

# Official Journal

of the European Union

ISSN 1725-2555

L 95

Volume 47

31 March 2004

English edition

## Legislation

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I Acts whose publication is obligatory

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Acts whose titles are printed in light type are those relating to day-to-day management of agricultural matters, and are generally valid for a limited period.

The titles of all other acts are printed in bold type and preceded by an asterisk.

## I

(Acts whose publication is obligatory)

**Regulation No 39 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of vehicles with regard to the speedometer equipment including its installation (\*)**

1. SCOPE

This Regulation applies to the approval of vehicles of categories L, M and N <sup>(1)</sup>.

2. DEFINITIONS

For the purposes of this Regulation:

- 2.1. 'Approval of a vehicle' means the approval of a vehicle type with regard to the speedometer equipment including its installation.
- 2.2. 'Type of vehicle in respect of its speedometer' means vehicles which do not among themselves display any essential differences, where those differences can apply, in particular to the following:
- 2.2.1. the size designation of the tyres chosen from the range of tyres normally fitted;
- 2.2.2. the overall transmission ratio, including any reduction drives, to the speedometer;
- 2.2.3. the type of speedometer as characterised by:
- 2.2.3.1. the tolerances of the speedometer's measuring mechanism;
- 2.2.3.2. the technical constant of the speedometer;
- 2.2.3.3. the range of speeds displayed.
- 2.3. 'Tyres normally fitted' means the type or types of tyre provided by the manufacturer on the vehicle type in question; snow tyres shall not be regarded as tyres normally fitted;
- 2.4. 'Normal running pressure' means the cold inflation pressure specified by the vehicle manufacturer increased by 0,2 bar;
- 2.5. 'Speedometer' means that part of the speedometer equipment which indicates to the driver the speed of his vehicle at any given moment <sup>(2)</sup>;
- 2.5.1. 'Tolerances of the speedometer's measuring mechanism' shall mean the accuracy of the speedometer instrument itself, expressed as the upper and the lower speed indication limits for a range of speed inputs;
- 2.5.2. 'Technical constant of the speedometer' shall mean the relationship between the input revolutions or pulses per minute and a specified displayed speed;

(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346, 17.12.1997, p. 78).

<sup>(1)</sup> As defined in annex 7 of the Consolidated Resolution on the Construction of Vehicles (R.E.3) (document TRANS/WP.29/78/Rev. 1/Amend. 2).

<sup>(2)</sup> This does not include the speed-indicating part of a tachograph if this complies with type approval specifications which do not permit an absolute difference between true and indicated speed which is higher than the values resulting from the requirements in paragraph 5.3. below.

- 2.6. 'Unladen vehicle' means the vehicle in running order, complete with fuel, coolant, lubricant, tools and a spare wheel (if provided as standard equipment by the vehicle manufacturer), carrying a driver weighing 75 kg, but no driver's mate, optional accessories or load.
3. APPLICATION FOR APPROVAL
- 3.1. The application for approval of a vehicle type with regard to the speedometer equipment including its installation shall be submitted by the vehicle manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the following documents in triplicate and by the following particulars:
- 3.2.1. a description of the vehicle type with regard to the items mentioned in paragraphs 2.2, 2.3, 2.4 and 2.5 above; the vehicle type shall be specified.
- 3.3. An unladen vehicle representative of the vehicle type to be approved shall be submitted to the technical service conducting approval tests.
- 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.
4. APPROVAL
- 4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of the Regulation in respect of the speedometer equipment including its installation, approval of that vehicle type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. The first two digits shall be the highest number of the series of amendments incorporated in the Regulation at the time of issue of the approval. The same Contracting Party may not assign the same number to another vehicle type subject to the provisions of paragraph 6 of this Regulation.
- 4.3. Notice of approval or of refusal of approval of a vehicle type pursuant to 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 and of diagrams, supplied by the applicant for approval, of the installation in a format not larger than A4 (210 × 297 mm) or folded to that format, and on an appropriate scale.
- 4.4. To every vehicle conforming to a vehicle type approved under this Regulation there shall be affixed in a conspicuous and easily accessible position, specified on the approval form, an international approval mark consisting of:
- 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;

<sup>(1)</sup> 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 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 (vacant), 36 for Lithuania, 37 for Turkey, 38 (vacant), 39 for Azerbaijan, 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, 46 for Ukraine, 47 for South Africa and 48 for New Zealand. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of 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 Approvals 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.

- 4.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle described in paragraph 4.4.1.
- 4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such a case the additional numbers and symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and shall be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. SPECIFICATIONS
- 5.1. The display of the speedometer must be located within the direct field of view of the driver and must be clearly legible both day and night. The range of speeds displayed must be sufficiently wide to include the maximum speed of this type of vehicle as stated by the manufacturer.
- 5.1.1. In the case of speedometers intended for vehicles of categories M, N, and L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub>, the graduation shall be 1, 2, 5 or 10 km/h. The numerical values of the speed shall be indicated on the display as follows: when the highest value on the display does not exceed 200 km/h, speed values shall be indicated at intervals not exceeding 20 km/h. When the maximum value on the display exceeds 200 km/h, then the speed values shall be indicated at intervals not exceeding 30 km/h. The indicated numerical speed value intervals need not be uniform.
- 5.1.2. In the case of vehicles manufactured for sale in any country where imperial units are used, the speedometer shall also be marked in miles per hour (mph); the graduations shall be of 1, 2, 5 or 10 mph. The values of the speed shall be indicated on the dial at intervals not exceeding 20 mph and commencing at 10 or 20 mph. The indicated speed value intervals need not be uniform.
- 5.1.3. In the case of speedometers intended for vehicles of categories L<sub>1</sub> (mopeds) and L<sub>2</sub>, the display readings must not exceed 80 km/h. The graduation shall be 1, 2, 5 or 10 km/h and the marked numerical values of the speed indicated shall not exceed 10 km/h. The indicated numerical speed value intervals need not be uniform.
- 5.1.4. In the case of vehicles of categories M, N, and L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub> manufactured for sale in any country where imperial units are used, the speedometer shall also be marked in mph (miles per hour); the graduation shall be of 1, 2, 5 or 10 mph. The numerical values of the speed shall be indicated on the display at intervals not exceeding 20 mph and commencing at 10 or 20 mph. The indicated numerical speed value intervals need not be uniform.
- 5.2. The accuracy of the speedometer equipment shall be tested in accordance with the following procedure:
- 5.2.1. The tyres shall be one of the types normally fitted to the vehicle as defined in paragraph 2.3 of this Regulation. A test shall be carried out for each type of speedometer intended to be fitted by the manufacturer.
- 5.2.2. The test shall be carried out with the vehicle at its unladen weight. An additional weight can be carried for purposes of measurement. The weight of the vehicle and its distribution between the axles shall be indicated in the approval communication (see annex 1, paragraph 6).

- 5.2.3. The reference temperature at the speedometer shall be  $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$ .
- 5.2.4. During each test the pressure of the tyres shall be the normal running pressure as defined in paragraph 2.4.
- 5.2.5. The vehicle is tested at the following speeds:

Maximum design speed $V_{\max}$ of the vehicle specified by the vehicle manufacturer (km/h)	Test speed ( $V_1$ ) (km/h)
$V_{\max} \leq 45$	80 % of $V_{\max}$
$45 < V_{\max} \leq 100$	40 km/h and 80 % $V_{\max}$ (if the resulting speed is $\geq 55$ km/h)
$100 < V_{\max} \leq 150$	40 km/h, 80 km/h and 80 % $V_{\max}$ (if the resulting speed is $\geq 100$ km/h)
$150 < V_{\max}$	40 km/h, 80 km/h and 120 km/h

- 5.2.6. The test instrumentation used for measuring the true vehicle speed shall be accurate to  $\pm 0,5$  per cent.
- 5.2.6.1. The surface of a test track when used shall be flat and dry, and provide sufficient adhesion;
- 5.2.6.2. if a roller dynamometer is used for the test, the diameter of the roller should be at least 0,4 m.
- 5.3. The speed indicated shall not be less than the true speed of the vehicle. At the test speeds specified in paragraph 5.2.5 above, there shall be the following relationship between the speed displayed ( $V_1$ ) and the true speed ( $V_2$ ).

$$0 \leq (V_1 - V_2) \leq 0,1 V_2 + 4 \text{ km/h}$$

6. MODIFICATIONS OF THE VEHICLE TYPE
- 6.1. Every modification of the vehicle type shall be communicated to the administrative department which approved the vehicle type. The department may then either:
- 6.1.1. consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the vehicle still meets the requirements; or
- 6.1.2. require a further test report from the technical service responsible for conducting the tests.
- 6.2. Notice of confirmation or refusal of approval, accompanied by particulars of the modifications, shall be communicated by the procedure specified in paragraph 4.3 above to the Parties to the Agreement applying to this Regulation.
7. CONFORMITY OF PRODUCTION
- 7.1. 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:
- 7.2. Every vehicle approved under this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements of the relevant part(s) of this Regulation.

- 7.3. For each type of vehicle sufficient checks are carried out regarding the speedometer equipment and its installation; in particular, for each type of vehicle at least the test prescribed in annex 3 to this Regulation shall be carried out.
- 7.4. 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.
- 7.5. Where unsatisfactory results are found during verifications and checks pursuant to paragraph 7.4 above, the competent authority shall ensure that all necessary steps are taken to restore conformity of production as rapidly as possible.

8. PENALTIES FOR NON CONFORMITY OF PRODUCTION

- 8.1. The approval granted for a vehicle type pursuant to this Regulation may be withdrawn if the requirement laid down in paragraph 7.1 above is not met or if the vehicles have failed to pass the checks prescribed in paragraph 7 above.
- 8.2. If a Party to the Agreement which applies 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.

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

The Parties to the Agreement applying this Regulation shall communicate to the secretariat of the United Nations 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.

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ANNEX 1

COMMUNICATION

(Maximum format: A4 (210 × 297 mm))



issued by: Name of administration <sup>(1)</sup>

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

concerning <sup>(2)</sup>: APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a vehicle type with regard to the speedometer equipment including its installation pursuant to Regulation No 39.

Approval No: ..... Extension No: .....

1. Trade name or mark of the vehicle: .....

2. Vehicle type: .....

3. Manufacturer's name and address: .....

.....

4. If applicable, name and address of the manufacturer's representative: .....

.....

.....

5. Description of the speedometer equipment: .....

.....

5.1. Details of tyres normally fitted: .....

5.2. Details of tyres fitted during the test: .....

5.3. Ratio of speedometer equipment: .....

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

<sup>(2)</sup> Strike out what does not apply.

- 6. Mass of vehicle as tested and its distribution between the axles: .....
- .....
- 7. Variants: .....
- 8. Vehicle submitted for approval on: .....
- 9. Technical service responsible for conducting approval tests: .....
- .....
- 10. Date of report issued by that service: .....
- 11. Number of report issued by that service: .....
- 12. Approval granted/refused/extended/withdrawn <sup>(1)</sup>
- 13. Position of approval mark on the vehicle: .....
- 14. Place: .....
- 15. Date: .....
- 16. Signature: .....

\_\_\_\_\_

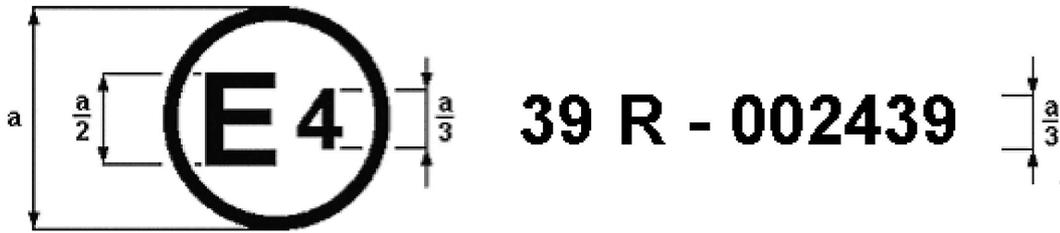
\_\_\_\_\_  
<sup>(1)</sup> Strike out what does not apply.

## ANNEX 2

## ARRANGEMENTS OF APPROVAL MARKS

## Model A

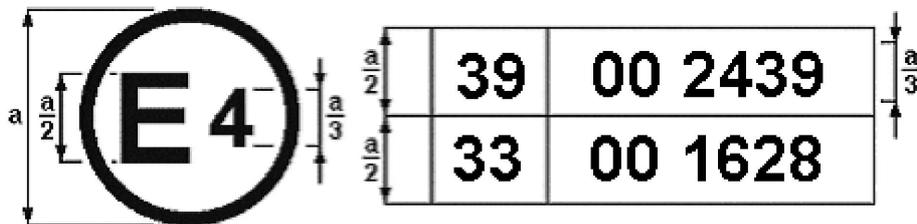
(see paragraph 4.4 of this Regulation)

 $a \geq 8 \text{ mm}$ 

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4), pursuant to Regulation No 39. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No 39 in its original form.

## Model B

(see paragraph 4.5. of this Regulation)

 $a \geq 8 \text{ mm}$ 

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos 39 and 33 <sup>(1)</sup>. The approval numbers indicate that, at the dates when the respective approvals were granted, Regulations Nos 39 and 33 were still in their original form.

<sup>(1)</sup> The second number is given merely as an example.

## ANNEX 3

**TEST OF SPEEDOMETER ACCURACY FOR CONFORMITY OF PRODUCTION**

## 1. TEST CONDITIONS

The test conditions shall be as set out in paragraphs 5.2.1 to 5.2.6 of this Regulation.

## 2. REQUIREMENTS

The production shall be deemed to conform to this Regulation if the following relationship between the speed indicated on the display of the speedometer ( $V_1$ ) and the actual speed ( $V_2$ ) is observed:

In the case of vehicles of categories M and N:

$$0 \leq (V_1 - V_2) \leq 0,1 V_2 + 6 \text{ km/h};$$

In the case of vehicles of categories L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub>:

$$0 \leq (V_1 - V_2) \leq 0,1 V_2 + 8 \text{ km/h};$$

In the case of vehicles of categories L<sub>1</sub> and L<sub>2</sub>:

$$0 \leq (V_1 - V_2) \leq 0,1 V_2 + 4 \text{ km/h}.$$

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**Regulation No 60 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of two-wheeled motor cycles and mopeds with regard to driver-operated controls including the identification of controls, tell-tales and indicators (\*)**

1. SCOPE

This Regulation applies to two-wheeled motor cycles and two-wheeled mopeds with regard to driver-operated controls including the identification of controls, tell-tales and indicators.

2. DEFINITIONS

For the purposes of this Regulation:

2.1. 'Approval of a vehicle' means the approval of a vehicle type with regard to driver-operated controls, where such controls are fitted and to their identification;

2.2. 'Vehicle type' means a category of power-driven vehicles which do not differ in respect of the arrangements which may affect the function or position of the driver-operated controls;

2.3. 'Vehicle' means a two-wheeled motor cycle as defined in article 1 (n) or a two-wheeled moped as defined in article 1 (m) of the United Nations Convention on Road Traffic, Vienna 1968;

2.4. 'Control' means any part of the vehicle or a device directly actuated by the driver which changes the state or functioning of the vehicle or any part thereof;

2.5. 'Handlebars' means any part of the bar or bars connected to the head of the forks (steering head) by means of which the vehicle is steered;

2.5.1. 'Handlebars: right side' means any part of the handlebars which, when facing the direction of forward movement, lies on the right side of the longitudinal median plane of the vehicle;

2.5.2. 'Handlebars: left side' means any part of the handlebars which, when facing the direction of forward movement, lies on the left side of the longitudinal median plane of the vehicle;

2.5.3. 'Handlebars: forward' means any part of the handlebars lying on the side farthest from the driver when seated in a driving position;

2.6. 'Handgrip' means that part of the handlebars, furthest from the centre, by which the handlebars are held by the driver of the vehicle;

2.6.1. 'Rotating handgrip' means a handgrip, operating some functional mechanism of the vehicle, which is free to rotate around the handlebar when so turned by the driver of the vehicle;

2.7. 'Frame' means any part of the frame, chassis or cradle of the vehicle, to which is attached the engine and/or transmission unit, and/or the engine and transmission unit itself;

2.7.1. 'Frame: right side' means any part of the frame which, when facing the direction of forward movement, lies on the right side of the longitudinal median plane of the vehicle;

2.7.2. 'Frame: left side' means any part of the frame which, when facing in the direction of forward movement, lies on the left side of the longitudinal median plane of the vehicle;

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(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346 of 17.12.1997, p. 78).

- 2.8. 'Lever' means any device consisting of an arm turning on a fulcrum, by means of which some functional mechanism of the vehicle is operated;
- 2.8.1. 'Hand lever' means a lever operated by the hand of the driver;
- Note:* Unless otherwise stated, a hand lever is operated by compression (that is, movement of the apex of the lever towards the supporting structure), e.g. to engage a brake mechanism or to disengage the clutch mechanism.
- 2.8.2. 'Foot lever' means a lever operated by contact between the foot of the driver and a spur projecting from the arm of the lever;
- 2.8.3. 'Pedal' means a lever operated by contact between the foot of the driver and a pad on the lever, so placed as to allow pressure to be applied to the arm of the lever;
- Note:* Unless otherwise stated, a pedal is operated by depression, for example to engage a brake mechanism.
- 2.8.4. 'Riding pedals' means those devices which are linked to some form of transmission and may be used to propel a moped;
- 2.8.5. 'Rocker arm' means a lever, pivoted at or near its centre and having a pad or spur at each end, operated by contact between the foot of the driver and the said pads or spurs (see annex 3, figure 3);
- 2.9. 'Footrest' means the projections on either side of the vehicle on which the driver places his feet when seated in the driving position;
- 2.10. 'Platform' means that part of the vehicle on which the driver places his feet, when seated in the normal driving position, in the case that the vehicle is not equipped with riding pedals or footrests for the driver;
- 2.11. 'Clockwise' means the direction of rotation around the axis of the part considered, following the motion of the hands of a clock when viewed from the upper or the outer side of the part considered;
- 2.11.1. 'Anticlockwise' has the inverse meaning;
- 2.12. 'Combined service brake' means a system of operation (by hydraulic action or mechanical linkage, or both) whereby both the front and the rear brakes of the vehicle are brought into operation at least partially by the use of only one control;
- 2.13. 'Indicator' means a device which presents information on the functioning or situation of a system or a part of a system, for example a fluid level;
- 2.14. 'Tell-tale' means an optical signal which indicates the actuation of a device, correct or defective functioning or condition, or failure to function;
- 2.15. 'Symbol' means a diagram from which to identify a control, a tell-tale or an indicator.
3. APPLICATION FOR APPROVAL
- 3.1. The application for approval of a vehicle type with regard to driver-operated controls shall be submitted by the vehicle manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the undermentioned documents in triplicate and the following particulars:
- 3.2.1. Drawings, on an appropriate scale and in sufficient detail, of the parts of the vehicle to which the requirements of this Regulation relate and, where necessary, of the vehicle itself.

- 3.3. A vehicle representative of the vehicle type to be approved shall be submitted to the technical service responsible for conducting approval tests, for the checks referred to in paragraph 5 of this Regulation.
4. APPROVAL
- 4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5 and 6 below, approval of that vehicle type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) 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 vehicle type.
- 4.3. Notice of approval or of refusal of approval of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in annex 1 to this Regulation and of drawings and diagrams supplied by the applicant for approval, in a format not exceeding A4 (210 × 297 mm) or folded to that format and on an appropriate scale.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:
- 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;
- 4.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle prescribed in paragraph 4.4.1.
- 4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approve mark shall be clearly legible and shall be indelible.
- 4.7. The approval mark shall be readily accessible.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. GENERAL REQUIREMENTS
- 5.1. All the driver-operated controls specified in paragraphs 6.1, 6.2, 6.3, and 6.4, shall be within the reach of the driver when seated in the driving position.
- 5.1.1. The driver's reach to the controls shall not be impeded by the intrusion of any other control or any part of the structure of the vehicle.

<sup>(1)</sup> 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 . . . , 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 . . . , 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus and 29 for Estonia. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 5.1.2. The controls detailed in paragraphs 6.1 to 6.4 below shall be located in the positions or in the specified areas indicated in those paragraphs.
- 5.1.3. The position of the controls on the handlebars specified in
- paragraph 6.2.1 (Front brake)
  - paragraph 6.2.2.2 (Rear brake: mopeds)
  - paragraph 6.3.1 (Clutch)
  - paragraph 6.4.1 (Audible warning device)
  - paragraph 6.4.2.2 (Driving beam/Passing beam control)
  - paragraph 6.4.3 (Direction indicators control)
- shall be such that they can be reached without the removal of the driver's hands from the respective handgrips.
- 5.2. The controls detailed in paragraphs 6.2.1, 6.2.2, 6.2.3 and 6.3.1 shall be so designed as to comply with the requirements of annex 3, Part one (Hand levers) or Part two (Foot levers, Rocker arms and Pedals) respectively.
- 5.3. Identification
- 5.3.1. The controls, tell-tales and indicators, when fitted, shall be identified in accordance with the provisions of annex 4.
6. SPECIAL REQUIREMENTS
- 6.1. Engine controls
- 6.1.1. Starting
- 6.1.1.1. Engine ignition switch: In the case of a rotary switch, the direction of motion shall be clockwise from the ignition 'off' position to the ignition 'on' position.
- 6.1.1.2. Starter switch: No special requirement.
- 6.1.1.3. Combined ignition/starter switch: In the case of a rotary switch, the direction of motion shall be clockwise, passing from the 'off' position to the ignition 'on' position to the starter energizing position.
- 6.1.2. Speed
- 6.1.2.1. Speed control: The speed of the engine shall be controlled by a handoperated control.
- Position of control: on handlebars: right side.
- Type of control: rotating handgrip on handlebars.
- Direction of rotation: anticlockwise to increase speed.
- 6.1.3. Stop
- 6.1.3.1. Engine cut-out: As a means of stopping the engine, alternative to the main switch (paragraph 6.1.1.1) or a decompression valve control (paragraph 6.1.3.2 below), the vehicle may be equipped with an engine electrical power supply cut-out.
- Position of control: on handlebars: right side.

- 6.1.3.2. Manual decompression control:  
Position of control: on handlebars  
Type of control: Lever, or Rotating handgrip, provided that it is combined with the speed control (right side).
- 6.2. Brakes
- 6.2.1. Front (wheel) brake:  
Position of control: on handlebars: right side forward  
Type of control: hand lever
- 6.2.2. Rear (wheel) brake:
- 6.2.2.1. Vehicles equipped with manually operated clutch:  
Position of control: on frame: right side  
Type of control: pedal
- 6.2.2.2. Vehicles having no manual clutch control
- 6.2.2.2.1. Vehicles equipped with riding pedals must, and vehicles equipped with a platform or with footrests integrated into a platform which have a maximum design speed not exceeding 100 km/h may, conform to the requirement.  
Position of control: on handlebars: left side forward  
Type of control: hand lever
- 6.2.2.2.2. All other vehicles  
Position of control: on frame: right side  
Type-of control: pedal
- 6.2.2.3. Nothing in the requirements set out in paragraphs 6.2.2.1 or 6.2.2.2.1 of this Regulation shall prohibit a moped equipped with riding pedals from being equipped with a rear (wheel) brake operated by a back-peddalling device actuated by those riding pedals.
- 6.2.3. Combined service brake: Nothing in the requirements set out in paragraphs 6.2.1 or 6.2.2 of this Regulation shall prohibit a vehicle from being equipped with a combined service brake (see paragraph 2.12).  
Position and type of control: as specified in paragraphs 6.2.1 and 6.2.2.
- 6.2.4. Parking brake: No special requirement.  
Type of control: hand lever or pedal
- 6.3. Transmission
- 6.3.1. Clutch: operating control  
Position of control: on handlebars: left side forward  
Type of control: hand lever
- Note:* The above-mentioned requirement shall not prohibit, as a device for operating the clutch, the use of a combined foot lever control for both clutch operation and gear selection.

- 6.3.2. Gear selection control
- 6.3.2.1. In the case of vehicles equipped with a gear selection control operated independently of the clutch operating control
- Position of control: on frame: left side
- Type of control: foot lever or rocker arm
- 6.3.2.1.1. Movement of the foot lever or the forward part of the rocker arm in an upward direction shall progressively select gears giving an increased forward speed and conversely for the selection of gears giving a reduced speed. A separate, positive, 'neutral' position shall be provided.
- 6.3.2.1.2. Movement of the foot-operated gear selection control in a forward or a rearward direction is also permitted. In this case, movement of the foot lever in a rearward direction shall progressively select gears giving an increased speed and conversely for the selection of gears giving a reduced speed. A separate, positive, 'neutral' position shall be provided.
- 6.3.2.2. In the case of vehicles equipped with a gear selection control operated in conjunction with the clutch operating control:
- Position of control: on handlebars: left
- Type of control: rotating handgrip on handlebars
- 6.3.2.2.1. Rotation of the handgrip anticlockwise shall progressively select gears giving an increased forward speed and conversely for the selection of gears giving a reduced speed. A separate, positive 'neutral' position shall be provided.
- 6.4. Lighting and signalling controls
- 6.4.1. Audible Warning Device
- 6.4.1.1. In the case of vehicles equipped with a gear selection control operated independently of the clutch operating control:
- Position of control: on handlebars: left side
- Type of control: button
- 6.4.1.2. In the case of vehicles equipped with a gear selection control operated in conjunction with the clutch operating control:
- Position of control: on handlebars: right side
- Type of control: button
- 6.4.2. Lighting
- 6.4.2.1. Light control switch
- In the case of a rotary switch, operation of the switch in a clockwise direction shall engage, progressively, the vehicle's position lights and then the vehicle's main lights. This shall not prevent the inclusion of additional switch positions provided that they are clearly indicated. The light control switch may be combined with the ignition switch if so desired.

- 6.4.2.2. Driving Beam/Passing Beam Switch
- 6.4.2.2.1. In the case of vehicles equipped with a gear selection control operated independently of the clutch operating control:
- Position of control: on handlebars: left side
- 6.4.2.2.2. In the case of vehicles equipped with a gear selection control operated in conjunction with the clutch operating control:
- Position of control: on handlebars: right side
- 6.4.2.3. Optical Warning Device: The control for this device shall be adjacent to the Driving Beam/Passing Beam Switch or shall be an additional function of the latter.
- 6.4.3. Direction indicators switch
- Position of control: on handlebars
- The control shall be so designed that, when viewed from the rider's seat, operation of the left hand portion, or movement to the left, of the control actuates the left side indicators and vice versa for the right side indicators.
- The control shall be clearly marked in such a manner as to indicate the side of the vehicle on which the control actuates the indicators.
- 6.5. Fuel supply controls
- 6.5.1. Cold starting device. The control shall be so placed as to be reasonably and conveniently accessible to the rider.
- 6.5.2. Manual fuel shut-off control. The control shall have separate positive positions for 'OFF', 'ON' and 'RESERVE' (where a reserve supply is provided).
- The control shall be in the ON position when it is in the direction downstream of the flow of fuel from the tank to the engine: in the OFF position when it is in a direction perpendicular to the flow of fuel, and in the RESERVE position (where applicable) when it is in the direction upstream of the flow of fuel.
- 6.5.2.1. Where a machine is so equipped the rider must be able to switch to the reserve fuel supply when in the seated position.
7. MODIFICATIONS OF THE 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 4.3 above to the Parties to the Agreement applying this Regulation.
8. CONFORMITY OF PRODUCTION
- 8.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform to the vehicle type approved, particularly as regards the driver-operated controls.

- 8.2. In order to verify conformity as prescribed in paragraph 8.1 above, a sufficient number of random checks shall be made on serially-manufactured vehicles bearing the approval mark required by this Regulation.
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 laid down in paragraph 8.1 above are not complied with or if the vehicle or vehicles taken fail to pass the tests prescribed in paragraph 8.2 above.
- 9.2. If a 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 copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'APPROVAL WITHDRAWN'.
10. PRODUCTION DEFINITELY DISCONTINUED
- If the holder of the approval completely ceases to manufacture a type of vehicle 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 Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'PRODUCTION DISCONTINUED'.
11. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS
- The Parties to the 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 refusal or withdrawal of approval, issued in other countries, are to be sent.
12. TRANSITIONAL PROVISIONS
- The use of symbols specified in annex 4 to this Regulation becomes mandatory as from 1 July 1986.
-

ANNEX 1

**COMMUNICATION CONCERNING THE APPROVAL (OR REFUSAL OR WITHDRAWAL OF APPROVAL OR PRODUCTION DEFINITELY DISCONTINUED) OF A VEHICLE TYPE WITH REGARD TO DRIVER-OPERATED CONTROLS PURSUANT TO REGULATION No 60**

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



Name of administration

Approval No: .....

- 1. Trade name or mark of the vehicle: .....
- 2. Vehicle type: .....
- 3. Manufacturer's name and address: .....
- 4. If applicable, name and address of manufacturer's representative: .....
- 5. Brief description of the vehicle as regards the driver-operated controls: .....
- 6. Vehicle submitted for approval on: .....
- 7. Technical service responsible for conducting approval inspection: .....
- 8. Date of report issued by that service: .....
- 9. Number of report issued by that service: .....
- 10. Approval granted/refused <sup>(1)</sup>
- 11. Position of approval mark on the vehicle: .....
- 12. Place: .....
- 13. Date: .....
- 14. Signature: .....
- 15. The following documents, bearing the approval number shown above, are annexed to this communication:

... drawings, diagrams and layout plans of the driver-operated controls and of the parts of the vehicle considered to be of importance for the purposes of this Regulation.

\_\_\_\_\_

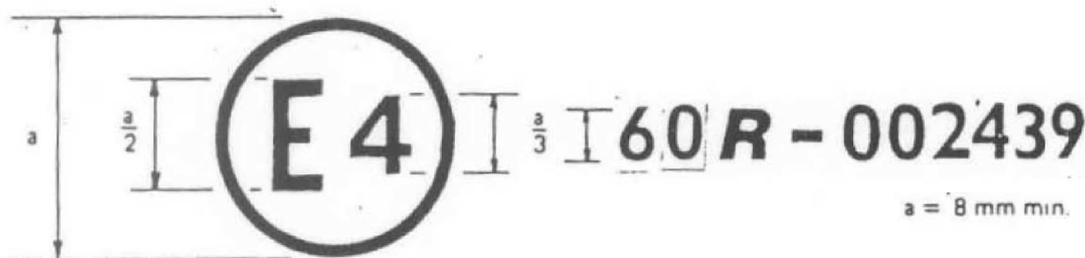
<sup>(1)</sup> Strike out what does not apply.

## ANNEX 2

## ARRANGEMENTS OF APPROVAL MARKS

## Model A

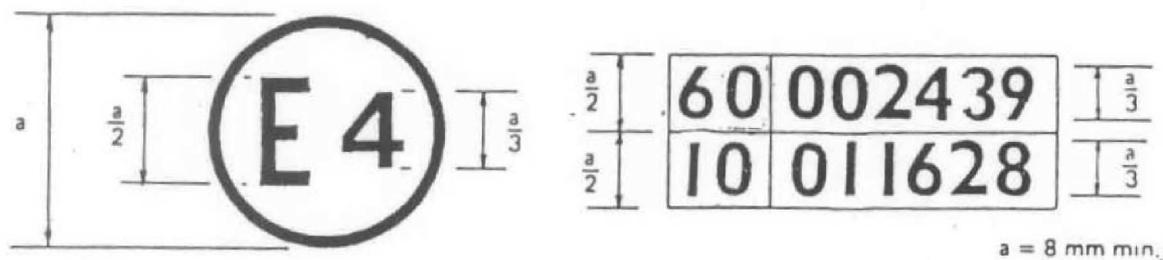
(See paragraph 4.4 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the driver-operated controls, been approved in the Netherlands (E 4) pursuant to Regulation No 60 under approval number 002439. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No 60 in its original form.

## Model B

(See paragraph 4.5 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos 60 and 10.3<sup>(1)</sup>.

The approval numbers indicate that, at the dates when the respective approvals were given, Regulation No 60 had not been modified, and Regulation No 10 already included the 01 series of amendments.

<sup>(1)</sup> The latter number is given as an example only.

## ANNEX 3

**SPECIAL PROVISIONS RELATING TO LEVERS**

1. PART ONE: HAND LEVERS
  - 1.1. The maximum dimension between the forward face of the hand lever and the rearward face of the handgrip shall not exceed 120 mm measured perpendicularly to the axis of the handgrip at any point between the mid-point and the end thereof nearest the fulcrum of the hand lever (see figure 1 (a)). In the case of vehicles equipped with a gear selection control operated in conjunction with the clutch operating control, the maximum dimension shall not exceed 135 mm.
  - 1.2. This dimension may increase beyond the mid-point of the handgrip and towards the open end of the hand lever.
  - 1.3. The minimum dimension (clearance) between the rearward face of the hand lever and the forward face of the handgrip shall not be less than 45 mm at any point between the outer end and the mid-point of the handgrip (see figure 1 (b)).
  - 1.4. This dimension may decrease beyond the mid-point of the handgrip and towards the fulcrum but must in no case be less than 25 mm.
  - 1.5. The outer end of the hand lever shall not project beyond the outer end of the handgrip by more than 30 mm when the hand lever is in its position of maximum compression (see figure 1 (c)).
2. PART TWO: FOOT LEVERS, ROCKER ARMS AND PEDALS
  - 2.1. *Foot Levers*
    - 2.1.1. The maximum dimension between the rearward face of the spur of the foot lever and the rearward face of the corresponding footrest shall not exceed 200 mm at any point of the spur of the foot lever (see figure 2).
    - 2.1.2. The minimum dimension (clearance) between the rearward face of the spur of the foot lever and the forward face of the corresponding footrest shall not be less than 105 mm at any point on the spur of the foot lever (see figure 2).
    - 2.1.3. In case footrests are adjustable, such dimensions shall be measured at the normal points of adjustment provided for the footrest, as stated in the instructions given by the manufacturer to the owner/user of the vehicle (the 'Owner's Manual') and with the foot lever in the position prescribed by the manufacturer.
  - 2.2. *Rocker Arms*
    - 2.2.1. The dimension (K) between the rearward part of the pad, or the rearward face of the spur, situated at the front of the rocker arm and the rearward face of the footrest shall not be more than 200 mm, nor less than 60 mm (see figure 3).
    - 2.2.2. The dimension (L) between the forward part of the pad, or the forward face of the spur, situated at the rear of the rocker arm and the rearward face of the footrest shall not be more than 100 mm, nor less than 50 mm (see figure 3).
    - 2.2.3. In case footrests are adjustable such dimensions shall be measured at the normal points of adjustment provided for the footrest, as stated in the Owner's Manual, and with the rocker arm in the position prescribed by the manufacturer.
  - 2.3. *Pedals*
    - 2.3.1. *Vehicles equipped with footrests*
      - 2.3.1.1. The maximum dimension between the rearward part of the pad of the pedal and the rearward face of the corresponding footrest shall not exceed 170 mm at any point (see figure 4).
      - 2.3.1.2. The minimum dimension (clearance) between the rearward part of the pad of the pedal and the forward face of the corresponding footrest shall not be less than 50 mm at any point (see figure 4).
      - 2.3.1.3. In case footrests are adjustable, such dimensions shall be measured at the normal points of adjustment provided for the footrest, as stated in the Owner's Manual, and with the pedal in the position prescribed by the manufacturer.

2.3.2. Vehicles equipped with platforms

- 2.3.2.1. The maximum dimension between the surface of the platform and the highest point of the pad of the pedal, measured perpendicularly to the surface of the platform adjacent to the pedal, shall not exceed 105 mm (see figure 5).
- 2.3.2.2. The extreme outer edge of the pad of the pedal shall not project more than 25 mm beyond the outer edge of the platform (see figure 5).

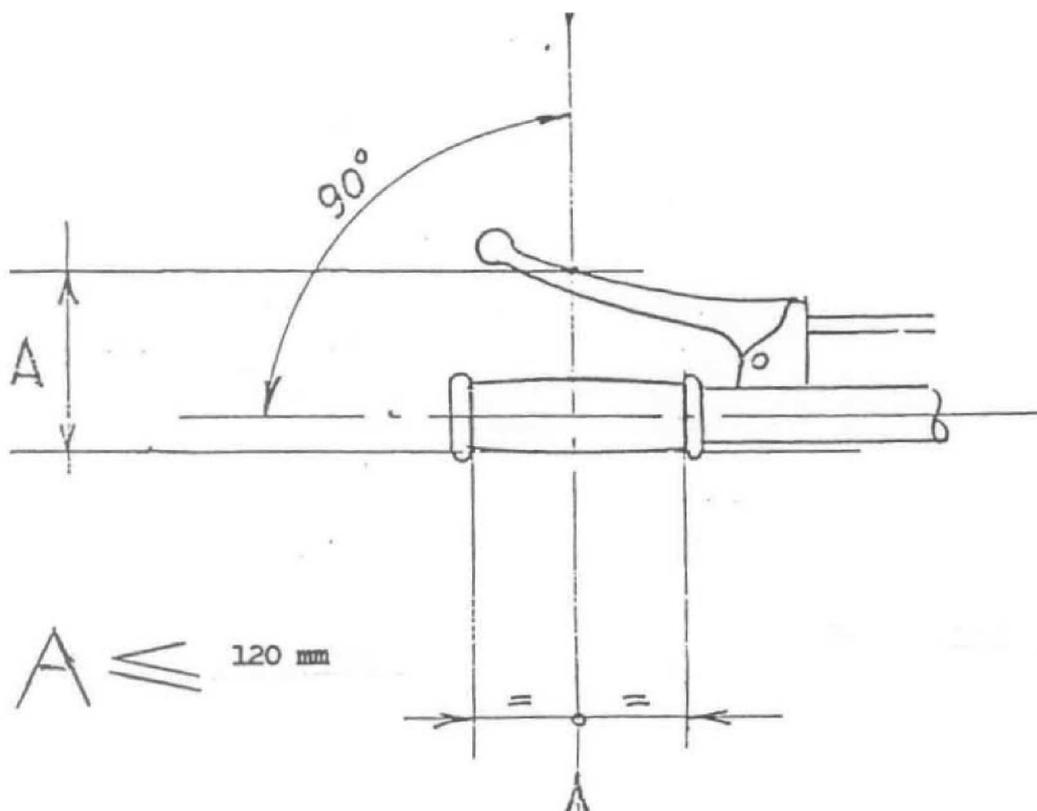


Figure 1 (a)

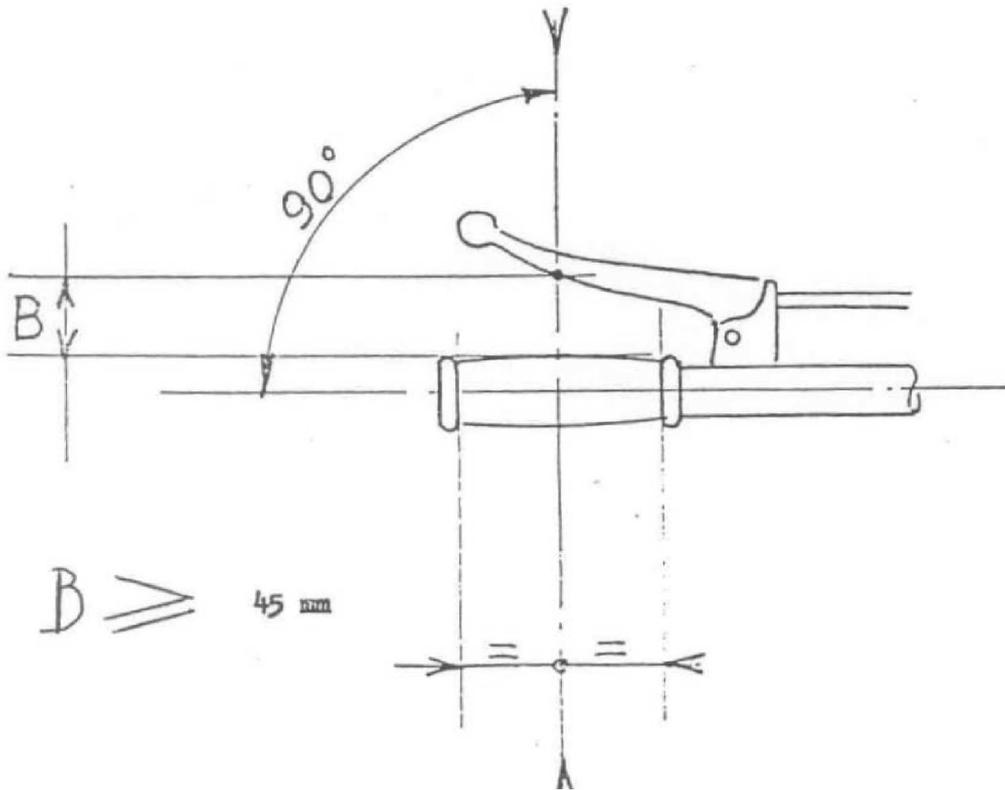


Figure 1 (b)

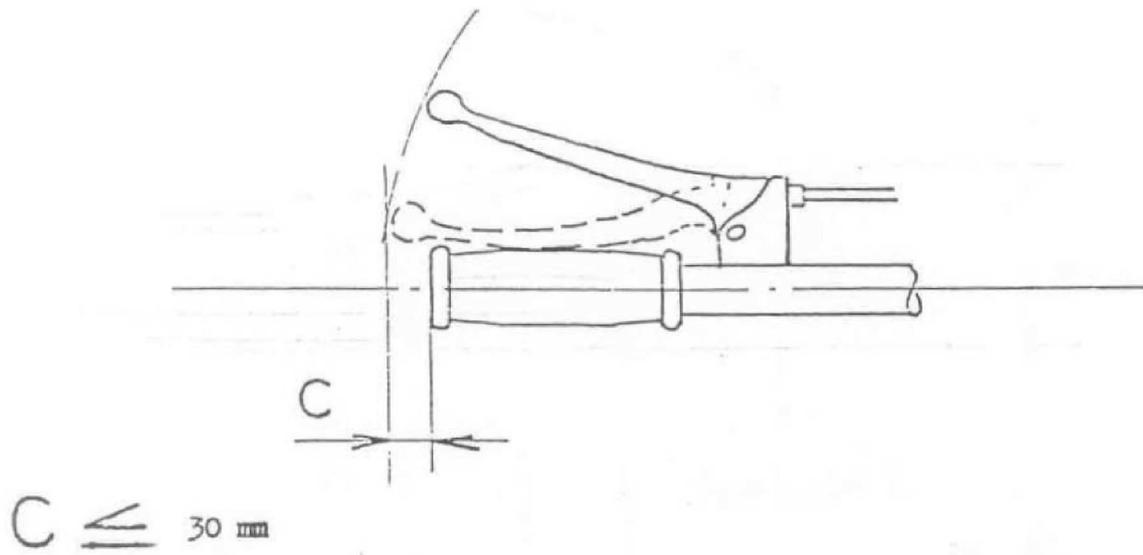


Figure 1 (c)

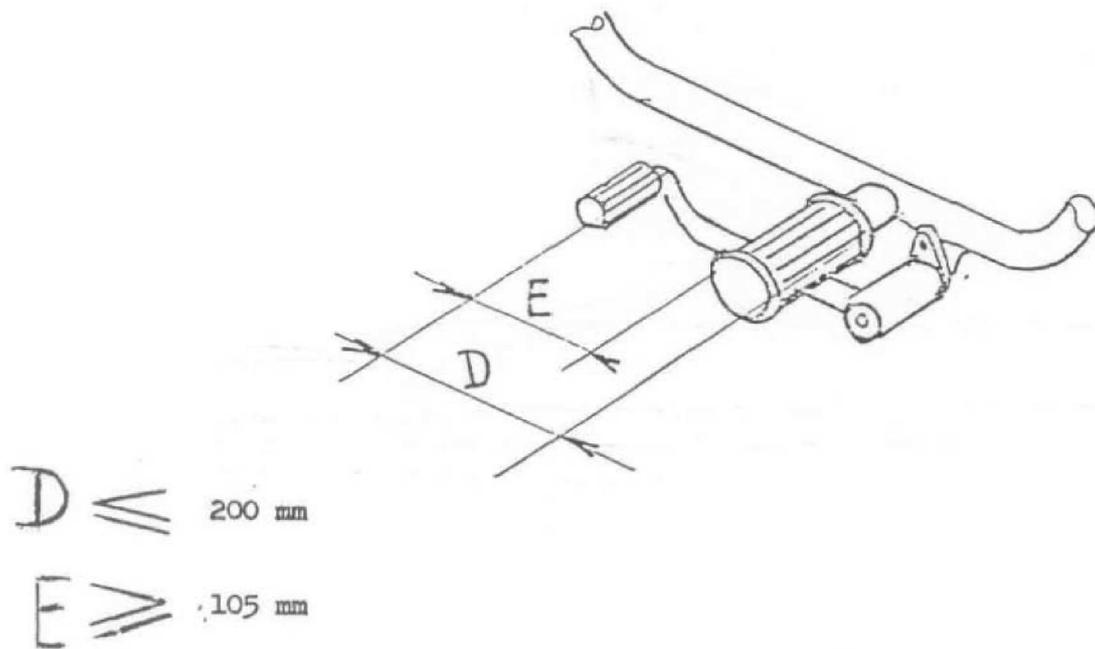


Figure 2

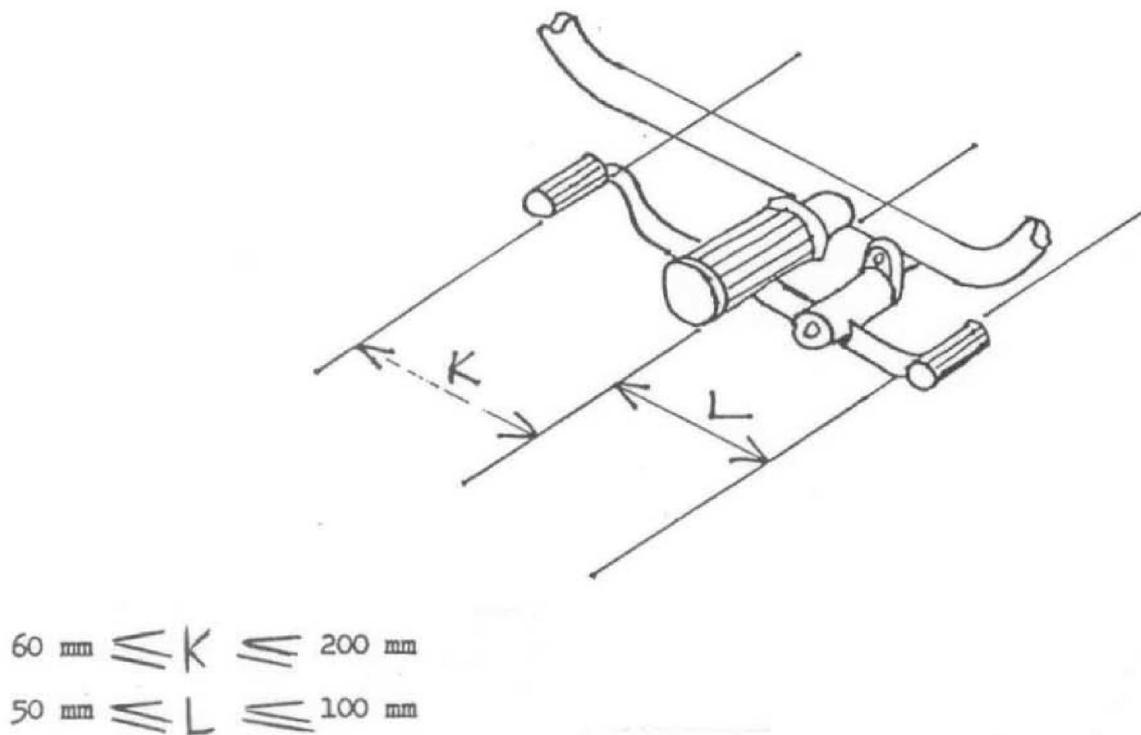


Figure 3

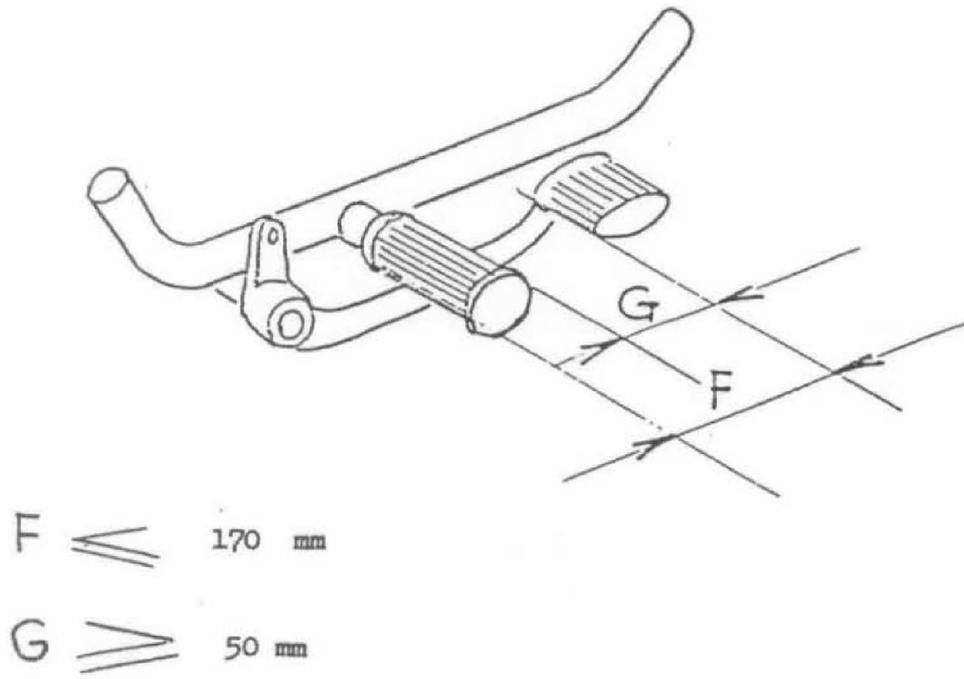


Figure 4

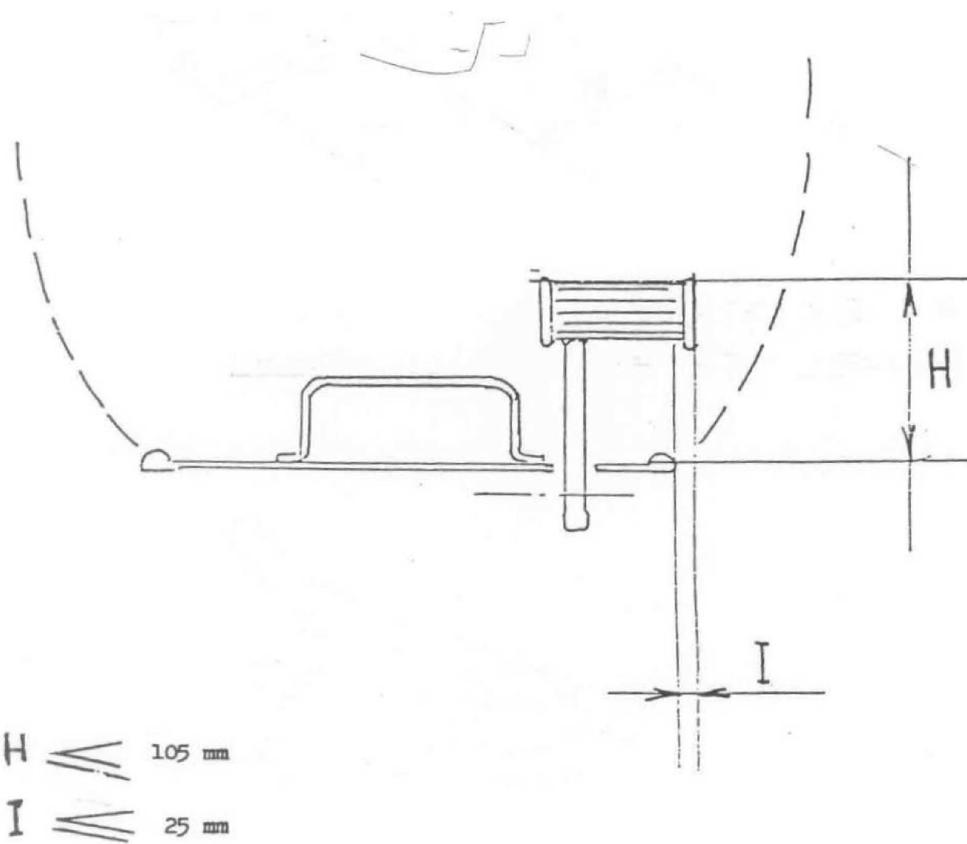


Figure 5

## ANNEX 4

**CONTROLS, TELL-TILES AND INDICATORS FOR WHICH, WHEN FITTED, IDENTIFICATION IS MANDATORY, AND SYMBOLS TO BE USED FOR THAT PURPOSE <sup>(1)</sup>**

1. This annex specifies the symbols, i.e. conventional signs, used to identify certain controls, indicators and tell-tales on a motor cycle or a moped and to facilitate their usage. It also indicates the colours of possible optical tell-tales which warn the driver of the operation of malfunctioning of the devices and equipment connected to the corresponding controls.
2. This annex is applicable to those controls which, when used, are fitted on the instrument panel or in the immediate vicinity of the motor cycle or the moped driver. This definition of application does not signify the mandatory presence of each and every control listed, in this annex.
3. The symbols must be such that, when viewed by the driver from the seated position, they are recognizable as shown in paragraph 5 below.
4. The symbols shall stand out clearly against the background, being either light on a dark background or dark on a light background.
5. The symbol must be placed on, or adjacent to, the control or tell-tale to be identified. Where this is not possible, the symbol and the control or tell-tale must be joined by a continuous line as short as possible.
6. If, in a symbol, a motor cycle/(a moped) or parts of a motor cycle/(a moped) are shown in a side view, a motor cycle/(a moped) driving from right to left shall be assumed.
7. Focused light shall be represented by parallel rays and diffuse light by divergent rays.
8. When the following colours are used on the optical tell-tales, they shall have the meaning indicated below:

Red: Danger

Yellow (Amber): Caution

Green: Safe

(Blue shall be used only for the headlamp driving beam tell-tale.)

<sup>(1)</sup> In conformity with the International Standards ISO 6727-1981 and 4129-1978. In order to ensure correct graphic presentation and observance of the exact proportions, the symbols are reproduced in accordance with the ISO grid system (see also appendix to this annex).

## 9. Designation and illustration of the symbols

Figure 1 (1)  
Headlamp beam control  
Driving beam  
Colour of tell-tale light: blue

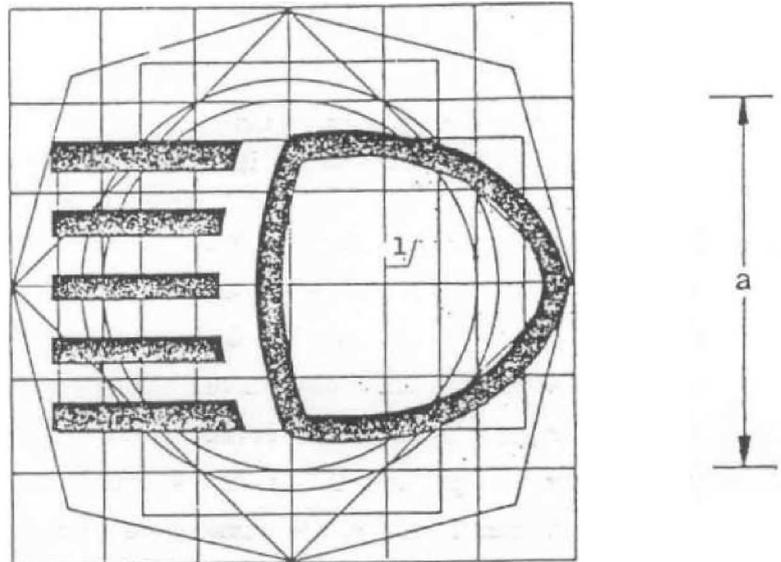


Figure 2 (1)  
Headlamp beam control  
Passing beam

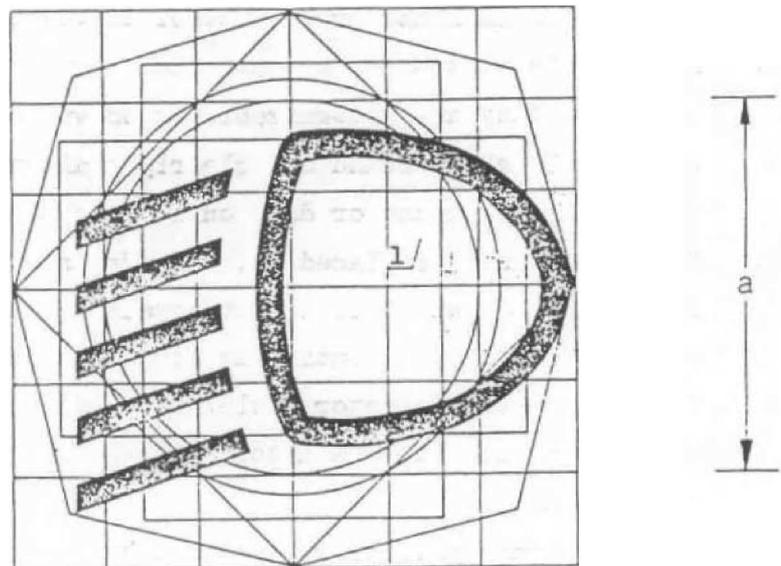


Figure 3 (1)  
Turn signal  
Colour of tell-tale light: green

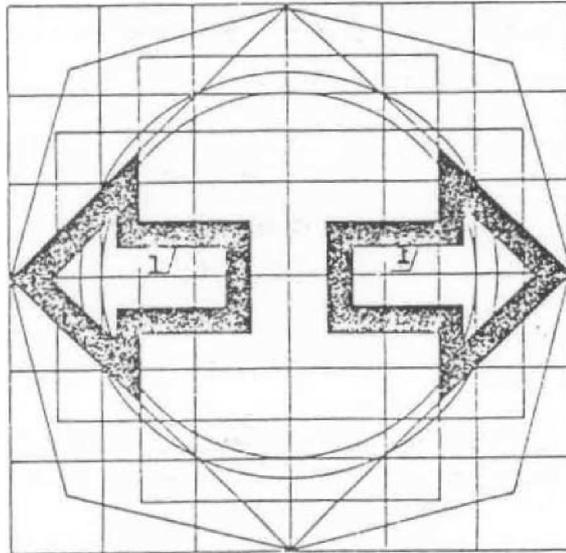


Figure 4 (1)  
Hazard warning (alternatives)  
Colour of tell-tale light: red or simultaneous  
operation of both arrows of figure 3

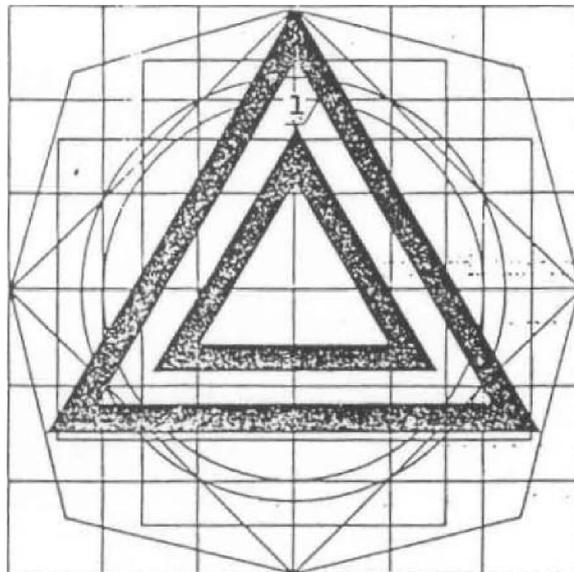


Figure 5  
Manual choke  
Colour of tell-tale light: amber

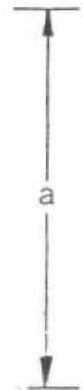
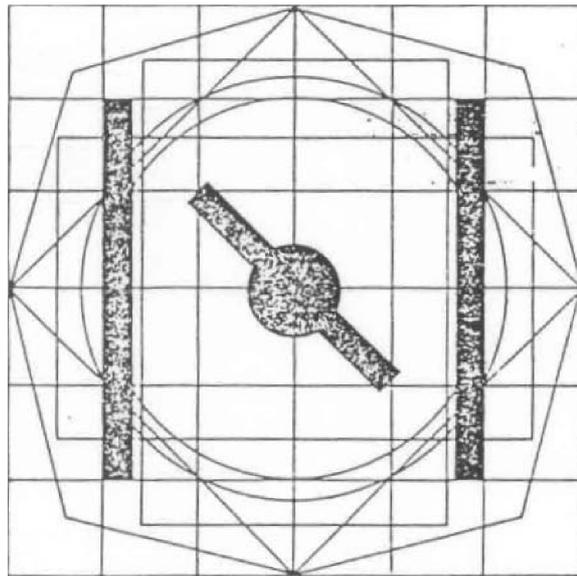


Figure 6 (?)  
Horn

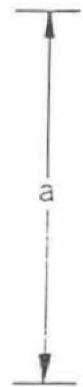
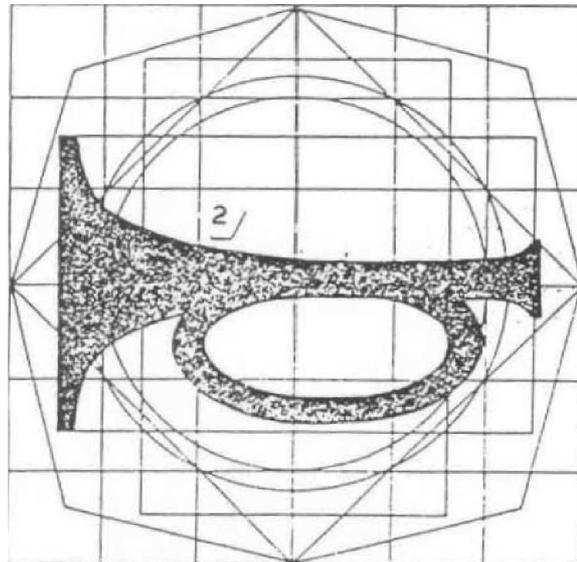


Figure 7 (2)  
Fuel  
Colour of tell-tale light: amber

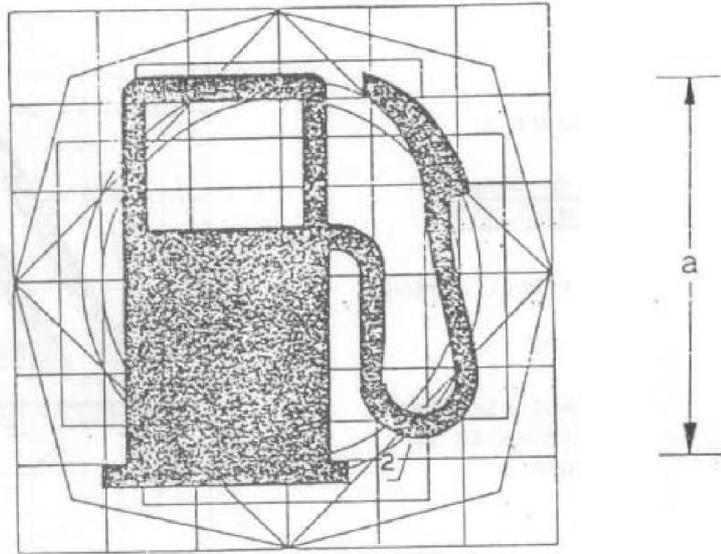


Figure 8  
Engine coolant temperature  
Colour of tell-tale light: red

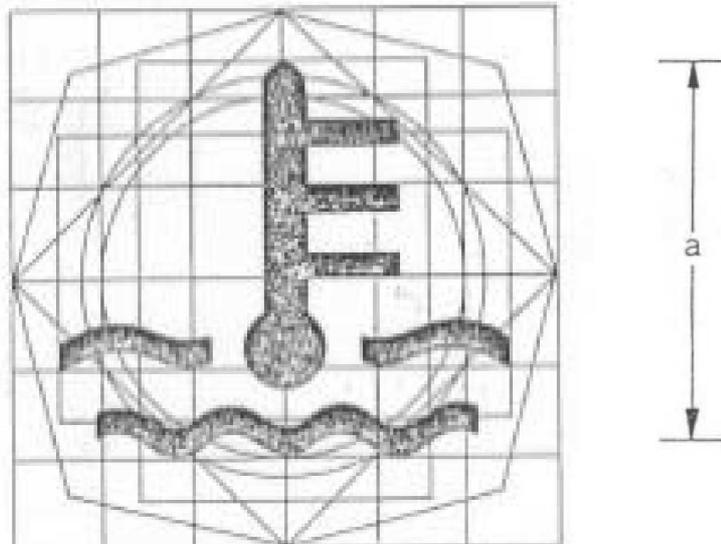


Figure 9  
Battery charging  
Colour of tell-tale light: red

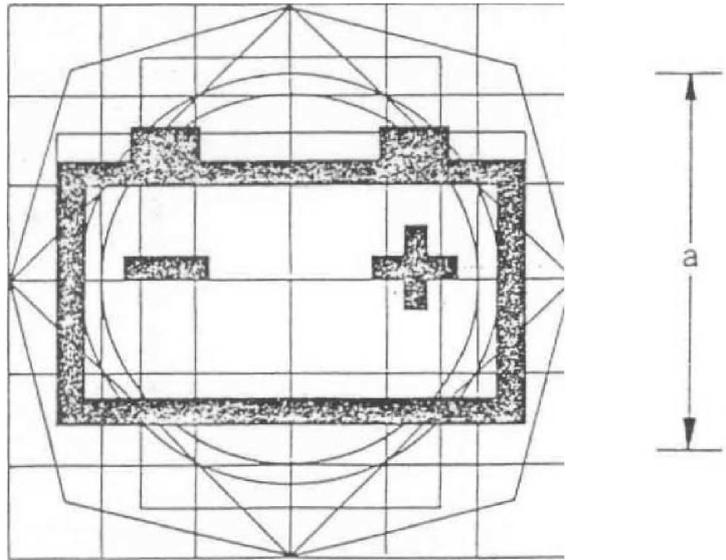


Figure 10  
Engine oil  
Colour of tell-tale light: red

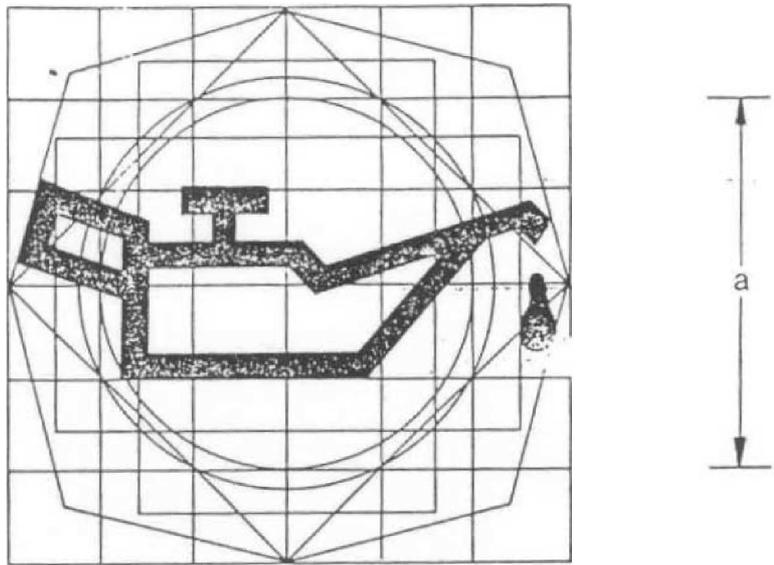


Figure 11 (1)  
Front fog light (2)  
Colour of tell-tale light: green

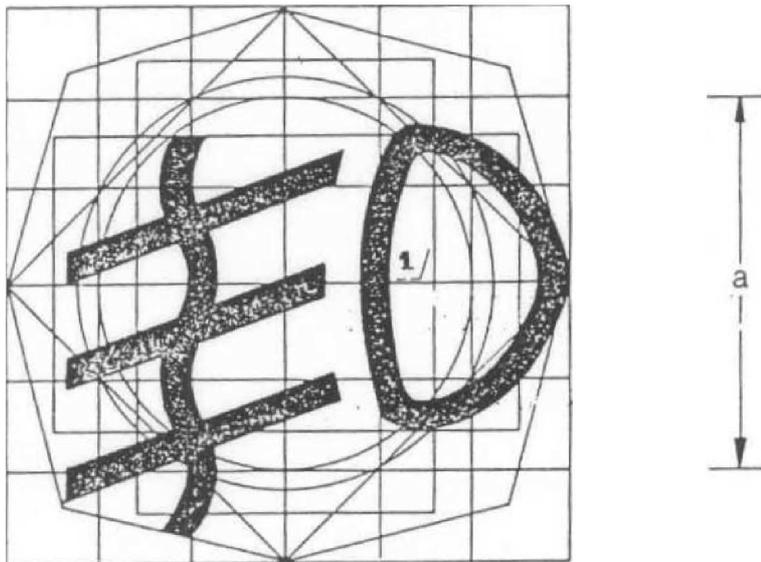


Figure 12  
Rear fog light (3)  
Colour of tell-tale light: amber

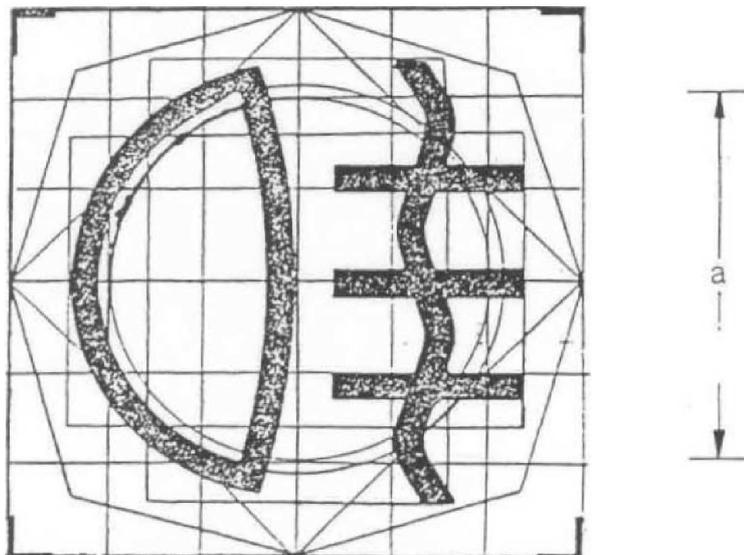


Figure 13  
Fuel tank shut off valve — position 'off'  
Fuel tank shut off valve — position 'on'

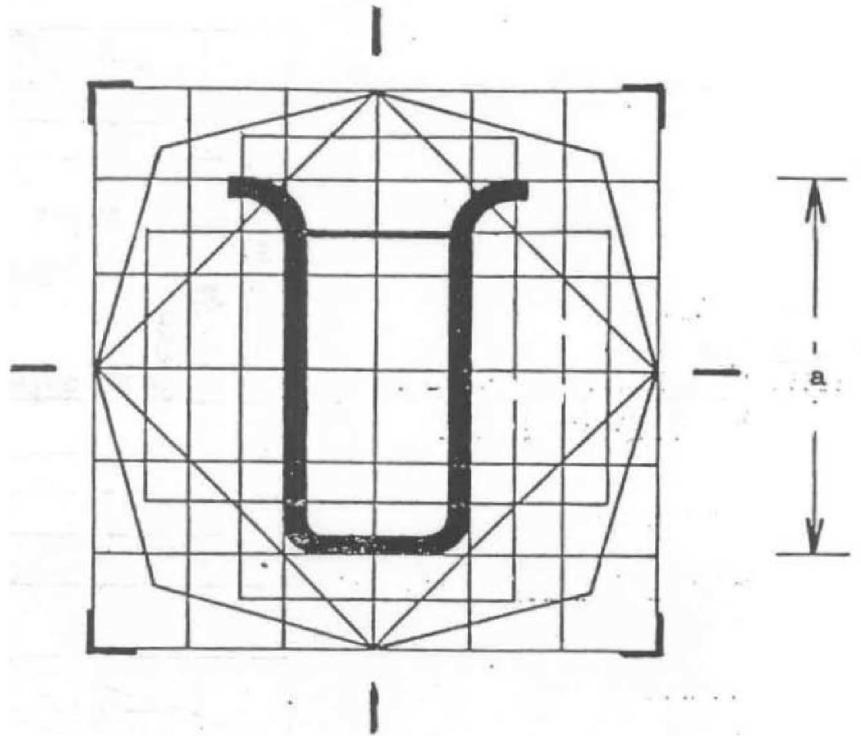
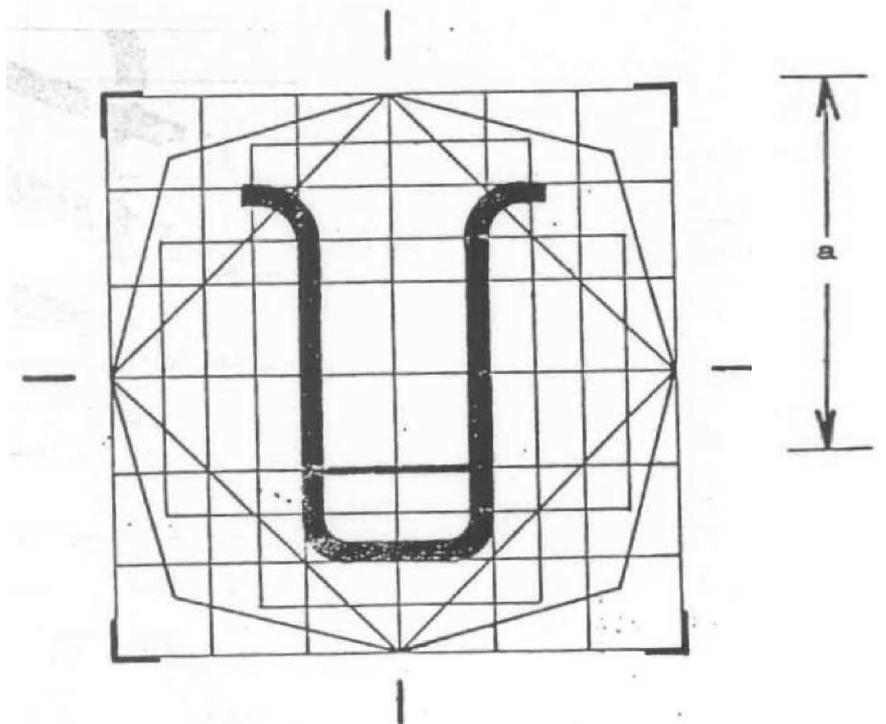


Figure 14  
Fuel tank shut off valve — position 'reserve'



Figures 15a, b

Ignition control or supplemental engine stop

Figure 15a  
position 'off'

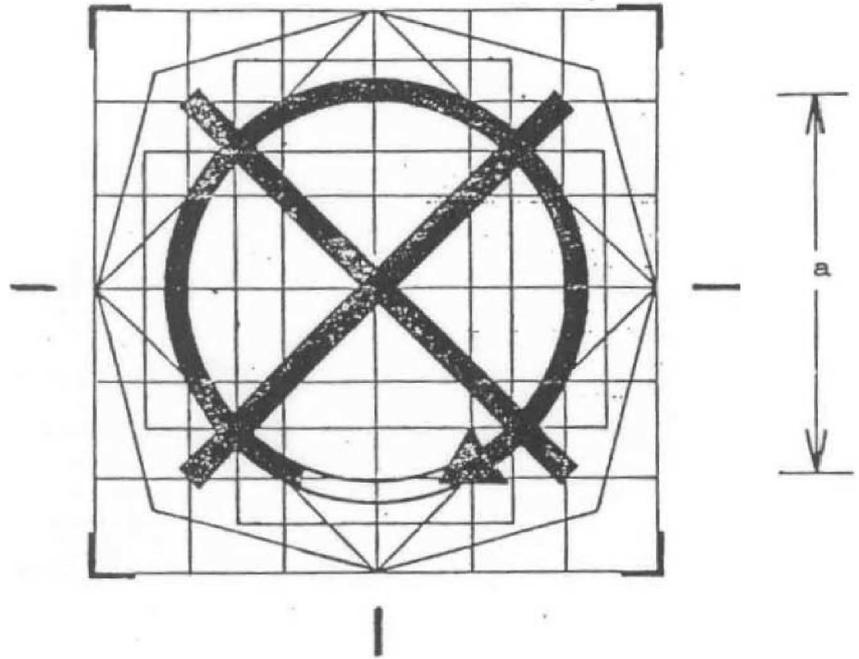
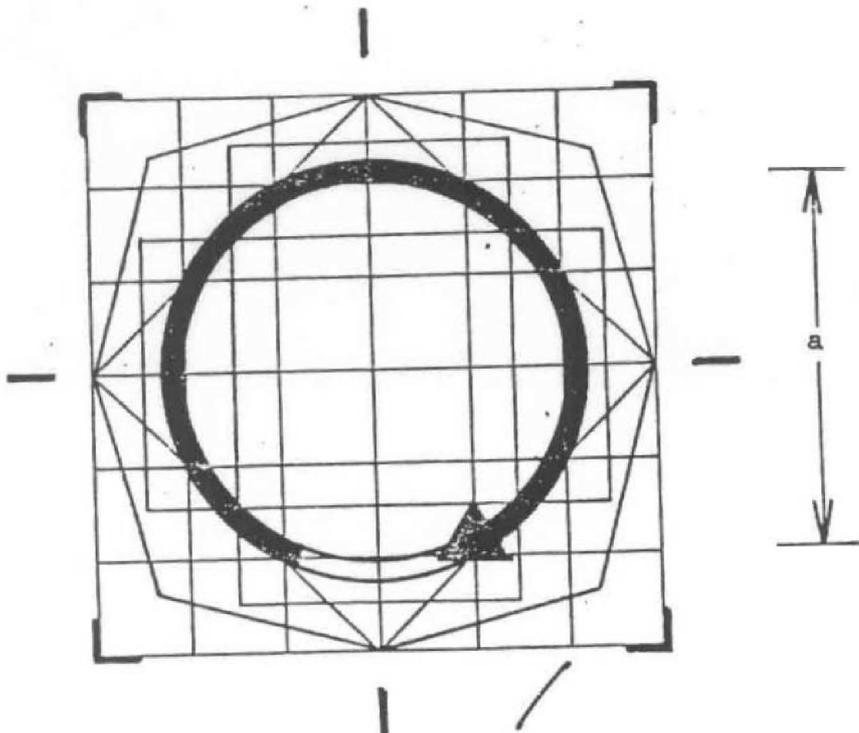


Figure 15b  
position 'run'



Figures 16a, b, c

Lighting switch (may be combined with ignition control)

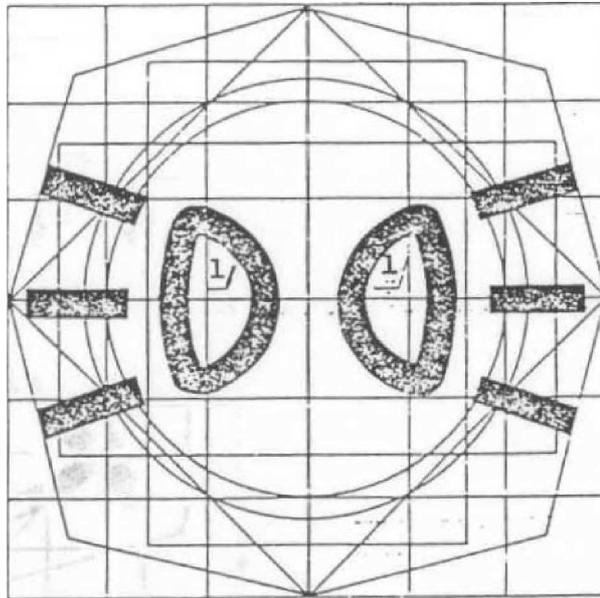


Figure 16a (!)  
Position light  
Colour of tell-tale light: green

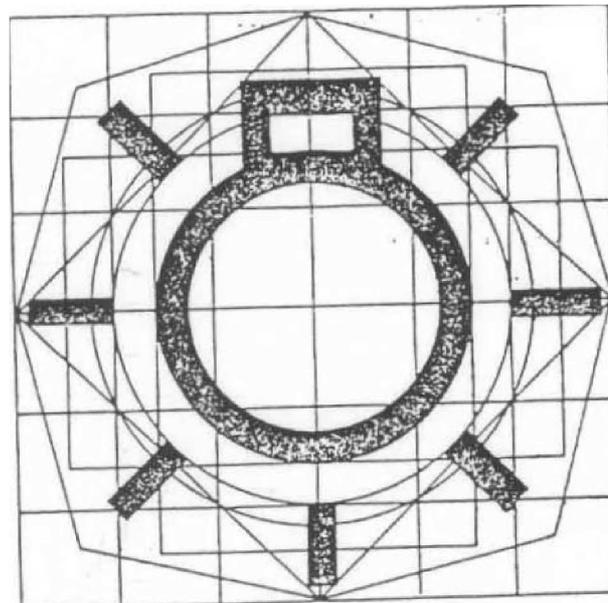


Figure 16b  
Master lamp switch  
Colour of tell-tale light: green

Figure 16c  
Parking light

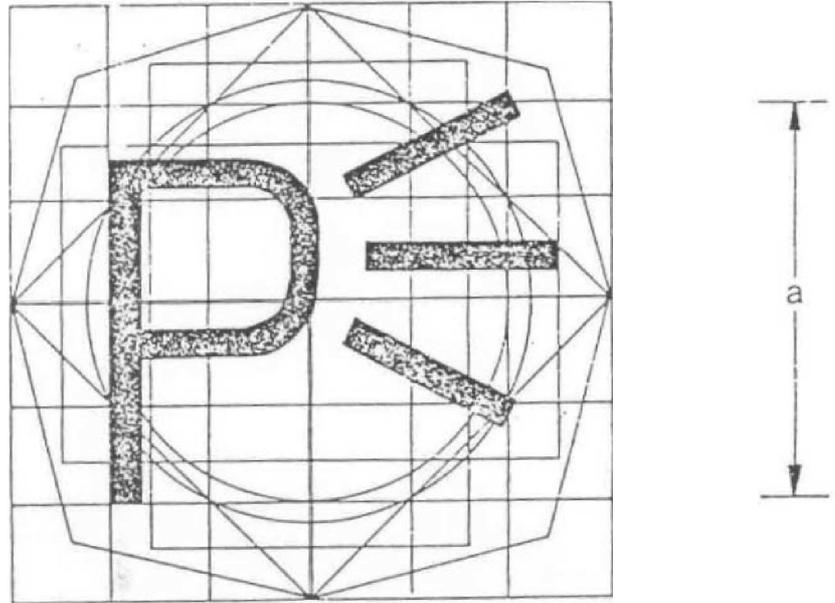


Figure 17  
Neutral indicator  
Colour of tell-tale light: green

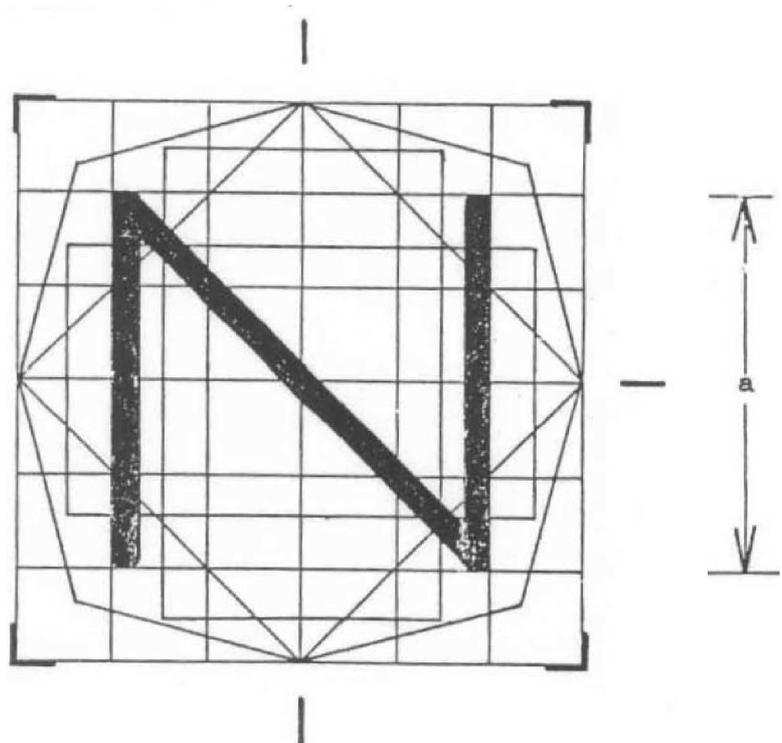
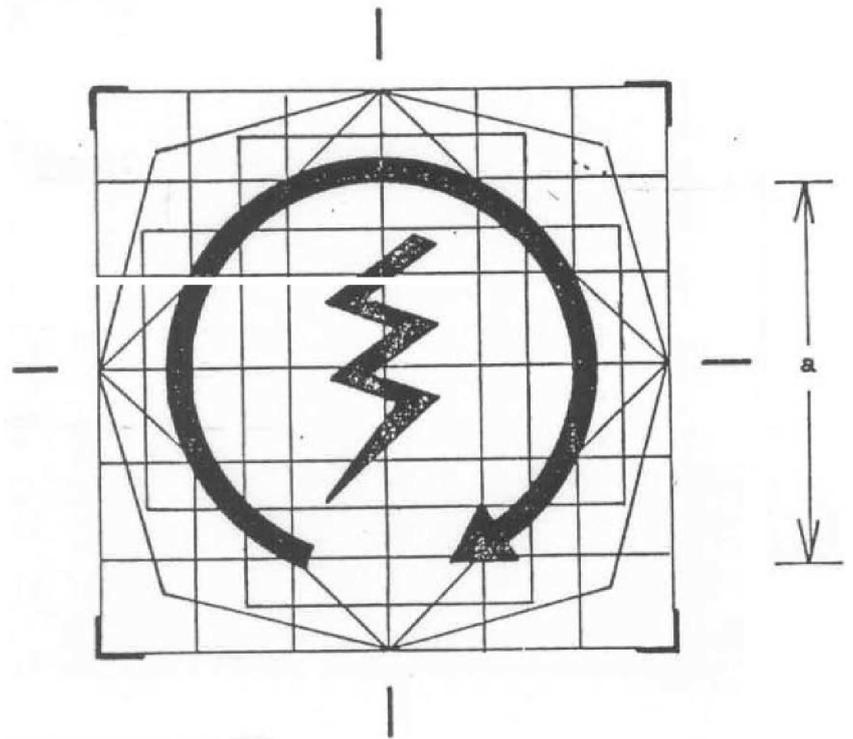


Figure 18  
Electric starter



Notes

- (<sup>1</sup>) The interior of the symbol may be entirely in a dark colour.
- (<sup>2</sup>) The dark part of this symbol may be replaced by its outline, in which case the portion shown here as white must be entirely in a dark colour.
- (<sup>3</sup>) If one control is used for both front and rear fog lights, the symbol used shall be the one designated 'front fog light'.

## Appendix

## Construction of the basic pattern for the symbols shown in Annex 4

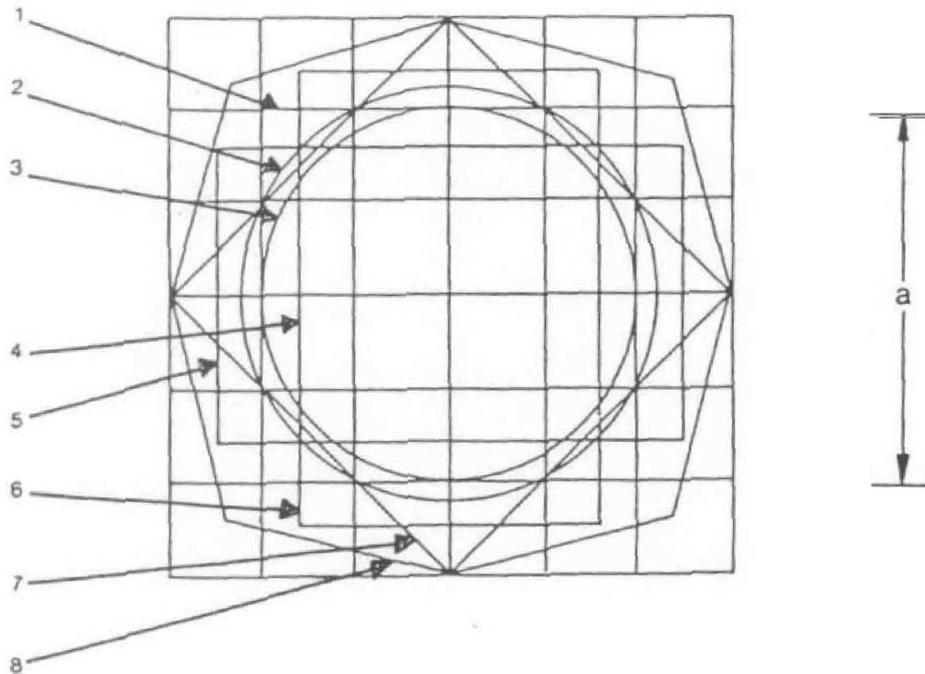


Figure 1

## Basic pattern

The basic pattern comprises:

1. A basic square of side 50 mm; this dimension is equal to the nominal dimension, 'a', of the basic pattern;
2. A basic circle of 56 mm diameter having approximately the same area as the basic square (1);
3. A second circle of 50 mm diameter, being the inscribed circle of the basic square (1);
4. A second square whose corners touch the basic circle (2) and whose sides are parallel to those of the basic square (1);
- 5 and 6. Two rectangles having the same area as the basic square (1); they are mutually perpendicular, each being drawn to cross opposite sides of the basic square symmetrically;
7. A third square whose sides pass through the points of intersection of the basic square (1) and the basic circle (2) and are at an angle of 45°, giving the largest horizontal and vertical dimensions of the basic pattern;
8. An irregular octagon, formed by lines at an angle of 30° to the sides of the square (7).

The basic pattern is superimposed on a 12,5 mm grid which coincides with the basic square (1).

**Regulation No 62 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of power-driven-vehicles with handlebars with regard to their protection against unauthorized use (\*)**

1. SCOPE
  - 1.1. This Regulation applies to protective devices designed to prevent the unauthorized use of two-wheeled power-driven-vehicles with or without sidecars and of power-driven three-wheeled-vehicles equipped with handle-bars.
2. DEFINITIONS

For the purposes of this Regulation:

  - 2.1. 'Approval of a vehicle' means the approval of a vehicle type with regard to its protection against unauthorized use;
  - 2.2. 'Vehicle type' means a category of power-driven vehicles which do not differ in such essential respects as:
    - 2.2.1. the manufacturer's indications of the vehicle type,
    - 2.2.2. the arrangement and design of the vehicle component or components on which the protective device acts,
    - 2.2.3. the type of protective-device,
  - 2.3. Protective device means a system designed to prevent unauthorized use of the vehicle providing a positive locking action of the steering or of the transmission; this system may be:
    - 2.3.1. type 1: solely and positively operated on the steering alone,
    - 2.3.2. type 2: positively operated on the steering in conjunction with the device which de-activates the engine of the vehicle,
    - 2.3.3. type 3: pre-loaded, operating on the steering in conjunction with the device which de-activates the engine of the vehicle;
    - 2.3.4. type 4: positively operated on the transmission.
  - 2.4. 'Steering' means the steering control (handlebars), the steering head and its accessory cladding, the steering shaft and all other components which directly affect the effectiveness of the protective device;
  - 2.5. 'Combination' means one of the specifically planned and constructed variations of a locking system which, when properly activated, permits operation of the locking system;
  - 2.6. 'Key' means any device designed and constructed to provide a method of operating a locking system which is designed and constructed to be operated only by that device.
3. APPLICATION FOR APPROVAL
  - 3.1. The application for approval of a vehicle type with regard to a protective device to prevent its unauthorized use shall be submitted by the vehicle manufacturer or by his duly accredited representative.

(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346, 17.12.1997, p. 78).

- 3.2. It shall be accompanied by the under-mentioned documents in triplicate and by the following particulars:
- 3.2.1. a detailed description of the vehicle type with regard to the arrangement, and design of the vehicle component or components on which the protective device acts;
- 3.2.2. drawings, on an appropriate scale and in sufficient detail of the protective device and of its mountings on the vehicle;
- 3.2.3. a technical description of the device.
- 3.3. There shall be submitted to the technical service responsible for conducting the approval tests:
- 3.3.1. a vehicle, representative of the vehicle type to be approved, if requested by the technical service; and also
- 3.3.2. at the request of the technical service, such components of the vehicle as the service deems essential for the checks prescribed in paragraphs 5 and 6 of this Regulation.
4. APPROVAL
- 4.1. If the vehicle submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5 and 6 below, approval of that vehicle type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) 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 either to the same vehicle type equipped with another type of protective device or whose protective device is mounted differently, or to another vehicle type.
- 4.3. Notice of approval or of refusal of approval of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the Agreement which apply to this Regulation, by means of a form conforming to the model in annex 1 to this Regulation and of drawings of the protective device and its mounting supplied by the applicant for approval, in a format not exceeding A4 (210 × 297 mm) or folded to that format and on an appropriate scale.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:
- 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;
- 4.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle described in paragraph 4.4.1.

<sup>(1)</sup> 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 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. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of 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 Approvals 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

- 4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to this Agreement in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such case the regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. GENERAL SPECIFICATIONS
- 5.1. The protective device shall be so designed that:
- 5.1.1. it is necessary to put it out of action in order to enable the vehicle to be steered, or to be driven or moved forward in a straight line,
- 5.1.2. in the case of protective devices of type 4, the device shall be so designed that it is necessary to put it out of action in order to release the transmission. If this device is activated by the control of the parking device it must act in conjunction with the device which deactivates the engine of the vehicle,
- 5.1.3. it shall only be possible to extract the key with the bolt in the fully engaged or in the fully disengaged position. Any intermediate position of the key which risks subsequent engagement of the bolt, even if the key of the protective device is inserted, shall be excluded.
- 5.2. The requirements of paragraph 5.1 shall be met by the single application of one key.
- 5.3. The protective device referred to in paragraph 5.1 above, and the vehicle components on which it operates, shall be so designed that it cannot rapidly and without attracting attention be opened, rendered ineffective, or destroyed by, for example, the use of low-cost, easily-concealed tools, equipment or fabrications readily available to the public at large.
- 5.4. The protective device shall be mounted on the vehicle as an item of original equipment (i.e. equipment installed by the vehicle manufacturer prior to first retail sale). The lock shall be securely assembled in the protective device. (If the lock can be extracted using the key and after the cover or any other retention device has been removed, this is not in contradiction with the requirement).
- 5.5. The key looking system shall provide at least 1 000 different key combinations or a number equal to the total number of vehicles manufactured annually if less than 1 000. In vehicles of one type the frequency of occurrence of each combination shall be roughly one per 1 000.
- 5.6. The key and lock shall not be visibly coded.
- 5.7. The lock shall be so designed, constructed and fitted that turning of the lock cylinder, when in the locked position, with a torque of less than 0,245 mdaN is not possible with anything other than the mating key, and
- 5.7.1. for lock cylinders with pin tumblers no more than two identical tumblers operating in the same direction shall be positioned adjacent to each other, and in a lock there shall not be more than 60 per cent identical tumblers,
- 5.7.2. for lock cylinders with disc tumblers no more than two identical tumblers operating in the same direction shall be positioned adjacent to each other, and in a lock there shall not be more than 50 per cent identical tumblers.

- 5.8. Protective devices shall be such as to exclude any risk, while the vehicle is in motion with engine running, of accidental blockage likely to compromise safety in particular.
- 5.9. The protective device, if it is of type 1, type 2 or type 3, shall, in its activated position, be strong enough to withstand, without damage to the steering mechanism likely to compromise safety, the application of a torque of 20 mdaN about the axis of the steering shaft in both directions under static conditions.
- 5.10. The protective device, if it is of type 1, type 2 or type 3, shall be so designed that the steering can only be locked at an angle of at least 20° to the left and/or the right of the straight ahead position
6. PARTICULAR SPECIFICATIONS
- 6.1. In addition to the general specifications prescribed in paragraph 5, the protective device shall comply with the particular conditions prescribed below:
- 6.1.1. In the case of protective devices of type 1 or type 2, it shall only be possible to engage the lock by means of a movement of the key, the handlebars being in the position appropriate for the engagement of the bolt in the corresponding slot.
- 6.1.2. In the case of protective devices of type 3, it shall only be possible to pre-load the bolt by a separate action on the part of the user of the vehicle, combined with or in addition to the rotation of the key. It shall not be possible to remove the key once the bolt has been pre-loaded, except in accordance with the provisions of paragraph 5.1.3 above.
- 6.2. In the case of protective devices of type 2 and type 3, it shall not be possible for the bolt to engage so long as the device is set in a position which permits the activation of the engine of the vehicle.
- 6.3. In the case of protective devices of type 3, when the device is set to act, it shall not be possible to prevent the device from functioning.
- 6.4. In the case of protective devices of type 3, the protective device must remain in good working order and must, in particular, continue to meet the requirements of paragraphs 5.7, 5.8, 5.9 and 6.3 above after it has undergone 2 500 locking cycles in each direction of the test specified in annex 3 of this Regulation.
7. MODIFICATIONS OF VEHICLE TYPE OR OF THE VEHICLE'S PROTECTIVE DEVICE
- 7.1. Every modification of the vehicle type or of the vehicle's protective device 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 4.3 above to the Parties to the Agreement which apply this Regulation.
8. CONFORMITY OF PRODUCTION
- 8.1. Every vehicle bearing an approval mark as prescribed under this Regulation shall conform, with regard to the type of protective device, to the mounting of the latter on the vehicle, and, to the components on which the protective device acts, to the vehicle type approved.
- 8.2. In order to verify conformity as prescribed in paragraph 8.1 above, a sufficient number of random checks shall be made on serially-manufactured vehicles bearing the approval mark required by this Regulation.

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 laid down in paragraph 8.1 above are not complied with.

9.2. If a Party to the Agreement who applies 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 copy of the approval form beaming at the end, in large letters, the signed and dated annotation 'APPROVAL WITHDRAWN'.

10. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of vehicle 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 Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation: 'PRODUCTION DISCONTINUED'.

11. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the 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 refusal or withdrawal of approval, issued in other countries, are to be sent.

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ANNEX 1

COMMUNICATION CONCERNING THE APPROVAL (OR REFUSAL OR WITHDRAWAL OF APPROVAL OR PRODUCTION DEFINITELY DISCONTINUED) OF A TYPE OF POWER-DRIVEN VEHICLE WITH HANDLEBARS WITH REGARD TO PROTECTION AGAINST UNAUTHORIZED USE, PURSUANT TO REGULATION No 62

(Maximum format: A4 (210 × 297 mm))



Name of administration

Approval No: .....

1. Trade name or mark of the power-driven vehicle: .....

2. Vehicle type: .....

3. Manufacturer's name and address: .....

4. If applicable, name and address of manufacturer's representative: .....

5. Brief description of the protective device, of its mounting and function, and of the steering system of the vehicle: .....

6. Vehicle submitted for approval on: .....

7. Technical service responsible for conducting approval tests: .....

8. Date of report issued by that service: .....

9. Number of report issued by that service: .....

10. Approval granted/refused <sup>(1)</sup>:

11. Position of approval mark on the vehicle: .....

12. Place: .....

13. Date: .....

14. Signature: .....

15. The following documents, gearing the approval number shown above, are annexed to this communication:

drawings, diagrams and plans of the protective device, of its mounting, and of the vehicle components on which it acts; photographs of the protective device.

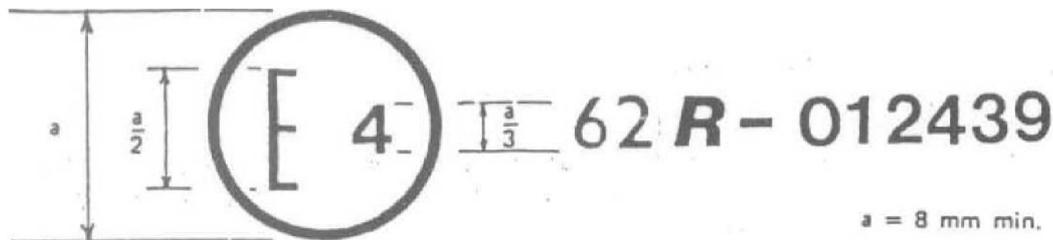
<sup>(1)</sup> Strike out what does not apply.

## ANNEX 2

## ARRANGEMENTS OF APPROVAL MARKS

## Model A

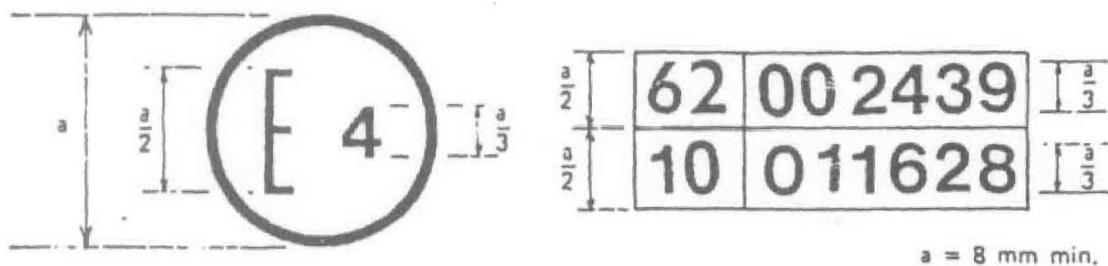
(See paragraph 4.4 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to the protection against unauthorized use, been approved in the Netherlands (E 4) pursuant to Regulation No 62 under the approval number 002439. The approval number indicates that the approval was granted in accordance with the requirements of Regulation No 62 in its original form.

## Model B

(See paragraph 4.5 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to the Regulations Nos 62 and 10<sup>(1)</sup>. The approval numbers indicate that, at the dates when the respective approvals were given, Regulation No 62 had not been modified, and Regulation No 10 already included the 01 series of amendments.

<sup>(1)</sup> This number is given merely as an example.

## ANNEX 3

**TEST FOR WEAR IN TYPE 3 PROTECTIVE DEVICES**

1. TEST EQUIPMENT
    - 1.1. The test equipment shall consist of:
      - 1.1.1. a fixture suitable for mounting the sample steering complete with the protective device attached, as defined in paragraph 2.3 of this Regulation;
      - 1.1.2. a means for activating and de-activating the protective device which shall include the use of the key;
      - 1.1.3. a means for rotating the steering shaft relative to the protective device.
  2. TEST METHOD
    - 2.1. A sample of the steering complete with the protective device is attached to the fixture referred to in paragraph 1.1.1 above.
    - 2.2. One cycle of the test procedure shall consist of the following operations:
      - 2.2.1. *Start position*

The protective device shall be de-activated and the steering shaft shall be rotated to a position which prevents engagement of the protective device.
      - 2.2.2. *Set to activate*

The protective device shall be moved from the de-activated to the activated position, using the key.
      - 2.2.3. *Activated*

The steering shaft shall be rotated such that the torque on it, at the instant of engagement of the protective device, shall be  $5,88 \text{ Nm} \pm 0,25$ .
      - 2.2.4. *De-activated*

The protective device shall be de-activated by the normal means, the torque being reduced to zero to facilitate disengagement.
      - 2.2.5. *Return*

The steering shaft shall be rotated to a position which prevents engagement of the protective device.
      - 2.2.6. *Opposite rotation*

Repeat procedures described in paragraphs 2.2.2, 2.2.3, 2.2.4 and 2.2.5 but in the opposite direction of rotation of the steering shaft.
      - 2.2.7. The time interval between two successive engagements of the device shall be at least 10 seconds.
    - 2.3. The wear-producing cycle shall be repeated for the number of times specified in paragraph 6.4 of this Regulation.
-

**Regulation No 71 of the Economic Commission for Europe of the United Nations (UN/ECE) —  
Uniform provisions concerning the approval of agricultural tractors with regard to the driver's  
field of vision (\*)**

1. SCOPE
  - 1.1. This Regulation applies to the 180° forward field of vision of the drivers of agricultural tractors.
2. DEFINITIONS
  - 2.1. For the purposes of this Regulation 'agricultural tractor' means any power-driven vehicle, either wheeled or tracklaying, which has at least two axles, whose function depends essentially on its tractive power, and which is specially designed to pull, push, carry or actuate certain implements, machines or trailers intended for use in agriculture or forestry. Such a tractor may be arranged to carry a load and attendants;
  - 2.2. 'Approval of a tractor' means the approval of a tractor type with regard to the field of vision defined in paragraph 2.4;
  - 2.3. 'Tractor type' means a category of tractors which do not differ in such essential respects as:
    - 2.3.1. such external and internal shapes and arrangements within the area specified in paragraph 1.1 as may affect visibility;
    - 2.3.2. the form and size of the windscreen and of the side windows situated in the area specified in paragraph 1.1;
  - 2.4. 'Field of vision' means the aggregate of forward and side directions in which the tractor driver can see;
  - 2.5. 'Reference point' means the point which is situated in the plane parallel to the median longitudinal plane of the tractor passing through the middle of the seat, at a position 700 mm along the vertical above the line of intersection of that plane with the surface of the seat and 270 mm — in the direction of the pelvis support — from the vertical plane tangential to the front edge of the seat surface and perpendicular to the median longitudinal plane of the tractor (see figure 1); the reference point as thus determined applies to an empty seat adjusted in the average position prescribed by the tractor manufacturer;
  - 2.6. 'Semi-circle of vision' means the semi-circle described by a radius of 12 m around the point situated in the horizontal plane of the road at the vertical below the reference point so that the arc — seen from the direction in which the vehicle travels — is situated in front of the tractor and that the diameter delimiting the semi-circle forms a right angle with the longitudinal axis of the tractor (see figure 2);
  - 2.7. 'Masking effect' means the chords of the sectors of the semi-circle of vision which cannot be seen because of structural components — for instance, the roof pillars, air intakes, exhaust stacks, windscreen frames, protective frame;
  - 2.8. 'Area of vision' means that part of the field of vision which is delimited:
    - 2.8.1. in an upward direction by a horizontal plane passing through the reference point,
    - 2.8.2. on the plane of the road by the area, situated outside the semi-circle of vision, which extends the area of the semi-circle of vision, whose chord, 9,5 m in length, is perpendicular to and bisected by the plane parallel to the median longitudinal plane of the tractor passing through the middle of the driver's seat;

(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346, 17.12.1997, p. 78).

- 2.9. 'Operating area of the windscreen wipers' means the external surface of the windscreen which is swept by the windscreen wipers.
3. APPLICATION FOR APPROVAL
- 3.1. The application for approval of a tractor with regard to the driver's field of vision shall be submitted by the manufacturer of the tractor or by his duly accredited representative.
- 3.2. It shall be accompanied by the under-mentioned documents in triplicate, and by the following particulars:
- 3.2.1. A description of the tractor with regard to the points mentioned in paragraph 2.3 above, together with dimensioned drawings and tyre sizes designated by the manufacturer and either a photograph or an exploded view of the passenger compartment; the numbers and/or symbols identifying the tractor type shall be specified;
- 3.2.2. Particulars of the position of the reference point in relation to any obstacles to the driver's vision, the particulars being sufficiently detailed for, *inter alia*, calculation of the masking effects according to the formula given in paragraph 5.2.2.2.
- 3.3. A tractor representative of the tractor type to be approved shall be submitted to the technical service responsible for conducting approval tests.
4. APPROVAL
- 4.1. If the tractor type submitted for approval pursuant to this Regulation meets the requirements of paragraph 5 below, approval of that tractor type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) 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 shall not assign the same number to another tractor type as defined in paragraph 2.3 above.
- 4.3. Notice of approval or of refusal or of extension or withdrawal of approval or production definitely discontinued of a tractor type pursuant to this Regulation shall be communicated to the Parties to the Agreement applying this Regulation, by means of a form conforming to the model in annex 1 to this Regulation.
- 4.4. To every tractor conforming to a type approved pursuant to this Regulation there shall be affixed, conspicuously and in a readily accessible place specified on the approval form, an international approval mark consisting of:
- 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;
- 4.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle described in paragraph 4.4.1.

<sup>(1)</sup> One for the Federal Republic of Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for Czechoslovakia, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 for the German Democratic Republic, 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal and 22 for the Union of Soviet Socialist Republics. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 4.5. If the tractor conforms to a tractor type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such a case the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the tractor data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. SPECIFICATION
- 5.1. *General*
- 5.1.1. The tractor shall be so constructed and equipped that, in road traffic and when used in agriculture or forestry, the driver has an adequate field of vision in all normal conditions of road traffic and of field and forest work. The field of vision shall be deemed to be adequate when the driver can, wherever possible, see part of each front wheel and when the following requirements are met.
- 5.2. *Verification of field of vision*
- 5.2.1. Procedure for determining masking effects.
- 5.2.1.1. The tractor shall be placed on a horizontal surface as shown in figure 2. On a horizontal support level with the reference point, there shall be mounted two point sources of light, e.g. 2 x 150 W, 12 V, 65 mm apart and symmetrically located with respect to the reference point. The support shall be rotatable at its centre point about a vertical axis passing through the reference point. For the purpose of measuring the masking effects, the support shall be so aligned that the line joining the two light sources is perpendicular to the line joining the masking component and the reference point. The most adverse arrangement of tyre equipment shall be fitted. The silhouette (deepest shadow) overlaps projected onto the semi-circle of vision by the masking component, when the light sources are switched on simultaneously or alternately, shall be measured in accordance with paragraph 2.7 (figure 3).
- 5.2.1.2. Each masking effect shall not exceed 700 mm.
- 5.2.1.3. Masking effects due to adjacent structural components over 80/mm in width shall be so disposed that there is an interval of at least 2 200/mm — measured as a chord of the semi-circle of vision — between the centres of two masking effects.
- 5.2.1.4. There shall not be more than six masking effects in the semi-circle of vision as a whole, nor more than two within the area of vision referred to in paragraph 2.8.
- 5.2.1.5. Masking effects exceeding 700 mm but not exceeding 1 500 mm are, however, permissible if the components causing them cannot be redesigned or relocated. Outside the sector of vision, there may be on each side a total of either:
- 5.2.1.5.1. two such masking effects, one not exceeding 700 mm and the other not exceeding 1 500 mm, or
- 5.2.1.5.2. two such masking effects, neither exceeding 1 200 mm.
- 5.2.1.6. Any obstruction of vision caused by the presence of rear-view mirrors of an authorized model shall not be taken into consideration if such mirrors cannot be positioned differently.

- 5.2.2. Mathematical determination of binocular-vision masking effects.
- 5.2.2.1. The admissibility of various masking effects may be verified mathematically rather than through the verification procedure referred to in paragraph 5.2.1. The extent, distribution and number of masking effects shall be governed by paragraphs 5.2.1.3 to 5.2.1.6.
- 5.2.2.2. On the basis of a binocular vision and a distance between the eyes of 65 mm, the masking effect expressed in mm can be calculated by the formula

$$x = \frac{b - 65}{a} \times 12\,000 + 65$$

where

a = the distance in mm between the component obscuring vision and the reference point, measured along the line of vision joining the reference point, the centre of the component and the perimeter of the semi-circle of vision;

b = the width in mm of the component obscuring vision, measured horizontally and perpendicularly to the line of vision.

- 5.3. The verification procedures referred to in paragraph 5.2 may be replaced by other procedures, provided that the latter can be shown to be equally valid.

5.4. *Masking effect of the windscreen frame*

In determining the masking effects in the sector of vision, the masking effect caused by the windscreen frame and the masking effect caused by another obstruction may, for the purposes of paragraph 5.2.1.4 be considered as a single masking effect, provided the distance between the outermost points of such masking effects does not exceed 700 mm.

5.5. *Windscreen wiper*

- 5.5.1. If the tractor is equipped with a windscreen, it shall also be equipped with one or more power-driven windscreen wipers. Their operating area shall be such as to ensure a clear forward view corresponding to one chord of the semi-circle measuring not less than 8 m, within the area of vision.

- 5.5.2. Windscreen wipers shall operate with not less than 20 wiping cycles per minute.

6. MODIFICATIONS OF THE TRACTOR TYPE AND EXTENSION OF APPROVAL

- 6.1. Every modification of the tractor type shall be notified to the administrative department, which approved the tractor type. The department may then either:

- 6.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the tractor still complies with the requirements; or

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

- 6.2. Confirmation or refusal of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.3 above to the Parties to the Agreement who apply this Regulation.

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

7. CONFORMITY OF PRODUCTION

- 7.1. Every tractor bearing an approval mark as prescribed by this Regulation shall conform to the tractor type approved and satisfy the requirements of paragraph 5 above.
- 7.2. In order to verify conformity as prescribed in paragraph 7.1 above, a sufficient number of random checks shall be made on serially-manufactured tractors bearing the approval mark required under this Regulation.

8. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

- 8.1. The approval granted in respect of a tractor type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 7.1 are not complied with or if the tractor fails to pass the checks prescribed in paragraph 7 above.
- 8.2. If a Party to the Agreement which applies 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 copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'APPROVAL WITHDRAWN'.

9. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a tractor 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 Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'PRODUCTION DISCONTINUED'.

10. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the 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 refusal or extension or withdrawal of approval, issued in other countries, are to be sent.

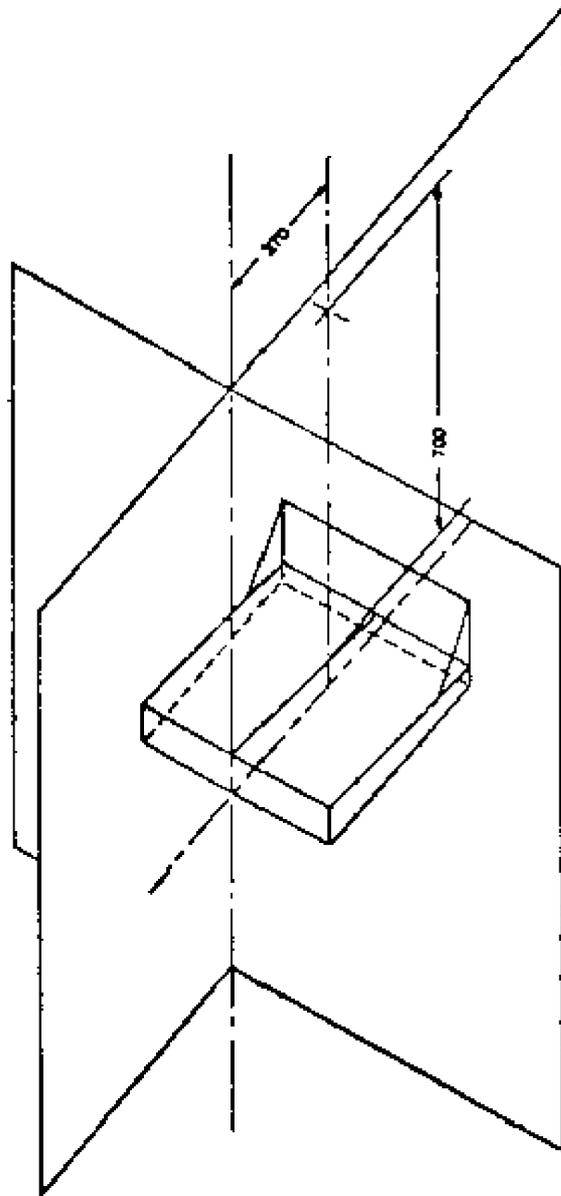


Figure 1

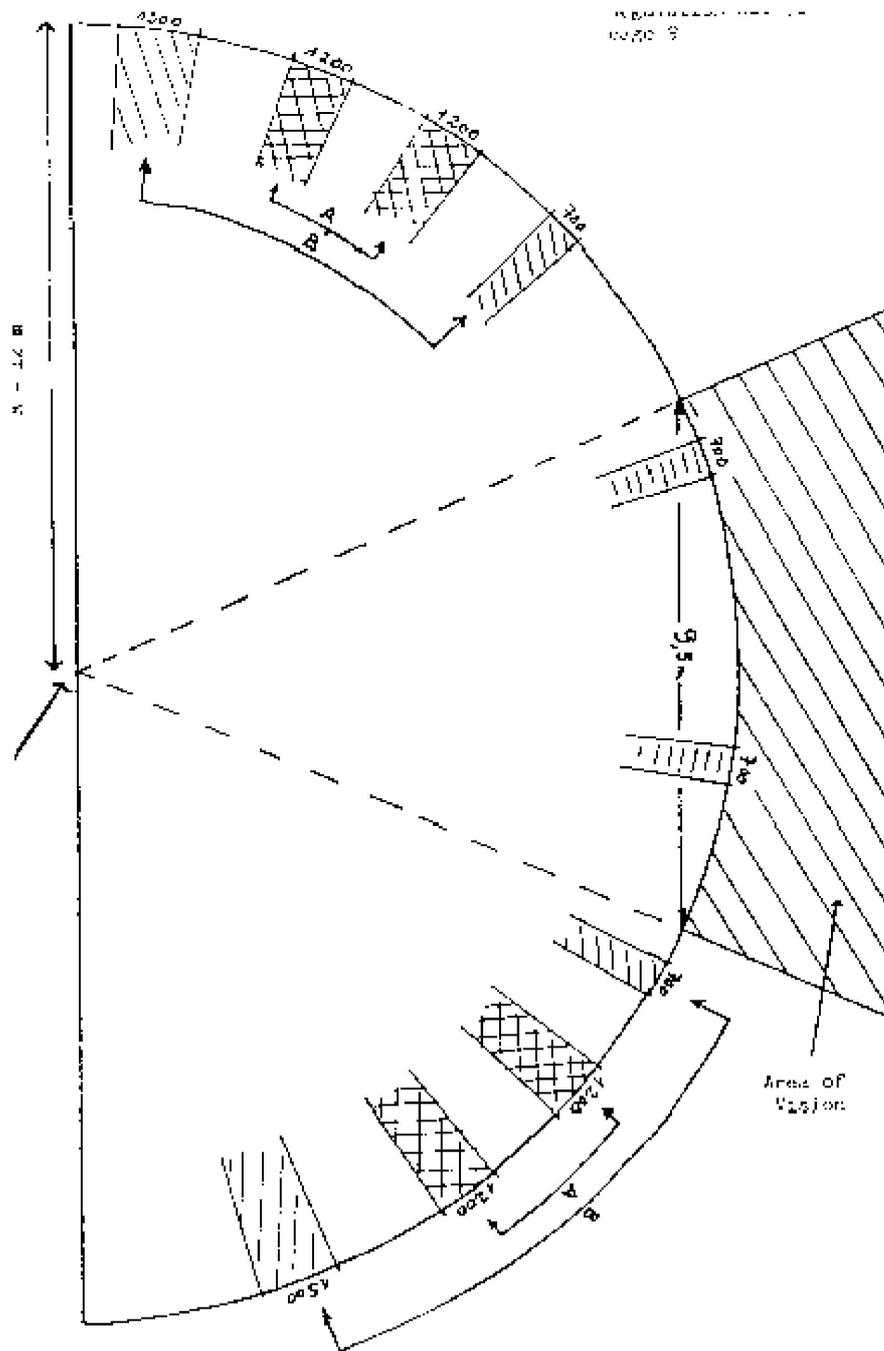
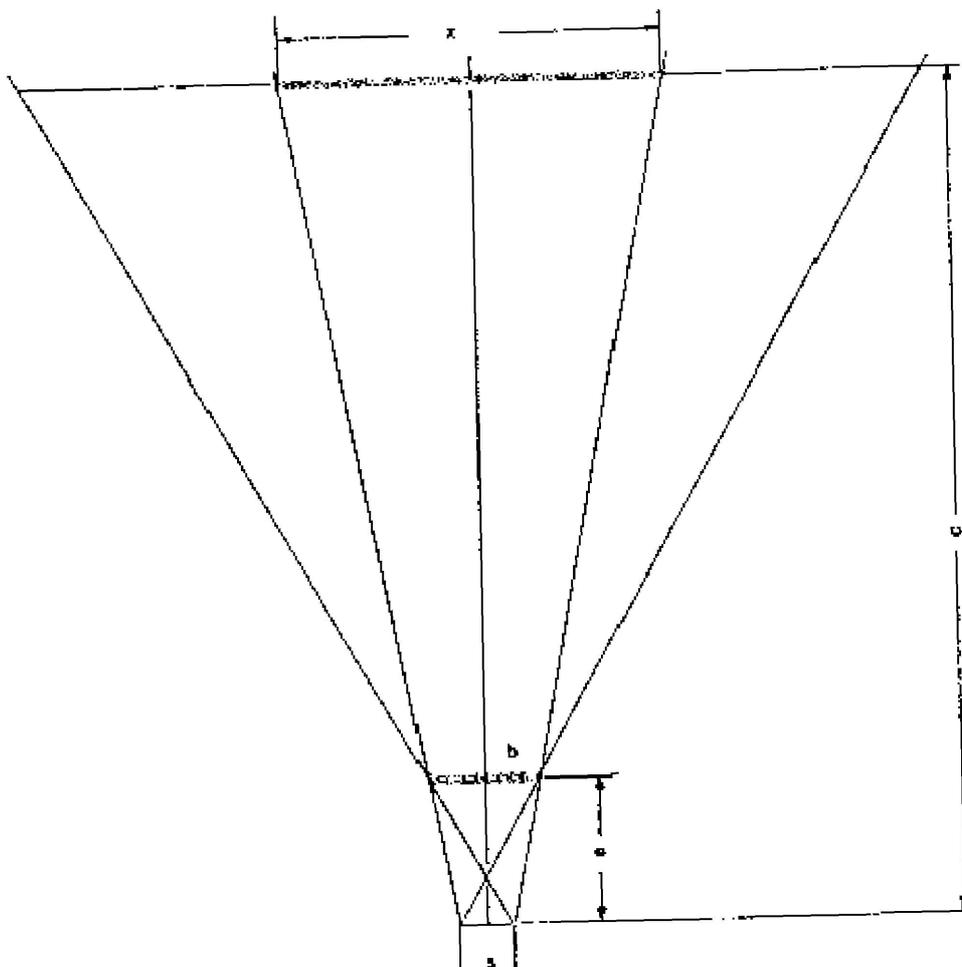


Figure 2



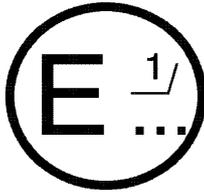
$$\frac{\frac{x}{2} - \frac{s}{2}}{c} = \frac{\frac{b}{2} - \frac{s}{2}}{a}$$

$$x = \frac{b - 65}{a} \times 12\,000 + 65$$

Figure 3

ANNEX 1

(Maximum format: A4 (210 × 297 mm))



(1) .....  
.....  
.....

Communication concerning:

- approval
- refusal of approval
- extension of approval
- withdrawal of approval
- production definitely discontinued (2)

of a tractor type with regard to the driver's field of vision, pursuant to Regulation No 71

Approval No ..... Extension No .....

1. Trade name or mark of tractor: .....
2. Tractor type: .....
3. Manufacturer's name and address: .....
4. If applicable, name and address of manufacturer's representative: .....
5. Brief description of tractor: .....
6. The most adverse arrangement of tyre equipment for forward vision (front, rear): .....
7. Tractor submitted for approval on: .....
8. Technical service responsible for conducting approval tests: .....
9. Date of report issued by that service: .....
10. Number of report issued by that service: .....
11. Approval granted/refused/extended/withdrawn (2)
12. Reason(s) of extension (if applicable): .....
13. Site of approval mark on tractor: .....
14. Place: .....
15. Date: .....
16. Signature: .....
17. The following documents, bearing the approval number shown above, are annexed to this communication:
  - dimensioned drawings;
  - exploded view or photograph of the passenger compartment.

(1) Name of administration.

(2) Strike out what does not apply.

## ANNEX 2

## ARRANGEMENTS OF APPROVAL MARKS

## Model A

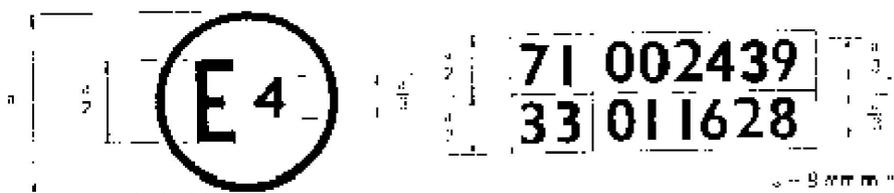
(see paragraph 4.4 of this Regulation)



The above approval mark affixed to a tractor shows that the tractor type concerned has, with regard to the driver's field of vision, been approved in the Netherlands (E 4) pursuant to Regulation No 71 under the approval number 002439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of Regulation No 71 in its original form.

## Model B

(see paragraph 4.5 of this Regulation)



The above approval mark affixed to a tractor shows that the tractor type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos 71 and 33 (1). The first two digits of the approval numbers indicate that, at the dates when the respective approvals were granted, Regulation No 71 had not been modified, and Regulation No 33 already included the 01 series of amendments.

(1) The latter number is given as an example only.

**Regulation No 73 of the Economic Commission for Europe of the United Nations (UN/ECE) —  
Uniform provisions concerning the approval of goods vehicles, trailers and semi-trailers with  
regard to their lateral protection (\*)**

1. SCOPE

This Regulation applies to the lateral protection of complete vehicles of categories N<sub>2</sub>, N<sub>3</sub>, O<sub>3</sub> and O<sub>4</sub> <sup>(1)</sup>. It does not apply to:

- Tractors for semi-trailers;
- Trailers specially designed and constructed for the carriage of very long loads of indivisible length, such as timber, steel bars, etc.;
- Vehicles designed and constructed for special purposes where it is not possible, for practical reasons, to fit such lateral protection.

2. PURPOSE

Vehicles covered by this Regulation shall be so constructed and/or equipped as to offer effective protection to unprotected road users against the risk of falling under the sides of the vehicle and being caught under the wheels <sup>(2)</sup>.

3. DEFINITIONS

3.1. For the purposes of this Regulation:

- 3.1.1. 'Approval of a vehicle' means the approval of a complete vehicle type with regard to its lateral protection;
- 3.1.2. 'Vehicle type' means a category of vehicles which do not differ with respect to the essential points such as the width of the rear axle, the overall width, the dimensions, the shape and the materials of the whole side of the vehicle (including the cab if fitted), and the characteristics of the suspension in so far as they have a bearing on the requirements specified in paragraph 7 of this Regulation;
- 3.1.3. 'Maximum mass' means the mass stated by the vehicle manufacturer to be technically permissible (this mass may be higher than the 'permissible maximum mass' laid down by the national administration);
- 3.1.4. 'Unladen mass' means the weight of the vehicle in running order, unoccupied and unladen, but complete with fuel, coolant, lubricant, tools and spare wheel, if supplied by the vehicle manufacturer as standard equipment;
- 3.1.5. 'Unprotected road users' means pedestrians, cyclists or motor cyclists using the road in such a way that they are liable to fall under the sides of the vehicle and be caught under the wheels.

4. APPLICATION FOR APPROVAL

- 4.1. The application for approval of a vehicle type with regard to its lateral protection shall be submitted by the vehicle manufacturer or by his duly accredited representative.

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(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346, 17.12.1997, p. 78).

<sup>(1)</sup> See annex 3: Classification of vehicles.

<sup>(2)</sup> This Regulation does not prevent any country from having additional requirements for the vehicle parts forward of the front wheels and rearward of the rear wheels.

- 4.2. It shall be accompanied by the undermentioned documents in triplicate and by the following particulars:
- 4.2.1. a detailed description of the vehicle type with respect to its structure, dimensions, lines and constituent materials in so far as required for the purpose of this Regulation;
- 4.2.2. drawings of the vehicle showing the vehicle type in side and rear elevation and design details of the lateral parts of the structure;
- 4.2.3. a detailed description of the specific device for lateral protection: its dimensions, lines, constituent materials and position on the vehicle.
- 4.3. A vehicle representative of the type to be approved shall be submitted to the technical service responsible for controlling the technical specifications.
- 4.3.1. A vehicle not comprising all the components proper to the type may be accepted for approval provided that it can be shown that the absence of the components omitted has no detrimental effect on the results of the approval so far as the requirements of this Regulation are concerned.
- 4.3.2. It shall be the responsibility of the applicant for approval to show that acceptance of the variants referred to in paragraph 4.3.1 above is compatible with compliance with the requirements of this Regulation.
- 4.3.3. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of production before type approval is granted.
5. APPROVAL
- 5.1. If the vehicle submitted for approval pursuant to this Regulation meets the requirements of paragraphs 6 and 7 below, approval of that vehicle type shall be granted.
- 5.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) 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 vehicle type.
- 5.3. Notice of approval or refusal or extension of approval of a vehicle type pursuant to 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, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:
- 5.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval<sup>(1)</sup>;
- 5.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle prescribed in paragraph 5.4.1.

<sup>(1)</sup> 1 for the Federal Republic of Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for Czechoslovakia, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 for the German Democratic Republic, 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal and 22 for the Union of Soviet Socialist Republics. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 5.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 5.4.1 need not be repeated; in such a case the regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 5.4.1.
- 5.6. The approval mark shall be clearly legible and be indelible.
- 5.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 5.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.

## 6. REQUIREMENTS

### 6.1. *General*

- 6.1.1. Vehicles in categories N<sub>2</sub>, N<sub>3</sub>, O<sub>3</sub> and O<sub>4</sub> must be constructed and equipped in such a way as to offer, throughout their length, effective protection to unprotected road users against the risk of falling under the sides of the vehicle and being caught under the wheels. This requirement will be considered satisfied either:

6.1.1.1. if the vehicle is equipped with a special lateral protective device (sideguards) in accordance with the requirements of paragraph 7; or

6.1.1.2. if the vehicle is so designed and/or equipped at the side that, by virtue of their shape and characteristics, its component parts can be incorporated and/or regarded as replacing the lateral protective device. Components whose combined function satisfies the requirements set out in paragraph 7 below are considered to form a lateral protective device.

### 6.2. *Positioning of the vehicle during checks*

When checked for compliance with the technical specifications set out in paragraph 7 below, the position of the vehicle shall be as follows:

- The vehicle shall be positioned on a horizontal and flat surface;
- The steered wheels shall be in a straight-ahead position;
- The vehicle shall be unladen;
- Semi-trailers shall be positioned on their supports in an essentially horizontal manner.

## 7. TECHNICAL SPECIFICATIONS FOR LATERAL PROTECTIVE DEVICES

7.1. The lateral protective device shall not increase the overall width of the vehicle and the main part of its outer surface shall not be more than 120 mm inboard from the outermost plane (maximum width) of the vehicle. Its forward end may be turned inwards on some vehicles in accordance with paragraphs 7.4.3 and 7.4.4. Its rearward end shall not be more than 30 mm inboard from the outermost edge of the rear tyres (excluding any bulging of the tyres close to the ground) over at least the rearmost 250 mm.

7.2. The outer surface of the device shall be smooth, and so far as possible continuous from front to rear; adjacent parts may however overlap provided that the overlapping edge faces rearwards or downwards, or a gap of not more than 25 mm measured longitudinally may be left, provided that the rearward part does not protrude outboard of the forward part; domed heads of bolts or rivets may protrude beyond the surface to a distance not exceeding 10 mm and other parts may protrude to the same extent provided that they are smooth and similarly rounded; all external edges and corners shall be rounded with a radius not less than 2,5 mm.

- 7.3. The device may consist of a continuous flat surface, or of one or more horizontal rails, or a combination of surface and rails; when rails are used they shall be not more than 300 mm apart and not less than:
- 50 mm high in the case of N<sub>2</sub> and O<sub>3</sub>;
  - 100 mm high and essentially flat in the case of N<sub>3</sub> and O<sub>4</sub>;
- combinations of surfaces and rails shall form a practically continuous sideguard subject, however, to the provisions of 7.2.
- 7.4. The forward edge of the sideguard shall be constructed as follows:
- 7.4.1. Its position shall be:
- 7.4.1.1. on a motor vehicle: not more than 300 mm to the rear of the vertical plane perpendicular to the longitudinal plane of the vehicle and tangential to the outer surface of the tyre on the wheel immediately forward of the guard;
- 7.4.1.2. on a drawbar trailer: not more than 500 mm to the rear of the plane defined in paragraph 7.4.1.1;
- 7.4.1.3. on a semi-trailer: not more than 250 mm to the rear of the transverse median plane of the support legs, if support legs are fitted, but in any case the distance from the front edge to the transverse plane passing through the centre of the kingpin in its rearmost position may not exceed 2,7 m.
- 7.4.2. Where the forward edge lies in an otherwise open space, the edge shall consist of a continuous vertical member extending the whole height of the guard; the outer and forward faces of this member shall measure at least 50 mm rearwards and be turned 100 mm inwards in the case of N<sub>2</sub> and O<sub>3</sub> and at least 100 mm rearwards and be turned 100 mm inwards in the case of N<sub>3</sub> and O<sub>4</sub>.
- 7.4.3. On a motor vehicle where the 300 mm dimension referred to in paragraph 7.4.1.1 falls within the cab, the guard shall be so constructed that the gap between its forward edge and the cab panels does not exceed 100 mm and, if necessary, shall be turned in through an angle not exceeding 45°. In this case, the provisions of paragraph 7.4.2 are not applicable.
- 7.4.4. On a motor vehicle where the 300 mm dimension referred to in paragraph 7.4.1.1 falls behind the cab and the sideguard is extended forward to within 100 mm of the cab, as an option to the manufacturer, then the provisions of paragraph 7.4.3 must be met.
- 7.5. The rearward edge of the sideguard shall not be more than 300 mm forward of the vertical plane perpendicular to the longitudinal plane of the vehicle and tangential to the outer surface of the tyre on the wheel immediately to the rear; a continuous vertical member is not required on the rear edge.
- 7.6. The lower edge of the sideguard shall at no point be more than 550 mm above the ground.
- 7.7. The upper edge of the guard shall not be more than 350 mm below that part of the structure of the vehicle, cut or contacted by a vertical plane tangential to the outer surface of the tyres, excluding any bulging close to the ground, except in the following cases:
- 7.7.1. Where the plane in paragraph 7.7 does not cut the structure of the vehicle, then the upper edge shall be level with the surface of the load-carrying platform, or 950 mm from the ground, whichever is the less;

- 7.7.2. Where the plane in paragraph 7.7 cuts the structure of the vehicle at a level more than 1,3 m above the ground, then the upper edge of the sideguard shall not be less than 950 mm above the ground;
- 7.7.3. On a vehicle specially designed and constructed, and not merely adapted, for the carriage of a container or demountable body, the upper edge of the guard may be determined in accordance with paragraphs 7.7.1 and 7.7.2 above, the container or body being considered as part of the vehicle.
- 7.8. Sideguards shall be essentially rigid, securely mounted (they shall not be liable to loosening due to vibration in normal use of the vehicle) and, except as regards the parts listed in paragraph 7.9, made of metal or any other suitable material. The sideguard shall be considered suitable if it is capable of withstanding a horizontal static force of 1 kN applied perpendicularly to any part of its external surface by the centre of a ram the face of which is circular and flat, with a diameter of 220 mm  $\pm$  10 mm, and if the deflection of the guard under load is then not more than:

— 30 mm over the rearmost 250 mm of the guard, and

— 150 mm over the remainder of the guard.

Compliance with this requirement can be verified by calculation.

- 7.9. Components permanently fixed to the vehicle, e.g. spare wheels, batterybox, air tanks, fuel tanks, lamps, reflectors and tool boxes may be incorporated in the sideguard, provided that they meet the dimensional requirements of this Regulation. The requirements of paragraph 7.2 shall generally apply as regards gaps between protective devices and permanently fixed components.

- 7.10. The guard may not be used for the attachment of brake, air or hydraulic pipes.

## 8. DEROGATIONS

- 8.1. By derogation from the above provisions, vehicles of the following types need comply only as indicated in each case:

- 8.1.1. An extendible trailer shall comply with all the requirements of paragraph 7 when closed to its minimum length; when the trailer is extended, however, the sideguards shall comply with paragraphs 7.6, 7.7, and 7.8, and with either 7.4 or 7.5, but not necessarily both; extension of the trailer shall not produce gaps in the length of the sideguards;

- 8.1.2. A tank-vehicle, that is a vehicle designed solely for the carriage of a fluid substance in a closed tank permanently fitted to the vehicle and provided with hose or pipe connections for loading or unloading, shall be fitted with sideguards which comply so far as is practicable with all the requirements of paragraph 7; strict compliance may be waived only where operational requirements make this necessary;

- 8.1.3. On a vehicle fitted with extendible legs to provide additional stability during loading, unloading or other operations for which the vehicle is designed, the sideguard may be arranged with additional gaps, where these are necessary, to permit extension of the legs.

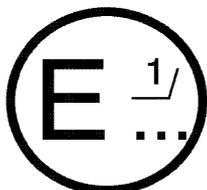
- 8.1.4. On a vehicle equipped with anchorage points for ro-ro transport, gaps shall be permitted within the sideguard to accept the passage and tension of fixing ropes.

- 8.2. If the sides of the vehicle are so designed and/or equipped that by their shape and characteristics the component parts together meet the requirements of paragraph 7, they may be regarded as replacing the sideguards.
9. MODIFICATIONS OF VEHICLE TYPE AND EXTENSION OF APPROVAL
- 9.1. Every modification of the vehicle type shall be notified to the administrative department which approved the vehicle type. The department may then either:
- 9.1.1. 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
- 9.1.2. require a further test report from the technical service responsible for conducting the tests.
- 9.2. Confirmation or refusal of approval, specifying the modification, shall be communicated by the procedure specified in paragraph 5.3 above to the Parties to the Agreement which apply this Regulation.
- 9.3. The competent authority issuing the extension of approval shall assign a series number to each communication form drawn up for such an extension.
10. CONFORMITY OF PRODUCTION
- 10.1. Vehicles approved in accordance with this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set out in paragraph 6 above.
- 10.2. In order to verify that the requirements of paragraph 7 are met, suitable controls of the production shall be carried out. In this case, suitable controls means checking the dimensions of the product as well as the existence of procedures for the effective control of the quality of products.
- 10.3. The holder of the approval shall in particular:
- 10.3.1. Have access to control equipment necessary for checking the conformity to each approved type;
- 10.3.2. Ensure that data on test results are recorded and that annexed documents remain available for a period to be determined in accordance with the administrative service, and
- 10.3.3. 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.
- 10.4. The competent authority which has granted type-approval may at any time verify the conformity control methods applicable to each production unit.
- 10.5. The normal frequency of inspections authorized by the competent authority shall be one every two years. Where negative 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.
11. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 11.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraphs 6 and 7 above are not complied with.

- 11.2. If a Party to the Agreement which applies 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 copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'APPROVAL WITHDRAWN'.
12. PRODUCTION DEFINITELY DISCONTINUED
- If the holder of the approval completely ceases to manufacture a type of vehicle 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 Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'PRODUCTION DISCONTINUED'.
13. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS
- The Parties to the 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, issued in other countries, are to be sent.
-

ANNEX 1

(Maximum format: A4 (210 × 297 mm))



(1) .....  
.....  
.....

Communication concerning:

- approval
- refusal of approval
- extension of approval
- withdrawal of approval
- production definitely discontinued (2)

of a vehicle type with regard to its lateral protection pursuant to Regulation No 73

Approval No ..... Extension No .....

1. Trade name or mark of the vehicles: .....
2. Vehicle type: .....
3. Manufacturer's name and address: .....
4. If applicable, name and address of manufacturer's representative: .....
5. Brief description of the vehicle type as regards its structure, dimensions, lines and constituent materials:  
.....
6. Brief description of the protective devices as regards their lines, dimensions and constituent materials: .....
7. Maximum mass: .....
8. Value of deflection recorded (see paragraph 7.8) (measured or calculated): .....
9. Vehicle submitted for approval on: .....
10. Technical service responsible for conducting approval tests: .....

(1) Name of administration.

(2) Strike out what does not apply.

- 11. Date of report issued by that service: .....
- 12. Number of report issued by that service: .....
- 13. Approval granted/refused/extended/withdrawn <sup>(1)</sup>
- 14. Position of approval mark on the vehicle: .....
- 15. Place: .....
- 16. Date: .....
- 17. Signature: .....
- 18. The following documents, bearing the approval number shown above, are available upon request:  
.....  
.....

\_\_\_\_\_

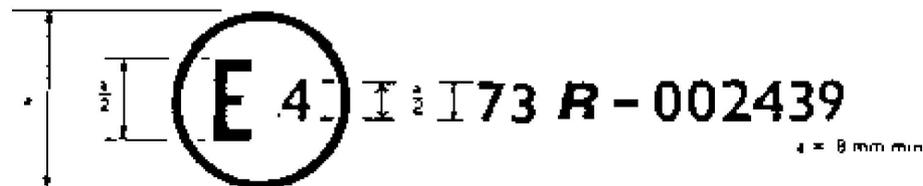
<sup>(1)</sup> Strike out what does not apply.

ANNEX 2

EXAMPLES OF APPROVAL MARKS

Model A

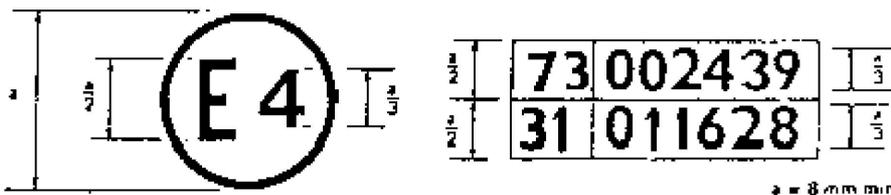
(see paragraph 5.4 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to its lateral protection, been approved in the Netherlands (E 4) pursuant to Regulation No 73 under approval number 002439. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of Regulation No 73 in its original form.

Model B

(see paragraph 5.5 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos 73 and 31 <sup>(1)</sup>. The first two digits of the approval numbers indicate that, at the dates when the respective approvals were granted, Regulation No 73 had not been modified, and Regulation No 31 already included the 01 series of amendments.

<sup>(1)</sup> This latter number is given as an example only.

## ANNEX 3

**CLASSIFICATION OF VEHICLES <sup>(1)</sup>**

1. *Category N:* *Power-driven vehicles having at least four wheels or having three wheels when the maximum mass exceeds 1/metric/ton, and used for the carriage of goods*
- 1.1. *Category N<sub>2</sub>:* Vehicles used for the carriage of goods and having a maximum mass exceeding 3.5 but not exceeding 12 metric tons.
- 1.2. *Category N<sub>3</sub>:* Vehicles used for the carriage of goods and having a maximum mass exceeding 12 metric tons.
2. *Category O:* *Trailers (including semi-trailers)*
- 2.1. *Category O<sub>3</sub>:* Trailers with a maximum mass exceeding 3.5, but not exceeding 10 metric tons.
- 2.2. *Category O<sub>4</sub>:* Trailers with a maximum mass exceeding 10 metric tons.
3. *Remarks*
- 3.1 With regard to category N
- 3.1.1. The equipment and installations carried on certain special-purpose vehicles not designed for the carriage of passengers (crane vehicles, workshop vehicles, publicity vehicles, etc.) are assimilated to goods for the purposes of paragraph 1 above.
- 3.2. With regard to category O
- 3.2.1. In the case of a semi-trailer, the maximum mass to be considered for classifying the vehicle is the mass transmitted to the ground by the axle or axles of the semi-trailer when the latter is coupled to the drawing vehicle and carrying its maximum load.

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<sup>(1)</sup> In conformity with Regulation No 13, paragraph 5.2.

**Regulation No 78 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of vehicles of category L with regard to braking (\*)**

1. SCOPE
  - 1.1. This regulation applies to the braking of power-driven vehicles having two or three wheels of the types defined in paragraph 2 below.
  - 1.2. This Regulation does not cover:
    - 1.2.1. Vehicles with a maximum design speed not exceeding 25 km/h;
    - 1.2.2. Vehicles fitted for invalid drivers.
2. DEFINITIONS

For the purposes of this Regulation,

  - 2.1. 'Approval of a vehicle' means the approval of a vehicle type with regard to braking;
  - 2.2. 'Vehicle type' means a category of power-driven vehicles which do not differ in such essential respects as:
    - 2.2.1. the vehicle category, as defined in the Consolidated Resolution (R.E.3),
    - 2.2.2. the maximum mass, as defined in paragraph 2.14,
    - 2.2.3. the distribution of mass between the axles,
    - 2.2.4. the maximum design speed,
    - 2.2.5. a different type of braking device,
    - 2.2.6. the number and arrangement of the axles,
    - 2.2.7. the engine type,
    - 2.2.8. the number and ratios of gears,
    - 2.2.9. the final drive ratios,
    - 2.2.10. the tyre dimensions;
  - 2.3. 'Braking device' means the combination of parts whose function is progressively to reduce the speed of a moving vehicle or to bring it to a halt, or to keep it stationary if it is already halted; these functions are specified in paragraph 5.1.2 below. The device consists of the control, the transmission, and the brake proper;
  - 2.4. 'Control' means the part actuated directly by the driver to furnish to the transmission the energy required for braking or controlling it. This energy may be the muscular energy of the driver, or the energy from another source controlled by the driver, or a combination of these various kinds of energy;

(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346, 17.12.1997, p. 78).

- 2.5. 'Transmission' means the combination of components comprised between the control and the brake and linking them functionally. Where the braking power is derived from or assisted by a source of energy independent of the driver but controlled by him, the reserve of energy in the device is likewise part of the transmission;
- 2.6. 'Brake' means the parts of the braking device in which the forces opposing the movement of the vehicle are developed; it may be a friction brake (when the forces are generated by friction between two parts of the vehicle moving relatively to one another), an electrical brake (when the forces are generated by electro-magnetic action between two parts of the vehicle moving relatively to but not in contact with one another), a fluid brake (when the forces are generated by the action of a fluid situated between two parts of the vehicle moving relatively to one another), or an engine brake (when the forces are derived from an artificial increase in the braking action, transmitted to the wheels of the engine);
- 2.7. 'Different types of braking devices' means devices which differ in such essential respects as:
- 2.7.1. components having different characteristics,
- 2.7.2. a component made of materials having different characteristics, or a component differing in shape or size,
- 2.7.3. a different assembly of the components;
- 2.8. 'Component(s) of the braking device' means one or more of the individual parts which, when assembled, constitute the braking device;
- 2.9. 'Combined braking system' means
- 2.9.1. in the case of vehicles of categories L<sub>1</sub> and L<sub>3</sub>, a system whereby at least two brakes on different wheels are actuated in combination by the operation of a single control. This method of actuation requires a control which is independent of the second braking device which operates on one wheel only;
- 2.9.2. in the case of vehicles of categories L<sub>2</sub> and L<sub>5</sub>, a braking device which operates on all the wheels;
- 2.9.3. in the case of vehicles of category L<sub>4</sub>, a braking device which operates at least on the front and rear wheel. Therefore a braking device which operates simultaneously on the rear wheel and on the sidecar wheel is regarded as a rear brake.
- 2.10. 'Progressive and graduated braking' means braking during which, within the normal operating range of the device, and whether during application or during release of the brakes,
- 2.10.1. the driver can at any moment increase or decrease the braking force by acting on the control,
- 2.10.2. the braking force varies proportionally to the action on the control (monotonic function), and,
- 2.10.3. the braking force can be easily regulated with sufficient precision;
- 2.11. 'Maximum design speed' means the speed which the vehicle cannot exceed, on the level and without undue external influence, taking into account any special limitations imposed on the design and construction of the vehicle;
- 2.12. 'Laden vehicle' means, except where otherwise stated, a vehicle so laden as to attain its 'maximum mass';
- 2.13. 'Unladen vehicle' means the vehicle alone, as submitted for the tests, plus the rider alone and any necessary test equipment or instrumentation.

- 2.14. 'Maximum mass' means the maximum mass stated by the vehicle manufacturer to be technically permissible (this mass may be higher than the 'permissible maximum mass' laid down by the national administration).
- 2.15. 'Wet brake' means a brake or brakes which has or have been treated in accordance with paragraph 1.6 of annex 3 of this Regulation.
3. APPLICATION FOR APPROVAL
- 3.1. The application for approval of a vehicle type with regard to braking shall be submitted by the vehicle manufacturer or by his duly accredited representative.
- 3.2. It shall be accompanied by the undermentioned documents in triplicate and by the following particulars:
- 3.2.1. a description of the vehicle type with regard to the items specified in paragraph 2.2 above. The numbers and/or symbols identifying the vehicle type and the engine type shall be specified;
- 3.2.2. a list of components, duly identified, constituting the braking device;
- 3.2.3. a diagram of the assembled braking device and an indication of the position of its components on the vehicle;
- 3.2.4. detailed drawings of each component to enable it to be easily located and identified.
- 3.3. A vehicle, representative of the vehicle type to be approved, shall be submitted to the technical service responsible for conducting the approval tests.
4. APPROVAL
- 4.1. If the vehicle type submitted for approval pursuant to this Regulation meets the requirements of paragraphs 5 and 6 below, approval of that vehicle type shall be granted.
- 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 01 corresponding to the series 01 of amendments which entered into force on 22 November 1990) 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 shall not assign the same number to the same vehicle type equipped with another type of braking device, or to another vehicle type.
- 4.3. Notice of approval or refusal or extension or withdrawal of approval or production definitely discontinued of a vehicle type pursuant to 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.
- 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation an international approval mark consisting of:
- 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;

(<sup>1</sup>) 1 for the Federal Republic of Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for Czechoslovakia, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 for the German Democratic Republic, 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal and 22 for the Union of Soviet Socialist Republics. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Approval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

- 4.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle prescribed in Paragraph 4.4.1.
- 4.5. If the vehicle conforms to a vehicle type approved, under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate affixed by the manufacturer.
- 4.8. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. SPECIFICATIONS
- 5.1. *General*
- 5.1.1. *Braking device*
- 5.1.1.1. The braking device shall be so designed, constructed and fitted as to enable the vehicle in normal use, despite the vibration to which it may be subjected, to comply with the provisions of this Regulation.
- 5.1.1.2. In particular, the braking device shall be so designed, constructed and fitted as to be able to resist the corroding and ageing phenomena to which it is exposed.
- 5.1.1.3. Brake linings shall not contain asbestos.
- 5.1.2. *Functions of the braking device*
- The braking device defined in paragraph 2.3 above must fulfil the following functions:
- 5.1.2.1. *Service braking*
- The service braking must make it possible to control the movement of the vehicle and to halt it safely, speedily and effectively, whatever its speed and load, on any up or down gradient. It must be possible to graduate this braking action. The driver must be able to achieve this braking action from his driving seat without removing his hands from the steering control.
- 5.1.2.2. *Secondary braking (if fitted)*
- The secondary (emergency) braking must make it possible to halt the vehicle within a reasonable distance in the event of failure of the service braking. It must be possible to graduate this braking action. The driver must be able to obtain this braking action from his driving seat while keeping at least one hand on the steering control. For the purpose of these provisions it is assumed that not more than one failure of the service braking can occur at one time.
- 5.1.2.3. *Parking brake (if fitted)*
- The Parking braking must make it possible to hold the vehicle stationary on an up or down gradient even in the absence of the driver, the working parts being then held in the locked position by a purely mechanical device. The driver must be able to achieve this braking action from his driving seat.

5.2. *Characteristics of Braking Devices*

- 5.2.1. Every vehicle of categories L<sub>1</sub> and L<sub>3</sub> shall be equipped with two service braking devices, with independent controls and transmissions, one acting at least on the front wheel and the other at least on the rear wheel.
- 5.2.1.1. The two service braking devices may have a common brake so long as a failure in one braking device does not affect the performance of the other. Certain parts such as the brake itself, the brake cylinders and their pistons (except the seals), the push rods and the cam assemblies of the brakes, shall not be regarded as liable to breakage if they are amply dimensioned, are readily accessible for maintenance and exhibit sufficient safety features.
- 5.2.1.2. A parking braking device is not compulsory.
- 5.2.2. Every vehicle of category L<sub>4</sub> shall be equipped with the braking devices which would be required if it had no sidecar; if these devices enable the required level of performance to be achieved in tests of the vehicle with sidecar, a brake on the sidecar wheel shall not be required; a parking braking device is not compulsory.
- 5.2.3. Every vehicle of category L<sub>2</sub> shall be equipped:
- 5.2.3.1. with either two independent service braking devices which together actuate the brakes on all the wheels, or
- 5.2.3.2. with a service braking device which operates on all the wheels and a secondary (emergency) braking device which may be the parking brake.
- 5.2.3.3. In addition, every vehicle of category L<sub>2</sub> shall be equipped with a parking brake device acting on the wheel or wheels of at least one axle. The parking brake device, which may be one of the two devices specified in paragraph 5.2.3.1 above, must be independent of the device acting on the other axle or axles.
- 5.2.4. Every vehicle of category L<sub>5</sub> shall be equipped:
- 5.2.4.1. with a foot-controlled service braking device which operates on all the wheels, and a secondary (emergency) braking device which may be the parking brake, and
- 5.2.4.2. with a parking braking device acting on the wheels of at least one axle. The control of the parking braking device must be independent of the control of the service braking device.
- 5.2.5. The braking devices must act on brake surfaces permanently connected to the wheels either rigidly or through components unlikely to fail.
- 5.2.6. The component parts of all braking devices, where attached to the vehicle, shall be so secured that the braking devices do not fail in their function under normal operating conditions.
- 5.2.7. The braking devices shall operate freely when correctly lubricated and adjusted.
- 5.2.7.1. Wear of the brakes must be capable of being easily taken up by means of either manual or automatic adjustment. The brakes shall be capable of being adjusted to an efficient operating position until the brake linings have worn to the point of requiring replacement.
- 5.2.7.2. The control and the components of the transmission and of the brakes must possess a reserve of travel such that, when the brakes become heated and the brake linings have reached maximum permitted degree of wear, effective braking is ensured without immediate adjustment being necessary.

- 5.2.7.3. When correctly adjusted, the components of a braking device shall not, when operated, contact anything other than the intended parts.
- 5.2.8. In braking devices where the transmission is hydraulic, the receptacles containing the reserve fluid must be so designed and constructed that the level of the reserve fluid can be easily checked.
6. TESTS
- Braking tests which the vehicles submitted for approval are required to undergo, and the braking performance required, are prescribed in annex 3 to this Regulation.
7. MODIFICATIONS OF VEHICLE TYPE OR BRAKING DEVICE AND EXTENSION OF APPROVAL
- 7.1. Every modification of the vehicle type or of its braking device shall be communicated to the administrative department which approved the vehicle type. That 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 4.3 above, to the Parties to the Agreement which apply this Regulation.
- 7.3. 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
- 8.1. Vehicle (device) approved to this Regulation shall be so manufactured as to conform to the type approved by meeting the requirements set forth in paragraph 5 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 to 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 annexes 3 and 4 to this Regulation are carried out,

- 8.3.6. ensure that any sampling of samples 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 methods 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 authorized by the competent authority shall be once every two years. In the case where negative 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.
9. TRANSITIONAL PROVISIONS
- 9.1. As from the official date of entry into force of the 01 series of amendments to this Regulation, no Contracting Party applying this Regulation shall refuse an application for approval under this Regulation as amended by the 01 series of amendments. At the request of the manufacturer, Contracting Parties applying this Regulation may agree to the application of these amendments before the official date of their entry into force.
- 9.2. As from 24 months after the official date of entry into force mentioned in paragraph 9.1 above, Contracting Parties applying this Regulation shall grant approvals only if the type of vehicle corresponds to the requirements of the Regulation as amended by the 01 series of amendments.
- 9.3. Approvals granted before the end of the 24-month period following the official date of entry into force shall cease to be valid 48 months after the date of entry into force mentioned in paragraph 9.1, unless the Contracting Party which granted the approval notifies the other Contracting Parties applying this Regulation that the type-approved vehicle meets the requirements of this Regulation as amended by the 01 series of amendments.
- 9.4. Approvals granted to vehicles of category L in accordance with the 05 series of amendments to Regulation No 13 continue to be considered equivalent to approvals granted in accordance with the original text of this Regulation.
10. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 10.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 8.1 above are not complied with or if a vehicle of this type has failed to pass the checks prescribed in paragraph 8.3 above.

- 10.2. If a Party to the Agreement which applies 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 copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'APPROVAL WITHDRAWN'.
11. PRODUCTION DEFINITELY DISCONTINUED
- If the holder of the approval completely ceases to manufacture a type of vehicle 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 Agreement applying this Regulation by means of a copy of the approval form bearing at the end, in large letters, the signed and dated annotation 'PRODUCTION DISCONTINUED'.
12. TRANSITIONAL PROVISIONS
- 12.1. No Contracting Party shall refuse to grant approvals under this Regulation as amended by the 02 series of amendments.
- 12.2. As from 1 January 1995 Contracting Parties applying this Regulation shall grant approvals only if the vehicle type approved meets the requirements of this Regulation as amended by the 02 series of amendments.
- 12.3. As from 1 January 1997, Contracting Parties applying this Regulation may refuse first national registration (first entry into service) of a vehicle which does not meet the requirements of the 02 series of amendments to this Regulation.
13. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF ADMINISTRATIVE DEPARTMENTS
- 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 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 1 (\*)

COMMUNICATION

(Maximum format: A4 (210 × 297 mm))



Issued by: Name of administration (1)

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

concerning (2) APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a type of vehicle of category L with regard to braking pursuant to Regulation No 78

Approval No ..... Extension No .....

1. Trade name or mark of the vehicle: .....

2. Vehicle type designation by the manufacturer: .....

3. Name and address of the manufacturer: .....

4. Name and address of the manufacturer's representative (if applicable): .....

5. Summarized description: .....

5.1. Vehicle:

Category of vehicle: .....

Maximum mass of vehicle: .....

5.2. Engine: .....

5.3. Transmission:

Number and ratios of gears: .....

Final drive ratio: .....

Tyre dimensions: .....

(\*) At the request of (an) applicant(s) for Regulation No 90 approval, the information shall be provided by the Type Approval Authority, as contained in appendix 1 to this annex. However, this information shall not be provided for purposes other than Regulation No 90 approvals.

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

(2) Strike out what does not apply.

- 5.4. Braking device: .....
- Make(s) and type(s) of linings: .....
- Service brake(s) (front, rear, combined) <sup>(1)</sup>
- Secondary braking, parking brake (if applicable) <sup>(1)</sup>
- Other devices (anti-lock brakes, etc.)
- 6. Technical service conducting approval tests: .....
- 7. Date of test report: .....
- 8. Number of test report: .....
- 9. Reason for extension of approval (if applicable): .....
- .....
- 10. Other remarks (if applicable), (right or left hand driven): .....
- 11. Place: .....
- 12. Date: .....
- 13. Signature: .....
- 14. Annexed the list of parts constituting the approval documents, which can be obtained on request, submitted to the Administrative Service which has delivered the approval.

\_\_\_\_\_

\_\_\_\_\_  
<sup>(1)</sup> Strike out what does not apply.

## Appendix 1

**List of vehicle data for the purpose of Regulation No 90 approvals (\*)**

1. Description of the vehicle type: .....
- 1.1. Trade name or mark of the vehicle, if available: .....
- 1.2. Vehicle category: .....
- 1.3. Vehicle type according to Regulation No 78 approval: .....
- 1.4. Models or trade names of vehicles constituting the vehicle type, if available: .....
- 1.5. Manufacturer's name and address: .....
2. Make and type of brake linings: .....
3. Minimum mass of vehicle: .....
- 3.1. Distribution of mass of each axle (maximum value): .....
4. Maximum mass of vehicle: .....
- 4.1. Distribution of mass of each axle (maximum value): .....
5. Maximum vehicle speed: ..... km/h
6. Tyre and wheel dimensions: .....
7. Configuration of the independent braking systems: .....
8. Specifications of brake valves (if applicable): .....
- 8.1. Adjustment specifications of the load sensing valve: .....
- 8.2. Setting of pressure valve: .....
9. Specification of brake: .....
- 9.1. Disc brake type (e.g. number of pistons with diameter(s), ventilated or solid disc): .....  
.....
- 9.2. Drum brake type (e.g. simplex, with piston size and drum dimensions): .....
10. Master cylinder type and size (if applicable): .....

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(\*) At the request of (an) applicant(s) for Regulation No 90 approval, the information shall be provided by the Type Approval Authority, as contained in appendix 1 to this annex. However, this information shall not be provided for purposes other than Regulation No 90 approvals.

## ANNEX 2

## ARRANGEMENTS OF APPROVAL MARKS

## Model A

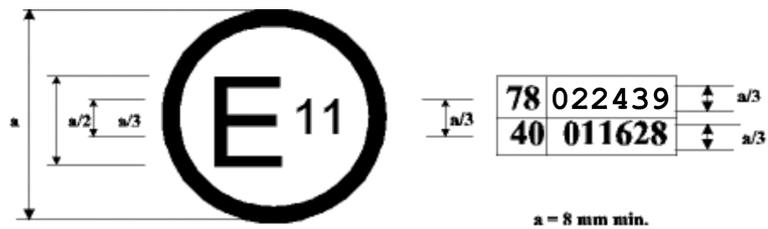
(see paragraph 4.4 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has, with regard to braking, been approved in the United Kingdom (E 11) pursuant to Regulation No 78 under approval number 022439. The first two digits of the approval number indicate that Regulation No 78 already included the 02 series of amendments when the approval was granted.

## Model B

(see paragraph 4.5 of this Regulation)



The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the United Kingdom (E 11) pursuant to Regulations Nos 78 and 40 <sup>(1)</sup>. The first two digits of the approval numbers indicate that, at the dates when the respective approvals were granted, Regulation No 78 included the 02 series of amendments and Regulation No 40 included the 01 series of amendments.

<sup>(1)</sup> This latter number is given merely as an example.

## ANNEX 3

**BRAKING TESTS AND PERFORMANCE**

## 1. BRAKING TESTS

1.1. *General*

1.1.1. The performance prescribed for braking devices shall be based on the stopping distance and/or the mean fully developed deceleration. The performance of a braking device shall be determined by measuring the stopping distance in relation to the initial speed of the vehicle and/or measuring the mean fully developed deceleration during the test.

1.1.2. The stopping distance shall be the distance covered by the vehicle from the moment when the driver begins to actuate the control of the braking system until the moment when the vehicle stops; the initial vehicle speed,  $V_1$ , shall be the speed at the moment when the driver begins to actuate the control of the braking system; the initial speed shall not be less than 98 per cent of the prescribed speed for the test in question. The mean fully developed deceleration ( $d_m$ ) shall be calculated as the deceleration averaged with respect to distance over the interval  $V_b$  to  $V_e$  according to the following formula:

$$d_m = \frac{V_b^2 - V_e^2}{25,92 (s_e - s_b)} \text{ m/s}^2$$

Where:

$d_m$  = mean fully developed deceleration

$V_1$  = as defined above

$V_b$  = vehicle speed at 0,8  $V_1$  in km/h

$V_e$  = vehicle speed at 0,1  $V_1$  in km/h

$s_b$  = distance travelled between  $V_1$  and  $V_b$  in metres

$s_e$  = distance travelled between  $V_1$  and  $V_e$  in metres

The speed and distance shall be determined using instrumentation having an accuracy of  $\pm 1$  per cent at the prescribed speed for the test. The ' $d_m$ ' may be determined by other methods than the measurement of speed and distance; in this case, the accuracy of the ' $d_m$ ' shall be within  $\pm 3$  per cent.

1.2. For the approval of the vehicle, the braking performance shall be measured during road tests conducted under the following conditions:

1.2.1. the vehicle's condition as regards its mass shall be as prescribed for each type of test and shall be specified in the test report;

1.2.2. the test shall be carried out at the speed and in the manner prescribed for each type of test: if the maximum speed of the vehicle does not conform to the speed prescribed, the test shall be carried out under the special, alternative conditions provided;

1.2.3. the prescribed performance must be obtained without locking of the wheel(s), without deviation of the vehicle from its course and without any abnormal vibration;

1.2.4. during the tests the force applied to the brake control in order to obtain the prescribed performance must not exceed the maximum laid down for the test vehicle's category.

1.3. *Test Conditions*

1.3.1. The service braking tests shall be carried out under the following conditions:

1.3.1.1. at the start of the test or any series of tests the tyres must be cold and at the pressure prescribed for the load actually borne by the wheels when the vehicle is stationary;

1.3.1.2. the vehicle shall be loaded, when required to be tested in the laden condition, with the weight distributed in accordance with the manufacturer's requirement;

1.3.1.3. for all type-O tests the brakes must be cold: a brake is deemed to be cold when the temperature measured on the disc or on the outside of the drum is below 100 °C.

- 1.3.1.4. the driver shall be seated in the saddle as for normal driving and shall maintain the same position throughout the test;
- 1.3.1.5. the test area must be level, dry and have a surface affording good adhesion;
- 1.3.1.6. the tests must be performed when there is no wind liable to affect the test result.
- 1.4. *Type-O test (service braking)*
- 1.4.1. **General**
- The limits prescribed for minimum performance are those laid down hereunder for each category of vehicle; the vehicle shall satisfy both the prescribed stopping distance and the prescribed mean fully developed deceleration for the relevant vehicle category, but it may not be necessary to measure both parameters
- 1.4.2. **Type-O test with engine disconnected**
- The test must be carried out at the speed prescribed for the category to which the vehicle belongs, the figures prescribed in this connection being subject to a certain margin of tolerance. In the case of vehicles where the two service brakes can be applied separately, the braking devices shall be tested separately. The minimum performance for each braking device for each category of vehicle must be attained;
- 1.4.2.1. in the case of a vehicle with a manual gear box or an automatic transmission where the gear box can be disengaged manually, the tests shall be carried out with the gear box inoperative and/or the engine disconnected by clutch disengagement or otherwise;
- 1.4.2.2. in the case of a vehicle with other types of automatic transmission, the tests shall be carried out under the normal operating conditions.
- 1.4.3. **Type-O test with engine connected for vehicles of categories L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub>**
- Tests must be carried out in the unladen condition at various speeds, the lowest being equal to 30 % of the maximum speed of the vehicle and the highest being equal to 80 % of that speed or 160 km/h whichever is the lower.
- The maximum practical performance figures shall be measured and together with the behaviour of the vehicle must be recorded in the test report.
- In the case where two service braking devices can be applied separately, both these braking devices shall be tested together and simultaneously, with the vehicle unladen.
- 1.4.4. **Type-O test with engine disconnected: with wet brakes**
- This test shall (subject to the exemption contained in paragraph 1.5.1 below) be carried out on vehicles of categories L<sub>1</sub>, L<sub>2</sub>, L<sub>3</sub> and L<sub>4</sub>. The test procedure is identical to that for the type-O test with engine disconnected, except for the provisions for wetting the brakes described in paragraph 1.5 of this annex.
- 1.5. *Special provisions relating to testing with wet brakes*
- 1.5.1. Enclosed brakes: it shall not be necessary to carry out this series of type-O tests on vehicles equipped with conventional drum brakes or with fully enclosed disc brakes which are not subject to water penetration under normal running conditions.
- 1.5.2. The test with brakes subject to wetting shall be carried out under the same conditions as the test with dry brakes. There shall be no adjustment or alteration of the braking system other than fitting the equipment to allow brake wetting.
- 1.5.3. The test equipment shall continuously wet the brakes for each test run at a flow rate of 15 l/h for each brake. Two disc brakes on one wheel will be considered as two brakes.
- 1.5.4. For exposed or partly exposed disc brakes, the prescribed amount of water shall be directed on to the rotating disc in such a manner that it is equally distributed on the surface or surfaces of the disc swept by the friction pad or pads:
- 1.5.4.1. for fully exposed disc brakes, the water shall be directed on to the surface(s) of the disc 45° in advance of the friction pad(s);

- 1.5.4.2. for partly exposed disc brakes, the water shall be directed on to the surface(s) of the disc 45° in advance of the shield or baffle.
- 1.5.4.3. The water shall be directed on the surface(s) of the disc(s) in a continuous jet, in a direction perpendicular to the surface of the disc, from single jet nozzles so positioned as to be between the inner extremity and a point two thirds of the distance from the outer extremity of that part of the disc swept by the friction pad(s) (see figure in appendix).
- 1.5.5. For fully enclosed disc brakes, where the provisions of paragraph 1.5.1 above do not apply, the water shall be directed on to both sides of the shield or baffle at a point and in a manner corresponding with that described in subparagraphs 1.5.4.1 and 1.5.4.3 of this annex. Where the nozzle would be coincident with a ventilation or inspection port, the water shall be applied one quarter of a revolution in advance of the said port.
- 1.5.6. Where in the preceding paragraphs 1.5.3 and 1.5.4, it is not possible to apply the water in the position specified owing to the presence of some fixed part of the vehicle, the water shall be applied at the first point, exceeding 45° where uninterrupted application is possible.
- 1.5.7. For drum brakes, where the provisions of paragraph 1.5.1 above do not apply, the prescribed amount of water shall be distributed equally on either side of the braking device (that is, on the stationary back plate and the rotating drum) from nozzles so positioned as to be two-thirds of the distance from the outer circumference of the rotating drum to the wheel hub.
- 1.5.8. Subject to the requirements of the preceding subparagraph and to the requirement that no nozzle shall be within 15° of or coincident with a ventilation or inspection port on the stationary back plate, the test equipment for drum brakes shall be so positioned as to obtain the optimum uninterrupted application of water.
- 1.5.9. To ensure the correct wetting of the brake(s), the vehicle shall be driven, immediately before the commencement of the test series
- with the wetting equipment functioning continuously as prescribed in this annex
  - at the prescribed test speed
  - without the operation of the braking device(s) to be tested
- For a distance of not less than 500 m prior to the point at which the test is to be carried out.
- 1.6. *Type-I test (fade test)*
- 1.6.1. *Special provisions*
- 1.6.1.1. The service brakes of all vehicles of categories L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub> must be tested by a series of repeated stops, the vehicle being in the laden condition, in accordance with the requirements set out below (table under paragraph 2). For vehicles equipped with a combined braking system, it will be sufficient to submit this service braking device to the type-I test.
- 1.6.1.2. The type-I test shall be carried out in three parts:
- 1.6.1.2.1. a single type-O test as required by paragraphs 2.1.2 or 2.2.2.1 of this annex;
  - 1.6.1.2.2. a series of 10 repeated stops carried out in accordance with the requirements of paragraph 1.6.2 below;
  - 1.6.1.2.3. a single type-O test, carried out in the same conditions (and in particular at a control force as constant as possible of which the mean value is no greater than the mean force actually used in paragraph 1.6.1.2.1) as those used for the test in subparagraph 1.6.1.2.1 above as soon as possible after the completion of the test specified in subparagraph 1.6.1.2.2 above but, in any case, within one minute thereof.
- 1.6.2. *Test conditions*
- 1.6.2.1. The vehicle and the brake(s) to be tested shall be substantially free from moisture and the brake(s) shall be cold (< 100 °C).
- 1.6.2.2. The initial test speed shall be:
- 1.6.2.2.1. for testing the front brake(s)
- whichever is the lower of 70 % of the vehicle's maximum speed and 100 km/h;

- 1.6.2.2.2. for testing the rear brake(s)  
whichever is the lower of 70 % of the vehicle's maximum speed and 80 km/h;
- 1.6.2.2.3. for testing a combined braking system  
whichever is the lower of 70 % of the vehicle's maximum speed and 100 km/h.
- 1.6.2.3. The distance between the initiation of one stop and the initiation of the next shall be 1 000 meters.
- 1.6.2.4. The use of the gear box and/or clutch shall be as follows:
- 1.6.2.4.1. In the case of a vehicle with a manual gear box or an automatic transmission where the gear box can be disengaged manually, the highest gear, consistent with attaining the initial test speed, shall be engaged during the stops.  
  
When the vehicle speed has fallen to 50 % of the initial test speed, the engine shall be disengaged.
- 1.6.2.4.2. In the case of a vehicle with a fully automatic transmission, the test shall be carried out under the normal operating conditions for such equipment.  
  
For the approach, the gear suitable to the initial test speed shall be used.
- 1.6.2.5. After each stop, the vehicle shall immediately be subjected to maximum acceleration to reach the initial test speed and maintained at that speed until the initiation of the next stop. If appropriate, the vehicle may be turned round on the test track before acceleration.
- 1.6.2.6. The force applied to the control must be so adjusted as to maintain a mean deceleration of 3 m/s<sup>2</sup> or the maximum deceleration achievable with that brake, whichever is the lower, at the first stop: this force must remain constant throughout the succeeding stops required by subparagraph 1.6.1.2.2 above.
- 1.6.3. **Residual performance**  
  
At the end of the type-I test the residual performance of the service braking device must be measured in the same conditions (and in particular at a control force as constant as possible, the mean value of which is not greater than the mean force actually used) as for the type-O test with the engine disconnected (the temperature conditions may be different).  
  
This residual performance must not be:
- if expressed as a deceleration, less than 60 % of the deceleration figure achieved during the type-O test
  - if expressed as a stopping distance, more than the stopping distance figure, calculated in accordance with the following formula:

$$S_2 \leq 1,67 S_1 - 0,67 a \cdot V$$

where

$S_1$  = the stopping distance achieved in the Type-O test

$S_2$  = the stopping distance as recorded in the residual performance test

$a$  = 0,1

$V$  = the initial speed at the beginning of braking as defined in paragraph 2.1.1 or 2.2.1 of this annex.

## 2. PERFORMANCE OF BRAKING DEVICES

2.1. Provisions relating to tests of vehicles with braking devices operating on the wheel or wheels of the front or rear axle only.

## 2.1.1. Prescribed speed

$V = 40 \text{ km/h}$  <sup>(1)</sup> for categories L<sub>1</sub> and L<sub>2</sub>,

$V = 60 \text{ km/h}$  <sup>(1)</sup> for categories L<sub>3</sub> and L<sub>4</sub>.

## 2.1.2. Braking performance with the vehicle laden

For the purposes of the type-I residual performance test (vehicles of categories L<sub>3</sub> and L<sub>4</sub>), the recorded performance levels in terms of stopping distances, mean fully developed deceleration, as well as the control force used, shall be recorded.

## 2.1.2.1. Braking with the front brake only

Category	Stopping distance (S) (m)	Corresponding mean fully developed deceleration (m/s <sup>2</sup> )
L <sub>1</sub>	$S \leq 0,1 \cdot V + V^2/90$	3,4
L <sub>2</sub>	$S \leq 0,1 \cdot V + V^2/70$	2,7 (*)
L <sub>3</sub>	$S \leq 0,1 \cdot V + V^2/115$	4,4 (*)
L <sub>4</sub>	$S \leq 0,1 \cdot V + V^2/95$	3,6

## 2.1.2.2. Braking with the rear brake only

Category	Stopping distance (S) (m)	Corresponding mean fully developed deceleration (m/s <sup>2</sup> )
L <sub>1</sub>	$S \leq 0,1 \cdot V + V^2/70$	2,7
L <sub>2</sub>	$S \leq 0,1 \cdot V + V^2/70$	2,7 (*)
L <sub>3</sub>	$S \leq 0,1 \cdot V + V^2/75$	2,9 (*)
L <sub>4</sub>	$S \leq 0,1 \cdot V + V^2/95$	3,6

## 2.1.3. Braking performance with the vehicle unladen

A practical test of the vehicle ridden by the driver alone shall not be required if a calculation shows that the distribution of the mass on the braked wheels allows a mean fully developed deceleration of at least  $2,5 \text{ m/s}^2$  or a stopping distance  $S \leq 0,1 \cdot V + V^2/65$  to be achieved with each of the single axle braking devices.

2.2. Provisions relating to tests of vehicles of which (at least) one of the braking devices is a combined braking system.

For the purposes of the type-I residual performance test (vehicles of categories L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub>), the recorded performance levels in terms of stopping distance, mean fully developed deceleration, as well as the control force used, shall be recorded.

## 2.2.1. Prescribed speed

$V = 40 \text{ km/h}$  <sup>(1)</sup> for categories L<sub>1</sub> and L<sub>2</sub>,

$V = 60 \text{ km/h}$  <sup>(1)</sup> for categories L<sub>3</sub>, L<sub>4</sub> and L<sub>5</sub>.

<sup>(1)</sup> Vehicles of which the maximum speed ( $V_{\text{max}}$ ) is lower than 45 km/h in the case of categories L<sub>1</sub> and L<sub>2</sub>, or 67 km/h in the case of categories L<sub>3</sub> and L<sub>4</sub>, shall be tested at a speed equal to  $0,9 V_{\text{max}}$ .

(\*) If the values for single braking devices cannot be achieved because of limited adhesion, the following values shall be substituted for a test with the vehicle laden using both braking devices together: L<sub>2</sub>, 4,4 m/s<sup>2</sup>; L<sub>3</sub>, 5,8 m/s<sup>2</sup>.

2.2.2. The vehicle shall be tested unladen and laden.

2.2.2.1. Braking with the combined braking system only.

Category	Stopping distance (S) (m)	Corresponding mean fully developed deceleration (m/s <sup>2</sup> )
L <sub>1</sub> , L <sub>2</sub>	$S \leq 0,1 \cdot V + V^2/115$	4,4
L <sub>3</sub>	$S \leq 0,1 \cdot V + V^2/132$	5,1
L <sub>4</sub>	$S \leq 0,1 \cdot V + V^2/140$	5,4
L <sub>5</sub>	$S \leq 0,1 \cdot V + V^2/130$	5,0

2.2.2.2. Braking with the second service or the secondary (emergency) braking device, all categories:

the stopping distance must be:

$$S \leq 0,1 \cdot V + V^2/65 \text{ (corresponding mean fully developed deceleration: } 2,5 \text{ m/s}^2\text{).}$$

2.3. Braking performance with the parking braking device (if applicable).

The parking braking device must, even if it is combined with one of the other braking devices, be capable of holding the laden vehicle stationary on an 18 % up or down gradient.

2.4. Forces applied to service brake controls:

hand control  $\leq 200 \text{ N}$

foot control  $\leq 350 \text{ N (L}_1, \text{L}_2, \text{L}_3, \text{L}_4)$

$\leq 500 \text{ N (L}_5)$

parking brake control (if applicable):

with manual control  $\leq 400 \text{ N}$

with foot control  $\leq 500 \text{ N}$

In the case of hand brake levers, the point of application of the manual force shall be assumed to be 50 mm from the outer end of the lever.

2.5. Performance levels (minimum and maximum) to be attained with wet brakes.

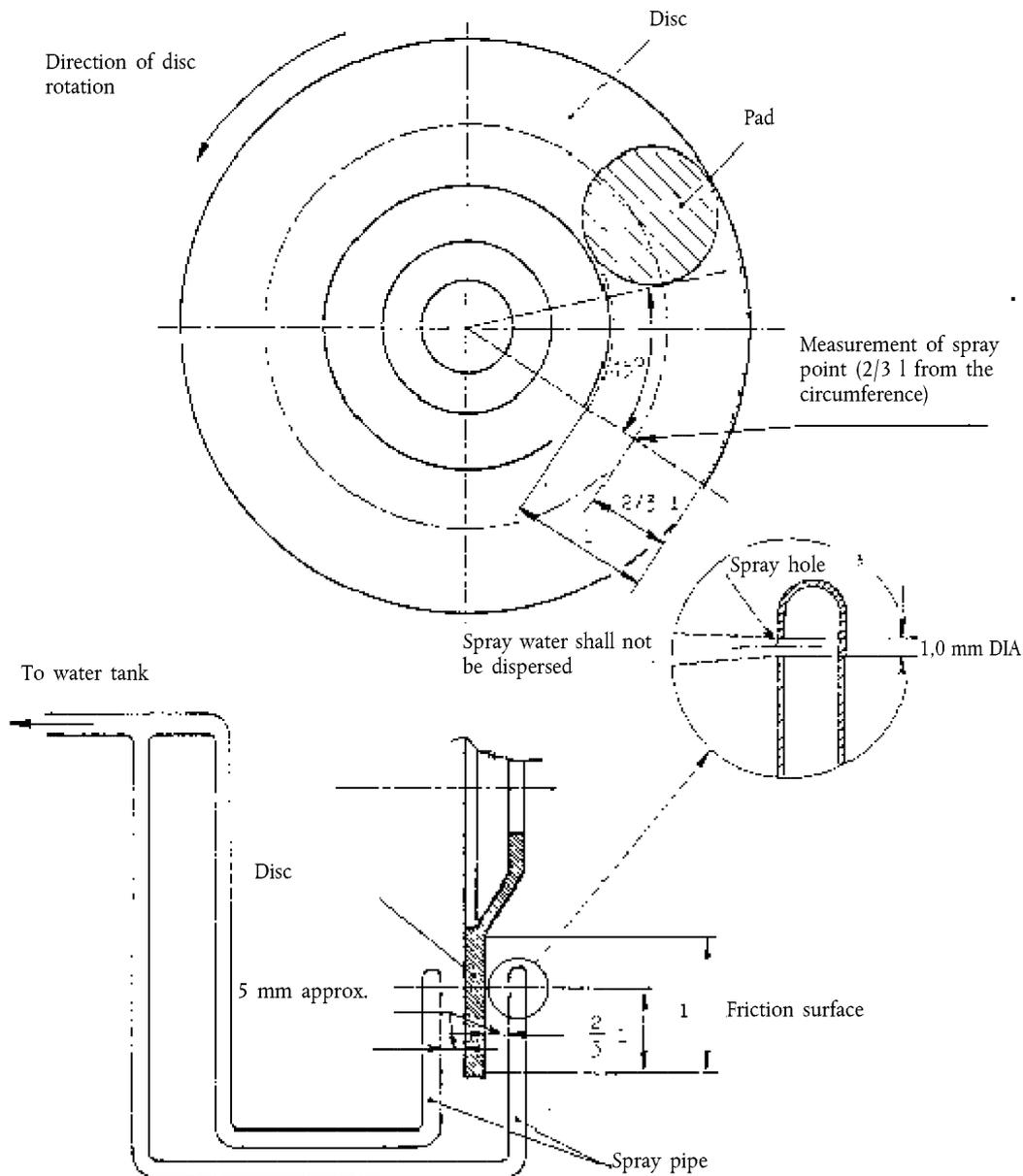
2.5.1. The mean deceleration to be attained with wet brake(s) between 0,5 and 1,0 second after application of the brake shall be at least 60 % of that attained with dry brake(s) when the same control force is applied.

2.5.2. The control force used, which must be applied as quickly as possible, shall be equivalent to that required to attain a deceleration of 2,5 m/s<sup>2</sup> with dry brake(s).

2.5.3. At no time during the type-O test with wet brake(s) shall the deceleration exceed 120 % of that attained with dry brake(s).

Appendix

Method of water application



## ANNEX 4

**REQUIREMENTS APPLICABLE TO VEHICLES OF CATEGORIES L<sub>1</sub> AND L<sub>3</sub> EQUIPPED WITH ANTI-LOCK DEVICES**

## 1. GENERAL

- 1.1. The purpose of these provisions is to define minimum performances for braking systems with anti-lock devices fitted to vehicles of categories L<sub>1</sub> and L<sub>3</sub>. This does not make it compulsory to fit vehicles with anti-lock devices but if such devices are fitted to a vehicle they must meet the requirements below.
- 1.2. The devices known at present comprise a sensor or sensors, a controller or controllers and a modulator or modulators. Any devices of a different design will be deemed to be anti-lock devices within the meaning of this annex if they provide performances at least equal to those prescribed by this annex.

## 2. DEFINITIONS

- 2.1. An 'anti-lock device' is a component of a service braking system which automatically controls the degree of slip, in the direction of rotation of the wheel(s) on one or more wheels of the vehicle during braking;
- 2.2. 'Sensor' means a component designed to identify and transmit to the controller the conditions of rotation of the wheel(s) or the dynamic conditions of the vehicle;
- 2.3. 'Controller' means a component designed to evaluate the data transmitted by the sensor(s) and to transmit a signal to the modulator;
- 2.4. 'Modulator' means a component designed to vary the braking force(s) in accordance with the signal received from the controller.

## 3. NATURE AND CHARACTERISTICS OF THE SYSTEM

- 3.1. Each controlled wheel shall be such that it can bring at least its own device into operation.
- 3.2. Any break in the supply of electricity to the device and/or in the wiring external to the electronic controller(s) shall be signalled to the driver by an optical warning signal, which must be visible even in daylight; it must be easy for the driver to check that it is in working order <sup>(1)</sup>.
- 3.3. In the event of a failure in an anti-lock device, the braking efficiency of the laden vehicle shall not be less than that prescribed for whichever is the lower of the two requirements for the vehicle defined in paragraph 2.1.2.1 or paragraph 2.1.2.2 of annex 3 of this Regulation.
- 3.4. The operation of the device must not be affected adversely by electro-magnetic fields <sup>(2)</sup>.
- 3.5. Anti-lock devices must maintain their performance when the brake is fully applied for the duration of any stop.

## 4. UTILIZATION OF ADHESION

4.1. *General*

- 4.1.1. In the case of vehicles of category L<sub>3</sub>, braking systems equipped with an anti-lock device shall be deemed acceptable when the condition  $\epsilon \geq 0,70$  is satisfied where  $\epsilon$  represents the adhesion utilized as defined in the appendix to this annex <sup>(3)</sup>.
- 4.1.2. The coefficient of adhesion utilization  $\epsilon$  shall be measured on road surfaces with a coefficient of adhesion not exceeding 0,45 and of not less than 0,8.
- 4.1.3. Tests shall be carried out with the vehicle unladen.

<sup>(1)</sup> The Technical Service should examine the electronic controller and/or any drive system with regard to possible failure modes.

<sup>(2)</sup> Until uniform test procedures have been agreed, the manufacturers shall provide the Technical Service with their test procedures and results.

<sup>(3)</sup> For L<sub>1</sub> vehicles, until a minimum value for  $\epsilon$  has been established, the measured value shall be recorded in the test report.

- 4.1.4. The test procedure to determine the coefficient of adhesion (K) and the formula for calculating the adhesion utilization ( $\epsilon$ ) shall be those prescribed in the appendix to this annex.

5. ADDITIONAL CHECKS

The following additional checks shall be carried out with the vehicle unladen.

- 5.1. Any wheel controlled by an anti-lock device must not lock when the full force <sup>(1)</sup> is suddenly applied to its control device, on the two kinds of road surface specified in paragraph 4.1.2 above at initial speeds of up to  $0,8 V_{\max}$  but not exceeding 80 km/h <sup>(2)</sup>.
- 5.2. When a wheel controlled by an anti-lock device passes from a high-adhesion surface to a low-adhesion surface as described in paragraph 4.1.2 above with the full force <sup>(1)</sup> applied to the control device, the wheel must not lock. The running speed and the instant of applying the brakes shall be so calculated that, with the anti-lock device fully cycling on the high-adhesion surface, the passage from one surface to the other is made at about  $0,5 V_{\max}$  not exceeding 50 km/h.
- 5.3. When a vehicle passes from a low-adhesion surface to a high-adhesion surface as described in paragraph 4.1.2 above with the full force <sup>(1)</sup> applied to the control device, the deceleration of the vehicle must rise to the appropriate high value within a reasonable time and the vehicle must not deviate from its initial course. The running speed and the instant of applying the brakes shall be so calculated that, with the anti-lock device fully cycling on the low-adhesion surface, the passage from one surface to the other occurs at about  $0,5 V_{\max}$  not exceeding 50 km/h.
- 5.4. Where both independent braking devices are equipped with an anti-lock device, the tests prescribed in paragraphs 5.1, 5.2 and 5.3 shall also be performed using both independent braking devices together, whereupon the stability of the vehicle shall be maintained at all times.
- 5.5. However, in the tests provided for in paragraphs 5.1, 5.2, 5.3, and 5.4 above, periods of wheel locking or of extreme wheel slip shall be allowed provided that the stability of the vehicle is not adversely affected. Below vehicle speeds of 10 km/h wheel locking is permitted.

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<sup>(1)</sup> 'Full force' means the maximum force prescribed in paragraph 2.4 of annex 3 for the category of vehicle: a higher force may be used if required to activate the anti-lock device.

<sup>(2)</sup> On low adhesion surfaces ( $\leq 0,35$ ) the initial speed may be reduced for safety reasons: in such cases, the K value and the initial speed shall be noted in the test report.

## Appendix

1. DETERMINATION OF THE COEFFICIENT OF ADHESION (K)
  - 1.1. The coefficient of adhesion shall be determined from the maximum braking rate, without wheel lock, of the vehicle with the anti-lock device(s) disconnected and braking both wheels simultaneously <sup>(1)</sup>.
  - 1.2. Braking tests should be carried out by applying the brakes at an initial speed of about 60 km/h (or, in the case of vehicles unable to attain 60 km/h, at a speed of about  $0,9 V_{\max}$ ) with the vehicle unladen (except for any necessary test instrumentation and/or safety equipment). Constant brake control forces must be used throughout the tests.
  - 1.3. A series of tests may be carried out up to the critical point reached immediately before the wheel(s) lock by varying both the front and the rear brake forces, in order to determine the maximum braking rate of the vehicle <sup>(2)</sup>.
  - 1.4. The braking rate (Z) will be determined by reference to the time taken for the speed of the vehicle to reduce from 40 km/h to 20 km/h, using the formula:

$$Z = \frac{0,56}{t}$$

where t is measured in seconds.

Alternatively, for vehicles unable to attain 50 km/h, the braking rate shall be determined by reference to the time taken for the speed of the vehicle to reduce from  $0,8 V_{\max}$  to  $(0,8 V_{\max} - 20)$  where  $V_{\max}$  is measured in km/h.

The maximum value of  $Z = K$ .

2. DETERMINATION OF THE ADHESION UTILIZATION ( $\epsilon$ )
  - 2.1. The adhesion utilized is defined as the quotient of the maximum braking rate with the anti-lock device in operation ( $Z_{\max}$ ) and the maximum braking rate with the anti-lock device disconnected ( $Z_m$ ). Separate tests must be carried out on each wheel equipped with an anti-lock device.
  - 2.2.  $Z_{\max}$  shall be based on the average of three tests using the time taken for the speed of the vehicle to achieve the reductions in speed specified in paragraph 1.4 above.
  - 2.3. The adhesion utilized is given by the formula:

$$\epsilon = \frac{Z_{\max}}{Z_m}$$

<sup>(1)</sup> Additional requirements may have to be established in the case of vehicles equipped with combined braking systems.

<sup>(2)</sup> As an initial step, to facilitate these preliminary tests, the maximum control force applied before the critical point may be obtained for each individual wheel.

**Regulation No 101 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of passenger cars equipped with an internal combustion engine with regard to the measurement of the emission of carbon dioxide and fuel consumption and of categories M<sub>1</sub> and N<sub>1</sub> vehicles equipped with an electric power train with regard to the measurement of electric energy consumption and range (\*)**

1. SCOPE

This Regulation applies to the measurement of the emission of carbon dioxide (CO<sub>2</sub>) and fuel consumption from all motor vehicles of M<sub>1</sub> category vehicles, or to the measurement of electric energy consumption and range of categories M<sub>1</sub> and N<sub>1</sub> vehicles (1).

2. DEFINITIONS

For the purposes of this Regulation,

- 2.1. 'Approval of a vehicle' means the approval of a vehicle type with regard to the measurement of energy consumption (fuel or electric energy).
- 2.2. 'Vehicle type' means a category of power driven vehicles which do not differ in such essential respects as body, drive train, transmission, traction battery (if applicable), tyres and unladen mass.
- 2.3. 'Unladen mass' means the mass of the vehicle in running order without crew, passengers or load, but with the fuel tank full (if any), cooling liquid, service and traction batteries, oils, onboard charger, portable charger, tools and spare wheel, whatever is appropriate for the vehicle considered and if provided by the manufacturer of the vehicle.
- 2.4. 'Reference mass' means the unladen mass of the vehicle increased by a uniform figure of 100 kg.
- 2.5. 'Maximum mass' means the technically permissible maximum mass declared by the manufacturer (this mass may be greater than the maximum mass authorized by the national administration).
- 2.6. 'Test mass' for the pure electric vehicles means the 'reference mass' for the category M<sub>1</sub> vehicles and the unladen mass plus half the full load for the category N<sub>1</sub> vehicles.
- 2.7. 'Cold start device' means a device, which enriches the air/fuel mixture of the engine temporarily, to assist starting.
- 2.8. 'Starting aid' means a device which assists engine starting without enrichment of the air/fuel mixture, e.g. glow plug, changed injection timing, etc.
- 2.9. 'Drive train' means the combination of an electric motor and a power controller.
- 2.10. 'Power train' means the combination of a drive train and a traction battery.
- 2.11. 'Periodically regenerating system' means an anti-pollution device (e.g. catalytic converter, particulate trap) that requires a periodical regeneration process in less than 4 000 km of normal vehicle operation. If a regeneration of an anti-pollution device occurs at least once per Type I test and has already regenerated at least once during the vehicle preparation cycle, it will be considered as a continuously regenerating system, which does not require a special test procedure. Annex 8 does not apply to continuously regenerating systems.

(\*) Publication in accordance with article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346 of 17.12.1997, p. 78).

(1) As defined in the Consolidated Resolution on the Construction of Vehicles (R.E.3) (document TRANS/WP.29/78/Rev. 1/Amend. 2).

At the request of the manufacturer, the test procedure specific to periodically regenerating systems will not apply to a regenerative device if the manufacturer provides data to the type approval authority that, during cycles where regeneration occurs, emission of CO<sub>2</sub> does not exceed the declared value by more than 4 per cent after agreement of the technical service.

3. APPLICATION FOR APPROVAL
  - 3.1. The application for approval of a vehicle type with regard to the measurement of the emission of carbon dioxide and fuel consumption or to the measurement of electric energy consumption shall be submitted by the vehicle manufacturer or by his duly accredited representative.
  - 3.2. It shall be accompanied by the under-mentioned documents in triplicate and the following particulars:
    - 3.2.1. A description of the internal combustion engine type or the electric power train type comprising all the particulars referred to in annex 1 or annex 2. At the request of the technical service in charge of the tests or the manufacturer, complementary technical information could be considered for specific vehicles, which are particularly fuel efficient.
    - 3.2.2. Description of the basic features of the vehicle, including those used in drafting annex 3.
  - 3.3. A vehicle, representative of the vehicle type to be approved, shall be submitted to the technical services responsible for conducting approval tests. During the test, the technical service will check that this vehicle, if equipped with an internal combustion engine, conforms to the limit values applicable to that type, as described in Regulation No 83.
  - 3.4. The competent authority shall verify the existence of satisfactory provisions to ensure an effective check of conformity of production before approval of the vehicle type is granted.
4. APPROVAL
  - 4.1. If the emissions of CO<sub>2</sub> and fuel consumption of internal combustion engine or the electric energy consumption of the vehicle type submitted for approval pursuant to this Regulation have been measured according to the conditions specified in paragraph 5 below, approval of that vehicle type shall be granted.
  - 4.2. An approval number shall be assigned to each type approved. Its first two digits (at present 00 for the Regulation in its original form) 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 shall not assign the same number to another vehicle type.
  - 4.3. Notice of approval or of extension or refusal of approval of a vehicle type pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement applying this Regulation by means of a form conforming to the model in annex 3 to this Regulation.
  - 4.4. There shall be affixed, conspicuously and in a readily accessible place specified on the approval form, to every vehicle conforming to a vehicle type approved under this Regulation, an international approval mark consisting of:

- 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;
- 4.4.2. the number of this Regulation, followed by the letter 'R', a dash and the approval number to the right of the circle prescribed in paragraph 4.4.1.
- 4.5. If the vehicle conforms to a vehicle type approved under one or more other Regulations annexed to the Agreement, in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be clearly legible and be indelible.
- 4.7. The approval mark shall be placed close to or on the vehicle data plate.
- 4.8. Annex 4 to this Regulation gives examples of arrangements of the approval mark.

5. SPECIFICATIONS AND TESTS

5.1. *General*

The components liable to affect the emissions of CO<sub>2</sub> and fuel consumption or the electric energy consumption shall be so designed, constructed and assembled as to enable the vehicle, in normal use, despite the vibrations to which it may be subjected, to comply with the provisions of this Regulation.

5.2. *Description of tests for internal combustion engines*

- 5.2.1. The emissions of CO<sub>2</sub> shall be measured during the test cycle simulating the urban and extra-urban driving patterns as described in appendix 1 of annex 4 to Regulation No. 83, in force at the time of the approval of the vehicle.
- 5.2.2. The results of the test must be expressed as CO<sub>2</sub> emissions in grams per kilometre (g/km) rounded to the nearest whole number.
- 5.2.3. Fuel consumptions are calculated according to paragraph 1.5 of annex 4 by the carbon balance method using the measured emissions of CO<sub>2</sub> and the other carbon related emissions (CO and HC). The results will be rounded to the first decimal place.
- 5.2.4. The appropriate reference fuels as defined in annex 10 to Regulation No 83 must be used for testing.

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<sup>(1)</sup> 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Serbia and Montenegro, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 27 for Slovakia, 28 for Belarus, 29 for Estonia, 30 (vacant), 31 for Bosnia-Herzegovina, 32 for Latvia, 33 (vacant), 34 for Bulgaria, 35 and 36 (vacant), 37 for Turkey, 38 (vacant), 39 for Azerbaijan, 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, 46 for Ukraine, 47 for South Africa and 48 for New Zealand. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement Concerning the Adoption of 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 Approvals 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.

For LPG and natural gas (NG) that reference fuel must be used which is chosen by the manufacturer for the measurement of the net power in accordance with Regulation No 85. The chosen fuel must be specified in the communication document as defined in annex 3 to this Regulation.

For the purpose of calculation mentioned in paragraph 5.2.3, the fuel consumption shall be expressed in appropriate units and the following fuel characteristics shall be used:

(a) density: measured on the test fuel according to ISO 3675 or an equivalent method.

For petrol and diesel fuel the density measured at 15 °C will be used; for LPG and natural gas a reference density will be used, as follows:

0,538 kg/litre for LPG

0,654 kg/m<sup>3</sup> for NG <sup>(1)</sup>

(b) hydrogen-carbon ratio: fixed values will be used which are:

1,85 for petrol

1,86 for diesel fuel

2,525 for LPG

4,00 for NG

### 5.3. *Description of tests for pure electric vehicles*

5.3.1. The technical service in charge of the tests conducts the measurement of the electric energy consumption according to the method and test cycle described in annex 6 to this Regulation.

5.3.2. The technical service in charge of the tests conducts the measurement of the range of the vehicle according to the method described in annex 7.

The range measured by this method is the only one which may be included in sales promotional material.

5.3.3. The result of the electric energy consumption must be expressed in Watt hours per kilometer (Wh/km) and the range in km, both rounded to the nearest whole number.

### 5.4. *Interpretation of results*

5.4.1. The CO<sub>2</sub> value or the value of electric energy consumption adopted as the type approval value shall be the value declared by the manufacturer if the value measured by the technical service does not exceed the declared value by more than 4 per cent. The measured value can be lower without any limitations.

In the case of periodically regenerating systems as defined in paragraph 2.11, the results are multiplied by the factor  $K_1$  obtained from annex 8 before being compared to the declared value.

5.4.2. If the measured value of CO<sub>2</sub> or electric energy consumption exceeds the manufacturer's declared CO<sub>2</sub> or electric energy consumption value by more than 4 per cent, then another test is run on the same vehicle.

When the average of the two test results does not exceed the manufacturer's declared value by more than 4 per cent, then the value declared by the manufacturer is taken as the type approval value.

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<sup>(1)</sup> Mean value of G 20 and G 23 reference fuels at 15 °C.

- 5.4.3. If the average still exceeds the declared value by more than 4 per cent, a final test is run on the same vehicle. The average of the three test results is taken as the type approval value.
6. MODIFICATION AND EXTENSION OF APPROVAL OF THE APPROVED TYPE
- 6.1. Every modification of the approved type shall be notified to the administrative department, which approved the type. The department may then either:
- 6.1.1. Consider that the modifications made are unlikely to have an appreciable adverse effect on the values of CO<sub>2</sub> and fuel consumption or electric energy consumption and that, in this case, the original approval will be valid for the modified vehicle type; or
- 6.1.2. require a further test report from the technical service responsible for conducting the tests according to conditions in paragraph 7 of this Regulation.
- 6.2. Confirmation or extension of approval, specifying the alterations, shall be communicated by the procedure specified in paragraph 4.3 to the Parties to the 1958 Agreement applying this Regulation.
- 6.3. The competent authority which grants the extension of the 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 3 to this Regulation.
7. CONDITIONS OF EXTENSION OF THE TYPE APPROVAL FOR VEHICLE TYPE
- 7.1. *Vehicles powered by an internal combustion engine, except vehicles equipped with a periodically regenerating emission control system*
- The type approval can be extended to vehicles from the same type or from a different type differing with regard to the following characteristics of annex 2 if the CO<sub>2</sub> emissions measured by the technical service do not exceed by more than 4 per cent the type approved value:
- 7.1.1. Mass
- 7.1.2. Maximum authorized mass
- 7.1.3. Type of bodywork: saloon, estate, coupé
- 7.1.4. Overall gear ratios
- 7.1.5. Engine equipment and accessories
- 7.2. *Vehicles powered by an internal combustion engine and equipped with a periodically regenerating emission control system*
- The type approval can be extended to vehicles from the same type or from a different type, differing with regard to the characteristics of annex 3, given in paragraphs 7.1.1 to 7.1.5 above, but not exceeding the family characteristics of annex 8, if the CO<sub>2</sub> emissions measured by the technical service do not exceed by more than 4 per cent the type approved value, and where the same K<sub>i</sub> factor is applicable.
- The type approval can be extended also to vehicles from the same type, but with a different K<sub>i</sub> factor, if the corrected CO<sub>2</sub> value measured by the technical service does not exceed by more than 4 per cent the type approved value.

- 7.3. *Vehicles powered by an electric power train*
- Extensions may be granted after agreement with the technical service responsible for conducting the tests.
8. SPECIAL PROVISIONS
- In the future, vehicles with special energy efficient technologies may be offered which could be submitted to complementary testing programmes. These would be specified at a later stage, which can be claimed by the manufacturer in order to demonstrate the advantages of the solution.
9. CONFORMITY OF PRODUCTION
- 9.1. Vehicles approved to this Regulation shall be so manufactured as to conform to the type approved vehicle.
- 9.2. So as to verify that the conditions set out in paragraph 9.1 are complied with, appropriate production checks shall be carried out.
- 9.3. *Vehicles powered by an internal combustion engine:*
- 9.3.1. As a general rule, measures to ensure the conformity of production with regard to CO<sub>2</sub> emissions from vehicles is checked on the basis of the description in the type approval certificate conforming to the model in annex 3 of this Regulation.
- The control of production conformity is based on an assessment made by the competent authority of the manufacturer's auditing procedure in order to ensure conformity of the vehicle type with respect to the emission of pollutants.
- If the authority is not satisfied with the standard of the manufacturer's auditing procedure, they may require that verification tests be carried out on vehicles in production.
- 9.3.1.1. If a measurement of the emissions of CO<sub>2</sub> must be carried out on a vehicle type that has had one or several extensions, the tests will be carried out on the vehicle(s) available at the time of the test (vehicle(s) described in the first document or in subsequent extensions).
- 9.3.1.1.1. Conformity of the vehicle for the CO<sub>2</sub> test.
- 9.3.1.1.1.1. Three vehicles are randomly taken in the series and are tested as described in paragraph 1.4 of annex 5.
- 9.3.1.1.1.2. If the authority is satisfied with the production standard deviation given by the manufacturer, the tests are carried out according to paragraph 9.2.
- If the authority is not satisfied with the production standard deviation given by the manufacturer, the tests are carried out according to paragraph 9.3.
- 9.3.1.1.1.3. The production of a series is regarded as conforming or non-conforming, on the basis of tests on the three sampled vehicles, once a pass or fail decision is reached for CO<sub>2</sub>, according to the test criteria applied in the appropriate table.
- If no pass or fail decision is reached for CO<sub>2</sub>, a test is carried out on an additional vehicle (see Figure 1).

- 9.3.1.1.1.4. In the case of periodically regenerating systems as defined in paragraph 2.11., the results shall be multiplied by the factor  $K_i$  obtained by the procedure specified in annex 8 at the time when type approval was granted.

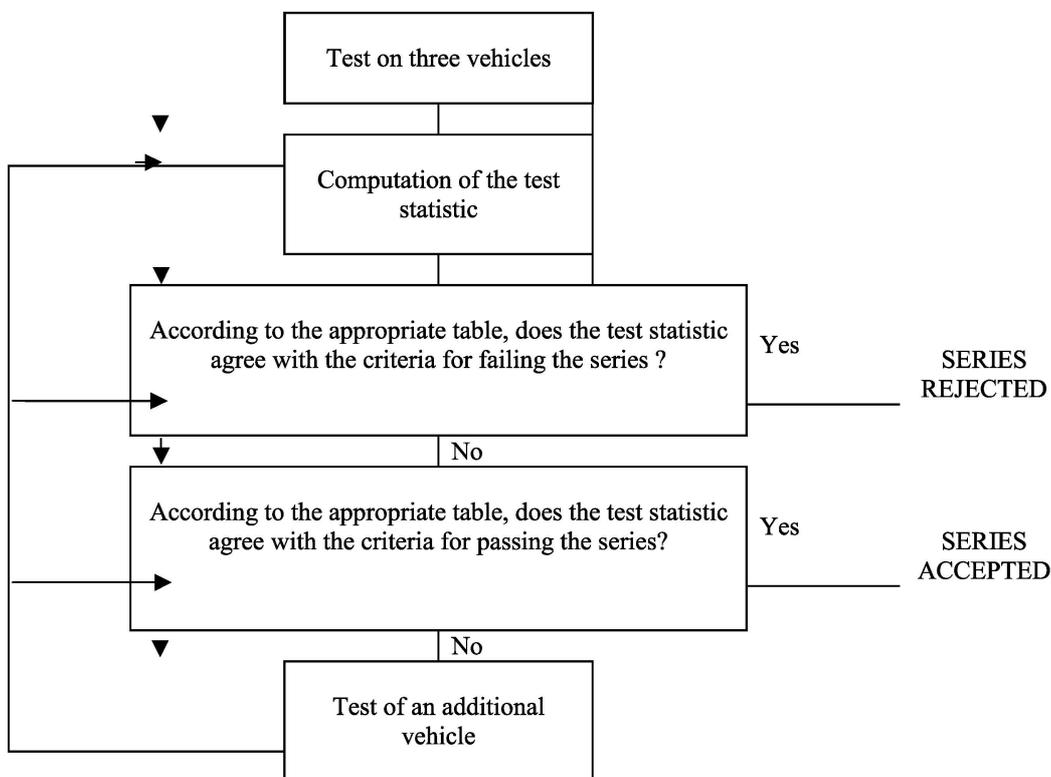
At the request of the manufacturer, testing may be carried out immediately after a regeneration has been completed.

- 9.3.1.1.2. Notwithstanding the requirements of paragraph 1.1.1 of annex 5, the tests will be carried out on vehicles which have not travelled any distance.

- 9.3.1.1.2.1. However, at the request of the manufacturer, the tests will be carried out on vehicles which have been run-in a maximum of 15 000 km.

In this case, the running-in procedure will be conducted by the manufacturer who shall undertake not to make any adjustments to those vehicles.

Figure 1



- 9.3.1.1.2.2. If the manufacturer asks to conduct a running-in procedure ('x' km, where  $\leq 15\,000$  km), it may be carried out as follows:

- the emissions of  $\text{CO}_2$  will be measured at zero and at 'x' km on the first tested vehicle (which can be the type approval vehicle);
- the evolution coefficient (EC) of the emissions between zero and 'x' km will be calculated as follows:

$$\text{EC} = \frac{\text{Emissions at x km}}{\text{Emissions at zero km}}$$

It may be less than 1.

— The following vehicles will not be subjected to the running-in procedure, but their zero km emissions will be modified by the evolution coefficient, EC.

In this case, the values to be taken will be:

- the value at 'x' km for the first vehicle;
- the values at zero km multiplied by the evolution coefficient for the following vehicles.

9.3.1.1.2.3. As an alternative to this procedure, the car manufacturer can use a fixed evolution coefficient, EC, of 0,92 and multiply all values of CO<sub>2</sub> measured at zero km by this factor.

9.3.1.1.2.4. The reference fuels described in annex 9 of Regulation No 83 shall be used for this test.

9.3.2. Conformity of production when manufacturer's statistical data is available.

9.3.2.1. The following sections describe the procedure to be used to verify the CO<sub>2</sub> conformity of production requirements when the manufacturer's production standard deviation is satisfactory.

9.3.2.2. With a minimum sample size of three, the sampling procedure is set so that the probability of a lot passing a test with 40 per cent of the production defective is 0,95 (producer's risk = 5 per cent) while the probability of a lot being accepted with 65 per cent of the production defective is 0,1 (consumer's risk = 10 per cent).

9.3.2.3. The following procedure is used (see Figure 1).

Let L be the natural logarithm of the CO<sub>2</sub> type approval value:

$x_i$  = the natural logarithm of the measurement for the i-th vehicle of the sample;

s = an estimate of the production standard deviation (after taking the natural logarithm of the measurements);

n = the current sample number.

9.3.2.4. Compute for the sample, the test statistic quantifying the sum of the standardized deviations to the limit and defined as:

$$\frac{1}{s} \sum_{i=1}^n (L - x_i)$$

9.3.2.5. Then:

9.3.2.5.1. if the test statistic is greater than the pass decision number for the sample given in Table 1, a pass decision is reached;

9.3.2.5.2. if the test statistic is less than the fail decision number for the sample size given in Table 1, a fail decision is reached;

9.3.2.5.3. otherwise, an additional vehicle is tested according to paragraph 1.4 of annex 5 and the procedure is applied to the sample with one unit more.

Table 1

Sample Size (cumulative number of vehicles tested)	Pass Decision No	Fail Decision No
(a)	(b)	(c)
3	3,327	- 4,724
4	3,261	- 4,790
5	3,195	- 4,856
6	3,129	- 4,922
7	3,063	- 4,988
8	2,997	- 5,054
9	2,931	- 5,120
10	2,865	- 5,185
11	2,799	- 5,251
12	2,733	- 5,317
13	2,667	- 5,383
14	2,601	- 5,449
15	2,535	- 5,515
16	2,469	- 5,581
17	2,403	- 5,647
18	2,337	- 5,713
19	2,271	- 5,779
20	2,205	- 5,845
21	2,139	- 5,911
22	2,073	- 5,977
23	2,007	- 6,043
24	1,941	- 6,109
25	1,875	- 6,175
26	1,809	- 6,241
27	1,743	- 6,307
28	1,677	- 6,373
29	1,611	- 6,439
30	1,545	- 6,505
31	1,479	- 6,571
32	- 2,112	- 2,112

9.3.3. Conformity of production when manufacturer's statistical data is unsatisfactory or unavailable.

9.3.3.1. The following sections describe the procedure to be used to verify the CO<sub>2</sub> conformity of production requirements when the manufacturer's evidence of production standard deviation is either unsatisfactory or unavailable.

9.3.3.2. With a minimum sample size of three the sampling procedure is set so that the probability of a lot passing a test with 40 per cent of the production defective is 0,95 (producer's risk = 5 per cent) while the probability of a lot being accepted with 65 per cent of the production defective is 0,1 (consumer's risk = 10 per cent).

9.3.3.3. The measurement of CO<sub>2</sub> is considered to be log-normally distributed and should first be transformed by taking the natural logarithms. Let  $m_0$  and  $m$  denote the minimum and maximum sample sizes respectively ( $m_0 = 3$  and  $m = 32$ ) and let  $n$  denote the current sample number.

- 9.3.3.4. If the natural logarithms of the measurements in the series are  $x_1, x_2, \dots, x_j$  and  $L$  is the natural logarithm of the CO<sub>2</sub> type approval value, then define:

$$d_j = x_j - L$$

$$\bar{d}_n = \frac{1}{n} \sum_{j=1}^n d_j$$

$$v_n^2 = \frac{1}{n} \sum_{j=1}^n (d_j - \bar{d}_n)^2$$

- 9.3.3.5. Table 2 shows values of the pass ( $A_n$ ) and fail ( $B_n$ ) decision numbers against current sample number. The test statistic is the ratio  $\bar{d}_n/v_n$  and shall be used to determine whether the series has passed or failed as follows:

for  $m_0 \leq n \leq m$ :

- 9.3.3.5.1. pass the series if  $\bar{d}_n/v_n \leq A_n$ ;
- 9.3.3.5.2. fail the series if  $\bar{d}_n/v_n \geq B_n$ ;
- 9.3.3.5.3. take another measurement if  $A_n < \bar{d}_n/v_n < B_n$ .

- 9.3.3.6. Remarks

The following recursive formulae are useful for computing successive values of the test statistic:

$$\bar{d}_n = \left(1 - \frac{1}{n}\right) \bar{d}_{n-1} + \frac{1}{n} d_n$$

$$v_n^2 = \left(1 - \frac{1}{n}\right) v_{n-1}^2 + \frac{(\bar{d}_n - d_n)^2}{n-1}$$

$$(n = 2, 3, \dots; \bar{d}_1 = d_1; v_1 = 0)$$

- 9.4. *Vehicles powered by an electric power train:*

As a general rule, measures to ensure the conformity of production with regard to electric energy consumption is checked on the basis of the description in the type approval certificate set out in annex 3 to this Regulation.

- 9.4.1. The holder of the approval shall, in particular:
- 9.4.1.1. Ensure the existence of procedures for the effective control of product quality;
- 9.4.1.2. Have access to the equipment necessary for checking conformity with each approved type;
- 9.4.1.3. Ensure that the data concerning the test results are recorded and that the annexed documents are available during a period to be agreed with the administrative service;
- 9.4.1.4. Analyze the results of each type of test so as to monitor and ensure the consistency of the characteristics of the product, taking into account the variations admissible in industrial manufacture;
- 9.4.1.5. Make sure that for each type of vehicle tests prescribed in annex 6 to this Regulation are carried out; notwithstanding the requirements of paragraph 2.3.1.6 of annex 6, at the request of the manufacturer, the tests will be carried out on vehicles which have not travelled any distance;

- 9.4.1.6. Make sure that any collections of samples or test pieces demonstrating non-conformity with the type of test under consideration is followed by a subsequent sampling and a further test. All necessary steps shall be taken to re-establish the conformity of production.
- 9.4.2. The competent authorities issuing the approval may verify at any time the methods applied in each production unit.
- 9.4.2.1. In every inspection, the records of tests and production monitoring shall be communicated to the visiting inspector.
- 9.4.2.2. The inspector may select at random the samples to be tested in the manufacturer's laboratory. The minimum number of samples may be determined on the basis of the results of the manufacturer's own checks.
- 9.4.2.3. When the quality standard does not seem satisfactory or when it seems necessary to verify the validity of the tests conducted under paragraph 9.4.2.2, the inspector shall collect samples to be sent to the technical service which carried out the approval tests.
- 9.4.2.4. The competent authorities may carry out all the tests prescribed in this Regulation.
- 9.4.2.5. If, during inspections, negative results are observed, the competent authority shall ensure that all necessary steps are taken to re-establish conformity of production as soon as possible.

Table 2

Sample Size (cumulative number of vehicles tested) $n$	Pass Decision No $A_n$	Fail Decision No $B_n$
(a)	(b)	(c)
3	-0,80381	16,64743
4	-0,76339	7,68627
5	-0,72982	4,67136
6	-0,69962	3,25573
7	-0,67129	2,45431
8	-0,64406	1,94369
9	-0,61750	1,59105
10	-0,59135	1,33295
11	-0,56542	1,13566
12	-0,53960	0,97970
13	-0,51379	0,85307
14	-0,48791	0,74801
15	-0,46191	0,65928
16	-0,43573	0,58321
17	-0,40933	0,51718
18	-0,38266	0,45922
19	-0,35570	0,40788
20	-0,32840	0,36203
21	-0,30072	0,32078
22	-0,27263	0,28343
23	-0,24410	0,24943
24	-0,21509	0,21831
25	-0,18557	0,18970
26	-0,15550	0,16328
27	-0,12483	0,13880
28	-0,09354	0,11603
29	-0,06159	0,09480
30	-0,02892	0,07493
31	0,00449	0,05629
32	0,03876	0,03876

10. PENALTIES FOR NON-CONFORMITY OF PRODUCTION
- 10.1. The approval granted in respect of a vehicle type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 9.1 are not complied with.
- 10.2. If a Party to the 1958 Agreement which applies 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 3 of this Regulation.
11. PRODUCTION DEFINITELY DISCONTINUED
- If the holder of the approval completely ceases to manufacture a type of vehicle 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 3 to this Regulation.
12. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS AND OF ADMINISTRATIVE DEPARTMENTS
- The 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 the administrative departments which grant approval and to which forms, certifying approval or refusal or extension or withdrawal of approval, issued in other countries, are to be sent.
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## ANNEX 1

**ESSENTIAL CHARACTERISTICS OF THE INTERNAL COMBUSTION ENGINE AND INFORMATION CONCERNING THE CONDUCT OF TESTS**

The following information, when applicable, shall be supplied in triplicate and shall include a summary.

If there are drawings, they shall be to an appropriate scale and show sufficient detail. They shall be presented in A4 format or folded to that format. In the case of microprocessor controlled functions, appropriate operating information shall be supplied.

1. **Description of Engine**
  - 1.1. Manufacturer: .....
  - 1.1.1. Manufacturer's engine code (as marked on the engine or other means of identification): .....
  - 1.2. Internal combustion engine:
    - 1.2.1. Specific engine information: .....
    - 1.2.1.1. Working principle: positive-ignition/compression-ignition, four stroke/two stroke <sup>(1)</sup>
    - 1.2.1.2. Number, arrangement and firing order of cylinders:
      - 1.2.1.2.1. Bore: <sup>(2)</sup> ..... mm
      - 1.2.1.2.2. Stroke: <sup>(2)</sup> ..... mm
    - 1.2.1.3. Engine capacity: <sup>(3)</sup> ..... cm<sup>3</sup>
    - 1.2.1.4. Volumetric compression ratio: <sup>(4)</sup> .....
    - 1.2.1.5. Drawing(s) of combustion chamber and piston crown: .....
    - 1.2.1.6. Idle speed: <sup>(4)</sup> .....
    - 1.2.1.7. Carbon monoxide content by volume in the exhaust gas with the engine idling:
 

..... per cent (according to the manufacturer's specifications) <sup>(4)</sup>
    - 1.2.1.8. Maximum net power: ..... kW at: ..... min<sup>-1</sup>
  - 1.2.2. Fuel: leaded petrol/unleaded petrol/diesel oil/LPG/NG <sup>(1)</sup>
  - 1.2.3. RON unleaded petrol: .....
  - 1.2.4. Fuel feed: .....
  - 1.2.4.1. By carburettor(s): yes/no <sup>(1)</sup>
    - 1.2.4.1.1. Make(s): .....
    - 1.2.4.1.2. Type(s): .....
    - 1.2.4.1.3. Number fitted: .....
    - 1.2.4.1.4. Adjustments: <sup>(4)</sup> .....
    - 1.2.4.1.4.1. Jets: .....
    - 1.2.4.1.4.2. Venturis: .....
    - 1.2.4.1.4.3. Float-chamber level: .....
    - 1.2.4.1.4.4. Mass of float: .....

1.2.4.1.4.5.	Float needle: .....
1.2.4.1.5.	Cold start system: manual/automatic <sup>(1)</sup>
1.2.4.1.5.1.	Operating principle: .....
1.2.4.1.5.2.	Operating limits/settings: <sup>(1)</sup> <sup>(4)</sup> .....
1.2.4.2.	By fuel injection (compression-ignition only): yes/no <sup>(1)</sup>
1.2.4.2.1.	System description: .....
1.2.4.2.2.	Working principle: direct injection/pre-chamber/swirl chamber <sup>(1)</sup>
1.2.4.2.3.	Injection pump
1.2.4.2.3.1.	Make(s): .....
1.2.4.2.3.2.	Type(s): .....
1.2.4.2.3.3.	Maximum fuel delivery: <sup>(1)</sup> <sup>(4)</sup> ..... mm <sup>3</sup> /stroke or cycle at a pump speed of ..... min <sup>-1</sup> : <sup>(1)</sup> <sup>(4)</sup> or characteristic diagram: .....
1.2.4.2.3.4.	Injection timing: <sup>(4)</sup>
1.2.4.2.3.5.	Injection advance curve: <sup>(4)</sup>
1.2.4.2.3.6.	Calibration procedure: test bench/engine <sup>(1)</sup> .....
1.2.4.2.4.	Governor:
1.2.4.2.4.1.	Type: .....
1.2.4.2.4.2.	Cut-off point: .....
1.2.4.2.4.3.	Cut-off point under load: ..... min <sup>-1</sup>
1.2.4.2.4.4.	Cut-off point without load: ..... min <sup>-1</sup>
1.2.4.2.4.5.	Idling speed: ..... min <sup>-1</sup>
1.2.4.2.5.	Injector(s): .....
1.2.4.2.5.1.	Make(s): .....
1.2.4.2.5.2.	Type(s): .....
1.2.4.2.5.3.	Opening pressure: <sup>(4)</sup> ..... kPa or characteristic diagram: .....
1.2.4.2.6.	Cold start system:
1.2.4.2.6.1.	Make(s): .....
1.2.4.2.6.2.	Type(s): .....
1.2.4.2.6.3.	Description: .....
1.2.4.2.7.	Auxiliary starting aid:
1.2.4.2.7.1.	Makes(s): .....
1.2.4.2.7.2.	Type(s): .....
1.2.4.2.7.3.	Description: .....
1.2.4.3.	By fuel, injection (positive-ignition only): yes/no <sup>(1)</sup>
1.2.4.3.1.	System description: .....

- 1.2.4.3.2. Working principle <sup>(1)</sup>: intake manifold (single/multi-point)/direct injection/other — specify)
- |  |   |  |
|--|---|--|
| <p>Control unit — type or No<br/>         Fuel regulator — type<br/>         Air flow sensor — type<br/>         Fuel distributor — type<br/>         Pressure regulator — type<br/>         Microswitch — type<br/>         Idle adjusting screw — type<br/>         Throttle housing — type<br/>         Water temperature sensor — type<br/>         Air temperature sensor — type<br/>         Air temperature switch — type</p> | } | <p>Information to be given<br/>         in the case of continuous<br/>         injection; in the case of<br/>         other systems, equivalent<br/>         details</p> |
|--|---|--|
- Electromagnetic interference protection.
- Description and/or drawing: .....
- 1.2.4.3.3. Makes(s): .....
- 1.2.4.3.4. Type(s): .....
- 1.2.4.3.5. Injector(s): Opening pressure: <sup>(4)</sup> ..... kPa or characteristic diagram: <sup>(4)</sup>
- 1.2.4.3.6. Injection timing: .....
- 1.2.4.3.7. Cold start system: .....
- 1.2.4.3.7.1. Operating principle(s): .....
- 1.2.4.3.7.2. Operating limits/settings: <sup>(1)</sup> <sup>(4)</sup> .....
- 1.2.4.4. Feed pump
- 1.2.4.4.1. Pressure: <sup>(1)</sup> ..... kPa or characteristic diagram: .....
- 1.2.4.5. By LPG fuelling system: yes/no <sup>(1)</sup>
- 1.2.4.5.1. Approval number according to Regulation No 67 and documentation: .....
- 1.2.4.5.2. Electronic Engine Management Control Unit for LPG-fuelling:
- 1.2.4.5.2.1. Make(s): .....
- 1.2.4.5.2.2. Type: .....
- 1.2.4.5.2.3. Emission related adjustment possibilities: .....
- 1.2.4.5.3. Further documentation:
- 1.2.4.5.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to LPG or back: .....
- .....
- 1.2.4.5.3.2. System lay-out (electrical connections, vacuum connections, compensation hoses, etc): .....
- 1.2.4.5.3.3. Drawing of the symbol: .....
- 1.2.4.6. By NG fuelling system: yes/no <sup>(1)</sup>
- 1.2.4.6.1. Approval number according to Regulation No 67: .....

- 1.2.4.6.2. Electronic Engine Management Control Unit for NG-fuelling:
- 1.2.4.6.2.1. Make(s): .....
- 1.2.4.6.2.2. Type: .....
- 1.2.4.6.2.3. Emission related adjustment possibilities: .....
- 1.2.4.6.3. Further documentation:
- 1.2.4.6.3.1. Description of the safeguarding of the catalyst at switch-over from petrol to NG or back: .....
- 1.2.4.6.3.2. System lay-out (electrical connections, vacuum connections, compensation hoses, etc.): .....
- 1.2.4.6.3.3. Drawing of the symbol: .....
- 1.2.5. Ignition
- 1.2.5.1. Make(s): .....
- 1.2.5.2. Type(s): .....
- 1.2.5.3. Working principle: .....
- 1.2.5.4. Ignition advance curve: (°) .....
- 1.2.5.5. Static ignition timing: (°) ..... degrees before TDC
- 1.2.5.6. Contact point gap: (°) .....
- 1.2.5.7. Dwell angle: (°) .....
- 1.2.5.8. Spark plugs: .....
- 1.2.5.8.1. Make: .....
- 1.2.5.8.2. Type: .....
- 1.2.5.8.3. Spark plug gap setting: ..... mm
- 1.2.5.9. Ignition coil:
- 1.2.5.9.1. Make: .....
- 1.2.5.9.2. Type: .....
- 1.2.5.10. Ignition condenser:
- 1.2.5.10.1. Make: .....
- 1.2.5.10.2. Type: .....
- 1.2.6. Cooling system: liquid/air (1)
- 1.2.7. Intake system: .....
- 1.2.7.1. Pressure charger: yes/no (1)
- 1.2.7.1.1. Make(s): .....
- 1.2.7.1.2. Type(s): .....
- 1.2.7.1.3. Description of the system (maximum charge pressure: ..... kPa, wastegate)

- 1.2.7.2. Intercooler: yes/no <sup>(1)</sup>
- 1.2.7.3. Description and/or drawings of inlet pipes and their accessories (plenum chamber, heating device, additional air intakes etc.): .....
- 1.2.7.3.1. Intake manifold description (include drawings and/or photographs): .....
- 1.2.7.3.2. Air filter, drawings, or
- 1.2.7.3.2.1. Make(s): .....
- 1.2.7.3.2.2. Type(s): .....
- 1.2.7.3.3. Intake silencer, drawings, or
- 1.2.7.3.3.1. Make(s): .....
- 1.2.7.3.3.2. Type(s): .....
- 1.2.8. Exhaust system:
- 1.2.8.1. Description and drawings of the exhaust system: .....
- 1.2.9. Valve timing or equivalent data
- 1.2.9.1. Maximum lift of valves, angles of operating and closing or timing details of alternative distribution systems, in relation to dead centres: .....
- 1.2.9.2. Reference and/or setting ranges: <sup>(1)</sup> .....
- 1.2.10. Lubricant used:
- 1.2.10.1. Make: .....
- 1.2.10.2. Type: .....
- 1.2.11. Measures taken against air pollution
- 1.2.11.1. Device for recycling crankcase gases (description and/or drawings): .....
- 1.2.11.2. Additional pollution control devices (if any, and if not covered by another heading):
- 1.2.11.2.1. Catalytic converter: yes/no <sup>(1)</sup>
- 1.2.11.2.1.1. Number of catalytic converters and elements: .....
- 1.2.11.2.1.2. Dimensions and shape of the catalytic converter(s) (volume, . . .): .....
- 1.2.11.2.1.3. Type of catalytic action: .....
- 1.2.11.2.1.4. Total charge of precious metal: .....
- 1.2.11.2.1.5. Relative concentration: .....
- 1.2.11.2.1.6. Substrate (structure and material): .....
- 1.2.11.2.1.7. Cell density: .....
- 1.2.11.2.1.8. Type of casing for catalytic converter(s): .....
- 1.2.11.2.1.9. Positioning of the catalytic converter(s) (Place and reference distances in the exhaust system):  
.....

- 1.2.11.2.1.10.      Regeneration systems/method of exhaust after-treatment systems, description: .....
- 1.2.11.2.1.10.1.    The number of Type I operating cycles, or equivalent engine test bench cycles, between two cycles where regenerative phases occur under the conditions equivalent to Type I test (Distance 'D' in figure 1 in annex 8): .....
- 1.2.11.2.1.10.2.    Description of method employed to determine the number of cycles between two cycles where regenerative phases occur: .....
- 1.2.11.2.1.10.3.    Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure etc.): .....
- 1.2.11.2.1.10.4.    Description of method used to load system in the test procedure described in paragraph 3.1, annex 8: .....
- 1.2.11.2.1.11.      Oxygen sensor: type: .....
- 1.2.11.2.1.11.1.    Location of oxygen sensor: .....
- 1.2.11.2.1.11.2.    Control range of oxygen sensor: .....
- 1.2.11.2.2.          Air injection: yes/no <sup>(1)</sup>
- 1.2.11.2.2.1.        Type (pulse air, air pump, . . .): .....
- 1.2.11.2.3.          EGR: yes/no <sup>(1)</sup>
- 1.2.11.2.3.1.        Characteristics (flow, . . .): .....
- 1.2.11.2.4.          Evaporative emission control system:  
                           Complete detailed description of the devices and their state of tune: .....
- Drawing of the evaporative control system: .....
- Drawing of the carbon canister: .....
- Drawing of the fuel tank with indication of capacity and material: .....
- 1.2.11.2.5.          Particulate trap: yes/no <sup>(1)</sup>
- 1.2.11.2.5.1.        Dimensions and shape of the particulate trap (capacity): .....
- 1.2.11.2.5.2.        Type of particulate trap and design: .....
- 1.2.11.2.5.3.        Location of the particulate trap (reference distances in the exhaust system): .....
- 1.2.11.2.5.4.        Regeneration system/method. Description and drawing: .....
- 1.2.11.2.5.4.1.     The number of Type I operating cycles, or equivalent engine test bench cycle, between two cycles where regeneration phases occur under the conditions equivalent to Type I test (Distance 'D' in figure 1 in annex 8): .....
- 1.2.11.2.5.4.2.     Description of method employed to determine the number of cycles between two cycles where regenerative phases occur: .....
- 1.2.11.2.5.4.3.     Parameters to determine the level of loading required before regeneration occurs (i.e. temperature, pressure, etc.): .....
- 1.2.11.2.5.4.4.     Description of method used to load system in the test procedure described in paragraph 3.1, annex 8: .....
- 1.2.11.2.6.          Other systems (description and working principles): .....

<sup>(1)</sup> Strike out what does not apply.

<sup>(2)</sup> This value must be rounded to the nearest tenth of a millimetre.

<sup>(3)</sup> This value must be calculated with  $\pi = 3,1416$  and rounded to the nearest  $\text{cm}^3$ .

<sup>(4)</sup> Specify the tolerance.

## ANNEX 2

**ESSENTIAL CHARACTERISTICS OF THE ELECTRIC POWER TRAIN AND INFORMATION CONCERNING THE CONDUCT OF TESTS <sup>(1)</sup>**

1. **Description of the traction battery**
  - 1.1. Trade name and mark of the battery: .....
  - 1.2. Kind of electro-chemical couple: .....
  - 1.3. Nominal voltage: ..... V
  - 1.4. Battery maximum thirty minutes power (constant power discharge): ..... kW
  - 1.5. Battery performance in 2 h discharge (constant power or constant current): <sup>(3)</sup>
  - 1.5.1. Battery energy: ..... kWh
  - 1.5.2. Battery capacity: ..... Ah in 2 h
  - 1.5.3. End of discharge voltage value: ..... V
  - 1.6. Indication of the end of the discharge that leads to a compulsory stop of the vehicle: <sup>(4)</sup> .....
  - 1.7. Battery mass: ..... kg
  
2. **Description of the drive train**
  - 2.1. General
    - 2.1.1. Make: .....
    - 2.1.2. Type: .....
    - 2.1.3. Use: <sup>(3)</sup> Monomotor/multimotors (number): .....
    - 2.1.4. Transmission arrangement: parallel/transaxial/others, to precise: .....
    - 2.1.5. Test voltage: ..... V
    - 2.1.6. Motor nominal speed: ..... min<sup>-1</sup>
    - 2.1.7. Motor maximum speed: ..... min<sup>-1</sup>  
 or by default:  
 reducer outlet shaft/gear box speed (specify gear engaged): ..... min<sup>-1</sup>
    - 2.1.8. Maximum power speed: <sup>(2)</sup> ..... min<sup>-1</sup>
    - 2.1.9. Maximum power: ..... kW
    - 2.1.10. Maximum thirty minutes power: ..... kW
    - 2.1.11. Flexible range (where P ≥ 90 % of max. power):  
 speed at the beginning of range: ..... min<sup>-1</sup>  
 speed at the end of range: ..... min<sup>-1</sup>

- 2.2. Motor
- 2.2.1. Working principle:
- 2.2.1.1. direct current/alternating current 3/number of phases: .....
- 2.2.1.2. separate excitation/series/compound <sup>(3)</sup>
- 2.2.1.3. synchron/asynchron <sup>(3)</sup>
- 2.2.1.4. coiled rotor/with permanent magnets/with housing <sup>(3)</sup>
- 2.2.1.5. number of poles of the motor: .....
- 2.2.2. Inertia mass: .....
- 2.3. Power controller
- 2.3.1. Make
- 2.3.2. Type
- 2.3.3. Control principle: vectorial/open loop/closed/other (to be specified): <sup>(3)</sup> .....
- 2.3.4. Maximum effective current supplied to the motor: <sup>(2)</sup> ..... A during ..... seconds
- 2.3.5. Voltage range use: ..... V to .....
- 2.4. Cooling system:
- motor: liquid/air <sup>(3)</sup>
- controller: liquid/air <sup>(3)</sup>
- 2.4.1. Liquid-cooling equipment characteristics:
- 2.4.1.1. Nature of the liquid ..... circulating pumps: yes/no <sup>(3)</sup>
- 2.4.1.2. Characteristics or make(s) and type(s) of the pump: .....
- 2.4.1.3. Thermostat: setting: .....
- 2.4.1.4. Radiator: drawing(s) or make(s) and type(s): .....
- 2.4.1.5. Relief valve: pressure setting: .....
- 2.4.1.6. Fan: characteristics or make(s) and type(s): .....
- 2.4.1.7. Fan duct: .....
- 2.4.2. Air-cooling equipment characteristics
- 2.4.2.1. Blower: characteristics or make(s) and type(s): .....
- 2.4.2.2. Standard air ducting: .....
- 2.4.2.3. Temperature regulating system: yes/no <sup>(3)</sup>
- 2.4.2.4. Brief description: .....
- 2.4.2.5. Air filter: ..... make(s): ..... type(s): .....

- 2.4.3. Temperatures admitted by the manufacturer
- maximum temperature
- 2.4.3.1. Motor outlet: ...°C
- 2.4.3.2. controller inlet: ...°C
- 2.4.3.3. at motor reference point(s): ...°C
- 2.4.3.4. at controller reference point(s): ...°C
- 2.5. Insulating category: .....
- 2.6. International protection (IP)-code: .....
- 2.7. Lubrication system principle: <sup>(3)</sup>
- |              |               |
|--------------|---------------|
| Bearings:    | friction/ball |
| Lubricant:   | grease/oil    |
| Seal:        | yes/no        |
| Circulation: | with/without  |

3. **Description of the transmission**

- 3.1. Drive wheels: front/rear/4 × 4 <sup>(3)</sup>
- 3.2. Type of transmission: manual/automatic <sup>(3)</sup>
- 3.3. Number of gear ratios: .....

3.3.1.

Gear	Wheel speed	Gear ratio	Motor speed
1			
2			
3			
4			
5			
Reverse			

min. CVT (Continuous Variable Transmission): .....

max. CVT: .....

3.4. Recommendations for changing the gears

- |                     |                      |
|---------------------|----------------------|
| 1 → 2: .....        | 2 → 1: .....         |
| 2 → 3: .....        | 3 → 2: .....         |
| 3 → 4: .....        | 4 → 3: .....         |
| 4 → 5: .....        | 5 → 4: .....         |
| overdrive in: ..... | overdrive out: ..... |

- 3.5. Tyres:
- Dimensions: .....
- Rolling circumference under load: .....
- Recommended pressure: .....
- 3.6. Inertia mass:
- 3.6.1. Equivalent inertia mass of complete front axle: .....
- 3.6.2. Equivalent inertia mass of complete rear axle: .....
4. **Charge**
- 4.1. Charger: on board/external <sup>(3)</sup>
- In case of an external unit, define the charger (trademark, model): .....
- 4.2. Description of the normal profile of charge: .....
- 4.3. Specification of mains:
- 4.3.1. Type of mains: single phase/three phase <sup>(3)</sup>
- 4.3.2. Voltage: .....
- 4.4. Rest period recommended between the end of the discharge and the start of the charge: .....
- 4.5. Theoretical duration of a complete charge: .....
- 

<sup>(1)</sup> For non-conventional motors or systems, the manufacturer will supply data equivalent to those requested hereafter.

<sup>(2)</sup> Specify tolerances.

<sup>(3)</sup> Strike out what does not apply.

<sup>(4)</sup> If applicable.

## ANNEX 3

## COMMUNICATION

(Maximum format: A4 (210 × 297 mm))

issued by: Name of administration <sup>(1)</sup>

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

concerning <sup>(2)</sup> APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a vehicle type pursuant to Regulation No 101

Approval No: ..... Extension No: .....

1. Trade name or mark of the vehicle: .....
2. Vehicle type: .....
3. Vehicle category: .....
4. Manufacturer's name and address: .....
5. If applicable, name and address of manufacturer's representative: .....
6. Description of the vehicle: .....
- 6.1. Mass of the vehicle in running order: .....
- 6.2. Maximum permitted mass: .....
- 6.3. Type of body: saloon/estate/coupé <sup>(2)</sup>
- 6.4. Drive: front-wheel/rear-wheel/four-wheel <sup>(2)</sup>
- 6.5. Internal combustion engine <sup>(2)</sup>
  - 6.5.1. Cylinder capacity: .....
  - 6.5.2. Fuel feed: carburettor/injection <sup>(2)</sup>
  - 6.5.3. Fuel recommended by the manufacturer: .....
  - 6.5.4. In the case of LPG/NG <sup>(1)</sup> the reference fuel used for the test (e. g. G20, G25): .....
  - 6.5.5. Maximum engine power: ..... kW at: ..... min<sup>-1</sup>
  - 6.5.6. Super-charger: yes/no <sup>(2)</sup>
  - 6.5.7. Ignition: compression ignition/positive ignition (mechanical or electronic) <sup>(2)</sup>

- 6.6. Electric power train <sup>(1)</sup>
  - 6.6.1. Drive train:
    - 6.6.1.1. Maximum net power: ..... kW, at ..... to ..... min<sup>-1</sup>
    - 6.6.1.2. Maximum thirty minutes power: ..... kW
    - 6.6.1.3. Working principle: .....
  - 6.6.2. Traction battery:
    - 6.6.2.1. Nominal voltage: ..... V
    - 6.6.2.2. Capacity (2 h rate): ..... Ah
    - 6.6.2.3. Battery maximum thirty minutes power: ..... kW
    - 6.6.2.4. Charger: on board/external <sup>(2)</sup>
- 6.7. Transmission
  - 6.7.1. Type of gearbox: manual/automatic/variable transmission <sup>(2)</sup>
  - 6.7.2. Number of gears: .....
  - 6.7.3. Overall gear ratios (including tyre tread circumference under load): road speeds (km/h) per 1 000 engine speed (min<sup>-1</sup>):
    - First gear: .....
    - Second gear: .....
    - Third gear: .....
    - Fourth gear: .....
    - Fifth gear: .....
    - Overdrive: .....
  - 6.7.4. Final drive ratio: .....
  - 6.7.5. Tyres
    - Type: .....
    - Dimensions: .....
    - Rolling circumference under load: .....
- 7. Test results
  - 7.1. Internal combustion engine <sup>(2)</sup>
    - 7.1.1. CO<sub>2</sub> mass emissions: ..... g/km
      - 7.1.1.1. Urban conditions: ..... g/km
      - 7.1.1.2. Extra-urban conditions: ..... g/km
      - 7.1.1.3. Combined: ..... g/km
    - 7.1.2. Fuel consumption <sup>(3)</sup> <sup>(4)</sup>
      - 7.1.2.1. Fuel consumption (urban conditions): ..... l/100 km
      - 7.1.2.2. Fuel consumption (extra-urban conditions): ..... l/100 km
      - 7.1.2.3. Fuel consumption (combined): ..... l/100 km

- 7.1.3. For vehicles equipped with periodically regenerating systems as defined in paragraph 2.11 of this Regulation, the test results must be multiplied by the factor  $K_i$  obtained from annex 8
- 7.2. Pure electric vehicles <sup>(2)</sup>
- 7.2.1. Measurement of electric energy consumption
- 7.2.1.1. Electric energy consumption: ..... Wh/km
- 7.2.1.2. Total time out of tolerance for the conduct of the cycle: ..... sec
- 7.2.2. Measurement of range:
- 7.2.2.1. Range: ..... km
- 7.2.2.2. Total time out of tolerance for the conduct of the cycle: ..... sec
8. Vehicle submitted for approval on: .....
9. Technical service responsible for conducting approval tests: .....
10. Number of report issued by that service: .....
11. Date of report issued by that service: .....
12. Approval granted/extended/refused/withdrawn <sup>(3)</sup>
13. Reasons for extension (if applicable): .....
14. Remarks: .....
15. Positioning of approval mark on the vehicle: .....
16. Place: .....
17. Date: .....
18. Signature: .....

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

<sup>(2)</sup> Strike out what does not apply.

<sup>(3)</sup> Repeat for petrol and gaseous fuel in the case of a vehicle that can run either on petrol or on a gaseous fuel.

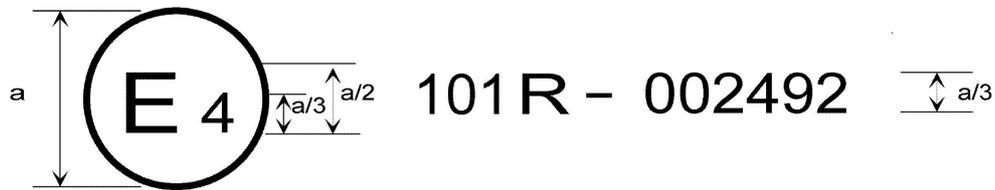
<sup>(4)</sup> For vehicles fuelled with NG the unit 1/100 km is replaced by m<sup>3</sup>/km.

## ANNEX 4

## ARRANGEMENTS OF APPROVAL MARKS

## Model A

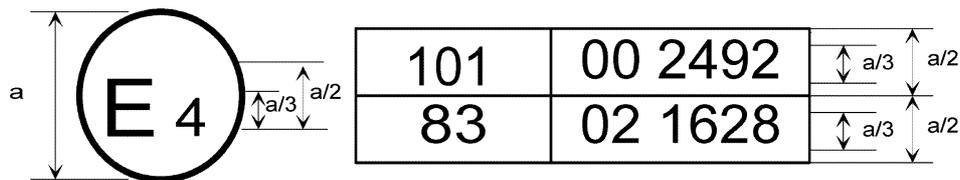
(see paragraph 4.4 of this Regulation)

 $a \geq 8 \text{ mm min}$ 

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) with regard to the measurement of emissions of CO<sub>2</sub> and fuel consumption or to the measurement of electric energy consumption and range pursuant to Regulation No 101 and under approval number 002492. The first two digits of the approval number indicate that the approval was granted according to the requirements of Regulation No 101 in its original form.

## Model B

(see paragraph 4.5 of this Regulation)

 $a \geq 8 \text{ mm min}$ 

The above approval mark affixed to a vehicle shows that the vehicle type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos 101 and 83<sup>(1)</sup>. The first two digits of the approval numbers indicate that, at the dates when the respective approvals were given, Regulation No 101 had not been modified and Regulation No 83 already included the 02 series of amendments.

<sup>(1)</sup> The second number is given merely as an example.

## ANNEX 5

**METHOD OF MEASURING EMISSIONS OF CARBON DIOXIDE AND FUEL CONSUMPTION OF INTERNAL COMBUSTION ENGINES**

1. TEST CONDITIONS
  - 1.1. *General condition of the vehicle*
    - 1.1.1. The vehicle shall have been run-in and shall have been driven for at least 3 000 km but less than 15 000 km before the test.
    - 1.1.2. The settings of the engine and of the vehicle's controls shall be those prescribed by the manufacturer. This requirement also applies, in particular, to the idle settings (rotation speed and carbon monoxide (CO) content of the exhaust gases), to the cold start device and to the exhaust gas pollutant emission control system.
    - 1.1.3. The laboratory may check the tightness of the inlet system to ensure that carburation is not affected by accidental intake of air.
    - 1.1.4. The laboratory may check that vehicle performance is as specified by the manufacturer and that it is possible to use it in normal driving conditions, particularly cold and hot starts.
    - 1.1.5. Before the test, the vehicle shall be stored in a room where the temperature remains relatively constant between 20 and 30 °C. This conditioning shall be carried out for at least six hours and shall continue until the engine oil temperature and coolant, if any, have reached the temperature of the room to within 2 °C. At the request of the manufacturer, the test shall be carried out not later than 30 hours after the vehicle has been run at its normal temperature.

At the request of the manufacturer, vehicles with positive-ignition engines may be preconditioned according to the procedure prescribed in paragraph 5.2.1 of annex 7 to Regulation No 83 in force at the time of the approval of the vehicle.
    - 1.1.6. Only the equipment necessary for the operation of the vehicle during the test shall be in use. If there is a manually controlled device for the engine intake air temperature, it shall be in the position prescribed by the manufacturer for the ambient temperature at which the test is performed. In general, the auxiliary devices required for the normal operation of the vehicle shall be in use.
    - 1.1.7. If the radiator fan is temperature controlled, it shall be in the condition of normal operation on the vehicle. The passenger compartment heating system shall be switched off, as shall any air conditioning system, but such systems compressor shall be functioning normally.
    - 1.1.8. If a super-charger is fitted, it shall be in the normal operating condition for the test conditions.
  - 1.2. *Lubricants*

All the lubricants shall be those recommended by the manufacturer of the vehicle and shall be specified in the test report.
  - 1.3. *Tyres*

The tyres shall be of a type specified as original equipment by the vehicle manufacturer inflated to the pressure recommended for the test load and speeds. The pressures shall be indicated in the test report.
  - 1.4. *Measurement of CO<sub>2</sub> and carbon-related emissions*
    - 1.4.1. The test cycle is described in appendix 1 of annex 4 to Regulation No 83 in force at the time of the approval of the vehicle.

## 1.4.2. Calculation of emissions:

1.4.2.1. The emissions of gaseous pollutants are calculated by means of the following equation:

$$M_i = \frac{V_{\text{mix}} \cdot Q_i \cdot C_i \cdot 10^{-6}}{d} \quad (1)$$

where:

 $M_i$  = mass emission of the pollutant  $i$  in grams per kilometre; $V_{\text{mix}}$  = volume of the diluted exhaust gas expressed in litres per test and corrected to standard conditions (273,2 K and 101,33 kPa); $Q_i$  = density of the pollutant  $i$  in grams per litre at normal temperature and pressure (273,2 K and 101,33 kPa); $C_i$  = concentration of the pollutant  $i$  in the diluted exhaust gas expressed in ppm and corrected by the amount of the pollutant  $i$  contained in the dilution air. If  $C_i$  is expressed in per cent volume,  $10^{-6}$  factor is replaced by  $10^{-2}$ ; $d$  = driven distance during the operating cycle in kilometres.

## 1.4.2.2. Volume determination:

1.4.2.2.1. Calculation of the volume when a variable dilution device with constant flow control by orifice or venturi is used. Record continuously the parameters showing the volumetric flow and calculate the total volume for the duration of the test.

1.4.2.2.2. Calculation of volume when a positive displacement pump is used. The volume of diluted exhaust gas in systems comprising a positive displacement pump is calculated with the following formula:

$$V = V_o \cdot N$$

where:

 $V$  = volume of the diluted exhaust gas expressed in litres per test (prior to correction); $V_o$  = volume of gas delivered by the positive displacement pump on testing conditions in litres per revolution; $N$  = number of revolutions per test.

1.4.2.2.3. Correction of the diluted exhaust gas volume to standard conditions. The diluted exhaust gas volume is corrected by means of the following formula:

$$V_{\text{mix}} V \cdot K_1 \cdot \frac{P_p}{T_p} \quad (2)$$

in which:

$$K_1 = \frac{273,2}{101,33} 2,6961 (K \cdot \text{kPa}^{-1}) \quad (2)$$

where:

 $P_p$  = absolute pressure at the inlet to the positive displacement pump in kPa; $T_p$  = average temperature of the diluted exhaust gas entering the positive displacement pump during the test (K).

1.4.2.3. Calculation of the corrected concentration of pollutants in the sampling bag:

$$C_i = C_e - C_d \left( 1 - \frac{1}{DF} \right) \quad (3)$$

where:

$C_i$  = concentration of the pollutant  $i$  in the diluted exhaust gas, expressed in ppm or per cent volume and corrected by the amount of  $i$  contained in the dilution air;

$C_e$  = measured concentration of pollutant  $i$  in the diluted exhaust gas, expressed in ppm or per cent volume;

$C_d$  = measured concentration of pollutant  $i$  in the air used for dilution, expressed in ppm or per cent volume;

DF = dilution factor.

where:

The dilution factor is calculated as follows:

$$\text{For petrol and diesel:} \quad DF = \frac{13,4}{C_{CO_2} + (C_{HC} + C_{CO}) 10^{-4}} \quad (5a)$$

$$\text{For LPG:} \quad DF = \frac{11,9}{C_{CO_2} + (C_{HC} + C_{CO}) 10^{-4}} \quad (5b)$$

$$\text{For natural gas:} \quad DF = \frac{9,5}{C_{CO_2} + (C_{HC} + C_{CO}) 10^{-4}} \quad (5c)$$

where:

$C_{CO_2}$  = concentration of  $CO_2$  in the diluted exhaust gas contained in the sampling bag, expressed in per cent volume;

$C_{HC}$  = concentration of HC in the diluted exhaust gas contained in the sampling bag, expressed in ppm carbon equivalent;

$C_{CO}$  = concentration of CO in the diluted exhaust gas contained in the sampling bag, expressed in ppm.

1.4.2.4. Example:

1.4.2.4.1. Data

1.4.2.4.1.1. Ambient conditions:

Ambient temperature: 23 °C = 296,2 K,

Barometric pressure:  $P_b = 101,33$  kPa.

1.4.2.4.1.2. Volume measured and reduced to standard conditions:

$V = 51,961$  litres

1.4.2.4.1.3. Analyser readings:

	Diluted exhaust	Dilution air
HC (*)	92 ppm	3,0 ppm
CO	470 ppm	0 ppm
CO <sub>2</sub>	1,6 volume	0,03 volume

(\*) in ppm carbon equivalent.

1.4.2.4.2. Calculation

1.4.2.4.2.1. Dilution factor (DF) (see formula 5):

$$DF = \frac{13,4}{C_{CO_2} + (C_{HC} + C_{CO}) \cdot 10^{-4}}$$

$$DF = \frac{13,4}{1,6 + (92 + 470) \cdot 10^{-4}}$$

$$DF = 8,091$$

1.4.2.4.2.2. Calculation of the corrected concentration of pollutants in the sampling bag:

HC Mass emissions (see formulas 4 and 1):

$$C_i = C_e - C_d \left( 1 - \frac{1}{DF} \right) \quad (4)$$

$$C_{HC} = 92 - 3 \cdot \left( 1 - \frac{1}{8,091} \right)$$

$$C_{HC} = 89,371 \text{ ppm}$$

$$M_{HC} = C_{HC} \cdot V_{mix} \cdot Q_{HC} \cdot \frac{1}{d} \cdot 10^{-6} \quad (1)$$

where:

$$Q_{HC} = 0,619$$

$$M_{HC} = 89,371 \cdot 51,961 \cdot 0,619 \cdot 10^{-6} \cdot \frac{1}{d}$$

$$M_{HC} = \frac{2,88}{d} \text{ g/km}$$

CO<sub>2</sub> mass emissions (see formula 1):

$$M_{CO} = C_{CO} \cdot V_{mix} \cdot Q_{CO} \cdot \frac{1}{d} \cdot 10^{-6} \quad (1)$$

where:

$$Q_{CO} = 1,25$$

$$M_{CO} = 470 \cdot 51,961 \cdot 1,25 \cdot 10^{-6} \cdot \frac{1}{d}$$

$$M_{CO} = \frac{30,5}{d} \text{ g/km}$$

CO<sub>2</sub> mass emissions (see formula 1):

$$C_i = C_e - C_d \left( 1 - \frac{1}{DF} \right) \quad (4)$$

$$C_{CO_2} = 1,6 - 0,03 \cdot \left( 1 - \frac{1}{8,091} \right)$$

$$C_{CO_2} = 1,573 \text{ volume \%}$$

and:

$$Q_{CO_2} = 1,964$$

$$M_{CO_2} = C_{CO_2} \cdot V_{mix} \cdot Q_{CO_2} \cdot 10^{-2} \cdot \frac{1}{d} \quad (1)$$

$$M_{CO_2} = 1,573 \cdot 51,961 \cdot 1,964 \cdot 10^{-2} \cdot \frac{1}{d}$$

$$M_{CO_2} = \frac{1\,605,27}{d} \text{ g/km}$$

1.4.2.5. Special provisions relating to vehicles equipped with compression-ignition engines.

HC measurements for compression-ignition engines.

The average HC concentration used in determining the HC mass emissions from compression-ignition engines is calculated with the aid of the following formula:

$$C_e = \frac{\int_{t_1}^{t_2} C_{HC} \cdot dt}{t_2 - t_1} \quad (7)$$

where:

$\int_{t_1}^{t_2} C_{HC} \cdot dt$  = integral of the recording of the heated FID on the test duration ( $t_2 - t_1$ )

$C_e$  = HC concentration of the diluted exhaust gas sample as calculated from the integrated HC trace, in ppm carbon equivalent.

1.5. *Calculation of fuel consumptions*

1.5.1. The fuel consumptions are calculated from the emissions of hydrocarbons, carbon monoxide and carbon dioxide in accordance with paragraph 1.4 of this annex.

1.5.2. The fuel consumption, expressed in litres per 100 km (in the case of petrol, LPG or diesel) or in m<sup>3</sup> per 100 km (in the case of NG) is calculated by means of the following formulas:

(a) for vehicles with a positive ignition engine fuelled with petrol:

$$FC = (0,1154/D) \cdot [(0,866 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

(b) for vehicles with a positive ignition engine fuelled with LPG:

$$FC_{norm} = (0,1212/0,538) \cdot [(0,825 \cdot HC) + (0,429 \cdot CO) + (0,273 \cdot CO_2)]$$

If the composition of the fuel used for the test differs from the composition that is assumed for the calculation of the normalised consumption, on the manufacturer's request a correction factor  $cf$  may be applied, as follows:

$$F_{c_{\text{norm}}} = (0,1212/0,538) \cdot (cf) \cdot [(0,825 \cdot \text{HC}) + (0,429 \cdot \text{CO}) + (0,273 \cdot \text{CO}_2)]$$

The correction factor  $cf$ , which may be applied, is determined as follows:

$$cf = 0,825 + 0,0693 \cdot n_{\text{actual}}$$

where:

$n_{\text{actual}}$  = the actual H/C ratio of the fuel used

(c) for vehicles with a positive ignition engine fuelled with NG:

$$F_{c_{\text{norm}}} = (0,1336/0,654) \cdot [(0,749 \cdot \text{HC}) + (0,429 \cdot \text{CO}) + (0,273 \cdot \text{CO}_2)]$$

(d) or vehicles with a compression ignition engine:

$$FC = (0,1155/D) \cdot [(0,866 \cdot \text{HC}) + (0,429 \cdot \text{CO}) + (0,273 \cdot \text{CO}_2)]$$

In these formulas:

FC = the fuel consumption in litre per 100 km (in the case of petrol, LPG or diesel) or in  $\text{m}^3$  per 100 km (in the case of natural gas)

HC = the measured emission of hydrocarbons in g/km

CO = the measured emission of carbon monoxide in g/km

CO<sub>2</sub> = the measured emission of carbon dioxide in g/km

D = the density of the test fuel. In the case of gaseous fuels this is the density at 15 °C.

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## ANNEX 6

## METHOD OF MEASURING THE ELECTRIC ENERGY CONSUMPTION

## 1. TEST SEQUENCE

1.1. *Composition*

The test sequence is composed of two parts (see figure 1):

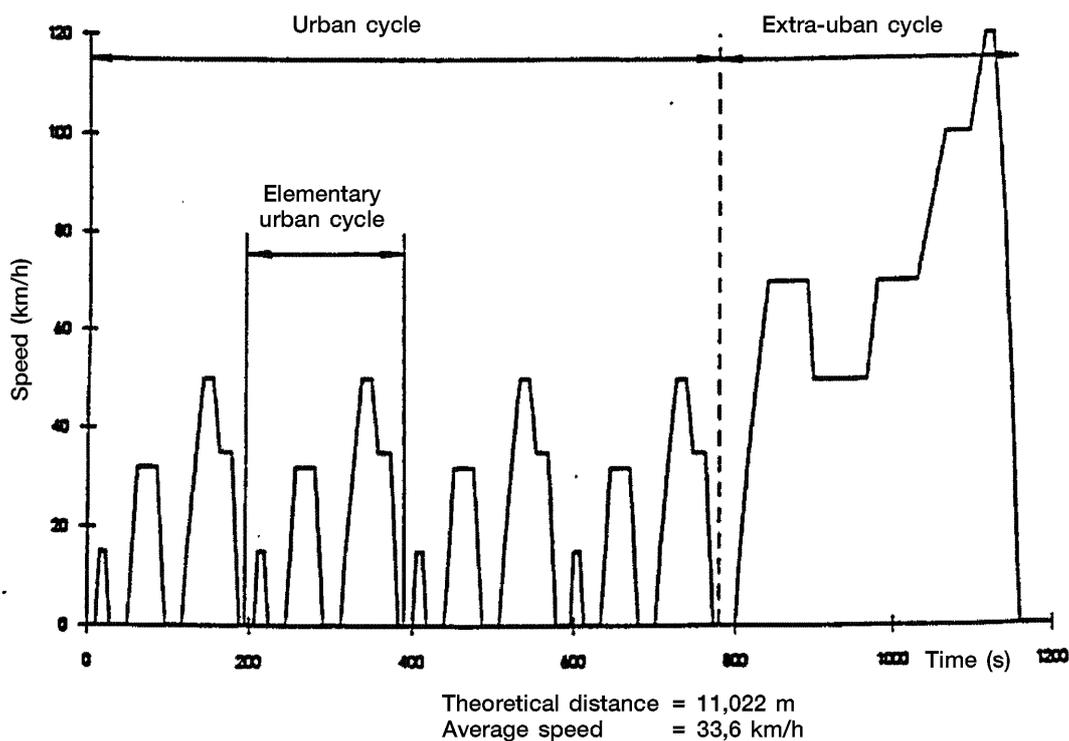
- (a) an urban cycle made of four elementary urban cycles;
- (b) an extra-urban cycle.

In case of a manual gear box with several gears, the operator changes the gear according to the manufacturer's specifications.

If the vehicle has several driving modes, which may be selected by the driver, the operator shall select the one to best match the target curve.

Figure 1

Test sequence —  $M_1$  and  $N_1$  categories of vehicles

1.2. *Urban cycle*

The urban cycle is composed of four elementary cycles of 195 seconds each and lasts 780 seconds in total.

Description of the elementary urban cycle is given in figure 2 and table 1.

Figure 2

Elementary urban cycle (195 seconds)

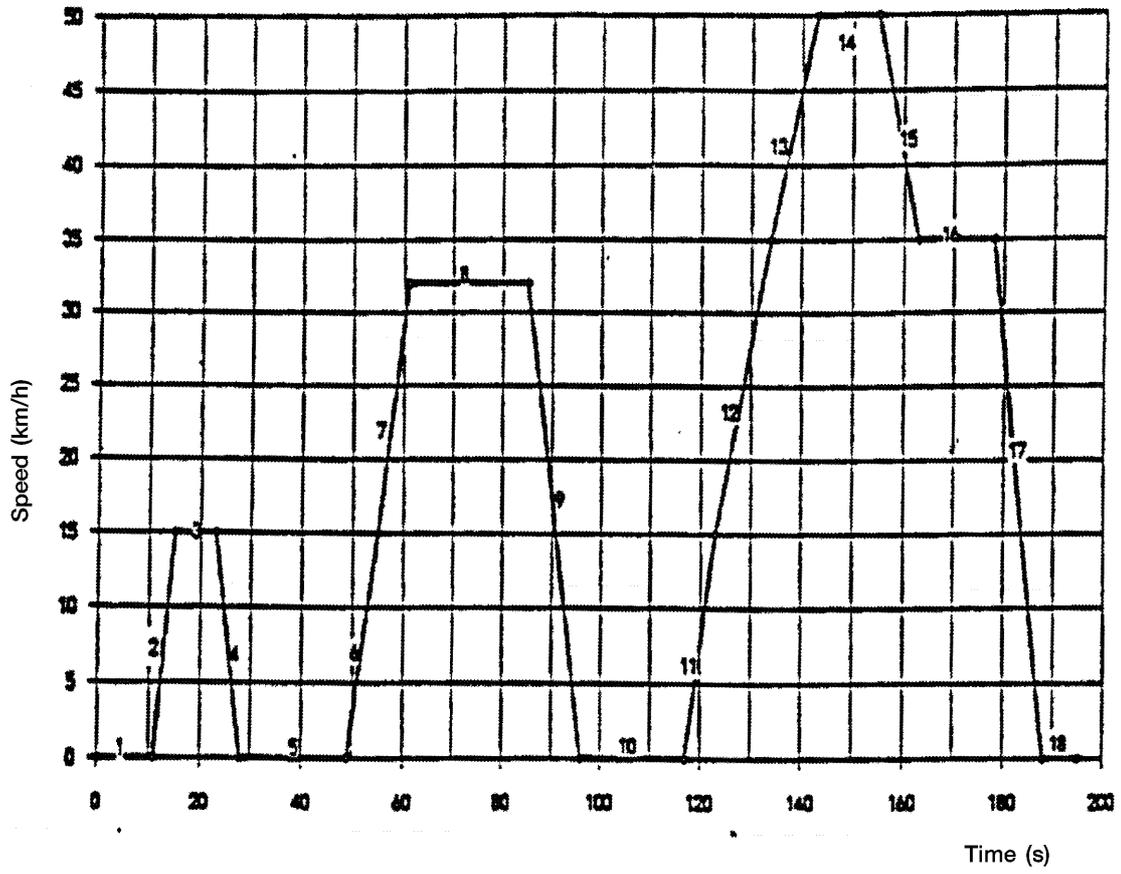


Table 1  
Elementary urban cycle

Operation No	Operation type	Mode No	Acceleration (m/s <sup>2</sup> )	Speed (km/h)	Operation duration (s)	Mode duration (s)	Total time (s)
1	Stop	1	0,00	0	11	11	11
2	Acceleration	2	1,04	0-15	4	4	15
3	Constant speed	3	0,00	15	8	8	23
4	Deceleration	4	- 0,83	15-0	5	5	28
5	Stop	5	0,00	0	21	21	49
6	Acceleration	6	0,69	0-15	6	12	55
7	Acceleration		0,79	15-32	6		61
8	Constant speed	7	0,00	32	24	24	85
9	Deceleration	8	- 0,81	32-0	11	11	96
10	Stop	9	0,00	0	21	21	117
11	Acceleration	10	0,69	0-15	6	26	123
12	Acceleration		0,51	15-35	11		134
13	Acceleration		0,46	35-50	9		143
14	Constant speed	11	0,00	50	12	12	155
15	Deceleration	12	- 0,52	50-35	8	8	163
16	Constant speed	13	0,00	35	15	15	178
17	Deceleration	14	- 0,97	35-0	10	10	188
18	Stop	15	0,00	0	7	7	195

Generalities	in time (s)	in percentage
Stop	60	30,77
Acceleration	42	21,54
Constant speed	59	30,26
Deceleration	34	17,44
Total	195	100,00

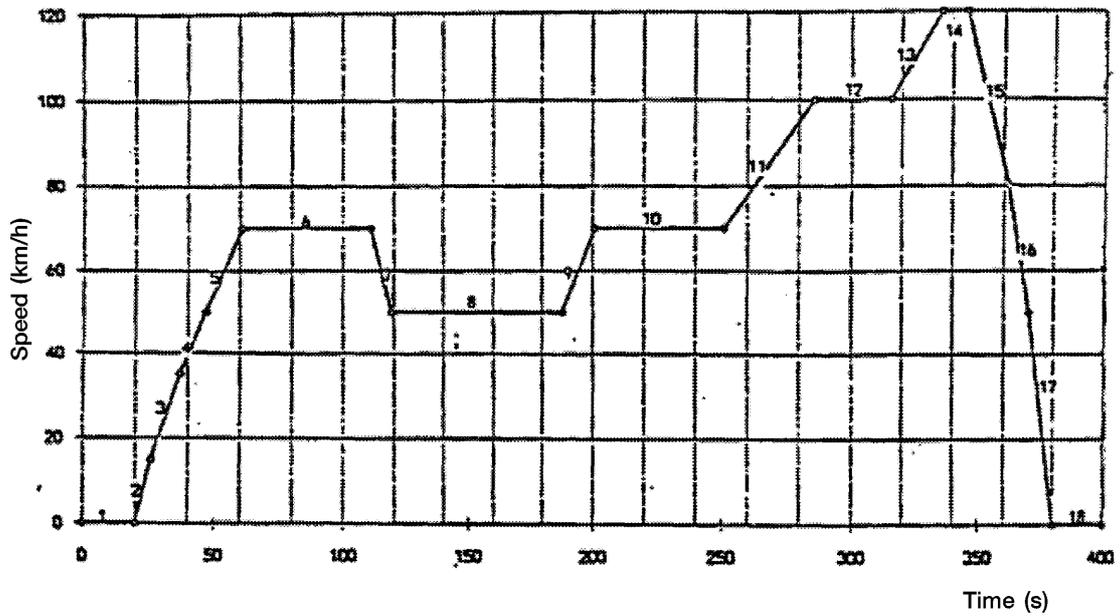
Average speed (km/h)	18,77
Working time (s)	195
Theoretical distance by elementary urban cycle (m)	1 017
Theoretical distance for four elementary urban cycles (m)	4 067

1.3. *Extra-urban cycle*

The description of the extra-urban cycle is given in figure 3 and table 2.

Figure 3

Extra-urban cycle (400 seconds)



Note: The procedure to be adopted when the vehicle failed to meet the speed requirements of this curve is detailed in item 1.4.

Table 2  
Extra-urban cycle

Operation No	Operation type	Mode No	Acceleration (m/s <sup>2</sup> )	Speed (km/h)	Operation duration (s)	Mode duration (s)	Total time (s)
1	Stop	1	0,00	0	20	20	20
2	Acceleration	2	0,69	0-15	6	41	26
3	Acceleration		0,51	15-35	11		37
4	Acceleration		0,42	35-50	10		47
5	Acceleration		0,40	50-70	14		61
6	Constant speed	3	0,00	70	50	50	111
7	Deceleration	4	- 0,69	70-50	8	8	119
8	Constant speed	5	0,00	50	69	69	188
9	Acceleration	6	0,43	50-70	13	13	201
10	Constant speed	7	0,00	70	50	50	251
11	Acceleration	8	0,24	70-100	35	35	286
12	Constant speed	9	0,00	100	30	30	316
13	Acceleration	10	0,28	100-120	20	20	336
14	Constant speed	11	0,00	120	10	10	346
15	Deceleration	12	- 0,69	120-80	16	34	362
16	Deceleration		- 1,04	80-50	8		370
17	Deceleration		- 1,39	50-0	10		380
18	Stop	13	0,00	0	20	20	400

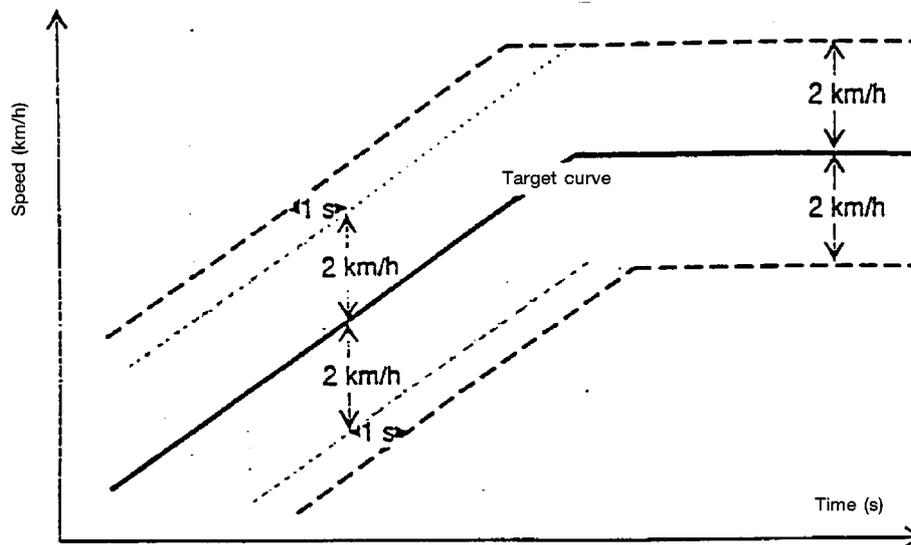
Generalities	in time (s)	in percentage
Stop	40	10,00
Acceleration	109	27,25
Constant speed	209	52,25
Deceleration	42	10,50
Total	400	100,00

Average speed (km/h)	62,60
Working time (s)	400
Theoretical distance (m)	6 956

## 1.4. Tolerance

Tolerances are given in figure 4

Figure 4  
Speed tolerance



Tolerances on speed ( $\pm 2$  km/h) and on time ( $\pm 1$  s) are geometrically combined at each point as represented in figure 4.

Below 50 km/h, deviations beyond this tolerance are permitted as follows:

- (a) at gear changes for a duration less than 5 seconds,
- (b) and up to five times per hour at other times, for a duration less than 5 seconds each.

The total time out of tolerance has to be mentioned in the test report.

Over 50 km/h, it is accepted to go beyond tolerances provided the accelerator pedal is fully depressed.

## 2. TEST METHOD

## 2.1. Principle

The test method described hereafter permits to measure the electric energy consumption expressed in Wh/km:

## 2.2. Parameters, units and accuracy of measurements

Parameter	Units	Accuracy	Resolution
Time	s	$\pm 0,1$ s	0,1 s
Distance	m	$\pm 0,1$ %	1 m
Temperature	$^{\circ}\text{C}$	$\pm 1$ $^{\circ}\text{C}$	1 $^{\circ}\text{C}$
Speed	km/h	$\pm 1$ %	0,2 km/h
Mass	kg	$\pm 0,5$ %	1 kg
Energy	Wh	$\pm 0,2$ %	Class 0,2 s according to IEC 687

IEC = International Electrotechnical Commission.

2.3. *Vehicle*

2.3.1. *Condition of the vehicle*

2.3.1.1. The vehicle tyres shall be inflated to the pressure specified by the vehicle manufacturer when the tyres are at the ambient temperature.

2.3.1.2. The viscosity of the oils for the mechanical moving parts shall conform to the specification of the vehicle manufacturer.

2.3.1.3. The lighting and light-signaling and auxiliary devices shall be off, except those required for testing and usual day-time operation of the vehicle.

2.3.1.4. All energy storage systems available for other than traction purposes (electric, hydraulic, pneumatic, etc.) shall be charged up to their maximum level specified by the manufacturer.

2.3.1.5. If the batteries are operated above the ambient temperature, the operator shall follow the procedure recommended by the car manufacturer in order to keep the temperature of the battery in the normal operating range.

The manufacturer's agent shall be in a position to attest that the thermal management system of the battery is neither disabled nor reduced.

2.3.1.6. The vehicle must have undergone at least 300 km during the seven days before the test with those batteries that are installed in the test vehicle.

2.4. *Operation mode*

All the tests are conducted at a temperature of between 20 °C and 30 °C.

The test method includes the four following steps:

- (a) Initial charge of the battery;
- (b) Application twice of the cycle made of four elementary urban cycles and an extra-urban cycle;
- (c) Charging the battery;
- (d) Calculation of the electric energy consumption.

Between the steps, if the vehicle shall move, it is pushed to the following test area (without regenerative recharging).

2.4.1. *Initial charge of the battery*

Charging the battery consists of the following procedures:

2.4.1.1. *Discharge of the battery*

The procedure starts with the discharge of the battery of the vehicle while driving (on the test track, on a chassis dynamometer, etc.) at a steady speed of 70 %  $\pm$  5 % from the maximum thirty minutes speed of the vehicle.

Stopping the discharge occurs:

- (a) when the vehicle is not able to run at 65 % of the maximum thirty minutes speed;
- (b) or when an indication to stop the vehicle is given to the driver by the standard on-board instrumentation, or
- (c) after covering the distance of 100 km.

2.4.1.2. *Application of a normal overnight charge*

The battery shall be charged according to the following procedure.

## 2.4.1.2.1. Normal overnight charge procedure

The charge is carried out:

- (a) with the on-board charger if fitted,
- (b) with an external charger recommended by the manufacturer, the connection being made with the domestic plug whose pattern has been recommended by the manufacturer,
- (c) in an ambient temperature comprised between 20 °C and 30 °C.

The procedure excludes all types of special charges that could be automatically or manually initiated like, for instance, the equalization charges or the servicing charges.

The car manufacturer shall be in a position to attest that during the test, a special charge procedure has not occurred.

## 2.4.1.2.2. End of charge criteria

The end of charge criteria corresponds to a charging time of 12 hours except if a clear indication is given to the driver by the standard instrumentation that the battery is not yet fully charged.

In this case,

$$\text{the maximum time is } \frac{3 \cdot \text{claimed battery capacity (Wh)}}{\text{mains power supply (W)}}$$

## 2.4.1.2.3. Fully charged battery

Battery having been charged according to overnight charge procedure until the end of charge criteria.

## 2.4.2. Application of the cycle and measurement of the distance

The end of charging time  $t_0$  (plug off) is reported.

The chassis dynamometer shall be set with the method described in appendix 1 to this annex.

Starting within 4 hours from  $t_0$ , the cycle made of four elementary urban cycles and an extra-urban cycle is run twice on a chassis dynamometer (test distance: 22 km, test duration: 40 minutes).

At the end, the measure D of the covered distance in km is recorded.

## 2.4.3. Charge of the battery

The vehicle shall be connected to the mains within the 30 minutes after the conclusion of the cycle made of four elementary urban cycles and an extra-urban cycle, carried out twice.

The vehicle is being charged according to normal overnight charge procedure (see paragraph 2.4.1.2 above).

The energy measurement equipment, placed between the mains socket and the vehicle charger, measures the charge energy E delivered from the mains, as well as its duration.

Charging is stopped after 24 hours from the previous end of charging time ( $t_0$ ).

*Note:* In case of a mains power cut, the 24 hours period will be extended accordingly to the cut duration. Validity of the charge will be discussed between the technical services of the approval laboratory and the vehicle's manufacturer.

## 2.4.4. Electric energy consumption calculation

Energy E in Wh and charging time measurements are recorded in the test report.

The electric energy consumption c is defined by the formula:

$$c = \frac{E}{D} \text{ (expressed in Wh/km and rounded to the nearest whole number)}$$

where D = range (km).

## Appendix 1

**Determination of the total road load power of a vehicle and calibration of the dynamometer**

## 1. INTRODUCTION

The purpose of this appendix is to define the method of measuring the total road load power of a vehicle with a statistical accuracy of  $\pm 4\%$  at a constant speed and to reproduce this measured road load power on a dynamometer with an accuracy of  $\pm 5\%$ .

## 2. CHARACTERISTICS OF THE TRACK

The test road layout shall be level, straight and free of obstacles or wind barriers which adversely affect the variability of road load measurement.

The test road longitudinal slope shall not exceed  $\pm 2\%$ . This slope is defined as the ratio of the difference in elevation between both ends of the test road and its overall length. In addition, the local inclination between any two points 3 m apart shall not deviate by more than  $\pm 0,5\%$  from this longitudinal slope.

The maximum cross-sectional camber of the test road shall be 1,5 % or less.

## 3. ATMOSPHERIC CONDITIONS

## 3.1. Wind

Testing shall be performed at wind speeds averaging less than 3 m/s with peak speeds less than 5 m/s. In addition, the vector component of the wind speed across the test track must be less than 2 m/s. Wind velocity shall be measured at 0,7 m above the track surface.

## 3.2. Humidity

The track shall be dry.

## 3.3. Reference conditions

Barometric pressure:  $H_0 = 100$  kPa

Temperature:  $T_0 = 293$  K (20 °C)

Air density:  $d_0 = 1,189$  kg/m<sup>3</sup>

## 3.3.1. Air density

3.3.1.1. The air density during the test, calculated as described in paragraph 3.3.1.2 below, shall not differ by more than 7,5 % from the air density under the reference conditions.

3.3.1.2. The air density shall be calculated by the formula:

$$d_T = d_0 \cdot \frac{H_T}{H_0} \cdot \frac{T_0}{T_T}$$

where:

$d_T$  = is the air density during the test (kg/m<sup>3</sup>)

$d_0$  = is the air density at reference conditions (kg/m<sup>3</sup>)

$H_T$  = is the total barometric pressure during the test (kPa)

$T_T$  = is absolute temperature during the test (K).

## 3.3.2. Ambient conditions

3.3.2.1. The ambient temperature shall be between 5 °C (278 K) and 35 °C (308 K) and the barometric pressure between 91 kPa and 104 kPa. The relative humidity shall be less than 95 %.

3.3.2.2. However, with the manufacturer's agreement, the tests may be made at lower ambient temperatures down to 1 °C. In this case the correction factor calculated for 5 °C should be used.

## 4. PREPARATION OF THE VEHICLE

4.1. *Running-in*

The vehicle shall be in normal running order and adjustment after having been run in for at least 300 km. The tyres shall be run in at the same time as the vehicle or shall have a tread depth within 90 and 50 % of the initial tread depth.

4.2. *Checks*

The following checks shall be made in accordance with the manufacturer's specifications for the use considered: wheels, wheel rims, tyres (make, type, pressure), front axle geometry, brake adjustment (elimination of parasitic drag), lubrication of front and rear axles, adjustment of the suspension and vehicle ground clearance, etc. Check that during freewheeling, there is no electrical braking.

4.3. *Preparation for the test*

4.3.1. The vehicle shall be loaded to its test mass including driver and measurement equipments, spread in a uniform way in the loading areas.

4.3.2. The windows of the vehicle shall be closed. Any covers for air conditioning systems, headlamps, etc. shall be closed.

4.3.3. The vehicle shall be clean.

4.3.4. Immediately before the test, the vehicle shall be brought to the normal running temperature in an appropriate manner.

5. SPECIFIED SPEED  $V$ 

The specified speed is required for determining the running resistance at the reference speed from the running resistance curve. To determine the running resistance as a function of vehicle speed in the vicinity of the reference speed  $V_0$ , running resistances shall be measured at the specified speed  $V$ . At least four to five points indicating the specified speeds, along with the reference speeds, are desired to be measured.

Table 1 shows the specified speeds in accordance with the category of the vehicle. The asterisk (\*) indicates the reference speed in the table.

Table 1

Category $V_{\max}$	Specified speeds (km/h)					
> 130	120 (**)	100	80 (*)	60	40	20
130-100	90	80 (*)	60	40	20	—
100-70	60	50 (*)	40	30	20	—
< 70	50 (**)	40 (*)	30	20	—	—

(\*\*) If it could be reached by the vehicle.

## 6. ENERGY VARIATION DURING COAST-DOWN

6.1. *Total road load power determination*6.1.1. *Measurement equipment and accuracy*

The margin of measurement error shall be less than 0,1 second for time and less than  $\pm 0,5$  km/h for speed.

6.1.2. *Test procedure*

6.1.2.1. Accelerate the vehicle to a speed of 5 km/h greater than the speed at which test measurement begins.

6.1.2.2. Put the gearbox to neutral, or disconnect the power supply.

6.1.2.3. Measure the time  $t_1$  taken by the vehicle to decelerate from:  $V_2 = V + \Delta V$  km/h to  $V_1 = V - \Delta V$  km/h

where:

$\Delta V \leq 5$  km/h for nominal speed  $\leq 50$  km/h

$\Delta V \leq 10$  km/h for nominal speed  $> 50$  km/h

6.1.2.4. Carry out the same test in the opposite direction, measuring time  $t_2$ .

6.1.2.5. Take the average  $T_1$  of the two times  $t_1$  and  $t_2$ .

6.1.2.6. Repeat these tests until the statistical accuracy ( $p$ ) of the average

$$T = \frac{1}{n} \sum_{i=1}^n T_i$$

is equal to or less than 4 % ( $p \leq 4$  %).

The statistical accuracy ( $p$ ) is defined by:

$$p = \frac{t \cdot s}{\sqrt{n}} \cdot \frac{100}{T}$$

where:

$T$  = is the coefficient given by the table below;

$s$  = is the standard deviation

$$s = \sqrt{\frac{\sum_{i=1}^n (T_i - T)^2}{n - 1}}$$

$n$  = is the number of tests

n	4	5	6	7	8	9	10
t	3,2	2,8	2,6	2,5	2,4	2,3	2,3
$t/\sqrt{n}$	1,6	1,25	1,06	0,94	0,85	0,77	0,73

6.1.2.7. Calculation of the running resistance force

The running resistance force  $F$  at the specified speed  $V$  is calculated as follows:

$$F = (M_{HP} + M_r) \frac{2 \cdot \Delta V}{\Delta T} \cdot \frac{1}{3,6}$$

Where:

$M_{HP}$  = is the test mass.

$M_r$  = is the equivalent inertia mass of all the wheels and vehicle portions rotating with the wheels during coast down on the road.  $M_r$  should be measured or calculated by an appropriate manner.

6.1.2.8. The running resistance determined on the track shall be corrected to the reference ambient conditions as follows:

$$F_{corrected} = k \times F_{measured}$$

$$k = \frac{R_R}{R_T} \cdot [1 + K_R(t - t_0)] + \frac{R_{AERO}}{R_T} \cdot \frac{d_0}{d_t}$$

where:

$R_R$  = is the rolling resistance at speed  $V$

$R_{AERO}$  = is the aerodynamic drag at speed  $V$

$R_T$  = is the total road load =  $R_R + R_{AERO}$

$K_R$  = is the temperature correction factor of rolling resistance, taken to be equal to:  $3,6 \times 10^{-3}/^{\circ}\text{C}$

$t$  = is the road test ambient temperature in  $^{\circ}\text{C}$

$t_0$  = is the reference ambient temperature =  $20^{\circ}\text{C}$

$d_t$  = is the air density at the test conditions

$d_0$  = is the air density at the reference conditions ( $20^{\circ}\text{C}$ ,  $100\text{ kPa}$ ) =  $1,189\text{ kg/m}^3$ .

The ratios  $R_R/R_T$  and  $R_{AERO}/R_T$  shall be specified by the vehicle manufacturer on the basis of the data normally available to the company.

If these values are not available, subject to the agreement of the manufacturer and the technical service concerned, the figures for the rolling/total resistance ratio given by the following formula may be used:

$$\frac{R_R}{R_T} = a \cdot M_{HP} + b$$

where:

$M_{HP}$  = is the test mass in kg

and for each speed the coefficients  $a$  and  $b$  are as shown in the following table:

$V$ (km/h)	$a$	$b$
20	$7,24 \cdot 10^{-5}$	0,82
30	$1,25 \cdot 10^{-4}$	0,67
40	$1,59 \cdot 10^{-4}$	0,54
50	$1,86 \cdot 10^{-4}$	0,42
90	$1,71 \cdot 10^{-4}$	0,21
120	$1,57 \cdot 10^{-4}$	0,14

## 6.2. Setting of the dynamometer

The purpose of this procedure is to simulate on the dynamometer the total road load power at a given speed.

### 6.2.1. Measurement equipment and accuracy

The measuring equipment shall be similar to that used on the track.

### 6.2.2. Test procedure

#### 6.2.2.1. Install the vehicle on the dynamometer.

#### 6.2.2.2. Adjust the tyre pressure (cold) of the driving wheels as required for the chassis dynamometer.

- 6.2.2.3. Adjust the equivalent inertia mass of the chassis dynamometer, according to table 2.

Table 2

Test mass $M_{HP}$ (kg)	Equivalent inertia $I$ (kg)
$M_{HP} \leq 480$	455
$480 < M_{HP} \leq 540$	510
$540 < M_{HP} \leq 595$	570
$595 < M_{HP} \leq 650$	625
$650 < M_{HP} \leq 710$	680
$710 < M_{HP} \leq 765$	740
$765 < M_{HP} \leq 850$	800
$850 < M_{HP} \leq 965$	910
$965 < M_{HP} \leq 1\ 080$	1\ 020
$1\ 080 < M_{HP} \leq 1\ 190$	1\ 130
$1\ 190 < M_{HP} \leq 1\ 305$	1\ 250
$1\ 305 < M_{HP} \leq 1\ 420$	1\ 360
$1\ 420 < M_{HP} \leq 1\ 530$	1\ 470
$1\ 530 < M_{HP} \leq 1\ 640$	1\ 590
$1\ 640 < M_{HP} \leq 1\ 760$	1\ 700
$1\ 760 < M_{HP} \leq 1\ 870$	1\ 810
$1\ 870 < M_{HP} \leq 1\ 980$	1\ 930
$1\ 980 < M_{HP} \leq 2\ 100$	2\ 040
$2\ 100 < M_{HP} \leq 2\ 210$	2\ 150
$2\ 210 < M_{HP} \leq 2\ 380$	2\ 270
$2\ 380 < M_{HP} \leq 2\ 610$	2\ 270
$2\ 610 < M_{HP}$	2\ 270

- 6.2.2.4. Bring the vehicle and the chassis dynamometer to the stabilized operating temperature, in order to approximate the road conditions.
- 6.2.2.5. Carry out the operations specified in paragraph 6.1.2 with the exception of paragraphs 6.1.2.4 and 6.1.2.5, replacing  $M_{HP}$  by  $I$  and  $M_r$  by  $M_{rm}$  in the formula given in paragraph 6.1.2.7.
- 6.2.2.6. Adjust the brake to reproduce the corrected running resistance half payload (paragraph 6.1.2.8) and to take into account the difference between the vehicle mass on the track and the equivalent inertia test mass ( $I$ ) to be used. This may be done by calculating the mean corrected road coast down time from  $V_2$  to  $V_1$  and reproducing the same time on the dynamometer by the following relationship:

$$T_{corrected} = (I + M_{rm}) \cdot \frac{2 \cdot \Delta V}{F_{corrected}} \cdot \frac{1}{3,6}$$

where:

$I$  = is the flywheel equivalent inertia mass of chassis dynamometer.

$M_{rm}$  = is the equivalent inertia mass of the powered wheels and vehicle portions rotating with the wheels during coast down.  $M_{rm}$  shall be measured or calculated by an appropriate manner.

- 6.2.2.7. The power  $P_a$  to be absorbed by the bench should be determined in order to enable the same total road load power to be reproduced for the same vehicle on different days or on different chassis dynamometers of the same type.

## ANNEX 7

**METHOD OF MEASURING THE RANGE OF VEHICLES POWERED BY AN ELECTRIC POWER TRAIN**

## 1. MEASUREMENT OF THE RANGE

The test method described hereafter permits to measure the range of vehicles powered by an electric power train, expressed in km.

## 2. PARAMETERS, UNITS AND ACCURACY OF MEASUREMENTS

Parameters, units and accuracy of measurements shall be as follows:

Parameter	Unit	Accuracy	Resolution
Time	s	$\pm 0,1$ s	0,1 s
Distance	m	$\pm 1$ %	1 m
Temperature	$^{\circ}\text{C}$	$\pm 1$ $^{\circ}\text{C}$	1 $^{\circ}\text{C}$
Speed	km/h	$\pm 1$ %	0,2 km/h
Mass	kg	$\pm 0,5$ %	1 kg

## 3. TEST CONDITIONS

3.1. *Condition of the vehicle*

- 3.1.1. The vehicle tyres shall be inflated to the pressure specified by the vehicle manufacturer when the tyres are at the ambient temperature.
- 3.1.2. The viscosity of the oils for the mechanical moving parts shall conform to the specifications of the vehicle manufacturer.
- 3.1.3. The lighting and light-signalling and auxiliary devices shall be off, except those required for testing and usual daytime operation of the vehicle.
- 3.1.4. All energy storage systems available for other than traction purposes (electric, hydraulic, pneumatic, etc.) shall be charged up to their maximum level specified by the manufacturer.
- 3.1.5. If the batteries are operated above the ambient temperature, the operator shall follow the procedure recommended by the vehicle manufacturer in order to keep the temperature of the battery in the normal operating range.

The manufacturer's agent shall be in a position to attest that the thermal management system of the battery is neither disabled nor reduced.

- 3.1.6. The vehicle must have undergone at least 300 km during the seven days before the test with those batteries that are installed in the test vehicle.

3.2. *Climatic conditions*

For testing performed outdoors, the ambient temperature shall be between 5  $^{\circ}\text{C}$  and 32  $^{\circ}\text{C}$ .

The indoors testing shall be performed at a temperature between 20  $^{\circ}\text{C}$  and 30  $^{\circ}\text{C}$ .

## 4. OPERATION MODES

The test method includes the following steps:

- (a) Initial charge of the battery.
- (b) Application of the cycle and measurement of the range.

Between the steps, if the vehicle shall move, it is pushed to the following test area (without regenerative recharging).

4.1. *Initial charge of the battery*

Charging the battery consists of the following procedures:

Note: 'Initial charge of the battery' applies to the first charge of the battery, at the reception of the vehicle. In case of several combined tests or measurements, carried out consecutively, the first charge carried out shall be an 'initial charge of the battery' and the following may be done in accordance with the 'normal overnight charge' procedure.

4.1.1. *Discharge of the battery*

The procedure starts with the discharge of the battery of the vehicle while driving (on the test track, on a chassis dynamometer, etc.) at a steady speed of  $70\% \pm 5\%$  from the maximum thirty minutes speed of the vehicle.

Stopping the discharge occurs:

- (a) when the vehicle is not able to run at 65 % of the maximum thirty minutes speed;
- (b) or when an indication to stop the vehicle is given to the driver by the standard on-board instrumentation, or;
- (c) after covering the distance of 100 km.

4.1.2. *Application of a normal overnight charge*

The battery shall be charged according to normal overnight charge procedure for a period not exceeding 12 hours (see paragraph 2.4.1.2.1 of annex 6).

4.2. *Application of the cycle and measurement of the range*

The test sequence as defined in paragraph 1.1 of annex 6 is applied on a chassis dynamometer adjusted as described in appendix 1 of annex 6, until the end of the test criteria is reached.

The end of the test criteria is when the vehicle is not able to meet the target curve up to 50 km/h, or when an indication from the standard on-board instrumentation is given to the driver to stop the vehicle.

Then the vehicle shall be slowed down to 5 km/h by releasing the accelerator pedal, without touching the brake pedal and then stopped by braking.

At a speed over 50 km/h, when the vehicle does not reach the required acceleration or speed of the test cycle, the accelerator pedal shall remain fully depressed until the reference curve has been reached again.

To respect human needs, up to three interruptions are permitted between test sequences, of no more than 15 minutes in total.

At the end, the measure D of the covered distance in km is the range of the electric vehicle. It shall be expressed to the nearest whole number.

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## ANNEX 8

**EMISSIONS TEST PROCEDURE FOR A VEHICLE EQUIPPED WITH A PERIODICALLY REGENERATING SYSTEM**

## 1. INTRODUCTION

- 1.1. This annex defines the specific provisions regarding type-approval of a vehicle equipped with a periodically regenerating system as defined in paragraph 2.11 of this Regulation.

## 2. SCOPE AND EXTENTION OF THE TYPE APPROVAL

2.1. *Vehicle family groups equipped with periodically regenerating system*

The procedure applies to vehicles equipped with a periodically regenerating system as defined in paragraph 2.11 of this Regulation. For the purpose of this annex vehicle family groups may be established. Accordingly, those vehicle types with regenerative systems, whose parameters described below are identical, or within the stated tolerances, shall be considered to belong to the same family with respect to measurements specific to the defined periodically regenerating systems.

## 2.1.1. Identical parameters are:

Engine:

- (a) number of cylinders,
- (b) engine capacity ( $\pm 15$  per cent),
- (c) number of valves,
- (d) fuel system,
- (e) combustion process (2 stroke, 4 stroke, rotary).

Periodically regenerating system (i.e. catalyst, particulate trap):

- (a) Construction (i.e. type of enclosure, type of precious metal, type of substrate, cell density),
- (b) Type and working principle,
- (c) Dosage and additive system,
- (d) Volume ( $\pm 10$  per cent)
- (e) Location (temperature  $\pm 50$  °C at 120 km/h or 5 per cent difference of maximum temperature/pressure).

2.2. *Vehicle types of different reference masses*

The  $K_i$  factor developed by the procedures in this annex for type approval of a vehicle type with a periodically regenerating system as defined in paragraph 2.11 of this Regulation, may be extended to other vehicles in the family group with a reference mass within the next two higher equivalent inertia classes or any lower equivalent inertia.

- 2.3. Instead of carrying out the test procedures defined in the following section, a fixed  $K_i$  value of 1,05 may be used, if the technical service sees no reason that this value could be exceeded.

## 3. TEST PROCEDURE

The vehicle may be equipped with a switch capable of preventing or permitting the regeneration process provided that this operation has no effect on original engine calibration. This switch shall be permitted only for the purpose of preventing regeneration during loading of the regeneration system and during the pre-conditioning cycles. However, it shall not be used during the measurement of emissions during the regeneration phase; rather the emission test shall be carried out with the unchanged Original Equipment Manufacturer's (OEM) control unit.

- 3.1. *Measurement of carbon dioxide emission and fuel consumption between two cycles where regenerative phases occur*
- 3.1.1. Average of carbon dioxide emission and fuel consumption between regeneration phases and during loading of the regenerative device shall be determined from the arithmetic mean of several approximately equidistant (if more than 2) Type I operating cycles or equivalent engine test bench cycles. As an alternative, the manufacturer may provide data to show that the carbon dioxide emission and fuel consumption remain constant  $\pm 4$  per cent between regeneration phases. In this case, the carbon dioxide emission and fuel consumption measured during the regular Type I test may be used. In any other case emissions measurement for at least two Type I operating cycles or equivalent engine test bench cycles must be completed: one immediately after regeneration (before new loading) and one as close as possible prior to a regeneration phase. All emissions measurements and calculations shall be carried out according to annex 5, paragraphs 1.4.3 and 1.5.
- 3.1.2. The loading process and  $K_i$  determination shall be made during the Type I operating cycle, on a chassis dynamometer or on an engine test bench using an equivalent test cycle. These cycles may be run continuously (i.e. without the need to switch the engine off between cycles). After any number of completed cycles, the vehicle may be removed from the chassis dynamometer, and the test continued at a later time.
- 3.1.3. The number of cycles (D) between two cycles where regeneration phases occur, the number of cycles over which emissions measurements are made (n), and each emissions measurement ( $M'_{sij}$ ) shall be reported in annex 1, items 1.2.11.2.1.10.1 or 1.2.11.2.1.10.4 to 1.2.11.2.5.4.1 to 1.2.11.2.5.4.4 as applicable.
- 3.2. *Measurement of carbon dioxide emission and fuel consumption during regeneration*
- 3.2.1. Preparation of the vehicle, if required, for the emissions test during a regeneration phase, may be completed using the preparation cycles in paragraph 5.3 of annex 4 of Regulation No 83 or equivalent engine test bench cycles, depending on the loading procedure chosen in paragraph 3.1.2 above.
- 3.2.2. The test and vehicle conditions for the test described in annex 5 apply before the first valid emission test is carried out.
- 3.2.3. Regeneration must not occur during the preparation of the vehicle. This may be ensured by one of the following methods:
- 3.2.3.1. A 'dummy' regenerating system or partial system may be fitted for the pre-conditioning cycles.
- 3.2.3.2. Any other method agreed between the manufacturer and the type approval authority.
- 3.2.4. A cold-start exhaust emission test including a regeneration process shall be performed according to the Type I operating cycle, or equivalent engine test bench cycle. If the emissions tests between two cycles where regeneration phases occur are carried out on an engine test bench, the emissions test including a regeneration phase shall also be carried out on an engine test bench.
- 3.2.5. If the regeneration process requires more than one operating cycle, subsequent test cycle(s) shall be driven immediately, without switching the engine off, until complete regeneration has been achieved (each cycle shall be completed). The time necessary to set up a new test should be as short as possible (e.g. particular matter filter change). The engine must be switched off during this period.
- 3.2.6. The carbon dioxide emission and fuel consumption values during regeneration ( $M_{ri}$ ) shall be calculated according to annex 5, paragraph 1.4.3 and 1.5. The number of operating cycles (d) measured for complete regeneration shall be recorded.

## 3.3. Calculation of the combined carbon dioxide emission and fuel consumption

$$M_{si} = \frac{\sum_{j=1}^n M'_{sij}}{n} \quad n \geq 2; \quad M_{ri} = \frac{\sum_{j=1}^d M'_{rij}}{d}$$

$$M_{pi} = \left\{ \frac{M_{si} \cdot D + M_{ri} \cdot d}{D+d} \right\}$$

where for each carbon dioxide emission and fuel consumption considered:

$M'_{sij}$  = mass emissions of CO<sub>2</sub> in g/km and fuel consumption in l/100 km over one part (i) of the operating cycle (or equivalent engine test bench cycle) without regeneration

$M'_{rij}$  = mass emissions of CO<sub>2</sub> in g/km and fuel consumption in l/100 km over one part (i) of the operating cycle (or equivalent engine test bench cycle) during regeneration (when  $n > 1$ , the first Type 1 test is run cold, and subsequent cycles are hot)

$M_{si}$  = mean mass emissions of CO<sub>2</sub> in g/km and fuel consumption in l/100 km over one part (i) of the operating cycle without regeneration

$M_{ri}$  = mean mass emissions of CO<sub>2</sub> in g/km and fuel consumption in l/100 km over one part (i) of the operating cycle during regeneration

$M_{pi}$  = mean mass emission of CO<sub>2</sub> in g/km and fuel consumption in l/100 km

$N$  = number of test points at which emissions measurements (Type 1 operating cycles or equivalent engine test bench cycles) are made between two cycles where regenerative phases occur,  $\geq 2$

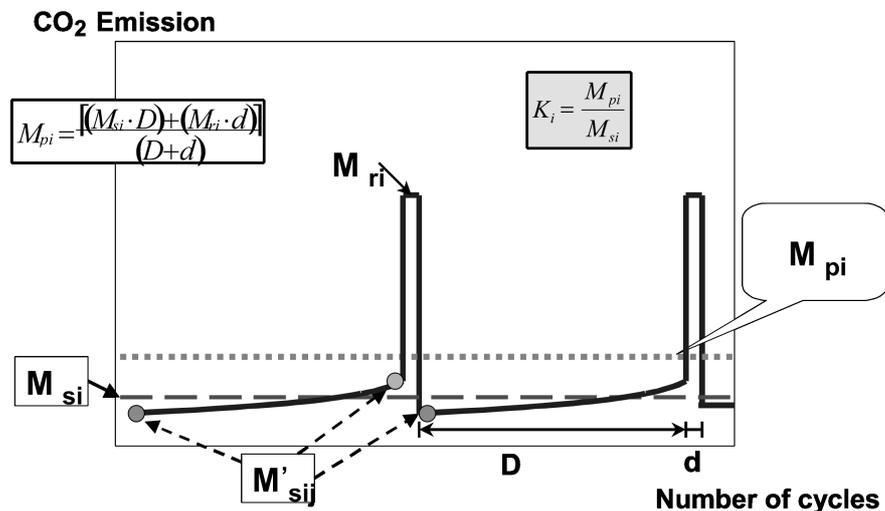
$d$  = number of operating cycles required for regeneration

$D$  = number of operating cycles between two cycles where regenerative phases occur

For exemplary illustration of measurement parameters see figure 1.

Figure 1

Parameters measured during carbon dioxide emission and fuel consumption test during and between cycles where regeneration occurs (schematic example, the emissions during 'D' may increase or decrease)



- 3.4. *Calculation of the regeneration factor K for each carbon dioxide emission and fuel consumption (i) considered*

$$K_i = M_{pi}/M_{si}$$

$M_{si}$ ,  $M_{pi}$  and  $K_i$  results shall be recorded in the test report delivered by the technical service.

$K_i$  may be determined following the completion of a single sequence.

---

**Regulation No 103 of the Economic Commission for Europe of the United Nations (UN/ECE) — Uniform provisions concerning the approval of replacement catalytic converters for power-driven vehicles (\*)**

1. SCOPE

This Regulation applies to catalytic converters intended to be fitted on power driven vehicles of categories M<sub>1</sub> and N<sub>1</sub> as replacement parts <sup>(1)</sup>.

2. DEFINITIONS

For the purpose of this Regulation:

2.1. 'Original equipment catalytic converter' means a catalytic converter or an assembly of catalytic converters covered by the type approval delivered for the vehicle and whose types are indicated in the documents related to annex 1 of Regulation No 83.

2.2. 'Replacement catalytic converter' means a catalytic converter or an assembly of catalytic converters for which approval can be obtained according to this Regulation, other than those defined in paragraph 2.1 above.

2.3. 'Type of catalytic converter' means catalytic converters which do not differ in such essential aspects as:

(i) number of coated substrates, structure and material

(ii) type of catalytic activity (oxidising, three-way, . . .)

(iii) volume, ratio of frontal area and substrate length

(iv) catalyst material content

(v) catalyst material ratio

(vi) cell density

(vii) dimensions and shape

(viii) thermal protection

2.4. 'Vehicle type'

See paragraph 2.3 of Regulation No 83.

2.5. 'Approval of a replacement catalytic converter' means the approval of a converter intended to be fitted as a replacement part on one or more specific types of vehicles with regard to the limitation of pollutant emissions, noise level and effect on vehicle performance.

3. APPLICATION FOR APPROVAL

3.1. The application for approval of a type of replacement catalytic converter shall be submitted by its manufacturer or by his authorized representative.

3.2. For each type of replacement catalytic converter for which type approval is requested, the application for approval shall be accompanied by the following documents in triplicate.

3.2.1. Drawings of the replacement catalytic converter identifying in particular all the characteristics referred to in paragraph 2.3 of this Regulation.

(\*) Publication in accordance with Article 4(5) of Council Decision 97/836/EC of 27 November 1997 (OJ L 346, 17.12.1997, p. 78).

<sup>(1)</sup> This Regulation does not apply to replacement catalytic converters intended to be fitted on vehicles of categories M<sub>1</sub> and N<sub>1</sub> equipped with an On-Board Diagnostic (OBD) system. As soon as an OBD Regulation enters into force, the technical content of this Regulation will be reconsidered.

- 3.2.2. Description of the vehicle type or types for which the replacement catalytic converter is intended. The number and/or symbols characterizing the engine and vehicle type(s) shall be indicated.
- 3.2.3. Description and drawings showing the position of the replacement converter relative to the engine exhaust manifold(s).
- 3.2.4. Drawings indicating the intended location of the approval mark.
- 3.3. The applicant for approval shall provide the technical service responsible for approval tests with:
  - 3.3.1. Vehicle(s) of a type approved in accordance with Regulation No 83 equipped with a new original catalytic converter. This (these) vehicle(s) shall be selected by the applicant with the agreement of the technical service. It (they) shall comply with the requirements of paragraph 3 of annex 4 of Regulation No 83.

The test vehicle(s) shall have no emission control system defects; any excessively worn out or malfunctioning emission related original part shall be repaired or replaced. The test vehicle(s) shall be tuned properly and set to the manufacturer's specification prior to emission testing.

- 3.3.2. One sample of the type of the replacement catalytic converter. This sample shall be clearly and indelibly marked with the applicant's trade name or mark and its commercial designation.

#### 4. APPROVAL

- 4.1. If the replacement catalytic converter submitted for approval pursuant to this Regulation meets the requirements of paragraph 5 below, approval of that type of replacement catalytic converter shall be granted.
- 4.2. An approval number shall be assigned to each type approved. Its first two digits (00 for the Regulation in its present form) 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 replacement catalytic converter.
- 4.3. Notice of approval or of extension or of refusal of approval of a type of replacement catalytic converter pursuant to this Regulation shall be communicated to the Contracting Parties to the Agreement applying this Regulation by means of a form conforming to the model in annex 1 to this Regulation.
- 4.4. There shall be affixed, conspicuously and in a place specified on the approval form, to the replacement catalytic converter conforming to a type of replacement catalytic converter approved under this Regulation, an international approval mark consisting of:
  - 4.4.1. a circle surrounding the letter 'E' followed by the distinguishing number of the country which has granted approval <sup>(1)</sup>;

<sup>(1)</sup> 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation, 23 for Greece, 24 for Ireland, 25 for Croatia, 26 for Slovenia, 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. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of 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 Approvals 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.

- 4.4.2. The number of this Regulation, followed by the letter 'R', a dash and the approval number in the vicinity of the circle prescribed in paragraph 4.4.1.
- 4.5. If the replacement catalytic converter conforms to a catalytic converter type approved under one or more other Regulations annexed to the Agreement in the country which has granted approval under this Regulation, the symbol prescribed in paragraph 4.4.1 need not be repeated; in such a case, the Regulation and approval numbers and the additional symbols of all the Regulations under which approval has been granted in the country which has granted approval under this Regulation shall be placed in vertical columns to the right of the symbol prescribed in paragraph 4.4.1.
- 4.6. The approval mark shall be indelible and clearly legible when the replacement catalytic converter is mounted under the vehicle.
- 4.7. Annex 2 to this Regulation gives examples of arrangements of approval marks.
5. REQUIREMENTS
- 5.1. *General requirements*
- 5.1.1. The replacement catalytic converter shall be designed, constructed and capable of being mounted so as to enable the vehicle to comply with the provisions of those Regulations which it was originally in compliance with and that pollutant emissions are effectively limited throughout the normal life of the vehicle under normal conditions of use.
- 5.1.2. The installation of the replacement catalytic converter shall be at the exact position of the original equipment catalytic converter, and the position on the exhaust line of the oxygen probe(s), if applicable, shall not be modified.
- 5.1.3. If the original equipment catalytic converter includes thermal protections, the replacement catalytic converter shall include equivalent protections.
- 5.1.4. The replacement catalytic converter shall be durable, that is designed, constructed and capable of being mounted, so that reasonable resistance to the corrosion and oxidation phenomena to which it is exposed is obtained, having regard to the conditions of use of the vehicle.
- 5.2. *Requirements regarding emissions*
- The vehicle(s) indicated in paragraph 3.3.1 of this Regulation, equipped with a replacement converter of the type for which approval is requested, shall be subjected to a type I test under the conditions described in the corresponding annexes of Regulation No 83 in order to compare its performance with the original catalytic converter according to the procedure described below.
- 5.2.1. *Determination of the basis for comparison*
- The vehicle(s) shall be fitted with a new original catalytic converter (see paragraph 3.3.1) which shall be run in with 12 extra urban cycles (test type I part 2). After this preconditioning, the vehicle(s) shall be kept in a room in which the temperature remains relatively constant between 293 and 303 K (20 and 30 °C). This conditioning shall be carried out for at least six hours and continue until the engine oil temperature and coolant, if any, are within  $\pm 2$  K of the temperature of the room. Subsequently three exhaust gas tests type I shall be made.
- 5.2.2. *Exhaust gas test with replacement catalytic converter*
- The original catalytic converter of the test vehicle(s) shall be replaced by the replacement catalytic converter (see paragraph 3.3.2) which shall be run in with 12 extra urban cycles (test type I part 2). After this preconditioning, the vehicle(s) shall be kept in a room in which the temperature remains relatively constant between 293 and 303 K (20 and 30 °C). This conditioning shall be carried out for at least six hours and continue until the engine oil temperature and coolant, if any, are within  $\pm 2$  K of the temperature of the room. Subsequently three exhaust gas tests type I shall be made.

5.2.3. Evaluation of the emission of pollutants of vehicles equipped with replacement catalytic converters

The test vehicle(s) with the original catalytic converter shall comply with the limit values according to the type approval of the vehicle(s) including — if applicable — the deterioration factors applied during the type approval of the vehicle(s).

The requirements regarding emissions of the vehicle(s) equipped with the replacement catalytic converter shall be deemed to be fulfilled if the results meet for each regulated pollutant (CO, HC + NO<sub>x</sub> and particulates) the following conditions:

1.  $M \leq 0,85 S + 0,4 G$

2.  $M \leq G$

where:

M: mean value of the emissions of one pollutant (CO or particulates) or the sum of two pollutants (HC + NO<sub>x</sub>) obtained from the three type I tests with the replacement catalytic converter

S: mean value of the emissions of one pollutant (CO or particulates) or the sum of two pollutants (HC + NO<sub>x</sub>) obtained from the three type I tests with the original catalytic converter

G: limit value of the emissions of one pollutant (CO or particulates) or the sum of two pollutants (HC + NO<sub>x</sub>) according to the type approval of the vehicle(s) divided by — if applicable — the deterioration factors determined in accordance with paragraph 5.4 below.

Where approval is applied for different types of vehicles from the same car manufacturer, and provided that these different types of vehicles are fitted with the same type of original equipment catalytic converter, the type I testing may be limited to at least two vehicles selected after agreement with the technical service responsible for approval.

5.3. *Requirements regarding noise and vehicle performance*

The replacement catalytic converter shall satisfy the technical requirements of Regulation No 59. As an alternative to the measurement of back-pressure as specified in Regulation No 59, the verification of the vehicle performance can be performed by measuring on a chassis dynamometer the maximum absorbed power at a speed corresponding to the engine maximum power. The value determined under reference atmospheric conditions as specified in Regulation No 85 with the replacement catalytic converter shall not be lower by more than 5 per cent than that determined with the original equipment catalytic converter.

5.4. *Requirements regarding durability*

The replacement catalytic converter shall comply with the requirements of paragraph 5.3.5 of Regulation No 83, i.e. type V test or deterioration factors from the following table for the results of the type I tests.

Engine category	Deterioration factors		
	CO	HC + NO <sub>x</sub>	Particulates
(i) Positive ignition	1,2	1,2	—
(ii) Compression ignition	1,1	1	1,2

6. MODIFICATION OF THE REPLACEMENT CATALYTIC CONVERTER TYPE AND EXTENSION OF APPROVAL

Every modification of the replacement catalytic converter type shall be notified to the administrative department which approved this type of replacement catalytic converter.

The department may then either:

- (i) consider that the modifications made are unlikely to have an appreciable adverse effect and that in any case the replacement catalytic converter still complies with the requirements, or
- (ii) require a further test report for some or all the tests described in paragraph 5 of this Regulation from the technical service responsible for conducting the tests.

Confirmation or refusal of approval, specifying the alteration, shall be communicated by the procedure specified in paragraph 4.3 above to the Parties to the Agreement applying this Regulation.

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

7. 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.

- 7.1. The replacement catalytic converters approved under this Regulation shall be so manufactured as to conform to the type approved in the characteristics as defined under paragraph 2.3 of this Regulation.

They shall meet the requirements set forth in paragraph 5 and, where applicable, fulfil the requirements of the tests specified in this Regulation.

- 7.2. The approval authority may carry out any check or test prescribed in this Regulation. In particular, the tests described in paragraph 5.2 of this Regulation (requirements regarding emissions) may be carried out. In this case, the holder of the approval may ask, as an alternative, to use as a basis for comparison not the original equipment converter, but the replacement catalytic converter which was used during the type approval tests (or another sample that has been proven to conform to the approved type). Emissions' values measured with the sample under verification shall then on average not exceed by more than 15 per cent the mean values measured with the sample used for reference.

8. PENALTIES FOR NONCONFORMITY OF PRODUCTION

- 8.1. The approval granted in respect of a type of replacement catalytic converter pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 7 above are not complied with.

- 8.2. If a Party to the Agreement which applies 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 form conforming to the model in annex 1 to this Regulation.

9. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a type of replacement catalytic converter 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 Agreement applying this Regulation by means of a form conforming to the model in annex 1 to this Regulation.

10. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Contracting Parties to the 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.

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ANNEX 1

COMMUNICATION

(Maximum format: A4 (210 × 297 mm))



issued by: Name of administration <sup>(1)</sup>

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

concerning <sup>(2)</sup> APPROVAL GRANTED

APPROVAL EXTENDED

APPROVAL REFUSED

APPROVAL WITHDRAWN

PRODUCTION DEFINITELY DISCONTINUED

of a replacement catalytic converter pursuant to Regulation No 103

Approval No: ..... Extension No: .....

- 1. Applicant's name and address: .....
- 2. Manufacturer's name and address: .....
- 3. Manufacturer's trade name or mark: .....
- 4. Commercial designation of the replacement catalytic converter: .....  
.....
- 5. Vehicles type(s) for which the catalytic converter type qualifies as replacement catalytic converter: .....  
.....
- 6. Type(s) of vehicle(s) on which the replacement catalytic converter has been tested: .....
- 7. Submitted for approval on: .....

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

<sup>(2)</sup> Strike out what does not apply.

- 8. Technical Service responsible for approval tests: .....
- .....
- 8.1. Date of test report: .....
- 8.2. Number of test report: .....
- 9. Approval granted/extended/refused/withdrawn <sup>(1)</sup>
- 10. Place: .....
- 11. Date: .....
- 12. Signature: .....
- 13. Annexed to this communication is a list of documents in the approval file deposited at the administrative services having delivered the approval and which can be obtained upon request.

\_\_\_\_\_

<sup>(1)</sup> Strike out what does not apply.

## ANNEX 2

## EXAMPLES OF ARRANGEMENTS OF APPROVAL MARKS

## Model A

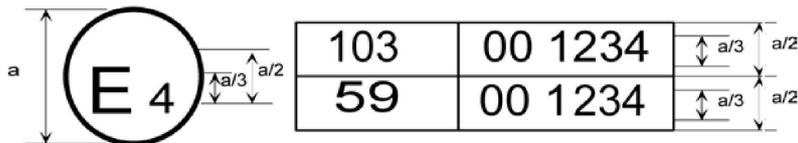
(see paragraph 4.4 of this Regulation)



The above approval mark affixed to a component of a replacement catalytic converter shows that the type concerned has been approved in the Netherlands (E 4), pursuant to Regulation No 103 under approval No 001234. The first two digits of the approval number indicate that the approval was granted in accordance with the requirements of Regulation No 103 in its original form.

## Model B

(see paragraph 4.5 of this Regulation)



The above approval mark affixed to a component of replacement catalytic converter shows that the type concerned has been approved in the Netherlands (E 4) pursuant to Regulations Nos 103 and 59 <sup>(1)</sup>.

The first two digits of the approval numbers indicate that, on the date on which these approvals were granted, Regulations Nos 103 and 59 were in their original form.

<sup>(1)</sup> The second number is given merely as an example.