Proposal for Supplement 1 to the 01 Series of amendments to Regulation No. 132 (Uniform provisions concerning the approval of Retrofit Emission Control devices (REC) for heavy duty vehicles, agricultural and forestry tractors and non-road mobile machinery equipped with compression ignition engines)

The text reproduced below was prepared by the expert from the European Commission to align the text of Regulation No. 132 to the provisions of the 05 series of amendments to Regulation No. 96.

 Modifications to 01 Series of amendments to Regulation No. 132 are marked in **bold**.

 Proposal

*Paragraph 3.13.,* amend to read*:*

3.13. "*Engine system*" means

**(a) for vehicles defined in paragraph 2.1.,** the engine, the emission control system and the communication interface (hardware and messages) between the engine system Electronic Control Unit(s) (ECU) and any other powertrain or vehicle control unit.

**(b) for engines defined in paragraphs 2.2. to 2.4., an energy converter, other than a gas turbine, designed to transform chemical energy (input) into mechanical energy (output) with an internal combustion process; it includes, where they have been installed, the emission control system and the communication interface (hardware and messages) between the engine's electronic control unit(s) and any other powertrain or category T vehicle or non-road mobile machinery control unit.**

*Paragraph 3.31.,* amend to read*:*

3.31. *"Particle number*" means the number of particles which is defined in the relevant series of amendments to Regulation**s** No. 49 **and No. 96**.

*Paragraph 5.4.,* amend to read*:*

5.4. REC samples for approval testing shall be clearly identified with at least the applicant’s name and the reference of the application **for type approval**.

*Paragraph 7.5.1.,* amend to read*:*

7.5.1. A particulate reduction REC shall be equipped with a monitoring device that detects incorrect operation or removal of the REC and that triggers an audible and/or visual alarm to the operator. For reagent based particulate reduction REC the monitoring device **shall include the detection of the interruption of** ~~may interrupt~~ the input of any reagent or additive~~, if necessary~~. The warning system can be based for example on the continuous measurement of the engine exhaust back-pressure

*Paragraph 7.9.,* amend to read*:*

7.9. The approval shall be conditional upon the **manufacturer ~~providing~~**~~the following sub-paragraphs.~~**:**

~~7.9.1~~**(a).** ~~The manufacturer providing~~ written maintenance instructions to be given by the installer to the driver or operator.

~~7.9.2.~~**(b)** ~~The manufacturer providing~~ installation documents for the REC.

~~7.9.3.~~**(c)** ~~The manufacturer providing~~ instructions for an the operator warning system, ~~an~~ **the** inducement system and the reagent freeze protection (where applicable) to be given by the installer to the **repair-**workshop, or the driver or the operator, as appropriate.

~~7.9.4~~**~~.~~(d)** ~~The manufacturer providing a~~ written statement to the installer, to be given to the driver or operator, on the normal operating conditions (temperature range, environmental conditions, …) within which the REC will operate correctly.

*Paragraph 8.2.2.* is inserted*:*

**8.2.2. The specific requirements regarding the approval of a REC with respect to the emissions limits set out in the 06 series of amendments of Regulation No 49 or 05 series of amendments of Regulation No 96 are laid down respectively in Annex 12 and Annex 13.**

**Renumber old 8.2.2.to new 8.2.3.**

*Paragraph 8.3.2.,* amend to read*:*

8.3.2. The reduction efficiency shall be determined by comparison of the emissions measured over the weighted WHTC for REC to be applied to heavy-duty engines or over the weighted NRTC for REC to be applied to non-road mobile machinery or **Category T vehicles** ~~agricultural and forestry tractor~~ engines. The reduction efficiency shall be calculated as defined in 8.3.4. of this Regulation.

*Paragraph 8.5.2.,* amend to read*:*

8.5.2. Direct sampling from raw exhaust gas prior to dilution is permitted. The dilution ratios of the particle number diluters (PND1 and PND2 of the particle transfer system, as defined in Regulation**s** No. 49 **and No. 96**) shall then be adapted to the measurement range of the particle number counter (PNC).

*Paragraph 8.5.2.,* amend to read:

8.6.2. For Class III and Class IV REC, emissions of ammonia shall not exceed a mean value of 25 ppm when measured using the procedures defined in Appendix 7 to Annex 4 of the 06 series of amendments to Regulation No. 49 **or in Appendix 7 to Annex 4 of the 05 series of amendment to Regulation No. 96.**

*Annexes 1, first paragraph of the Information document,* amend to read:

Information document No..….. of Regulation No. 132 relating to the type approval of Retrofit Emission Control devices (REC) for heavy duty vehicles, **Category T vehicles** ~~agricultural tractors~~ and non-road mobile machinery equipped with compression ignition engines.

*Paragraph 14.1., subparagraph (d) and (e) and paragraphs 4.3.5., 4.3.6., 5.3.5. and 5.3.6. in Annex 1,* amend units to read:

**(g/m3)**

*Paragraph 1. of Annex 3,* amend to read:

|  |  |  |  |
| --- | --- | --- | --- |
| *Engine No.* | *1* | *2* | *n* |
| Make |  |  |  |
| Type |  |  |  |
| Engine |  |  |  |
| Power |  |  |  |
| Category/**Sub-category** |  |  |  |

*Paragraph 3. of Annex 3,* amend to read:

|  |  |  |  |
| --- | --- | --- | --- |
| Number |   |   |   |
| Vehicle or engine manufacturer |   |   |   |
| Model year from/to |   |   |   |
| Engine type |   |   |   |
| ~~Capacity/cylinder~~ **Swept volume /cylinder** (cm³)  |   |   |   |
| **Swept volume** ~~Capacity~~VH (cm³) |   |   |   |
| ~~engine~~ **Engine** ~~net~~ power (kW ~~with~~ **@** min-1)**(1)** |   |   |   |
| Engine baseline emissions |   |   |   |
| Silencer replaced |   |   |   |
| Type identification of the REC |   |   |   |
| REC Type and Reduction Level |   |   |   |
| **(1)Either engine power according to Regulation No.85 or engine maximum net power according to Regulation No. 120 or engine rated net power according to Regulation No. 120 as applicable** |

*Paragraph 4.6.1. of Annex 5(second sub-paragraph),* amend to read:

 The determination of the NO2 and NOx-mass emissions is to be ~~determined~~ **carried out** by simultaneous measurement in accordance with paragraph 4.7.2. of this annex and paragraph 13. of this Regulation.

*Paragraph 4.7.2. of Annex 5(third sub-paragraph),* amend to read:

For CI engines used in non-road mobile machinery or Category T vehicles having an installed net power higher than ~~18~~ **19** kW, but not more than 560 kW the calculation of the NOx and NO2 emissions shall be determined over the complete NRTC cycle.

*Paragraph 4.3. of Annex 6(fourth sub-paragraph)*, amend to read:

 For CI engines used in non-road mobile machinery or Category T vehicles having an installed net power higher than ~~18~~ **19** kW, but not more than 560 kW the calculation of the NOx and NO2 emissions shall be determined over the complete NRTC cycle.

*Table A9/2 of Annex 9,* amend to read:

**Equivalence Matrix for Regulation No. 96 / REC Class I / II**

|  |  |  |  |
| --- | --- | --- | --- |
| *Baseline\** | *Net Power**[kW]* | *Component**[g/kWh]* | *Class I / II, to the standard of* |
| *H* | *I* | *J* | *K* | *L* | *M* | *N* | *P* | *Q* | *R* | ***Stage V*** |
| E | 130 ≤ P ≤ 560 | PM | - | - | - | - | 0.025 | - | - | - | 0.025 | - | **0.015** |
| F | 75 ≤ P < 130 | PM | - | - | - | - | - | 0.025 | - | - | - | 0.025 | **0.015** |
| G | 37 ≤ P < 75 | PM | - | - | - | - | - | - | 0.025 (1) | 0.025(2) | - | 0.025 (1) | **0.015** |
| D**(3)** | 19 ≤ P < 37 | PM | - | - | - | 0.6 | - | - | - | - | - | - | **0.015** |
|  |
| H | 130 ≤ P ≤ 560 | PM | - | - | - | - | 0.025 | - | - | - | 0.025 | - | **0.015** |
| I | 75 ≤ P < 130 | PM | - | - | - | - | - | 0.025 | - | - | - | 0.025 | **0.015** |
| J | 37 ≤ P < 75 | PM | - | - | - | - | - | - | 0.025 (1) | 0.025(2)- | - | 0.025 (1) | **0.015** |
| K | 19 ≤ P < 37 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
|  |
| L | 130 ≤ P ≤ 560 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| M | 75 ≤ P < 130 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| N | 56 ≤ P < 75 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| P | 37 ≤ P < 56 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
|  |
| Q | 130 ≤ P ≤ 560 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| R | 56 ≤ P < 130 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| (1) Only for engines 56 ≤ P < 75 |  |
| (2) Only for engines 37 ≤ P < 56**(3) Power band 19 ≤ P < 37 adapted to the subdivision defined in 05 series of amendment of Regulation No. 96 (Stage V)**\* Where the baseline corresponds to that in 04 series of amendment of Regulation No. 96. |  |

*Table A9/3 of Annex 9,* amend to read:

**Equivalence Matrix for Regulation No. 96 / REC Class III**

|  |  |  |  |
| --- | --- | --- | --- |
| *Baseline\**  | *Net Power*  | *Component* | *Class III, to the standard of* |
|  | *[kW]* | *[g/kWh]* | *H* | *I* | *J* | *K* | *L* | *M* | *N* | *P* | *Q* | *R* | ***Stage V*** |
| E | 130 ≤ P ≤ 560 | NOx | 4.0 (4) | - | - | - | 2.0 | - | - | - | 0.4 | - | **-** |
| F | 75 ≤ P < 130 | NOx | - | 4.0 (4) | - | - | - | 3.3 | - | - | - | 0.4 | **-** |
| G | 37 ≤ P < 75 | NOx | - | - | 4.7 (4) | - | - | - | 3.3 (1) | 4.7 (2,4) | - | 0.4 (1) | **-** |
| D**(3)** | 19 ≤ P < 37 | NOx | - | - | - | 7.5 (4) | - | - | - | - | - | - | **4.70 (4)** |
|  |
| H | 130 ≤ P ≤ 560 | NOx | - | - | - | - | 2.0 | - | - | - | 0.4 | - | **-** |
| I | 75 ≤ P < 130 | NOx | - | - | - | - | - | 3.3 | - | - | - | 0.4 | **-** |
| J | 37 ≤ P < 75 | NOx | - | - | - | - | - | - | 3.3 (1) | 4.7(2,4) | - | 0.4 (1) | **-** |
| K | 19 ≤ P < 37 | NOx | - | - | - | - | - | - | - | - | - | - | **-** |
|  |
| L | 130 ≤ P ≤ 560 | NOx | - | - | - | - | - | - | - | - | 0.4 | - | **-** |
| M | 75 ≤ P < 130 | NOx | - | - | - | - | - | - | - | - | - | 0.4 | **-** |
| N | 56 ≤ P < 75 | NOx | - | - | - | - | - | - | - | - | - | 0.4 | **-** |
| P | 37 ≤ P < 56 | NOx | - | - | - | - | - | - | - | - | - | - | **4.70 (4)** |
|  |
| Q | 130 ≤ P ≤ 560 | NOx | - | - | - | - | - | - | - | - | - | - | **-** |
| R | 56 ≤ P < 130 | NOx | - | - | - | - | - | - | - | - | - | - | **-** |
| (1) Only for engines 56 ≤ P < 75 |  |
| (2) Only for engines 37 ≤ P < 56**(3) Power band 19 ≤ P < 37 adapted to the subdivision defined in 05 series of amendment of Regulation No. 96 (Stage V)** |  |
| (4) Sum of hydrocarbons and oxides of nitrogen\* Where the baseline corresponds to that in 04 series of amendment of Regulation No. 96. |  |

*Table A9/4 of Annex 9,* amend to read:

**Equivalence Matrix for Regulation No. 96 / REC Class IV**

|  |  |  |  |
| --- | --- | --- | --- |
| *Baseline\** | *Net Power**[kW]* | *Component**[g/kWh]* | *Class IV, to the standard of* |
| *H* | *I* | *J* | *K* | *L* | *M* | *N* | *P* | *Q* | *R* | ***Stage V*** |
| E | 130 ≤ P ≤ 560 | PM | - | - | - | - | 0.025 | - | - | - | 0.025 | - | **0.015** |
| NOx | 4.0 (4) | - | - | - | 2.0 | - | - | - | 0.4 | - | **-** |
| F | 75 ≤ P < 130 | PM | - | - | - | - | - | 0.025 | - | - | - | 0.025 | **0.015** |
| NOx | - | 4.0 (4) | - | - | - | 3.3 | - | - | - | 0.4 | **-** |
| G | 37 ≤ P < 75 | PM | - | - | - | - | - | - | 0.025 (1) | 0.025(2) | - | 0.025 (1) | **0.015** |
| NOx | - | - | 4.7 (4) | - | - | - | 3.3 (1) | 4.7(2,4) | - | 0.4 (1) | **-** |
| D**(3)** | 19 ≤ P < 37 | PM | - | - | - | 0.6 | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | 7.5 (4) | - | - | - | - | - | - | **4.70 (4)** |
|  |
| H | 130 ≤ P ≤ 560 | PM | - | - | - | - | 0.025 | - | - | - | 0.025 | - | **0.015** |
| NOx | - | - | - | - | 2.0 | - | - | - | 0.4 | - | **-** |
| I | 75 ≤ P < 130 | PM | - | - | - | - | - | 0.025 | - | - | - | 0.025 | **0.015** |
| NOx | - | - | - | - | - | 3.3 | - | - | - | 0.4 | **-** |
| J | 37 ≤ P < 75 | PM | - | - | - | - | - | - | 0.025 (1) | 0.025(2) | - | 0.025 (1) | **0.015** |
| NOx | - | - | - | - | - | - | 3.3 (1) | 4.7 (2,4) | - | 0.4 (1) | **-** |
| K | 19 ≤ P < 37 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | - | - | **4.70 (4)** |
|  |
| L | 130 ≤ P ≤ 560 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | 0.4 | - | **-** |
| M | 75 ≤ P < 130 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | - | 0.4 | **-** |
| N | 56 ≤ P < 75 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | - | 0.4 | **-** |
| P | 37 ≤ P < 56 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | - | - | **4.70 (4)** |
|  |
| Q | 130 ≤ P ≤ 560 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | - | - | **-** |
| R | 56 ≤ P < 130 | PM | - | - | - | - | - | - | - | - | - | - | **0.015** |
| NOx | - | - | - | - | - | - | - | - | - | - | **-** |
| (1) Only for engines 56 ≤ P < 75(2) Only for engines 37 ≤ P < 56**(3) Power band 19 ≤ P < 37 adapted to the subdivision defined in 05 series of amendment of Regulation No. 96 (Stage V)**(4) Sum of hydrocarbons and oxides of nitrogen\* Where the baseline corresponds to that in 04 series of amendments of Regulation No. 96. |

*Paragraph 8.2 of Annex 10,* amend to read:

8.2. **The manufacturer shall specify a minimum acceptable reagent concentration CDmin, which results in tailpipe NOX emissions not exceeding the lower of either the applicable NOX limit multiplied by 2.25 or the applicable NOX limit plus 1.5 g/kWh. For engine sub-categories with a combined HC and NOX limit, the applicable NOX limit value for the purpose of this paragraph shall be the combined limit value for HC and NOX reduced by 0.19 g/kWh.**

 ~~The manufacturer shall specify a minimum acceptable reagent concentration CDmin, which results in tailpipe NO~~~~x~~ ~~emissions not exceeding~~

 ~~(a) 0.9 g/kWh for retrofitted engine systems complying with the NO~~~~x~~ ~~emission limit for stage Q and R of Regulation No. 96; or~~

 ~~(b) The NO~~~~x~~ ~~emission limit + 1.5 g/kWh for all other systems.~~

*New Annex 13* is inserted*:*

**Annex 13**

**Specific requirements regarding the approval of a REC with respect to the emission limits set out in the 05 series of amendments of Regulation No. 96**

**1. Introduction**

 **This annex sets out the specific requirements for the approval of a REC fitted to an engine, for the purpose of meeting the emission limits set out in the 05 series of amendments to Regulation No. 96.**

**2. Specific requirements**

**2.1. The retrofitted engine system shall meet the following specific requirements**

**2.1.1. The NOx and PM emissions limits set out in Table 7 and Table 8, Appendix 1 to paragraph 5. of the 05 series of amendments to Regulation No. 96.**

**2.1.2. The requirements for the verification of the durability of engine systems, as laid down in Annex 8 to the 05 series of amendments to Regulation No. 96.**

**2.1.3. The specific requirements to limit off-cycle emissions, as laid down in paragraph 5.6 of the 05 series of amendments to Regulation No. 96.**

**2.1.4. The requirement to verify the emissions of crankcase gases, as laid down in paragraph 5.7 of the 05 series of amendments to Regulation No. 96.**

**2.1.5. The requirements with regard to emission control strategies NOx control measures and particulate control measures, as laid down in Annex 9 to the 05 series of amendments to Regulation No. 96.**

**2.1.6. Notwithstanding paragraph 8.6.2. of this Regulation, for Class III and Class IV REC, emissions of ammonia shall not exceed a mean value of 10 ppm when measured according to the requirements of paragraph 3.4 of Annex 9 to the 05 series of amendments to Regulation No. 96.**