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# AGREEMENT

## CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS

**done at Geneva on 20 March 1958**

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*Addendum 50: Regulation No. 51*

*Amendment 3*

*Supplement 1 to the 01 series of amendments – Date of entry into force: 12 September 1991*

**UNIFORM PROVISIONS CONCERNING THE APPROVAL OF MOTOR VEHICLES HAVING AT LEAST FOUR WHEELS WITH REGARD TO THEIR NOISE EMISSIONS**

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UNITED NATIONS

Paragraphs 2.2.1 to 2.2.4, amend to read:

"2.2.1 the shape or materials of the bodywork (particularly the engine compartment and its soundproofing);

2.2.3 the type of engine (positive or compression ignition, two- or four-stroke, reciprocating or rotary piston), number and capacity of cylinders, number and type of carburetors or injection system, arrangement of valves, rated maximum power and corresponding engine speed(s);

2.2.4 the transmission system, the number of gears and ratios;"

Insert a new paragraph 2.2.5 to read:

"2.2.5 the noise reduction system as defined in the following paragraphs 2.3 and 2.4".

Paragraph 2.4.1, amend to read:

"2.4.1 that their components as specified in paragraph 4.1, bear different trade names or marks;"

Paragraph 2.4.2, amend to read:

"2.4.2 that the characteristics of the materials constituting a component are different or that the components differ in shape or size, a change in the plating procedure (galvanization, aluminium coating, etc.) is not deemed to produce a difference of type;"

After paragraph 2.4.4 add a new paragraph 2.4.5 to read:

"2.4.5 that the number of the intake and/or exhaust silencers is different."

Paragraph 2.5, amend to read:

"2.5 "Noise reduction system component" means one of the individual constituent parts whose assembly constitutes the noise reduction system.

These components are, in particular: the exhaust pipings, the expansion chamber(s), the silencer(s) proper."

After paragraph 2.5 add the new paragraph 2.5.1 to read:

"2.5.1 The air filter is considered as a component only if its presence is essential to ensure observance of the prescribed sound-level limits."

After paragraph 2.5.1 add a new paragraph 2.5.2 to read:

"2.5.2 Manifolds are not considered components of the noise reduction system."

Paragraph 3.3, delete.

Paragraph 3.4, renumber as 3.3.

Add a new paragraph 3.4 to read:

"3.4 The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted."

Paragraph 4.1, amend to read:

"4.1 The components of the noise reduction system, excluding fixing hardware and piping, shall bear:"

Footnote 2/ referred to in paragraph 5.4.1, amend to read:

"1 for ..... 15 (vacant), 21 for Portugal and 22 for the Russian Federation. Subsequent ....."

Paragraph 6.1.2, amend to read:

"6.1.2 The noise reduction system shall be so designed, constructed and assembled as to be able to reasonably resist the corrosive phenomena to which it is exposed having regard to the conditions of use of the vehicle."

Paragraph 6.2.2.2.2, add the reference to the footnote 4/ as follows:

"6.2.2.2.2 For vehicle types designed for off-road 4/ use and with a maximum authorized ....."

Add the footnote 4/

"4/ As defined in annex 4"

Add a new paragraph 6.3 to read:

"6.3 SPECIFICATIONS REGARDING EXHAUST SYSTEMS CONTAINING FIBROUS MATERIALS"

After paragraph 6.3, add a new paragraph 6.3.1 to read:

"6.3.1 Requirements of annex 5 shall be applied."

Paragraph 7., amend to read:

"7. MODIFICATION AND EXTENSION OF APPROVAL OF A VEHICLE TYPE

7.1 Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:

7.1.1 Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still complies with the requirements, or

7.1.2 Require a further test report from the technical service responsible for conducting the tests.

7.2 Confirmation or refusal of approval, specifying the alterations shall be communicated by the procedure specified in paragraph 5.3 above to the Parties to the Agreement applying this Regulation.

7.3 The competent authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation."

Paragraph 8., amend to read:

"8. CONFORMITY OF PRODUCTION

8.1 Vehicles approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraphs 6 above.

8.2 In order to verify that the requirements of paragraph 8.1 are met, suitable controls of the production shall be carried out.

8.3 The holder of the approval shall in particular

8.3.1 ensure existence of procedures for the effective control of the quality of products;

8.3.2 have access to the control equipment necessary for checking the conformity of each approved type;

8.3.3 ensure that data of test results are recorded and that annexed documents shall remain available for a period to be determined in accordance with the administrative service;

8.3.4 analyse the results of each type of test, in order to verify and ensure the stability of the product characteristics making allowance for variation of an industrial production;

8.3.5 ensure that for each type of product at least the tests prescribed in annex 6 to this Regulation are carried out;

8.3.6 ensure that any sampling or test pieces giving evidence of non-conformity with the type of test considered shall give rise to another sampling and another test. All the necessary steps shall be taken to re-establish the conformity of the corresponding production.

8.4 The competent authority which has granted type-approval may at any time verify the conformity control method applicable to each production unit.

8.4.1 In every inspection the test books and production survey records shall be presented to the visiting inspector.

8.4.2 The inspector may take samples at random which will be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own verification.

8.4.3 When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the tests carried out in application of paragraph 8.4.2 the inspector shall select samples to be sent to the technical service which has conducted the type approval tests.

8.4.4 The competent authority may carry out any test prescribed in this Regulation.

8.4.5 The normal frequency of inspections by the competent authority shall be one every two years. If unsatisfactory results are recorded during one of these visits, the competent authority shall ensure that, all necessary steps are taken to re-establish the conformity of production as rapidly as possible."

Paragraph 9., amend to read:

"9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

9.1 The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements set forth above are not met.

9.2 If a Contracting 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 a communication form conforming to the model in annex 1 to this Regulation."

Paragraph 10., amend to read:

"10. PRODUCTION DEFINITELY DISCONTINUED

10.1 If the holder of the approval completely ceases to manufacture a vehicle type approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation."

Paragraph 11.1.2, amend to read:

"..... equipped with a compression-ignition engine for ....."

Paragraph 12., amend to read:

"12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the 1958 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 3,

Paragraph 1.1, amend to read:

"1.1 Acoustic measurements

The apparatus used for measuring the noise level must be a precision sound-level meter of the type described in "Publication 651 Precision sound level meters", second edition, of the International Electrotechnical Commission (IEC). Measurements must be carried out using the "fast" response of the sound-level meter and the "A" weighting curve which are also described in that publication.

At the beginning and end of each set of measurements, the sound-level meter must be calibrated according to the manufacturer's instructions by means of an appropriate sound source (e.g. a pistonphone). The test must be considered invalid if the sound-level meter errors registered during this calibration exceed 1 dB. The actual deviation shall be stated in the approval document (Annex 1)."

Paragraph 1.2, amend to read:

"1.2 Speed measurements

The engine speed and vehicle speed on the test section shall be determined with an accuracy of 3% or better."

Paragraph 1.3, delete.

Paragraph 2.1.1, amend to read:

"2.1.1 The test site must consist of a central acceleration section surrounded by a substantially flat test area.

The acceleration section must be level; the track surface must be dry and such that rolling noise remains low.

The test track must be such that the conditions of a free sound field between the sound source and the microphone are attained to within 1 dB. This condition shall be deemed to be met if there are no large sound-reflecting objects such as fences, rocks, bridges or building within 50 m of the centre of the acceleration section. The surface of the site must be made of hard materials such as concrete, asphalt or any other acoustically equivalent material within a minimum radius of 10 m around the centre of the acceleration section and be free of powdery snow, tall grass, loose soil or cinders.

There must be no obstacle which could affect the sound field within the vicinity of the microphone and no persons shall stand between the microphone and the sound source. The observer carrying out the measurements must so position himself as not to affect the readings of the measuring instrument."

Paragraph 2.1.2, amend to read:

"2.1.2 Measurements shall not be made under adverse weather conditions. It must be ensured that the results are not affected by gusts of wind.

Any sound peak which appears to be unrelated to the characteristics of the general sound level of the vehicle shall be ignored in taking the readings."

Paragraph 2.1.3. amend to read:

"2.1.3 For measurements, the A-weighted sound level of sound sources other than those of the vehicle to be tested and of wind effects must be at least 10 dB(A) below the sound level produced by the vehicle. A suitable windscreen may be fitted to the microphone provided that account is taken of its effect on the sensitivity and directional characteristics of the microphone."

Paragraph 2.2.2, amend to read:

"2.2.2 The vehicle's tyres must be of the type normally fitted to such vehicle by the manufacturer and must be inflated to the appropriate pressure(s) for the unladen vehicle."

Paragraph 2.2.5, amend to read:

"2.2.5 If the vehicle is fitted with fan(s) having an automatic actuating mechanism, this system must not be interfered with during the measurements."

After paragraph 2.2.5, add a new paragraph 2.2.6 to read:

"2.2.6 If the vehicle is equipped with an exhaust system containing fibrous materials, the exhaust system is to be conditioned before the test according to annex 5."

Paragraph 3.1.1.2, amend to read:

"3.1.1.2 The microphone must be located at a distance of 7.5 ± 0.2 m from the reference line CC' (Figure 1) of the track and 1.2 ± 0.1 m above the ground. Its axis of maximum sensitivity must be horizontal and perpendicular to the path of the vehicle (line CC')."

Paragraph 3.1.1.3, amend to read:

"3.1.1.3 Two lines, AA' and BB', parallel to line PP' and situated respectively 10 m forward and 10 m rearward of that line shall be marked out on the test runway.

The vehicle shall be driven in a straight line over the acceleration section in such a way that the longitudinal median plane of the vehicle is as close as possible to the line CC' and approach line AA' at a steady speed as specified below. When the front of the vehicle reaches the line AA', the throttle shall be fully opened as rapidly as practicable and held in the fully-opened position until the rear of the vehicle crosses line BB'; the throttle shall then be closed again as rapidly as possible."

Paragraph 3.1.1.5, amend to read:

"3.1.1.5 The maximum sound level expressed in A-weighted decibels (dB(A)) shall be measured as the vehicle is driven between lines AA' and BB'. Such value shall constitute the result of the measurement."

Paragraph 3.1.2.3.2.1, add the reference to the footnote 1/ as follows:

"3.1.2.3.2.1 Vehicles of categories M1 and N1 1/ fitted with a gearbox having ....."

Paragraph 3.1.2.3.2.2, add the reference to the footnote 1/ as follows:

"3.1.2.3.2.2 Vehicles of categories M1 and N1 1/ fitted with a gearbox having ....."

Paragraph 3.1.2.3.2.3, amend to read:

"3.1.2.3.2.3 Vehicles of categories other than M1 and N1 1/ whose number of forward gears is X (including those obtained by way of an auxiliary transmission or a multi-gear axle) will be tested successively with the gear selection equal to or higher than $X/_2$. 2/ Only the condition giving the highest noise level shall be reported.

Notwithstanding the provision of items 2.2.2 and 2.2.4 of this Regulation, vehicles having the same type of engine and exhaust and intake systems, but different lengths or widths and different overall gear ratios, may be regarded as vehicles of the same type. In this case, it will be sufficient to test a single vehicle representative of the type in question, in principle, by selecting as the test vehicle that with the lowest mass in running order."

Add the following footnote: 1/

"1/ As defined in annex 4"

Paragraph 3.1.2.4.2.1, amend to read:

"3.1.2.4.2.1 .....
However, if during the test, in the case of vehicles having more than two separate gears, there is an automatic down-shift to first gear, this down-shift may be avoided, at the manufacturer's choice, either by:

Increasing the speed ....."

Paragraph 3.1.2.4.2.2, add the words:

"External downshifting (for example kickdown) shall be excluded."

After paragraph 3.1.2 add a new paragraph 3.1.3 to read:

"3.1.3 INTERPRETATION OF RESULTS

The measurements of noise emitted by the vehicle in motion shall be considered valid if the difference between the two consecutive measurements on the same side of the vehicle is not more than 2 dB(A).

The figure recorded shall be that corresponding to the highest sound level. Should that figure exceed by more than 1 dB(A) the maximum sound level authorized for the category of vehicle tested, a second series of two measurements shall be made. Three out of the four results so obtained must fall within the prescribed limits.

To allow for lack of precision in the measuring instrument the figures read from it during measurement shall each be reduced by 1 dB(A)."

After paragraph 3.2 add a new paragraph 3.2.1 to read:

"3.2.1 Acoustic measurements

A precision sound level meter as defined item 1.1 must be used for the measurements."

Renumber paragraph 3.2.1 as 3.2.2 and amend to read:

"3.2.2 Test site - local conditions (Figure 2)"

Renumber paragraphs 3.2.1.1, 3.2.1.2 and 3.2.1.3 as 3.2.2.1, 3.2.2.2 and 3.2.2.3

Renumber paragraph 3.2.2 as 3.2.3 and amend to read:

"3.2.3 Disturbance noise and wind interference

Readings on the measuring instruments produced by ambient noise and wind must be at least 10 dB(A) below the sound level to be measured. A suitable windscreen may be fitted to the microphone provided that account is taken of its effect on the sensitivity of the microphone."

Renumber paragraph 3.2.3 as 3.2.4

Renumber paragraph 3.2.3.1 as 3.2.4.1 and amend to read:

"3.2.4.1 Nature and number of measurements

The maximum sound level expressed in A-weighted decibels (dB(A)) must be measured during the operating period referred to in paragraph 3.2.4.3.2.1.

At least three measurements must be taken at each measuring point."

Renumber paragraph 3.2.3.2 as 3.2.4.2 and add at the end the following:

"..... specified by the manufacturer.

If the vehicle is fitted with fan(s) having an automatic actuating mechanism, this system shall not be interfered with during the sound level measurements."

Renumber paragraphs 3.2.3.3, 3.2.3.3.1, 3.2.3.3.1.1, 3.2.3.3.1.2 and 3.2.3.3.1.3 respectively as 3.2.4.3, 3.2.4.3.1, 3.2.4.3.1.1, 3.2.4.3.1.2 and 3.2.4.3.1.3.

Renumber paragraph 3.2.3.3.1.4 as 3.2.4.3.1.4 and amend to read:

"3.2.4.3.1.4 In the case of an exhaust provided with two or more outlets spaced less than 0.3 m apart and which are connected to the same silencer, only one measurement is made; the microphone ....."

Renumber paragraphs 3.2.3.3.1.5, 3.2.3.3.1.6, 3.2.3.3.2 and 3.2.3.3.2.1 respectively as 3.2.4.3.1.5, 3.2.4.3.1.6, 3.2.4.3.2 and 3.2.4.3.2.1.

Renumber paragraph 3.2.3.3.2.2 as 3.2.4.3.2.2 and amend to read:

"3.2.4.3.2.2 ..... maintenance of constant engine speed and throughout the entire deceleration period, the maximum sound level meter reading being taken as the test value."

Paragraph 3.2.3.3.3, delete

After paragraph 3.2.4.3.2.2 add the following paragraphs:

"3.2.5 Results

3.2.5.1 Readings, rounded off to the nearest decibel, shall be taken from the measuring instrument.

Only those values obtained from three consecutive measurements which do not differ by more than 2 dB(A) respectively will be taken into consideration.

3.2.5.2 The highest of these three values shall constitute the test result."

Paragraph 4 and subsequent paragraphs 4.1, 4.2 and 4.3 delete.

ANNEX 3 - Appendix - Fig. 1

Add the letter "C" at the bottom of the figure

After annex 4 add a new annex 5 and the relating appendix to read as follows:

"Annex 5

EXHAUST SYSTEMS CONTAINING FIBROUS MATERIALS

1. Fibrous materials shall not be used in the construction of silencers unless suitable measures are undertaken at the design or production stages to ensure that the efficiency required to comply with the limits imposed in paragraph 6.2.2 of this Regulation is achieved on the road. Such a silencer shall be considered to be efficient on the road if the exhaust gases are not in contact with the fibrous materials or if the silencer of the prototype vehicle tested in accordance with the requirements of paragraphs 3.1 and 3.2 of this Regulation has been put into a normal state for road use before the sound-level measurements are taken. This can be achieved by using one of the three tests described in paragraphs 1.1, 1.2 and 1.3 below or by removing the fibrous materials from the silencer.

1.1 Continuous road operation for 10,000 km

1.1.1 About half this operation consists of town driving and the other half of long-distance runs at high speed; continuous road operation can be replaced by a corresponding test-track programme.

1.1.2 The two speed régimes should be alternated on several occasions.

1.1.3 The complete test programme must include a minimum of 10 breaks of at least three hours duration in order to reproduce the effects of cooling and any condensation which may occur.

1.2 Conditioning on a test bench

1.2.1 Using standard parts and observing the vehicle manufacturer's instructions, the silencer must be fitted to the engine, which is coupled to a dynamometer.

1.2.2 The test must be conducted in six six-hour periods with a break of at least 12 hours between each period in order to reproduce the effects of cooling any condensation which may occur.

1.2.3 During each six-hour period, the engine shall be run, under the following conditions in turn:

(1) Five minutes at idling speed;

(2) One-hour sequence under 1/4 load at 3/4 of rated maximum speed (S);

(3) One-hour sequence under 1/2 load at 3/4 of rated maximum speed (S);

(4) 10-minute sequence under full load at 3/4 of rated maximum speed (S);

(5) 15-minute sequence under 1/2 load at rated maximum speed (S);

(6) 30-minute sequence under 1/4 load at rated maximum speed (S).

Total duration of the six sequences: three hours.

Each period must comprise two sets of the six above-mentioned sequences.

1.2.4 During the test, the silencer must not be cooled by a forced draught simulating normal airflow around the vehicle. Nevertheless, at the request of the manufacturer, the silencer may be cooled in order not to exceed the temperature recorded at its inlet when the vehicle is running at maximum speed.

1.3 Conditioning by pulsation

1.3.1 The exhaust system or components thereof must be fitted to the vehicle referred to in paragraph 3.3 of this Regulation or the engine referred to in paragraph 3.4 of this Regulation. In the former case the vehicle must be mounted on a roller dynamometer.

In the second case, the engine must be mounted on a dynamometer. The test apparatus, a detailed diagram of which is shown in Figure 3 of the appendix to this annex must be fitted at the outlet of the exhaust system. Any other apparatus providing equivalent results is acceptable.

1.3.2 The test apparatus must be adjusted in a such a way that the exhaust-gas flow is alternatively interrupted and re-established by the quick-action valve for 2,500 cycles.

1.3.3 The valve must open when the exhaust-gas back pressure, measured at least 100 mm downstream of the intake flange, reaches a value of between 0.35 and 0.40 bar. It must close when this pressure does not differ by more than 10% from its stabilized value with the valve open.

1.3.4 The time-delay switch shall be set for the duration of gas exhaust resulting from the provisions laid down in paragraph 1.3.3 above.

1.3.5 Engine speed must be 75% of the speed (S) at which the engine develops maximum power.

1.3.6 The power indicated by the dynamometer must be 50% of the full-throttle power measured at 75% of engine speed (S).

1.3.7 Any drainholes must be closed off during the test.

1.3.8 The entire test must be completed within 48 hours.

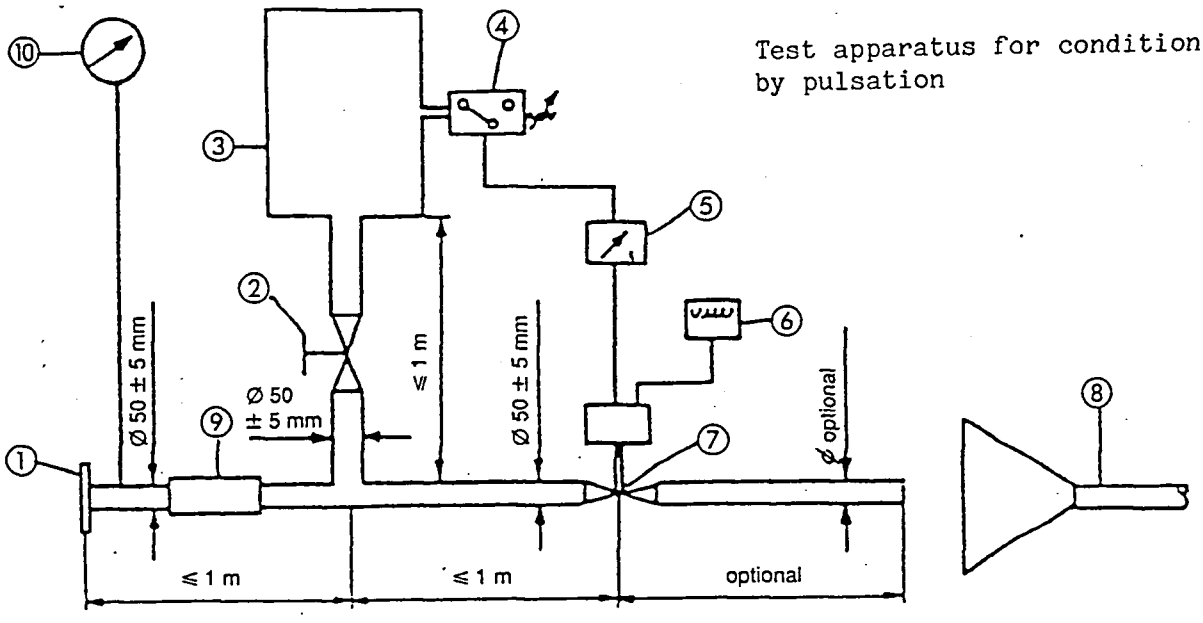
If necessary, one cooling period will be observed after each hour.".

Add the following new figure 3 to the appendix of this annex.

## Annex 5 - Appendix

Figure 3

Test apparatus for conditioning by pulsation




1. Inlet flange or sleeve for connection to the rear of the test exhaust system.

2. Hand-operated regulating valve.

3. Compensating reservoir with a maximum capacity of 40 l and a filling time of not less than one second.

4. Pressure switch with an operating range of 0.05 to 2.5 bar.

5. Time delay switch.

6. Pulse counter.

7. Quick-acting valve, such as exhaust brake valve 60 mm in diameter, operated by a pneumatic cylinder with an output of 120 N at 4 bar. The response time, both when opening and closing, must not exceed 0.5 second.

8. Exhaust gas evacuation.

9. Flexible pipe.

10. Pressure gauge.

After annex 5 and the relating appendix add a new annex 6 to read as follows:

"Annex 6

CHECKS ON CONFORMITY OF PRODUCTION

1. GENERAL

These requirements are consistent with test to be held to check conformity of production, according to paragraphs 8.3.5 and 8.4.3.

2. TESTING PROCEDURES

The methods of testing, measuring instruments and interpretation of results shall be those described in annex 3 to this Regulation. The vehicle(s) under test shall be subjected to the test for measurement of noise of vehicle in motion as described in annex 3, paragraph 3.1 to this Regulation.

3. SAMPLING

One vehicle has to be chosen. If after the test prescribed in paragraph 4.1 below the vehicle is not considered as conforming to the requirements of this Regulation, two more vehicles have to be tested.

4. EVALUATION OF THE RESULTS

4.1 If the sound level of the vehicle tested pursuant to paragraphs 1 and 2 above does not exceed by more than 1 dB(A) 1/ the limit values prescribed in paragraph 6.2.2 of this Regulation, the vehicle type shall be considered to conform to the requirements of this Regulation.

4.2 If the vehicle tested according to paragraph 4.1 above does not satisfy the requirements of that paragraph, two more vehicles of the same type have to be tested pursuant to paragraphs 1 and 2 above.

4.3 If the sound level of the second and/or third vehicle of paragraph 4.2 above exceeds by more than 1 dB(A) 1/ the limit values prescribed in paragraph 6.2.2 of this Regulation, the vehicle type shall be considered not to conform to the requirements of this Regulation and the manufacturer shall take the necessary measures to re-establish the conformity.

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1/ This tolerance covers variations in productions as well as the different conditions in the measuring procedures compared to the type approval tests."

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