"Annex 7

 Measuring method to evaluate compliance with the Real Driving Additional Sound Emission Provisions (RD-ASEP)

**In blue police, the work from the DRAFTING GROUP on July 10, 2019 afternoon**

**Highlighted in blue, corrections done during the 12th session of IWG ASEP**

***In red italic police, comments/points to be checked later***

Only applicable for vehicles as specified in paragraph 6.2.3. of this Regulation

1. General

Any vehicle operating conditions within the boundary conditions, as specified in paragraph 2.3. of Annex 7 are valid test conditions and reflect real driving in a general way.

Operation conditions outside of these boundary conditions in paragraph 2.3. of Annex 7 are considered to be extreme driving conditions which rarely occur in traffic. These conditions are covered by extended provisions [like GRB-68-03].

Given by the today’s test tracks geometries and in respect of driver safety, not every test condition may be able to be performed at every test facility.

Notwithstanding such restrictions, the type approval can be granted on these test tracks, however the vehicle has to comply to all provisions of this Annex 7. In these cases, the vehicle manufacturer shall explain to the satisfaction of the authority present at type approval that the vehicle fulfils also the requirements which could not be tested due to the restriction of the outdoor test facility. ***(to be reviewed for indoor facility)***

This annex describes a measurement method to evaluate compliance of the vehicle with the **RD-**ASEP conforming to paragraph 6.2.3. of this Regulation.

**~~A~~**~~ll tests for Annex 3 and for Annex 7 shall be carried out on the same test track~~ **~~or the same indoor facility.~~ Tests for Annex 7 can be carried out on different test facilities**[[1]](#footnote-2) **in case of facility limitation(s). *(to be checked if already in another place in this document)***

**To avoid extended measurements uncertainties, it is recommended to carry out all tests** under similar environmental conditions.

**[**If Annex 7 tests are carried out when type approval has already been granted, e.g. during tests for conformity of production or for in-use compliance, the test specified in Annex 3 **may** be repeated **by using the** same gears/gear ratios and weighting factors as determined during the type approval process**, if these data are available for the particular vehicle variant/version**.**]** *(sentence to be moved to Annex 6)*

2. Measurementmethod

2.1. Measurementinstruments and condition of measurements

Unless otherwise specified, the measurement instruments, the conditions of the measurements and the condition of the vehicle are equivalent to those specified in Annex 3, paragraphs 1. and 2.

[**If the vehicle has different modes,** the mode(s) used during **the measurements** shall be reported in **the** test report.**]** *(to be reconsidered with test report)*

2.2. Method of testing

Unless otherwise specified, the conditions and procedures of Annex 3, paragraphs 3.1. to 3.1.2.1.2.2. shall be used. For the purpose of this annex, single test runs are measured and evaluated.

2.3. Control range

**A measurement for RD-ASEP is valid, if all parameters are within the specifications of the table below during the whole pass-by test between AA’ and BB’.**

|  |  |  |
| --- | --- | --- |
| **Parameter \*\*\*)** | **Minimum** | **Maximum** |
| **Vehicle Speed**  | **> 0 km/h\*) at line AA’** | **100 km/h at line BB’** |
| **Acceleration****Deceleration \*\*)** | **0 m/s²****Limited by vehicle design** | **4 m/s²****< 0 m/s² from line BB’** |
| **Acceleration Performance** | **0 m²/s³**  | **35 m²/s³** |
| **Gear** | **ANY for forward driving**  |
| **Mode** | **ANY** |

**\*) Stable acceleration according to 2.26.1. shall be ensured. Therefore it is allowed to increase the approach vehicle speed such as a stable acceleration is given.**

**\*\*) Deceleration is understood as the vehicle deceleration stipulated by the acceleration control unit only, without any driver applied braking.**

**\*\*\*) In any test condition, the engine speed of a vehicle, which can be propelled only with an ICE operating, is limited to 80% of S.**

 ***(location in the Regulation to be confirmed + Definition of “acceleration performance” to be added in the paragraph 2 in the main body of this regulation related to the definitions)***

2.4 . **Operation** conditions

The operation condition for a particular run is randomly selected by the authority present during type approval in consultation with the manufacturer.

The operation condition per run is defined by the gear selector position, the vehicle mode, the vehicle entry speed at line AA’, and the percentage of accelerator depression at line AA’.

For any run, the technical service has a full random selection capability, but the chosen operation condition shall constitute a valid run within the control range and differ substantially from the test conditions of Annex 3.

The number of test runs is dependent on the vehicle design, for example the number of gear ratios, and the modes according to paragraph 2.25.

The table below provides guidance determining the number of runs under different operation conditions for a vehicle assessment.

|  |  |  |
| --- | --- | --- |
| Vehicle Technology | D-Range | M (locked) |
| Automatic Transmissions (lockable) | t.b.d. | t.b.d. |
| Automatic Transmissions (non lockable) | t.b.d. | n.a. |
| Vehicles with only one gear | t.b.d. | n.a. |
| Manual Transmissions | n.a. | t.b.d. |

*(number of runs to be defined later by the group)*

In addition to the number of runs, the authority present during type approval may request a maximum of [2] additional runs.

The operation conditions shall be entered into the test report sheet according to Table 1 of the Appendix to this Annex.

2.5. Test of the vehicle

2.5.1. The path of the centerline of the vehicle shall follow line CC' as closely as possible throughout the entire test, starting from the approach of the reference point according to definition 2.11. of the main body to line AA' until the rear of the vehicle passes line BB' **+ 20m**.

At line AA' the accelerator shall be **positioned** **to achieve the requested operation condition for this run**. **In cases of accelerated conditions, t**o achieve a more stable acceleration **according to definition 2.26.2.,** or to avoid a downshift between line AA' and BB' pre-acceleration before line AA' may be used according to the provisions of paragraphs 3.1.2.1.2.1. and 3.1.2.1.2.2. of Annex 3. The accelerator shall be kept in **its position** until the rear of the vehicle reaches line BB'. **The accelerator shall then be released as rapidly as possible.**

In case of non-locked transmission conditions, the test may include a gear ratio change to a lower range and a higher acceleration. A gear change to a higher range and a lower acceleration **may occur under cruise or deceleration conditions**.

2.5.2. Measurements reading:

Per **operation condition,** one **test** run is carried out.

For every test run, the following parameters shall be determined and noted:

The maximum A-weighted sound pressure level of both sides of the vehicle, indicated during each passage of the vehicle between the two lines AA' and BB'**+20m**, **shall be measured and** shall be mathematically rounded to the first decimal place (Lwot,κj). *(symbol to be checked)*

If a **measurement within the control range is invalid due to background disturbances, wind gusts or other reasons** ~~sound peak obviously out of character with the general sound pressure level is observed~~, the measurement shall be discarded **and repeated**.

Left and right side may be measured simultaneously or separately**.** For further processing, the higher sound pressure level of both sides shall be used.

The vehicle speed readings at lines AA', PP’ and BB' shall be rounded and reported with the first significant digit after the decimal place (vAA,κj; vPP,κj; vBB,κj). *(symbols to be checked)*

If applicable, the engine speed readings at line BB' and themaximum engine speed between line AA’ and line BB’+20m shall be reported as a full integer value (nBB,κj). *(symbol to be checked)*

In case of pre-acceleration, the distance of the reference point when depressing the accelerator relative to line AA’ shall be reported per run and rounded to a full meter.

All measured values shall be entered into the test report sheet according to the table 1 of Appendix of this Annex.

2.5.3. Calculated values

All calculated values shall be entered into the test report sheet according to the table 1 of Appendix of this Annex.

2.5.3.1. Acceleration

The accelerations shall be calculated between lines AA’ to BB’, and lines PP’ to BB’, in accordance to the formula provided in paragraph 3.1.2.1.2. of Annex 3 and be reported to the second digit after the decimal place (awot,test,κj) as interim results. *(symbol to be checked)*

If the ratio awot\_test,PP-BB / awot\_test,AA-BB **is lower or** equal to 1.20, then report the acceleration calculation between line AA’ and line BB’ as final result. *(symbols to be checked)*

 If the ratio awot\_test,PP-BB / awot\_test,AA-BB **is greater than** 1.20, then report the acceleration calculation between line PP’ and line BB’ as final result. *(symbols to be checked)*

2.5.3.2. Performance

 The performance shall be calculated from the reported vehicle speed at line BB’ in meters per second and the final acceleration result from 2.5.3.1. and rounded to the first digit after the decimal place. *(definition … to be introduced)*

 2.5.3.3. Expected sound pressure level

 For the calculation of the expected sound pressure level, the measured values according to paragraph 2.5.2. and calculated values according to paragraph 2.5.3.1. and 2.5.3.2. shall be used. All calculations are done according to Appendix 2 to this Annex.

 3. Compliance assessment

 3.1. Compliance of a single run

The compliance of a valid single run is given if the measured sound pressure level is lower or equal than the calculated expected sound pressure level of 2.5.3.3. including a margin of [x]dB(A). *(rounded to integer needed or not 🡪 to be decided later)*

Lmeasured,run ≤ Lexpected,run + [x]dB(A)

 3.2. Compliance of vehicle

 The compliance of a vehicle is given, if

* [z]% of the valid runs as defined in 2.4. are compliant according to 3.1. above, and
* ~~a maximum number of [100-z]% of valid runs may exceed the expected sound pressure level.~~
* no valid run shall exceed its expected sound pressure level by more than [x]dB(A) + [y]dB(A).

 Lmeasured,run ≤ Lexpected,run + [x]dB(A) + [y]dB(A).

 4. Extended area

The tests of the extended area are not required for type approval.

Any tests which will be done in the extended area under the conditions of this Annex shall be in line with [GRB-68-03] up to:

* A vehicle speed of [130]km/h,
* A vehicle acceleration of [5]m/s²
* A vehicle performance up to [100]m²/s3.

 II. Justification

1. **Tests for Annex 3 and Annex 7 may be carried out on different test facilities if documentation exists that demonstrates that the differences in sound performance are neglectable.** [↑](#footnote-ref-2)