivalences set out in point 2.4.1. shall apply in the following manner:’;

2.4.1.b.1. The OTL's and dates referred to in table 1 of Appendix 9 of Annex I to this Regulation and relevant to the assigned character for which the type-approval is sought shall apply.

2.4.1.b.2. The requirements on NO<sub>x</sub> control measures set out in points 2.1.2.2.1 to 2.1.2.2.5 of Annex XIII shall apply.';

(g) the following points 2.6 to 2.6.3 are added after point 2.5:

**‘2.6. Dual-fuel engines and vehicles**

2.6.1. Dual-fuel engines and vehicles shall comply with the requirements applicable to diesel engines specified in this Annex, regardless of whether operating in dual-fuel or diesel mode.

2.6.2. In addition to point 2.6.1, dual-fuel engines and vehicles shall comply with the OBD requirements set out in paragraph 7 of Annex 15 to UNECE Regulation No 49.

2.6.3. The provisions for alternative approval set out in point 2.4.1 shall not apply in the case of dual-fuel vehicles and engines.’;

(h) points 3.2.1 and 3.2.2 are replaced by the following:

‘3.2.1. The OBD threshold limits (hereinafter 'OTLs') applicable to the OBD system are those specified in the rows "general requirements" of Table 1 for compression ignition engines and of Table 2 for positive ignition engines.

3.2.2. Until the end of the phase-in period set out in Article 4(7), the OBD threshold limits specified in rows "phase-in period" of Table 1 for compression ignition engines and of Table 2 for positive ignition engines shall apply.

Table 1 – OTLs (compression ignition engines, including dual-fuel engines)

	Limit in mg/kWh	
	NO <sub>x</sub>	PM Mass
phase-in period	1500	25
general requirements	1200	25

Table 2 – OTLs (positive ignition engines)

	Limit in mg/kWh	
	NO <sub>x</sub>	CO
phase-in period	1500	7500 <sup>(1)</sup>
general requirements	1200	7500
<sup>(1)</sup> The limit shall apply as from the dates set out in row B of Table 1 in Appendix 9 to Annex I		

‘;

- (i) point 4.1 is replaced by the following:

'4.1. The demonstration requirements shall be those set out in paragraph 4 of Annex 9A to UNECE Regulation No 49.';

- (j) point 4.2 is deleted;

- (k) point 5.1 is replaced by the following:

'5.1. The documentation requirements shall be those set out in paragraph 5 of Annex 9A to UNECE Regulation No 49. The documentation package shall be provided in accordance with the provisions of Article 5(3) and Section 8 of Annex I to this Regulation.';

- (l) points 6 to 6.2.2 are replaced by the following:

**'6. IN-USE PERFORMANCE REQUIREMENTS**

- 6.1. The in-use performance requirements shall be those set out in paragraph 6 of Annex 9A to UNECE Regulation No 49, with the exceptions set out in points 6.1.1 to 6.1.3 of this Regulation.

- 6.1.1. The documentation package shall be provided in accordance with the provisions of Article 5(3) and Section 8 of Annex 1 to this Regulation.

- 6.1.2. Minimum in-use performance ratio

Paragraph 6.2.2 of Annex 9A to UNECE Regulation No 49 shall be understood as follows:

'The value of minimum in-use performance ratio IUPR(min) is 0.1 for all monitors.'

6.1.3. The conditions set out in paragraph A.1.5 of Appendix 1 of UNECE Regulation No 49 shall be subjected to review after the end of the phase-in period specified in Article 4(7) of this Regulation.

6.2. Assessment of the in-use performance during the phase-in period

6.2.1. During the phase-in period set out in Article 4(7) the assessment of the in-use performance of OBD systems shall be conducted in accordance with the provisions set out in Appendix 5 of this Annex.

6.2.2. During the phase-in-period set out in Article 4(7), compliance of the OBD systems with the requirements set out in paragraph 6.2.3 of Annex 9A to UNECE Regulation No 49 is not mandatory.';

(m) points 6.2.3 to 6.5.5.1 are deleted;

(n) Appendices 1 to 4 and 6 are deleted;

(10) Annex XI is amended as follows:

(a) point 4.3.1 is replaced by the following:

'4.3.1. Outline of procedure for evaluation of emissions

The engines indicated in point (a) of Article 16(4) equipped with a complete emissions control system, including the replacement pollution control device of the type for which approval is requested, shall be subjected to tests appropriate for the intended application as described in Annex 4 to UNECE Regulation No 49, in order to compare its performance with the original emissions control system in accordance with the procedure described in points 4.3.1.1 and 4.3.1.2.';

(b) in point 4.3.2.1, the second paragraph is replaced by the following:

'The exhaust after-treatment system shall be preconditioned with 12 WHSC cycles. After this preconditioning, the engines shall be tested in accordance with the WHDC test procedures described in Annex 4 to UNECE Regulation No 49. Three exhaust gas tests of each appropriate type shall be performed.';

(c) in point 4.3.2.2, the second paragraph is replaced by the following:

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

(d) in point 4.3.2.5, the second paragraph is replaced by the following:

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

- (e) point 4.3.2.6 is replaced by the following:

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

The ageing factor for each pollutant shall be the ratio of the applied emission value at the useful life end point and that at the start of the service accumulation (e.g., if the emissions of pollutant A at the start of the service accumulation are 1.50 g/kWh and those at the useful life end point are 1.82 g/kWh, the ageing factor is  $1.82/1.50 = 1.21$ ).';

- (11) Annex XII is amended as follows:

- (a) point 2.1 is replaced by the following:

'2.1. For in-service conformity testing, the provisions set out in Annex 8 to UNECE Regulation No 49, amendment 5, shall apply.';

- (b) point 2.3.1 is replaced by the following:

'2.3.1. All references to WHTC and WHSC shall be understood as references to ETC and ESC, respectively, as defined in Annex 4A to UNECE Regulation No 49, amendment 5.';

- (c) point 2.3.7 is replaced by the following:

'2.3.7. At the request of the manufacturer the approval authority may decide on a sampling plan in accordance with points 3.1.1, 3.1.2 and 3.1.3 of Annex II or in accordance with Appendix 3 of Annex 8 to UNECE Regulation No 49, amendment 5.';

- (12) Annex XIII is amended as follows:

- (a) points 2 and 2.1 are replaced by the following:

'2. GENERAL REQUIREMENTS

The general requirements shall be those set out in paragraph 2 of Annex 11 to Regulation UNECE Regulation No 49, with the exceptions provided for in paragraphs 2.1 to 2.1.5 of this Regulation.

- 2.1. Alternative approval';

(b) the following points 2.1.1 to 2.1.5 are inserted after point 2.1:

‘2.1.1. If requested by the manufacturer, for vehicles of categories M<sub>2</sub> and N<sub>1</sub>, for vehicles of categories M<sub>1</sub> and N<sub>2</sub> with a maximum permissible mass not exceeding 7,5 tonnes and for vehicles of categories M<sub>3</sub> Class I, Class II and Class A and Class B as defined in Annex I to Directive 2001/85/EC with a permissible mass not exceeding 7,5 tonnes, compliance with the requirements set out in Annex XVI to Regulation (EC) No 692/2008 shall be considered equivalent to the compliance with this Annex.

2.1.2. If the alternative approval is used:

2.1.2.1. The information related to the correct operation of NO<sub>x</sub> control measures in points 3.2.12.2.8.1 to 3.2.12.2.8.5 of Part 2 of Appendix 4 to Annex I to this Regulation is replaced by the information in point 3.2.12.2.8 of Appendix 3 of Annex I to Regulation (EC) No 692/2008.

2.1.2.2. The following exceptions shall apply regarding the application of the requirements set out in Annex XVI to Regulation (EC) No 692/2008 and those of this Annex:

2.1.2.2.1. The provisions on reagent quality monitoring set out in points 7.1 and 7.2 of this Annex shall apply, instead of Section 4 of Annex XVI to Regulation (EC) No 692/2008.

2.1.2.2.2. The provisions on reagent consumption monitoring set out in points 8.3 and 8.4 of this Annex shall apply, instead of Section 5 of Annex XVI to Regulation (EC) No 692/2008.

2.1.2.2.3. The driver warning system referred to in Sections 4, 7 and 8 of this Annex shall be understood as the driver warning system in Section 3 of Annex XVI to Regulation (EC) No 692/2008.

2.1.2.2.4. Section 6 of Annex XVI to Regulation (EC) No 692/2008 shall not apply.

2.1.2.2.5. The provisions set out in point 5.2 of this Annex shall apply, in the case of vehicles for use by the rescue services, or engines or vehicles specified in Article 2(3)(b) of Directive 2007/46/EC.

2.1.3. Paragraph 2.2.1 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

‘2.2.1. Information that fully describes the functional operational characteristics of an engine system covered by this Annex shall be

provided by the manufacturer in the form set out in Appendix 4 of Annex I to this Regulation.'

2.1.4. The first paragraph of point 2.2.4 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

'2.2.4. When a manufacturer applies for an approval of an engine or engine family as a separate technical unit, it shall include in the documentation package referred to in Articles 5(3), 7(3) or 9(3) of this Regulation, the appropriate requirements that will ensure that the vehicle, when used on the road or elsewhere as appropriate, will comply with the requirements set out in this Annex. This documentation shall include the following:'

2.1.5. Paragraph 2.3.1 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

'2.3.1. Any engine system falling within the scope of this Annex shall retain its emission control function during all conditions regularly pertaining in the territory of the Union, especially at low ambient temperatures, in line with Annex VI to this Regulation.'

;

(c) points 2.2 to 2.5 are deleted;

(d) point 3.1 is replaced by the following:

'3.1. The maintenance requirements shall be those set out in paragraph 3 of Annex 11 to UNECE Regulation No 49.';

(e) points 3.2 to 3.7 are deleted;

(f) point 4.1 is replaced by the following:

'4.1. The characteristics and operation of the driver warning system shall be those set out in paragraph 4 of Annex 11 to UNECE Regulation No 49, with the exceptions provided for in point 4.1.1 of this Regulation.';

(g) the following point 4.1.1 is inserted after point 4.1:

'4.1.1. Paragraph 4.8 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

'4.8. A facility to permit the driver to dim the visual alarms provided by the warning system may be provided on vehicles for use by the rescue services or on vehicles in the categories defined in point (b) of Article 2(3) of Directive 2007/46/EC.'



’;

(h) points 4.2. to 4.10. are deleted;

(i) point 5.1 is replaced by the following:

’5.1. The characteristics and operation of the driver inducement system shall be those set out in paragraph 5 of Annex 11 to UNECE Regulation No 49, with the exceptions provided for in point 5.1.1 of this Regulation.’;

(j) the following point 5.1.1 is inserted after point 5.1:

’5.1.1. Paragraph 5.2 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

’5.2. The requirement for a driver inducement system shall not apply to engines or vehicles for use by the rescue services or to engines or vehicles specified in point (b) of Article 2(3) of Directive 2007/46/EC. Permanent deactivation of the driver inducement system shall only be done by the engine or vehicle manufacturer.’

’;

(k) points 5.2 to 5.8 are deleted;

(l) point 6.1 is replaced by the following:

’6.1. The measures regarding reagent availability shall be those set out in paragraph 6 of Annex 11 to UNECE Regulation No 49.’;

(m) points 6.2 to 6.3.3 are deleted;

(n) points 7.1 and 7.1.1 are replaced by the following:

’7.1. The measures regarding reagent quality monitoring shall be those set out in paragraph 7 of Annex 11 to UNECE Regulation No 49, with the exceptions provided for in points 7.1.1, 7.1.2 and 7.1.3 of this Regulation.

7.1.1. Paragraph 7.1.1 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

’7.1.1. The manufacturer shall specify a minimum acceptable reagent concentration  $CD_{min}$ , which results in tailpipe emissions not exceeding the limit values specified in Annex I to Regulation (EC) No 595/2009.’

’;

(o) points 7.1.1.1 and 7.1.1.2 are deleted;

(p) points 7.1.2 and 7.1.3 are replaced by the following:

7.1.2. Paragraph 7.1.1.1 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

'7.1.1.1. During the phase-in period specified in Article 4(7) of this Regulation and upon request of the manufacturer for the purpose of point 7.1, the reference to the NO<sub>x</sub> emission limit specified in Annex I to Regulation (EC) No 595/2009 shall be replaced by the value of 900 mg/kWh.'

7.1.3. Paragraph 7.1.1.2 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

'7.1.1.2. The correct value of CD<sub>min</sub> shall be demonstrated during type-approval by the procedure provided for in Appendix 6 of Annex 11 to UNECE Regulation No 49 and recorded in the extended documentation package as specified in Article 3 and Section 8 of Annex I to this Regulation.'

;

(q) points 7.1.4 to 7.3.3 are deleted;

(r) point 8.1 is replaced by the following:

'8.1 The measures regarding reagent consumption monitoring shall be those set out in paragraph 8 of Annex 11 to UNECE Regulation No 49, with the exceptions provided for in point 8.1.1 of this Regulation.'

(s) the following point 8.1.1 is inserted after point 8.1:

'8.1.1. Paragraph 8.4.1.1 of Annex 11 to UNECE Regulation No 49 shall be understood as follows:

'8.4.1.1. Until the end of the phase-in period specified in Article 4(7) of this Regulation, the driver warning system described in Section 4 of Annex 11 to UNECE Regulation No 49 shall be activated if a deviation of more than 50 % between the average reagent consumption and the average demanded reagent consumption by the engine system over the period to be defined by the manufacturer, which shall not be longer than the maximum period specified in paragraph 8.3.1 of Annex 11 to UNECE Regulation No 49, is detected.'

;

(t) points 8.2 to 8.5.3 are deleted;

- (u) point 9.1 is replaced by the following:

'9.1. The measures regarding monitoring failures that may be attributed to tampering shall be those set out in paragraph 6 of Annex 11 to UNECE Regulation No 49.';

- (v) points 9.2 to 9.4.3 are deleted;

- (w) the following points 10 to 12 are added:

'10. Dual-fuel engines and vehicles

The requirements to ensure the correct operation of NO<sub>x</sub> control measures of dual-fuel engines and vehicles shall be those set out in paragraph 8 of Annex 15 to UNECE Regulation No 49, with the exceptions provided for in point 10.1 of this Regulation:

10.1. Paragraph 8.1 of Annex 15 to UNECE Regulation No 49 shall be understood as follows:

'8.1. Sections 1 to 9 of this Annex shall apply to HDDF engines and vehicles, whether operating in dual-fuel or diesel mode.'

11. Point (c) of paragraph A.1.4.3 of Appendix 1 to Annex 11 of UNECE Regulation No 49 shall be understood as follows:

'(c) The achievement of the torque reduction required for low-inducement may be demonstrated at the same time as the general engine performance approval process performed in accordance with this Regulation. Separate torque measurement during the inducement system demonstration is not required in this case. The speed limitation required for severe inducement shall be demonstrated in accordance with the requirements set out in Section 5 of this Annex.'

12. The first and second paragraphs of Appendix 4 of Annex 11 to UNECE Regulation 49 shall be understood as follows:

'This Appendix applies when the vehicle manufacturer requests EC type-approval of a vehicle with an approved engine with regard to emissions and access to vehicle repair and maintenance information in accordance with Regulation (EC) No 595/2009 and this Regulation.

In this case, and in addition to the installation requirements set out in Annex I to this Regulation, a demonstration of the correct installation is required. This demonstration shall be performed by the presentation to the approval authority of a

technical case using evidence, such as engineering drawings, functional analyses, and the results of previous tests.'

‘;

- (x) Appendices 1 to 5 are deleted;
- (y) Appendix 6 is replaced by the following:

,

#### Appendix 6

Demonstration of the minimum acceptable reagent quality  $CD_{min}$

1. The manufacturer shall demonstrate the minimum acceptable reagent quality  $CD_{min}$  during type-approval in accordance with the provisions set out in Appendix 6 of Annex 11 to UNECE Regulation No 49, with the exceptions provided for in point 1.1 of this Appendix:

1.1. Point A.6.3. shall be understood as follows:

‘A.6.3. The pollutant emissions resulting from this test shall be lower than the emission limits specified in paragraphs 7.1.1. and 7.1.1.1. of this Annex’

‘;

- (13) Annex XIV is amended as follows:

(a) points 2.2.1 to 2.2.4 are replaced by the following:

2.2.1. For positive ignition engines fuelled with petrol or E85, paragraph 5.2.3.1 of UNECE Regulation No 85 shall be understood as follows:

‘The fuel used shall be the one available on the market. In case of dispute, the fuel shall be the appropriate reference fuel specified in Annex IX to this Regulation. Instead of the reference fuels specified in Annex IX to this Regulation, the reference fuels defined by the Coordinating European Council for the Development of performance Tests for Lubricants and Engine Fuels (hereinafter "CEC"), for petrol fuelled engines in CEC documents RF-01-A-84 and RF-01-A-85 may be used.’

2.2.2. For positive ignition engines and dual-fuel engines fuelled with LPG:

2.2.2.1 In the case of an engine with self-adapting fuelling, paragraph 5.2.3.2.1 of UNECE Regulation No 85 shall be understood as follows:

'The fuel used shall be the one available on the market. In case of dispute, the fuel shall be the appropriate reference fuel specified in Annex IX to this Regulation. Instead of the reference fuels specified in Annex IX to this Regulation, the reference fuels specified in Annex 8 to UNECE Regulation No 85 may be used.'

2.2.2.2. In the case of an engine without self-adaptive fuelling, paragraph 5.2.3.2.2 of UNECE Regulation No 85 shall be understood as follows:

'The fuel used shall be the reference fuel specified in Annex IX to this Regulation or the reference fuels specified in Annex 8 to UNECE Regulation No 85 may be used with the lowest C<sub>3</sub>-content, or'

2.2.3. For positive ignition engines and dual-fuel engines fuelled with NG/biomethane:

2.2.3.1. In the case of an engine with self-adaptive fuelling, paragraph 5.2.3.3.1 of UNECE Regulation No 85 shall be understood as follows:

'The fuel used shall be the one available on the market. In case of dispute the fuel shall be the appropriate reference fuel specified in Annex IX to this Regulation. Instead of the reference fuels specified in Annex IX to this regulation, the reference fuels specified in Annex 8 to UNECE Regulation No 85 may be used.'

2.2.3.2. In the case of an engine without self-adaptive fuelling, paragraph 5.2.3.3.2 of UNECE Regulation No 85 shall be understood as follows:

'The fuel used shall be the one available on the market with a Wobbe index at least 52,6 MJm<sup>-3</sup> (20°C, 101,3 kPa). In case of dispute, the fuel used shall be the reference fuel G<sub>R</sub> specified in Annex IX to this Regulation.'

2.2.3.3. In the case of an engine labelled for a specific range of fuels, paragraph 5.2.3.3.3 of UNECE Regulation No 85 shall be understood as follows:

'The fuel used shall be the one available on the market with a Wobbe index at least 52,6 MJm<sup>-3</sup> (20°C, 101,3 kPa) if the engine is labelled for the H-range of gases, or at least 47,2 MJm<sup>-3</sup> (20°C, 101,3 kPa) if the engine is labelled for the L-range of gases. In case of dispute, the fuel used shall be the reference fuel G<sub>R</sub> specified in Annex IX to this Regulation if the engine is labelled for the H-range of gases, or the reference fuel G<sub>23</sub> if the engine is labelled for the L-range of gases, that is the fuel with the highest Wobbe index for the relevant range, or'

2.2.4. For compression ignition engines and dual-fuel engines, paragraph 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 this Regulation. Instead of the reference fuels specified in Annex IX to this Regulation, the reference

fuel defined by the CEC for compression ignition engines in CEC document RF-03-A-84 may be used.'

';

(b) point 2.3.2 is replaced by the following:

'2.3.2. For the purpose of emissions testing following the procedures provided for in Annex III to this Regulation, the provisions regarding engine power as specified in paragraph 6.3 of Annex 4 to UNECE Regulation No 49 shall apply.';

## ANNEX IV

### ANNEX III

#### VERIFYING EXHAUST EMISSIONS

##### **1. INTRODUCTION**

- 1.1. This Annex sets out the test procedure for verifying exhaust emissions.

##### **2. GENERAL REQUIREMENTS**

- 2.1. The requirements for conducting the tests and interpreting the results shall be those set out in Annex 4 to UNECE Regulation No 49, using the appropriate reference fuels as specified in Annex IX to this Regulation.
- 2.2. In the case of dual-fuel engines and vehicles, the additional requirements and exceptions set out in Appendix 4 to Annex 15 to UNECE Regulation No 49 when performing an emission test shall apply.
- 2.3. For testing positive ignition engines by using an exhaust dilution system, it is permitted to use analyser systems that meet the general requirements and calibration procedures provided for in UNECE Regulation No 83. In this case, the provisions of paragraph 9 and Appendix 2 to Annex 4 to UNECE Regulation No 49 shall not apply.

However, the test procedures provided for in paragraph 7 of Annex 4 to UNECE Regulation No 49 and the emission calculations provided for in paragraph 8 of Annex 4 to UNECE Regulation No 49 shall apply.';

## ANNEX V

## 'ANNEX XVIII

### SPECIFIC TECHNICAL REQUIREMENTS FOR DUAL-FUEL ENGINES AND VEHICLES

#### 1. Scope

This Annex shall apply to the dual-fuel engines and dual-fuel vehicles covered by this Regulation and sets out the additional requirements and exceptions applicable to the manufacturer for the type-approval of dual-fuel engines and vehicles.

1.1 Dual-fuel engines that operate over the hot part of the WHTC test-cycle with an average gas ratio that does not exceed 10 per cent ( $GER_{WHTC} \leq 10\%$ ) and that do not have a diesel mode are prohibited.

2. A list of types of dual-fuel engines covered by this Regulation and of the main operational requirements is provided for in the Appendix.

#### 3. Dual-fuel specific approval requirements

3.1. The dual-fuel specific approval requirements shall be those set out in paragraph 3 of Annex 15 to UNECE Regulation No 49.

#### 4. General requirements

4.1. Dual-fuel engines and vehicles shall comply with the general requirements specified in paragraphs 4.1 to 4.7 of Annex 15 to UNECE Regulation No 49.

#### 5. Performance requirements

##### 5.1. Emission limits applicable to Type 1A and Type 1B dual-fuel engines

5.1.1. The emission limits applicable to Type 1A and Type 1B dual-fuel engines operating in dual-fuel mode are those set for PI engines in Annex I to Regulation (EC) No 595/2009.

5.1.2. The emission limits applicable to Type 1B dual-fuel engines operating in diesel mode are those set for CI engines in Annex I to Regulation (EC) No 595/2009.

##### 5.2. Emission limits applicable to Type 2A and Type 2B dual-fuel engines

###### 5.2.1. Emission limits applicable over the WHSC test-cycle

For Type 2A and Type 2B dual-fuel engines operating in both diesel and dual-fuel mode, the exhaust emission limits, including the PM number limit, over the WHSC test-cycle are



those applicable to CI engines over the WHSC test-cycle as set in Annex I to Regulation (EC) No 595/2009.

## 5.2.2. Emission limits applicable over the WHTC test-cycle

### 5.2.2.1. Emission limits for CO, NO<sub>x</sub>, NH<sub>3</sub> and PM mass in dual-fuel mode

The CO, NO<sub>x</sub>, NH<sub>3</sub> and PM mass emission limits over the WHTC test-cycle applicable to Type 2A and Type 2B dual-fuel engines operating in dual-fuel mode are those applicable to both CI and PI engines over the WHTC test-cycle as set in Annex I to Regulation (EC) No 595/2009.

### 5.2.2.2. Emission limits for Hydrocarbons in dual-fuel mode

#### 5.2.2.2.1. Natural Gas/Biomethane engines

The THC, NMHC and CH<sub>4</sub> emission limits over the WHTC test-cycle applicable to Type 2A and Type 2B dual-fuel engines operating with Natural Gas/Biomethane in dual-fuel mode are calculated from those applicable to CI and PI engines over the WHTC test-cycle as set in Annex I to Regulation (EC) No 595/2009, in accordance with the calculation procedure specified in paragraph 5.2.3 of Annex 15 to UNECE Regulation No 49.

#### 5.2.2.2.2. LPG engines

The THC emission limits over the WHTC test-cycle applicable to Type 2A and Type 2B dual-fuel engines operating with LPG in dual-fuel mode are those applicable to CI engines over the WHTC test-cycle as set in Annex I to Regulation (EC) No 595/2009.

### 5.2.2.3. Emission limits for PM number in dual-fuel mode

The PM number limit over the WHTC test-cycle applicable to Type 2A and Type 2B dual-fuel engines operating in dual-fuel mode are calculated from those applicable to CI and PI engines over the WHTC test-cycle as set in Annex I to Regulation (EC) No 595/2009, in accordance with the calculation procedure specified in paragraph 5.2.4 of Annex 15 to UNECE Regulation No 49.

### 5.2.2.4. Emission limits in diesel mode

The emission limits, including the PM number limit, over the WHTC test-cycle applicable to Type 2B dual-fuel engines operating in diesel mode are those set for CI engines in Annex I to Regulation (EC) No 595/2009.

## 5.3. Emission limits applicable to Type 3B dual-fuel engines

The emissions limits applicable to Type 3B dual-fuel engines whether operating in dual-fuel mode or in diesel mode are the exhaust emission limits applicable to CI engines as set in Annex I to Regulation (EC) No 595/2009.

6. Demonstration requirements

6.1. Dual-fuel engines and vehicles shall comply with the additional requirements and exceptions related to demonstration set out in paragraph 6 of Annex 15 to UNECE Regulation No 49'

7. Documentation for installing in a vehicle a type approved dual-fuel engine

7.1. The manufacturer of a dual-fuel engine type-approved as separate technical unit shall include in the installation documents of its engine system the appropriate requirements that will ensure that the vehicle, when used on the road or elsewhere as appropriate, will comply with the dual-fuel specific requirements set out in this Regulation. This documentation shall include but is not limited to:

- (a) detailed technical requirements, including the provisions ensuring the compatibility with the OBD system of the engine system;
- (b) the verification procedure to be completed.

The existence and the adequacy of such installation requirements may be checked during the approval process of the engine system.

7.2. In the case where the vehicle manufacturer applying for an EC type-approval of the installation of the engine system on the vehicle is the same manufacturer receiving the type-approval of the dual-fuel engine as separate technical unit, the documentation specified in point 7.1 is not required.

## Appendix 1

### Types of dual-fuel engines and vehicles - list of main operational requirements

	$GER_{WHTC}$	Idle on diesel	Warm-up on diesel	Operation on diesel solely	Operation in absence of gas	Comments
Type 1A	$GER_{WHTC} \geq 90\%$	NOT Allowed	Allowed only on service mode	Allowed only on service mode	Service mode	
Type 1B	$GER_{WHTC} \geq 90\%$	Allowed only on Diesel mode	Allowed only on diesel mode	Allowed only on diesel & service modes	Diesel mode	
Type 2A	$10\% < GER_{WHTC} < 90\%$	Allowed	Allowed only on service mode	Allowed only on service mode	Service mode	$GER_{WHTC} \geq 90\%$ allowed
Type 2B	$10\% < GER_{WHTC} < 90\%$	Allowed	Allowed only on diesel mode	Allowed only on diesel & service modes	Diesel mode	$GER_{WHTC} \geq 90\%$ allowed
Type 3A	NEITHER DEFINED NOR ALLOWED					