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Draft new Regulation on uniform provisions concerning the approval of dual fuel retrofit systems to be installed on heavy duty diesel engines and vehicles

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Regulation No. xx

Draft new Regulation on uniform provisions concerning the approval of dual fuel retrofit systems to be installed on heavy duty diesel engines and vehicles.

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DRAFT

1. Scope

1.1 This Regulation applies to dual fuel retrofit systems intended to be fitted on diesel vehicles or engines, type approved according to Regulation No.49 as amended by the 03 04 or 05 series of amendments, with the exception of

- engines and vehicles type-approved according to row A of tables 1 and 2 in paragraph. 5.2.1. of the these Regulation,

- engines and vehicles type-approved for complying with requirements of Regulation No 83 in alternative to requirements laid down in Regulation No 49 proper.

2. Definitions

2.1 For the purpose of this Regulation, without any further precision, “Regulation 49” means Regulation No 49 as amended by the 03, 04 or 05 series of amendments

2.2 For the purposes of this Regulation the definitions listed in Regulation no. 49 as amended by the 05 series of amendment shall apply, unless otherwise stated by the present section 3

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

2.3.1. “ *Retrofit system or dual-fuel retrofit system*” means a retrofit system intended to be installed in a diesel engine or vehicle, as appropriate, to permit its operation either in diesel or in dual fuel mode.

2.3.2. “*Installation of a [dual-fuel] retrofit system*” means the installation of a type-approved dual-fuel retrofit system on a diesel engine or vehicle, as appropriate, to permit its operation either in diesel or in dual fuel mode.

2.3.3. “*retrofitted component or system*” means any component, system, or control system (hardware or software) modified or completed by installing the retrofit system

2.3.4. “*Retrofit system manufacturer or retrofitter*” means the person or body who is responsible to the approval authority for all aspects of the type-approval of a retrofit system and for ensuring the conformity of production of that system.

2.3.5. “*Retrofit system installer or installer*” means the person or body who is responsible to the approval authority for all aspects of the type-approval of the installation of a type-approved retrofit system and for ensuring the conformity of production of that installation.

- 2.3.8. “Euro IV engine” means an engine type-approved according to row B1 of table 1 and 2 of par. 5.2.1. of Regulation 49.
- 2.3.9. “Euro V engine” means an engine type-approved according to row B2 of table 1 and 2 of par. 5.2.1. of Regulation 49 .
- 2.3.10. “EEV engine” means an engine approved regarding exhaust emissions according to row C of table 1 and 2 of par. 5.2.1. of Regulation 49 .
- 2.3.11. “Original engine system” means the diesel engine system prior to the installation of the engine retrofit system.

3. Application for approval

3.1. Application for approval of a dual-fuel retrofit system intended to be fitted on diesel engines and vehicles.

- 3.1.1. The application for approval of a specific Hddf retrofit system shall be submitted by the retrofit system manufacturer or by his duly accredited representative.
- 3.1.2. It shall be accompanied by the following documentation
 - 3.1.2.1. Description of the retrofit system .
 - 3.1.2.2. Description and list of the engines and/or vehicles on which the retrofit system is intended to be monted
 - 3.1.2.3. Description of the parent engine and vehicle on which the requirements of this Regulation are going to be tested;
 - 3.1.2.4. Description of the modifications applied to the retrofitted engines and vehicles;
 - 3.1.2.5. Compliance statements as required by this Regulation
 - 3.1.2.6. Description of the means permitting Contracting Parties to access an up-to-date list of agreed installers;
 - 3.1.2.7. Description of the means permitting Contracting Parties to access an up-to-date status of the required ISO 9000 certificate of the retrofitter
 - 3.1.2.8. For each retrofit system considered in section 4.1.2.1. and for each engine or vehicle considered in section 4.1.2.2, reference to the applicable Installation manual(s) of the retrofit system and to the reports demonstrating the capability of the agreed installer(s) to perform specific retrofits .
 - 3.1.2.6. For each retrofit system considered in section 4.1.2.1. and for each engine or vehicle considered in section 4.1.2.2, reference to the applicable End-user manuals, .
- 3.1.3. The documentation requested in section 4.1.2. of this Regulation shall complies with the detailed specifications set out in Annexes 1 or 2 of this Regulation, as appropriate

- 3.1.2.8 Copy of the eventual agreements considered in section yyy of This Regulation and contracted between the engine/vehicle manufacturer and the retrofitter regarding the sharing of liability or responsibility

4. Markings

5. Approval

5.1. Approval of a dual-fuel retrofit system intended to be fitted on a diesel engine.

- 5.1.1. Type approval shall be granted if the retrofit system meets the requirements of Annex 1 to this Regulation.

[...]

5.2. Approval of a dual-fuel retrofit system intended to be fitted on road vehicles

- 5.1.1. Type approval shall be granted if the retrofit system meets the requirements of Annex 2 to this Regulation.

[...]

7. Conformity of production

7.1 Initial assessment

7.1.1. Initial assessment of the conformity of production of the dual-fuel retrofit system

The procedure for the initial assessment of the conformity of production of the dual-fuel retrofit system shall comply with those set out in section 1 of the 1958 Agreement, appendix 2 (E/ECE/324 - E/ECE/TRANS/505/Rev.2).

7.1.2. Initial assessment of the conformity of production during the installation of the retrofit system

7.1.2.1. The retrofitter shall, before granting agreement to an installer:

- 7.1.2.1.1. verify the existence of satisfactory arrangements and procedures for ensuring effective control of the installation so that the engine or vehicle when retrofitted complies with the installation manual and requirements, and formally approve them.

- 7.1.2.1.2. verify the installer's registration to harmonized standard ISO 9002 (the scope of which covers the retrofit system to be approved) or an equivalent accreditation standard.

- 7.1.2.1.3. include in its quality manual the procedures for complying with the verification requirements specified in section 7.2.2. of this regulation

- 7.1.2.2. Conformity of the verification requirements specified in paragraph 7.1.2.1.1. to 7.1.2.1.3. shall itself be part of the initial assessment of the conformity of production of the retrofitter

- 7.2. Conformity of production
- 7.2.1. Conformity of production of the dual-fuel retrofit system
- The procedure for conformity of production of the dual-fuel retrofit system shall comply with those set out in section 2 of the 1958 Agreement, appendix 2 (E/ECE/324 - E/ECE/TRANS/505/Rev.2).
- 7.2.2. Conformity of production during the installation of the retrofit system
- 7.2.2.1. The retrofitter shall take the appropriate measures to secure that every dual-fuel retrofit system he is responsible for is installed on an engine or vehicle as to conform with the installation manual and requirements.
- 7.2.2.1.1. These measures shall in particular include, but are not limited to the measures specified in sections 7.2.2.2. to 7.2.2.4 of this Regulation
- 7.2.2.1.2. These measures shall be considered as an integral part of the conformity of production measures considered in paragraph 7.2.1.
- 7.2.2.2. Requirements regarding the installation manual
- 7.2.2.2.1. The installation manual of the retrofit system shall include requirements for the installer to perform in a regular manner appropriate checks and testing, to undertake relevant corrective and curative actions in case of non-conformity, and to report to the retrofitter on the result of these periodic checks or tests.
- 7.2.2.2.2. The installer shall be required in particular to ensure that test results data are recorded and that annexed documents remain available for a period to be determined in agreement with the retrofitter. This period shall not exceed 10 years;
- 7.2.2.3. Verifications to be performed by the retrofitter
- 7.2.2.3.1. The retrofitter shall, at a frequency agreed at type-approval, verify the existence of and agree with the adequate arrangements and documented control plans of the installer to carry out at specified intervals the tests or associated checks specified in the installation manual.
- 7.2.2.3.2. The retrofitter shall, at a frequency to be agreed at type-approval, verify the validity of the registration of its agreed installers to harmonized standard ISO 9002 (the scope of which covers the retrofit system to be approved) or an equivalent accreditation standard
- 7.2.2.4. Withdrawal of an installer from the list of agreed installers
- 7.2.2.4.1. The retrofitter shall withdraw the installer from its list of agreed installers in the following cases
- a) In absence of a valid registration to harmonized standard ISO 9002 (the scope of which covers the retrofit system to be approved) or to an equivalent accreditation standard and scope,.
 - b) In the case when the installer creates obstacles not permitting the retrofitter to proceed to the verifications required in section 7.2.2.3. at the frequency agreed with the type-approval,
 - c) In the case when the retrofitter disagrees with the measures taken by the installer further to a non-conformity in the installation of retrofit systems

- d) In the case when the retrofitter detects a non-conformity in the installation of retrofit systems and the installer disagrees to undertake appropriate corrective and curative measures.

7.1.2.4.2. In case of withdrawal, the retrofitter shall inform in a timely manner the type-approval authority that granted the approval of the retrofit system of that withdrawal and present to that authority upon its request the relevant elements of justification.

7.2 Penalties for non-conformity of production

7.2.1. The approvals granted pursuant to this Regulation may be withdrawn if [...]

7.2.2. If a Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of the Communication specified in Annex 5 to this Regulation.

8. Modification and extension of approvals

10. Production definitely discontinued

11. Responsibilities and liabilities

11.1 In-service conformity of the engine or the vehicle as regards its gaseous and pollutant emissions

11.1.1 The retrofitter has the full responsibility of in-service conformity of the engine or vehicle operating in dual-fuel mode. It shall comply with the requirements set out in Annex 1 or 2 of this regulation, as appropriate

11.1.2 Unless otherwise contracted with the manufacturer of the Diesel engine, the retrofitter takes over the full responsibility of in-service conformity of the engine or vehicle operating in Diesel mode. It shall comply with the requirements set out in Annex 1 or 2 of this regulation, as appropriate

11.1.2.1. In the case when the retrofitter and manufacturer of the diesel engine have agreed that the in-service conformity of the engine operating in Diesel mode remains within the responsibility of the engine manufacturer,

- the retrofitter shall include a copy of that agreement in the type-approval documentation package specified in section xxx of this regulation
- the engine manufacturer shall inform the authority that type-approved the diesel engine of this agreement and include retrofitted engines in the sampling process considered for checking In-Service Conformity

11.2. Liability regarding the product and the protection of the environment

11.2.1. The retrofitter has the full liability of the engine or vehicle retrofit component, as appropriate, once installed on the engine or vehicle.

11.2.2. The retrofitter has the full liability of the retrofitted components or systems of engine or vehicle, as appropriate, when that engine or vehicle operates in dual-fuel mode

- 11.2.3. The retrofitter has the full liability of the retrofitted components or systems engine or vehicle, as appropriate, when that engine or vehicle is not in operation
- 11.2.4 As far as the engine system is concerned, and unless otherwise contracted with the manufacturer of the Diesel engine, the retrofitter takes over the full liabilities that previously were belonging to the engine manufacturer.
- 11.2.4.1. In the case when the retrofitter and manufacturer of the diesel engine have agreed that the engine manufacturer will remain liable for the engine or vehicle under some circumstances, the retrofitter shall include a copy of that agreement in the type-approval documentation package specified in section xxx of this regulation

12 Names and addresses of technical services conducting approval tests and of Administrative departments

- 12.1. The Parties to the Agreement applying this Regulation shall communicate to the United Nations Secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, issued in other countries, are to be sent.

Annex 1 - Approval of dual-fuel retrofit systems intended to be fitted on diesel engines mounted on on-road vehicles

1. Scope

This annex specifies the exhaust emission related technical requirements to be met by dual-fuel retrofit system intended to be fitted on a diesel engine within the scope of this Regulation and type-approved according to Regulation 49 and installed on a diesel on-road vehicle

2. Definitions

For the purpose of this annex, the following additional definitions shall apply:

- 2.1. “*Retrofit engine family*” is a set of engines sharing relevant characteristics regarding the installation and the operation of the engine retrofit system.
- 2.2. “*parent engine for retrofit*” means the engine within a retrofit engine family on which compliance with the requirements of this Regulation is demonstrated.
- 2.3. “*member of the retrofit engine family*” is an engine belonging to the same retrofit engine.
- 2.4. “*Application range*” means the set of retrofit engine families on which the engine retrofit system has been type approved for being installed.

3. Types of Engine retrofit system

- 3.1 Only engine retrofit systems of type [s 1B and] 2B may be type-approved according to this Regulation
- 3.2. Determination of the engine retrofit system type
 - 3.2.1 The determination of the type of an engine retrofit system shall be performed according to the following paragraphs 3.2.1.1. to 3.2.1.x
 - 3.2.2 The demonstration at type-approval of the type of an engine retrofit system may, at the request of the manufacturer be solely performed, per each retrofit engine family, on the parent retrofit engine of that family

4. Retrofit engine family

- 4.1. Criteria for belonging to a retrofit engine family
- 4.2 Selection of the parent retrofit engine
- 4.3 Extension of a retrofit engine family
- 4.4 Application range

- 4.4.1. The application range of an engine retrofit system may include retrofit engine families from one or several manufacturers
- 4.4.2. A complete and documented list of the retrofit engine families constituting the application range of the engine retrofit system shall be provided at type-approval to the type-approval authority
 - 4.4.2.1 This list shall mention for each concerned engine retrofit family the authority that granted type-approval of the engine retrofit system for that system as well as the type-approval number.
 - 4.4.2.2. The manufacturer shall commit itself at type-approval through a declaration to keep this list updated and to keep the approval authority informed in a timely manner of any change to this list.
 - 4.4.2.2.1. Appendix X to this Annex provides a model for that declaration.

5. Operating modes of dual-fuel engines and vehicles

- 5.1. *Conditions for a dual-fuel engine to idle using diesel fuel exclusively*
- 5.2. *Conditions for a dual-fuel engine to warm-up or start using diesel fuel exclusively in dual fuel mode.*
- 5.3. *Operability Restriction*
- 5.4. *Dual-fuel indicators*

6. Pollutant emissions requirements

- 6.1. *Measurement methods*
- 6.2. *Parent engine configurations and operational modes*
- 6.3 *Test cycles*
 - 6.3.2 *Limit values*

7. Power requirements

8. OBD Requirements

9. Durability requirements

- 9.1. Requirements

9.1.1 General durability requirements

The engine retrofit system shall be durable, that is designed, constructed and capable of being fitted so that reasonable resistance to the corrosion and oxidation phenomena to which it is exposed is obtained, having regard to the conditions of use of the vehicle.

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

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

9.1.2. Durability of the emission control system after retrofit

9.1.2.1. The durability of the emission control system of the original engine system shall not be reduced by the engine retrofit system.

9.1.2.1.1. When the requirement of section 9.1.2.1 cannot be met, the user manual shall contain a list of the engine retrofit components the durability of which reduces the overall durability of the emission control system after retrofit and specifies the maintenance and replacement schedule of these components

9.1.2.2. The durability of the emission control system of the original engine system shall not be reduced by the installation operation proper of the engine retrofit system.

9.1.2.2.1. The installation manual of the engine retrofit system shall contain the appropriate instructions for meeting the requirement set in paragraph 9.1.2.2.

9.1.3. Durability of the OBD system

9.1.3.1. The durability of the OBD system when the engine operates in diesel mode shall not be reduced by the retrofit

9.1.3.2. Durability of the OBD system (dual-fuel mode)

The OBD system in dual-fuel mode shall be designed and constructed so as to enable it to identify types of malfunctions over the complete life of the engine system.

The OBD system in dual-fuel mode shall not be programmed or otherwise designed to partially or totally deactivate based on age and/or mileage of the vehicle during the actual life of the vehicle, nor shall the system contain any algorithm or strategy designed to reduce the effectiveness of the OBD system over time.

9.2 Demonstration requirements

9.2.1. Demonstration of the durability of the emission control system system
[to be discussed]

9.2.2. Demonstration by reference to a retrofit engine family within the application range

9.2.2.1. In the case when the demonstration of the durability requirements of the engine retrofit system has already been performed during a previous type-

approval of that engine retrofit system for being retrofitted on an engine family within its application range, the durability of that retrofit system may be considered as granted without performing the demonstration required in paragraph 9.2 of this Annex, provided the conditions specified in the following sections 9.2.2.2. and 9.2.2.3 are met

9.2.2.2. The retrofit engine system has the same technical specifications and installation requirements regarding its exhaust after-treatment components as the ones applicable to the engine retrofit system for which durability has been demonstrated. The retrofitter shall provide data to the Type Approval Authority that demonstrate that the emissions reduction performance of the engine systems once the engine retrofit system installed are similar.

9.2.2.3. The retrofit engine system and its installation once performed according to the installation manual is neither modifying the durability of the components of the retrofitted engine system concerned by the type-approval nor of those of the engine retrofit system for which durability has been demonstrated. The retrofitter shall provide data to the Type Approval Authority that demonstrate these conditions are met.

10. CO₂ and fuel consumption

11. Vehicle requirements

11.1 Vehicle exhaust system

respect of the vehicle requirements regarding the exhaust system (see the R49 installation rules)

11.2 Vehicle OBD and NOx control systems and components

11.2.1 Vehicle OBD and NOx control systems and components for diesel mode operations

respect in diesel mode of the vehicle requirements regarding OBD and NOx control (see the R49 installation rules - either no change or re-approval)

11.2.2 Vehicle OBD and NOx control systems and components for dual-fuel mode operations

Specific rules regarding OBD MI, connector, etc... and demonstration requirements as appropriate

11.3. Dual-fuel specific vehicle indicators

Specific rules and demonstration requirements as appropriate

12 Installation requirements

12.1 In the case when the manufacturer is also fully responsible to the approval authority for all aspects of the type-approval regarding the installation of retrofit system and for ensuring the conformity of production of that installation, the requirements of this section do not apply

12.2 **Installation manual.**

12.3 **Validation of the capability of the installation process**

12.4 **Agreement of the installer by the retrofitter**

12.5 **List of agreed installers**

13. Complements to the User manual of the engine

13.1 **General requirements**

13.2 **Contents of the complementing manual**

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**Appendix 1 - Information document for dual-fuel retrofit
system intended to be fitted on diesel engines**

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Appendix 2 - Arrangement of the HDDF retrofit system type approval mark

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Annex 1 Appendix 3 - Communication

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**Annex 1 Appendix 4 - Addendum to the Communication.
Application range of the HDDF retrofit system.**

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Annex 2 - Approval of dual-fuel retrofit systems intended to be fitted on diesel road vehicles

1. Scope

This annex specifies the technical requirements to be met by dual-fuel retrofit systems intended to be fitted on a diesel vehicle type-approved according to Regulation 49.

These dual-fuel retrofit systems may consist of

- An engine retrofit system and a vehicle retrofit system, or
- A vehicle retrofit system solely, in the cases when the vehicle is equipped with a type approved dual-fuel engine or with an engine that has been retrofitted by a type-approved engine retrofit system.

2. Definitions

For the purpose of this annex, the following definitions shall apply

- 2.1. “*Engine retrofit system*” means a dual-fuel retrofit system intended to be fitted on a diesel engine and the additional emission related components intended to be fitted on the vehicle on which that engine is mounted
- 2.2. “*Vehicle retrofit system*” means a dual-fuel retrofit system intended to be mounted on a diesel vehicle and consisting solely of non-emission related components
- 2.x. “*Engine retrofitter*” means
- 2.y. “*Vehicle retrofitter*” means

3. General requirements

Safety , noise, etc...

Vehicle marking

4. Requirements regarding the engine retrofit system

- 4.1. When the dual fuel retrofit system includes an engine retrofit system, the requirements specified in the following paragraphs A2.3.2 to A.2.3.x shall apply:
- 4.2. The engine retrofit system shall comply with the technical and demonstration requirements set out in Annex I to this Regulation

- 4.3 The documentation of the dual-fuel system shall include the documentation required by Annex I to this Regulation
- 4.4 The specifications regarding the installation of the engine retrofit system set out in Annex I to this Regulation shall apply
- 4.5 The specifications regarding Conformity of Production set out in Annex I to this Regulation shall apply

5. Requirements regarding the vehicle retrofit system

Compliance with R110, R67

Documentation

Installation notice

Compliance with the installation notice of the vehicle retrofitter (Not applicable if the installer is the vehicle retrofitter)

User manual

6. Additional requirements in the case the dual fuel retrofit system consists of an engine retrofit system and a vehicle retrofit system

Single user manual

One single installer for both retrofit systems