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Economic Commission for Europe**Inland Transport Committee****World Forum for Harmonization of Vehicle Regulations****Working Party on Noise****Fifty-fourth session**

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Item 5 of the provisional agenda

Regulation No. 92 (Replacement exhaust silencing systems for motorcycles)**Proposal for 01 series of amendments to Regulation No. 92****Submitted by the expert from Italy ***

The text reproduced below was prepared by the expert from Italy assimilating of the original version of the Regulation and the amendments and updates, taking into consideration the revisions of Regulations Nos. 9, 41 and 63 referred to in this Regulation, as requested during the fifty-third session of the Working Party on Noise (GRB) (see ECE/TRANS/WP.29/GRB/51, para. 18). It is based on Informal document GRB-53-02. Since the proposed amendments are substantial, the text is presented as a Revision to Regulation No. 92. Modifications to the current text of the Regulation are marked in bold for new characters.

* In accordance with the programme of work of the Inland Transport Committee for 2006–2010 (ECE/TRANS/166/Add.1, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance the performance of vehicles. The present document is submitted in conformity with that mandate.

I. Proposal

"1. Scope

This Regulation applies to replacement exhaust silencing systems for vehicles of categories L₁, L₂, L₃, L₄ and L₅.¹

2. Definitions

For the purpose of this Regulation

- 2.1. "*Non-original replacement exhaust system or components of this system*" means a system of a type different from that fitted to the vehicle on approval or extension of approval. It may be used only as a replacement exhaust or silencing system.
- 2.2. "*Non-original replacement exhaust system component*" means one of the various components which together form the exhaust system;²
- 2.3. "*Non-original replacement exhaust systems of different types*" means silencing systems which differ significantly in such respects as:
- (a) Their components bear different trade names or marks,
 - (b) The characteristics of the materials constituting a component are different or the components differ in shape or size; a modification in respect to coating (zinc coating, aluminium coating, etc.) is not considered a change of type,
 - (c) The operating principles of at least one component are different,
 - (d) Their components are combined differently;
- 2.4. "*Non-original replacement exhaust system (RESS) or component thereof*" means any part of the exhaust silencing system defined in paragraph 2.1. intended for use on a vehicle other than a part of the type fitted to the vehicle when submitted for type approval pursuant to Regulation No. 9, Regulation No. 41 or Regulation No. 63;
- 2.5. "*Approval of a non-original RESS or component(s) thereof*" means the approval of the whole or a part of a silencing system adaptable to one or several specified types of motorcycle, moped or three-wheeled vehicle, as regards the limitation of their noise level
- 2.6. "*Motorcycle, moped or three-wheeled vehicle type*" means motorcycles, mopeds or three-wheeled vehicles which do not differ in such essential respects as:
- (a) The type of engine (two-stroke or four-stroke with reciprocating or rotary pistons; number and capacity of cylinders; number and type of carburettors or injection systems; arrangement of valves; maximum net power and corresponding engine speed). For rotary piston engines,

¹ As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3), Annex 7 (documents TRANS/WP.29/78/Rev.1/Amend. 2 and Amend. 4)

² Those components are, in particular, the exhaust manifold, the silencer proper, the expansion chamber and the resonator

the cubic capacity should be taken to be double of the volume of the chamber;

- (b) Number and ratio of gears;
- (c) Number, type and arrangement of exhaust silencing systems.

3. Application for approval

- 3.1. The application for approval of a RESS or components thereof shall be submitted by its manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the under mentioned documents in triplicate and the following particulars:
 - (a) A description of the motor cycle type(s) on which the RESS or components are intended to be fitted, with regard to the items referred to in paragraph 2.6 above. The numbers and/or symbols identifying the engine type and the motor cycle type shall be specified and the motor cycle type approval number, if necessary;
 - (b) A description of the complete RESS showing the relative position of each of its components, together with instructions for their assembly;
 - (c) Detailed drawings of each RESS component to enable it to be easily located and identified, and specification of the materials used. These drawings shall also indicate the location for the mandatory affixing of the approval number.
- 3.3. At the request of the technical service conducting the tests for approval, the manufacturer of the RESS shall submit:
 - (a) Two samples of the RESS or its components submitted for approval;
 - (b) A sample of the original exhaust silencing system with which the motor cycle was equipped when submitted for type approval;
 - (c) A test motor cycle representative of the type to which the RESS is to be fitted; this motor cycle, when measured for noise emission according to the methods described in annex 3 (including all relevant amendments) to Regulation No. 9, Regulation No. 41 or Regulation No. 63. shall satisfy the following conditions:
 - (i) If the **motorcycle**, moped or three-wheeled vehicle is of a type for which approval has been issued pursuant to the requirements of each of Regulations Nos. 9, 41 or 63:
 - a. The sound level, during the test in motion shall not exceed the specified limit by more than 1 dB(A);
 - b. The sound level during the stationary test shall not exceed by more than 3 dB(A), the level determined during the approval and indicated on the manufacturer's plate.
 - (ii) If the motorcycle, moped or three-wheeled vehicle is not of the type for which approval has been issued pursuant to the requirements of the Regulation, the sound level shall not exceed by more than 1 dB(A) the limit applicable at the time when it was first put on the road.

4. Markings

- 4.1. Each component of the RESS, excluding pipes and fitting accessories, shall bear:
- (a) The trade name or mark of the manufacturer of the RESS of its components;
 - (b) The commercial designation given by the manufacturer.
- 4.2. These markings shall be clearly legible and indelible and also visible in the position at which the RESS is fitted.
- 4.3. The RESS shall be labelled by its manufacturer; indicating the type(s) of motor cycle(s) for which it has been granted the approval.
- 4.4. A component may carry several approval numbers if it has been approved as a component of several replacement exhaust systems.
- 4.5. The replacement exhaust system shall be supplied in a packaging or carry a label both providing the following particulars:
- (a) The trade name or mark of the manufacturer of the replacement silencing system and its components,
 - (b) The address of the manufacturer or his representative,
 - (c) A list of vehicle models for which the replacement silencing system is intended.
- 4.6. The manufacturer shall provide:
- (a) Instructions explaining in detail the correct method of mounting on the vehicle,
 - (b) Instructions for handling the silencing system,
 - (c) A list of components with the numbers of the corresponding parts, excluding retainers.
- 4.7. The approval mark.

5. Approval

- 5.1. If the RESS or component thereof submitted for approval under this Regulation meets the requirements of paragraph 6 below, approval for that type shall be granted.
- 5.2. An approval number shall be assigned to each RESS type approved. Its first two digits (at preset **01** corresponding to the **01** series of amendments to the Regulation) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another type of RESS or component designed for, the same type(s) of motor cycle.
- 5.3. Notice of approval or extension or refusal of approval of a RESS or component thereof under this Regulation shall be communicated to the

Parties to the Agreement which apply this Regulation, by means of a form conforming to the model in Annex 1 to this Regulation.

- 5.4. There shall be affixed to every RESS and component thereof conforming to a type approved under this Regulation an international approval mark consisting of:
- (a) A circle surrounding the letter "E" followed by the distinguishing number of the country which has granted approval;³
 - (b) The number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in (a) **above**;
 - (c) The approval number shall be indicated in the approval form, together with the method used for the approval tests.
- 5.5. The approval mark shall be easily legible when the RESS is fitted to the vehicle, and shall be indelible.
- 5.6. A component may be marked with more than one approval number if it has been approved as a part of more than one RESS; in this case the circle need not be repeated. Annex 2 to this Regulation gives an example of the approval mark.

6. Specifications

6.1. General specifications

The silencer must be designed, constructed and capable of being mounted so that:

- (a) The motor cycle complies with the requirements of this Regulation under normal conditions of use, and in particular regardless of any vibrations to which it may be subjected,
- (b) It displays reasonable resistance to the corrosion phenomena to which it is exposed, with due regard to the normal conditions of use of the motor cycle,
- (c) The ground clearance provided by the silencer originally fitted, and the possible inclined position of the motor cycle, are not reduced,
- (d) Unduly high temperatures do not exist at the surface,

³ 1 for Germany, ... 24 for Ireland, ... 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia and Herzegovina, 32 for Latvia, 33 (vacant), 34 for Bulgaria, 35-36 (vacant), 37 for Turkey, 38-39 (vacant), 40 for the former Yugoslav Republic of Macedonia, 41 (vacant), 42 for the European Community (Approvals are granted by its Member States using their respective ECE symbol), 43 for Japan, 44 (vacant), 45 for Australia and 46 for Ukraine, 47 for South Africa, 48 for New Zealand, 49 for Cyprus, 50 for Malta, 51 for the Republic of Korea, 52 for Malaysia, 53 for Thailand, 54 and 55 (vacant), 56 for Montenegro, 57 (vacant) and 58 for Tunisia. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify the Agreement Concerning the Adoption for Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and/or be Used on Wheeled Vehicles, and the Conditions for Reciprocal Recognition of Approval Granted on the Basis of these Prescriptions, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement

- (e) Its edges are not sharp or jagged and there is sufficient space for shock absorbers and springs.
- (f) Adequate clearance of spring parts is provided,
- (g) Adequate safety clearance of pipes is provided,
- (h) It is tamper-resistant in a way that is compatible with clearly-defined maintenance and installation requirements.
- (i) **Additional prescriptions related to tamper-ability and manually adjustable multimode exhaust or silencing systems:**
 - (i) **All exhaust or silencing systems shall be constructed in a way that does not easily permit removal of baffles, exit-cones and other parts whose primary function is as part of the silencing/expansion chambers. Where incorporation of such a part is unavoidable, its method of attachment shall be such that removal is not facilitated easily (e.g. with conventional threaded fixings) and should also be attached such that removal causes permanent/ irrecoverable damage to the assembly.**
 - (ii) **Exhaust or silencing systems with multiple, manually adjustable operating modes shall meet all requirements in all operating modes. The reported noise levels shall be those resulting from the mode with the highest noise levels**

6.2. **Specifications regarding sound levels**

The acoustic efficiency of the RESS or components thereof shall be verified by means of the methods described in **paragraphs 6.2.1., 6.2.2. and 6.2.3. of Regulation No. 9, Regulation No. 41 or Regulation No. 63. In particular, for the application of this paragraph reference shall be made to [the amendment level of / to the series of amendments to] Regulation No. 92 which was in force at the time of type approval of the new vehicle.** When the RESS or its components is fitted to the motorcycle, moped or three-wheeled vehicle described in paragraph 3.3.(c), the sound level values obtained using the two methods (stationary and running vehicle) shall satisfy one of the following condition:

They shall not exceed the values measured in conformity with the requirements of paragraph 3.3.(c), for the same moped, motorcycle, or three-wheeled vehicle when fitted with the original silencing system during either the running test or the stationary test.

6.3. **Measurement of vehicle performance**

- 6.3.1. The RESS or its components shall be such as to ensure that the motor cycle's performance is comparable with that achieved with the original exhaust silencing system or components thereof.
- 6.3.2. The RESS or, at the manufacturer's choice, the components thereof shall be compared with an original silencing system or components, also in new condition, successively fitted to the motor cycle referred to in paragraph 3.3.(c).
- 6.3.3. The verification shall be carried out by measuring the output curve in accordance with paragraph 6.3.4.1. or 6.3.4.2. The maximum power and the maximum power speed measured with the RESS shall not exceed the net

power and the speed measured under the conditions set out below with the original equipment exhaust system by more than ± 5 per cent.

6.3.4. Test method

6.3.4.1. Engine test method

The measurements shall be carried out on the engine referred to in paragraph 3.3.(d) or, if it is not available, on the engine of the motor cycle referred to in paragraph 3.3.(c), the engine being in both cases mounted on a dynamometer.

6.3.4.2. Motor cycle test method

The measurements shall be carried out on the motor cycle referred to in paragraph 3.3.(c). The values obtained with the original silencing system shall be compared with those obtained with the RESS. The test shall be conducted on a roller dynamometer.

6.4. Additional provisions regarding the RESS or its components filled with fibrous materials

The use of fibrous absorbent material shall be permitted in the construction of the RESS only if the requirements in annex 3 are met.

6.5. Evaluation of the emission of pollutants of vehicles equipped with replacement silencer system

The vehicle referred to in paragraph 3.3.(c) exhaust silencing system (RESS) of the type for which approval is requested, shall fulfil the pollution requirements according to the type approval of the vehicle. The evidence shall be documented in the test report.

7. Modification and extension of the approval of RESS and extension of approval

7.1. Every modification of the type of RESS or its components shall be notified to the administrative department which approved the type of RESS. The said department may then either:

- (a) Consider that the modifications made are unlikely to have an appreciable adverse effect, or
- (b) Require a further test report from the technical service responsible for conducting the tests.

7.2. The manufacturer of the RESS or component thereof or his duly accredited representative may ask the administrative department which has granted the approval of the RESS for one or several types of motorcycle, **moped or three-wheeled vehicle** for an extension of the approval to other types of motorcycle, **moped or three-wheeled vehicle**. The procedure shall be as described in paragraph 3 above.

7.3. Confirmation or refusal of approval, specifying the modifications, shall be communicated in accordance with the procedure specified in paragraph 5.3. above to the Parties to the Agreement applying this Regulation.

7.4. The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such an extension.

8. Conformity of production

The conformity of production procedures shall comply with those set out in the Agreement, Appendix 2 (E/ECE/324-E/ECE/TRANS/505/Rev.2), with the following requirements:

- (a) The RESS approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraph 6. above.
- (b) The holder of the approval shall ensure that for each type of RESS at least the tests prescribed in paragraph 6. of this Regulation are carried out.
- (c) The authority which has granted type approval may at any time verify the conformity control methods applied in each production facility. The normal frequency of these verifications shall be once every two years.
- (d) The production is considered to conform to the requirements of this Regulation, if the provisions of Regulations Nos. 9, 41 and 63, corresponding to the type of vehicle, are complied with and if the sound level measured by the method described in the given Regulations during the test in motion does not exceed by more than 3 dB(A) the sound level measured during the type approval and does not exceed by more than 1 dB(A) the limits prescribed in Regulation Nos. 9, 41 and 63 as applicable.

9. Penalties for non-conformity of production

- 9.1. The approval granted in respect of a type of RESS or its components under this Regulation may be withdrawn if the requirements laid down in paragraph 8 above are not complied with, or if the RESS or its components fail to pass the tests provided for in paragraph **8.3.5.** above.⁴
- 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 Parties to the 1958 Agreement applying this Regulation, by means of a communication form conforming to the model contained in Annex 1 to this Regulation.

10. Production definitely discontinued

If the holder of the approval completely ceases to manufacture a type of replacement silencing system or components thereof in accordance with this Regulation, he shall so inform the authority which granted the approval which shall in turn inform thereof the other Parties to the 1958 Agreement applying this Regulation, by means of a copy of the communication form conforming to the model contained in Annex 1 to this Regulation.

⁴ Note by the secretariat: Reference to be checked as this paragraph has been deleted according to Amendment 1 to Regulation No. 92).

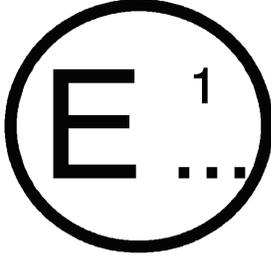
11. Names and addresses of technical services responsible for conducting approval tests, and of administrative departments

The Contracting Parties to the 1958 Agreement which apply 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, or production definitely discontinued issued in other countries, are to be sent.

Annex 1

Communication

(Maximum format: A4 (210 x 297 mm))



issued by:

Name of administration:

.....
.....
.....

- concerning ²:
- APPROVAL GRANTED
 - APPROVAL EXTENDED
 - APPROVAL REFUSED
 - APPROVAL WITHDRAWN
 - PRODUCTION DEFINITELY DISCONTINUED

of a vehicle type with regard to a type of RESS or component there of pursuant to Regulation No. 92.

Approval No.: Extension No.:

1. Trade name or mark of the **motorcycle**:
2. **Motorcycle type**:
3. Manufacturer's name and address:
4. If applicable, name and address of manufacturer's representative:
5. **Engine**
 - 5.1. **Manufacturer**:
 - 5.2. **Type**:
 - 5.3. **Model**:
 - 5.4. **Rated maximum net power**: kW at min⁻¹
 - 5.5. **Kind of engine (e.g. positive-ignition, compression ignition, etc.)**: ³
 - 5.6. **Cycles**: two-stroke/four-stroke ²
 - 5.7. **Cylinder capacity**: cm³
6. **Transmission**
 - 6.1. **Type of transmission: non-automatic gearbox/automatic gearbox**:

¹ Distinguishing number of the country which has granted/extended/refused/withdrawn an approval (see approval provisions in the Regulation).

² Delete what does not apply.

³ If a non-conventional engine is used, this should be stated.

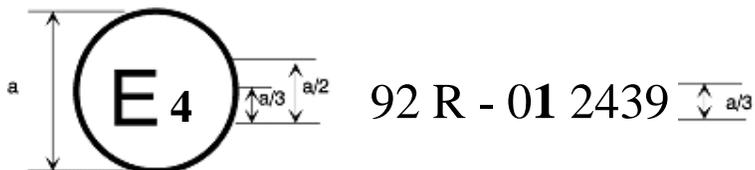
- 6.2. Number of gears:
7. Equipment
- 7.1. Exhaust silencer
- 7.1.1. Manufacturer or authorized representative (if any):
- 7.1.2. Model:
- 7.1.3. Type: in accordance with drawing No.
- 7.2. Intake silencer
- 7.2.1. Manufacturer or authorized representative (if any):
- 7.2.2. Model:
- 7.2.3. Type: in accordance with drawing No.
8. Gears used for test of motor cycle in motion:
9. Final drive ratio(s):
10. CE type approval number of tyre(s):
- If not available, the following information shall be provided:
- 10.1. Tyre manufacturer:
- 10.2. Commercial description(s) of the type of tyre (by axle), (e.g. trade name, speed index, load index):
- 10.3. Tyre size (by axle):
- 10.4. Other type approval number (if available):
11. Masses
- 11.1. Maximum permissible gross weight: kg
- 11.2. Test mass: kg
- 11.3. Power to mass ratio index (*PMR*):
12. Vehicle length: m
- 12.1. Reference length l_{ref} : m
13. Vehicle speeds of measurements in gear (i)
- 13.1. Vehicle speed at the beginning of the period of acceleration (average of 3 runs) for gear (i): km/h
- 13.2. Pre-acceleration length for gear (i): m
- 13.3. Vehicle speed $v_{PP'}$ (average of 3 runs) for gear (i): km/h
- 13.4. Vehicle speed $v_{BB'}$ (average of 3 runs) for gear (i): km/h
14. Vehicle speeds of measurements in gear (i+1) (if applicable)
- 14.1. Vehicle speed at the beginning of the period of acceleration (average of 3 runs) for gear (i+1): km/h
- 14.2. Pre-acceleration length for gear (i+1): m
- 14.3. Vehicle speed $v_{PP'}$ (average of 3 runs) for gear (i+1): km/h
- 14.4. Vehicle speed $v_{BB'}$ (average of 3 runs) for gear (i+1): km/h

- 15. Accelerations are calculated between lines AA' and BB'/PP' and BB'
- 15.1. Description of functionality of devices used to stabilize the acceleration (if applicable):
- 16. Noise levels of moving vehicle
- 16.1. Wide-open-throttle test result L_{wot} : db(A)
- 16.2. Constant speed test results L_{crs} : db(A)
- 16.3. Partial power factor k_p : db(A)
- 16.4. Final test result L_{urban} : db(A)
- 17. Noise level of stationary vehicle
- 17.1. Position and orientation of microphone (according to Appendix 2 of Annex 3 of 04 series of regulation No. 41):
- 17.2. Test result for stationary test: db(A) at min⁻¹
- 18. Additional sound emission provisions:
See manufacturer's statement of compliance (attached)
- 19. In-use compliance reference data
- 19.1. Gear (i) or, for vehicles tested with non-locked gear ratios, the position of the gear selector chosen for the test:
- 19.2. Pre-acceleration length l_{pA} : m
- 19.3. Vehicle speed at the beginning of the period of acceleration (average of 3 runs) for gear (i): km/h
- 19.4. Sound pressure level $L_{wot(i)}$: dB(A)
- 20. Deviations in calibration of sound level meter: dB(A)
- 21. Date of submission of vehicle for approval:.....
- 22. Technical Service performing the approval tests:
- 23. Date of report issued by that service:.....
- 24. Number of report issued by that service:
- 25. Approval granted/extended/refused/withdrawn: ².....
- 26. Position of approval mark on the **motor cycle**:
- 27. Place:
- 28. Date:
- 29. Signature:.....
- 30. The following documents, bearing the approval number shown above, are annexed to this communication :
Drawings, diagrams and plans of the engine and of the noise reduction system;
Photographs of the engine and of the exhaust or silencing system;
List of components, duly identified constituting the noise reduction system.

Annex 2

Example of the approval marks

(See paragraph 5.4. of this Regulation)



$a = 8 \text{ mm min}$

The above approval mark affixed to a component of silencing systems shows that the replacement silencing system type concerned has been approved in the Netherlands (E4) pursuant to Regulation No. 92 under approval No. **012439**. The first two digits of the approval number **[01]** indicate that the approval was granted in accordance with the requirements of this current Regulation No. 92 **whilst the approval number [00] indicate that the approval was granted in accordance with the requirements of Regulation No. 92** in its original form.

Annex 3

Requirements for fibrous absorbent materials used in RESS

(See paragraph 6.4. of this Regulation)

1. Fibrous absorbent material *shall be asbestos-free* and may be used in the construction of silencers only if suitable devices ensure that the fibrous absorbent material is kept in place for the whole time that the silencer is being used and it meets the requirements of any one of sections 2, 3 or 4 according to the manufacturer's choice.
2. After removal of the fibrous material, the sound level must comply with the requirements of paragraph 6.2. of this Regulation
3. The fibrous absorbent material may not be placed in those parts of the silencer through which the exhaust gases pass and must comply with the following requirements:
 - (a) The material must be heated at a temperature of $650 \pm 5^{\circ}\text{C}$ for four hours in a furnace without reduction in average length, diameter or bulk density of the fibre.
 - (b) After heating at $650 \pm 5^{\circ}\text{C}$ for one hour in a furnace, at least 98 per cent of the material must be retained in a sieve of nominal aperture size $250 \mu\text{m}$ complying with ISO 3310/1 when tested in accordance with ISO 2599.
 - (c) The loss in weight of the material must not exceed 10.5 per cent after soaking for 24 hours at $90 \pm 5^{\circ}\text{C}$ in a synthetic condensate of the following composition:
 - (i) 1 N hydrobromic acid (HBr), 10 ml
 - (ii) 1 N sulphuric acid (H_2SO_4), 10 ml
 - (iii) Distilled water to make up to 1,000 ml

Note: The material must be washed in distilled water and dried for one hour at 105°C before weighing.
4. Before the system is tested in accordance with paragraph 6.2. of this Regulation it must be put into a normal state for road use by one of the following conditioning methods in accordance with the manufacturer's choice in accordance with **the Appendix**.

Appendix

Conditioning methods

1. Test procedures

1.1. Motorcycles

- 1.1.1. According to the classes of motor cycles, the minimum distances to be completed during conditioning shall be in accordance with Table 1.

Table 1
Class of motor cycle and minimum distance to be completed during conditioning

<i>CLASS OF MOTORCYCLE</i> <i>according to Power-to-Mass ratio index (PMR)</i>	<i>DISTANCE</i> <i>(km)</i>
≤ 25	4 000
> 25 ≤ 50	6 000
> 50	8 000

- (a) 50 per cent ± 10 per cent of this conditioning cycle consists of town driving and the remainder of long-distance runs at high speed; the continuous road cycle may be replaced by a corresponding test-track programme.
- (b) The two speed modes must be alternated at least six times.
- (c) 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 condensation.
- #### 1.2. Mopeds
- 1.2.1. The minimum distance to be covered during conditioning shall be 2,000 km.
- 1.2.2. 50 per cent + 10 per cent of this conditioning cycle shall consist of town driving and the remainder of long-distance runs; the continuous road cycle may be replaced by a corresponding test-track programme.
- 1.2.3. The two speed regimes must be alternated at least six times.
- 1.2.4. 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 condensation.
- #### 1.3. Three-wheeled vehicles
- 1.3.1. Depending on the category of vehicle, the minimum distance to be completed during conditioning shall be in accordance with Table 2.

Table 2
Category of vehicle and minimum distance to be completed during conditioning

<i>CATEGORY OF VEHICLE</i> <i>according to cylinder capacity (cc)</i>	<i>DISTANCE</i> <i>(km)</i>
≤ 250	4 000
> 250 ≤ 500	6 000
> 500	8 000

1.3.2. 50 per cent + 10 per cent of this conditioning cycle shall consist of town driving and the remainder of long-distance runs at high speed; the continuous road cycle may be replaced by a corresponding test-track programme.

1.3.3. The two speed regimes must be alternated at least six times.

1.3.4. 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 condensation.

2. Conditioning by pulsation

2.1. The exhaust system or components thereof must be fitted to the motorcycle or to the engine. In the former case, the motorcycle must be mounted on a roller dynamometer. In the second case, the engine must be mounted on a test bench.

The test apparatus, a detailed diagram of which is shown in Figure 1, is fitted at the outlet of the exhaust system. Any other apparatus providing equivalent results is acceptable.

2.2. The test equipment must be adjusted so that the flow of exhaust gases is alternatively interrupted and restored 2,500 times by a rapid-action valve.

2.3. 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. Should such a figure be unattainable because of the engine characteristics, the valve must open when the gas back-pressure reaches a level equivalent to 90 per cent of the maximum that can be measured before the engine stops. It must close when this pressure does not differ by more than 10 per cent from its stabilized value with the valve open.

2.4. The time-delay switch must be set for the duration of exhaust gases calculated on the basis of the requirements of paragraph 4.2.3 above.

2.5. Engine speed must be 75 per cent of the speed (S) at which the engine develops maximum power.

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

2.7. Any drainage holes must be closed off during the test.

2.8. The entire test must be completed within 48 hours. If necessary, a cooling period must be allowed after each hour.

3. Conditioning on a test bench

- 3.1. The exhaust system must be fitted to an engine representative of the type fitted to the motorcycle for which the system is designed, and mounted on a test bench.
- 3.2. Motorcycles
- 3.2.1. Conditioning consists of the specified number of test-bench cycles for the class of motor cycle for which the exhaust system was designed. The number of cycles for each class of motor cycle shall be in accordance with Table 3.

Table 3
Number of cycles for each class of motorcycle

<i>CLASS OF MOTORCYCLE</i> <i>according to Power-to-Mass ratio index (PMR)</i>	<i>No. of CYCLES</i>
≤ 25	6
> 25 ≤ 50	9
> 50	12

- 3.2.2. Each test-bench cycle must be followed by a break of at least six hours in order to reproduce the effects of cooling and condensation.
- 3.2.3. Each test-bench cycle consists of six phases. The engine conditions for and the duration of each phase shall be in accordance with Table 4.

Table 4
Engine conditions for and the duration of each phase for motorcycles

<i>PHASE</i>	<i>CONDITIONS</i>	<i>DURATION OF PHASE</i> <i>(in minutes)</i>	
		<i>PMR ≤ 50</i>	<i>PMR > 50</i>
1	Idling	6	6
2	25% load at 75% S	40	50
3	50% load at 75% S	40	50
4	100% load at 75% S	30	10
5	50% load at 100% S	12	12
6	25% load at 100% S	22	22
	Total Time	150	150

- 3.2.4. During this conditioning procedure, at the request of the manufacturer, the engine and the silencer may be cooled so that the temperature recorded at a point not more than 100 mm from the exhaust gas outlet does not exceed that measured when the motor cycle is running at 110 km/h or 75 per cent of S in top gear. The engine and/or motor cycle speeds are determined to within ± 3 per cent.
- 3.3. Mopeds
- 3.3.1. Conditioning consists of three test cycles.
- 3.3.2. Each test-bench cycle must be followed by a break of at least six hours' duration in order to reproduce the effects of cooling and condensation.

- 3.3.3. Each test-bench cycle shall consist of six phases. The engine conditions for the duration of each phase shall be as given in Table 5.

Table 5
Engine conditions for the duration of each phase for mopeds

<i>PHASE</i>	<i>CONDITIONS</i>	<i>DURATION OF PHASE (minutes)</i>
1	Idling	6
2	25% load at 75% S	40
3	50% load at 75% S	40
4	100% load at 75% S	30
5	50% load at 100% S	12
6	25% load at 100% S	22
Total Time		150

- 3.3.4. During this conditioning procedure, at the request of the manufacturer, the engine and the silencer may be cooled so that the temperature recorded at a point not more than 100 mm from the exhaust gas outlet does not exceed that measured when the moped is running at 75 per cent of S in top gear. The engine and/or moped speeds shall be determined to within + 3 per cent.

3.4. Three-wheeled vehicles

- 3.4.1. Conditioning shall consist of the specified number of test-bench cycles for the category of vehicle for which the exhaust system was designed. The number of cycles for each vehicle category shall be as given in Table 6.

Table 6.
Number of cycles for each vehicle category for three wheeled vehicles

<i>CATEGORY OF VEHICLE</i> <i>by to cylinder capacity (cc)</i>	<i>No. of CYCLES</i>
≤ 250	6
> 250 ≤ 500	9
> 500	12

3.4.2. Each test-bench cycle must be followed by a break of at least six hours' duration in order to reproduce the effects of cooling and condensation.

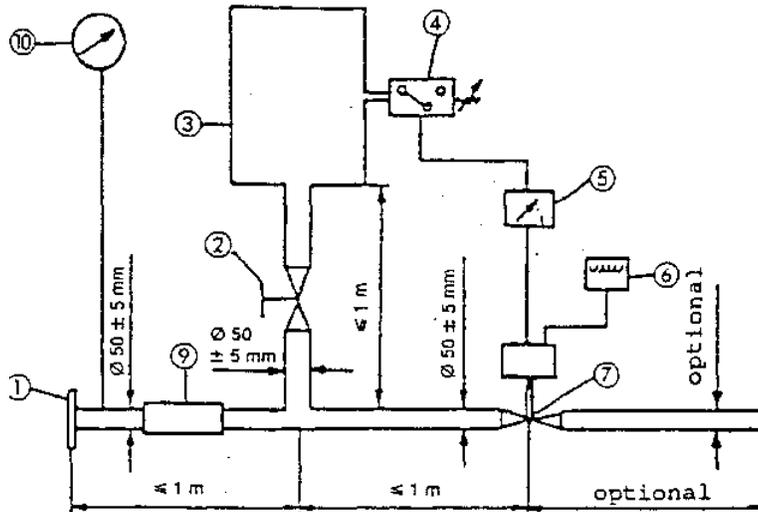
3.4.3. Each test-bench cycle shall consist of six phases. The engine conditions for and the duration of each phase shall be as given in Table 7.

Table 7.
Engine conditions for the duration of each phase for three wheeled vehicles

<i>PHASE</i>	<i>CONDITIONS</i>	<i>DURATION OF PHASE</i> <i>(minutes)</i>	
		Engines of less than 250 cm ³	Engines of not less than 250 cm ³
1	Idling	6	6
2	25% load at 75% S	40	50
3	50% load at 75% S	40	50
4	100% load at 75% S	30	10
5	50% load at 100% S	12	12
6	25% load at 100% S	22	22
Total Time		150	150

3.4.4. During this conditioning procedure, at the request of the manufacturer, the engine and the silencer may be cooled in order that the temperature recorded at a point not more than 100 mm from the exhaust gas outlet does not exceed that measured when the vehicle is running at 110 km/h or 75 per cent of S in top gear. The engine and/or vehicle speeds shall be determined to within + 3 per cent.

Figure 1
Test apparatus for conditioning by pulsation



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