# Commission Regulation (EC) No 692/2008 of 18 July 2008 implementing and amending Regulation (EC) No 715/2007 of the European Parliament and of the Council on type-approval of motor vehicles with respect to emissions from light passenger and commercial vehicles (Euro 5 and Euro 6) and on access to vehicle repair and maintenance information (Text with EEA relevance)

# ANNEX VII

## VERIFYING THE DURABILITY OF POLLUTION CONTROL DEVICES (TYPE 5 TEST)

2. TECHNICAL REQUIREMENTS

2.1. The technical requirements and specifications shall be those set out in section 2 to 6 of Annex 9 to UN/ECE Regulation No 83, with the exceptions set out in subsections 2.1.1 to 2.1.4.

2.1.1. As an alternative to the operating cycle described in paragraph 5.1. of Annex 9 of UN/ECE Regulation No 83 for the whole vehicle durability test, the vehicle manufacturer may use Standard Road Cycle (SRC) described in Appendix 3 of this Annex. This test cycle shall be conducted until the vehicle has covered a minimum of 160 000 km.

2.1.2. In paragraph 5.3 and paragraph 6 of Annex 9 of UN/ECE Regulation No 83 the reference to 80 000 km shall be understood as reference to 160 000 km.

2.1.3. The reference to paragraph 5.3.1.4. in the first section of paragraph 6 of Annex 9 of UN/ECE Regulation No 83 shall be understood as reference to Table 1 of Annex I of the Regulation (EC) No 715/2007 for Euro 5 vehicles and Table 2 of Annex I of the Regulation (EC) No 715/2007 for Euro 6 vehicles.

2.1.4. In Section 6 of Annex 9 of UN/ECE Regulation No 83, the sixth subparagraph shall be understood as follows:

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

$$D.E.F. = \frac{Mi_2}{Mi_1}$$

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

$$D.E.F. = Mi_2 - Mi_1$$

2.2. Bench Ageing Durability Test

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

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

2.3.1. Vehicles with Positive Ignition Engines

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

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

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

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

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

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

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

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

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

te for a temperature bin = th e((R/Tr)–(R/Tv))

Total te = Sum of te over all the temperature groups

Bench-Ageing Time = A (Total te)

Where:

| | | |
|---|---|---|
| A | = | 1,1 This value adjusts the catalyst ageing time to account for deterioration from sources other than thermal ageing of the catalyst. |
| R | = | Catalyst thermal reactivity = 17 500 |
| th | = | The time (in hours) measured within the prescribed temperature bin of the vehicle's catalyst temperature histogram adjusted to a full useful life basis e.g., if the histogram represented 400 km, and useful life is 160 000 km; all histogram time entries would be multiplied by 400 (160 000/400). |
| Total te | = | The equivalent time (in hours) to age the catalyst at the temperature of Tr on the catalyst ageing bench using the catalyst ageing cycle to produce the same amount of deterioration experienced by the catalyst due to thermal deactivation over the 160 000 km. |
| te for a bin | = | The equivalent time (in hours) to age the catalyst at the temperature of Tr on the catalyst ageing bench using the catalyst ageing cycle to produce the same amount of deterioration experienced by the catalyst due to thermal deactivation at the temperature bin of Tv over 160 000 km. |
| Tr | = | The effective reference temperature (in °K) of the catalyst on the catalyst bench run on the bench ageing cycle. The effective temperature is the constant temperature that would result in the same amount of ageing as the various temperatures experienced during the bench ageing cycle. |
| Tv | = | The mid-point temperature (in °K) of the temperature bin of the vehicle on-road catalyst temperature histogram. |

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

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

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

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

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

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

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

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

2.3.2. Vehicles with Compression Ignition Engines

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

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

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

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

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

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

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

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

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

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

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

**Changes to legislation:**
There are currently no known outstanding effects for the Commission Regulation (EC) No 692/2008, Division 2..