

## II

*(Acts whose publication is not obligatory)*

## COUNCIL

## COUNCIL DIRECTIVE

of 3 December 1987

**amending Directive 70/220/EEC on the approximation of the laws of the Member States relating to measures to be taken against air pollution by gases from the engines of motor vehicles**

(88/76/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100A thereof,

Having regard to the proposal from the Commission <sup>(1)</sup>,

In cooperation with the European Parliament <sup>(2)</sup>;

Having regard to the opinion of the Economic and Social Committee <sup>(3)</sup>,

Whereas it is important to adopt measures with the aim of progressively establishing the internal market over a period expiring on 31 December 1992; whereas the internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured;

Whereas the first programme of action of the European Communities on the protection of the environment, approved by the Council on 22 November 1973, called for account to be taken of the latest scientific

advances in combating atmospheric pollution caused by gases emitted from motor vehicles and for Directives adopted previously to be amended accordingly; whereas the third programme of action provides for additional efforts to be made to reduce considerably the present level of emissions of pollutants from motor vehicles;

Whereas Directive 70/220/EEC <sup>(4)</sup> lays down the limit values for carbon monoxide and unburnt hydrocarbon emissions from such engines; whereas these limit values were first reduced by Directive 74/290/EEC <sup>(5)</sup> and supplemented, in accordance with Directive 77/102/EEC <sup>(6)</sup>, by limit values for permissible emissions of nitrogen oxides; whereas the limit values for these three pollutants were successively reduced by Directives 78/665/EEC <sup>(7)</sup> and 83/351/EEC <sup>(8)</sup>;

Whereas the work undertaken by the Commission in connection with its policy of pursuing a comprehensive approach to the development of rules for the motor vehicle industry has shown that the European industry already has available, or is currently perfecting, engine technology which will allow a further reduction in limit values; whereas during the period under consideration such a reduction will not jeopardize the aims of Community policy in other fields, and in particular in that of the rational use of energy;

<sup>(1)</sup> OJ No C 178, 6. 7. 1984, p. 9, OJ No C 318, 29. 11. 1984, p. 6, and OJ No C 257, 28. 9. 1987, p. 1.

<sup>(2)</sup> Opinion published in OJ No C 12, 14. 1. 1985, p. 65, and OJ No C 190, 20. 7. 1987, p. 180, and position of Parliament on 18 November 1987 (OJ No C 345, 21. 12. 1987, p. 59).

<sup>(3)</sup> OJ No C 25, 28. 1. 1985, p. 46.

<sup>(4)</sup> OJ No L 76, 6. 4. 1970, p. 1.

<sup>(5)</sup> OJ No L 159, 15. 6. 1974, p. 61.

<sup>(6)</sup> OJ No L 32, 3. 2. 1977, p. 32.

<sup>(7)</sup> OJ No L 223, 14. 8. 1978, p. 48.

<sup>(8)</sup> OJ No L 197, 20. 7. 1983, p. 1.

Whereas it is necessary to promote innovation and industrial competitiveness respectively on the internal market and on foreign markets; whereas it is necessary that the Community adopt measures on vehicle emissions; whereas they should at the same time respect a high level of environmental protection and make it possible to achieve values adapted to European conditions so that their ultimate effect on the environment is equivalent to that of the standards for vehicle emissions in force in the United States of America; whereas to achieve this objective, it is advisable to provide for a solution which varies according to the category of vehicle engine capacity so as to allow, as far as possible, compliance with Community requirements at a reasonable cost and using different technical means; whereas the limit values laid down for vehicles with an engine capacity of less than 1,4 litres reflect the current technical and economic conditions of European manufacturers in this section of the market; whereas the limit values applicable in 1992/93 should be fixed in 1987;

Whereas the limit values in this Directive are based on the test method laid down in Directive 70/220/EEC, but this procedure must be adapted subsequently so that it is representative not only of traffic conditions in congested urban centres but also of those outside such centres; whereas a decision concerning such adaptation should be taken by 1987 at the latest;

Whereas Article 5 of Directive 70/220/EEC refers to the possibility of adapting the provisions of the Annexes to take account of technical progress;

Whereas petrol engines in all vehicles covered by this Directive should be designed to run on unleaded petrol so as to make it possible to stop the use of lead-based additives in fuels and thus make a decisive contribution to the reduction of environmental pollution by that element;

Whereas it is necessary to ensure that the provisions relating to the compression-ignition engines of vehicles covered by this Directive remain compatible, in view of the specific nature of all the pollutants emitted by such engines, with subsequent changes in the provisions relating to the other pollutants emitted by such engines, referred to in Directive 72/306/EEC (1);

Whereas, during the period between the adoption of European standards and the implementation of the modified European test cycle, it is desirable that vehicles which obtain type-approval in accordance with equivalent standards on Community export markets should also qualify for EEC type-approval;

Whereas, with due regard for the rules of the Treaty, Member States which so wish may apply in advance the new values laid down in this Directive, on the understanding that if they do so they may not prohibit the marketing or use of vehicles, whether manufactured at home or imported, which comply with Community requirements,

HAS ADOPTED THIS DIRECTIVE :

#### *Article 1*

Annexes I, II, III, VI and VII to Directive 70/220/EEC shall be amended in accordance with the Annex to this Directive. A new Annex IIIA shall be introduced.

#### *Article 2*

1. From 1 July 1988, no Member State may, on grounds relating to air pollution by gases from an engine or to engine fuel requirements :

— refuse to grant EEC type-approval, or to issue the document provided for in the second indent of Article 10 (1) of Directive 70/156/EEC (2), as last amended by Directive 87/403/EEC (3), or to grant national type-approval for a type of motor vehicle,

or

— prohibit the entry into service of such vehicles,

where the level of gaseous pollutants emitted from this type of motor vehicle or from such vehicles and the engine fuel requirements meet the provisions of Directive 70/220/EEC, as amended by this Directive.

2. Member States may: from 1 October 1988 in the case of the types of vehicle which have an engine capacity above 2 000 cm<sup>3</sup>,

(1) OJ No L 190, 20. 8. 1972, p. 1.

(2) OJ No L 42, 23. 2. 1970, p. 1.

(3) OJ No L 220, 8. 8. 1987, p. 44.

from 1 October 1990 in the case of the types of vehicle which have an engine capacity below 1 400 cm<sup>3</sup>,

from 1 October 1991 in the case of the types of vehicle which have an engine capacity of 1 400 to 2 000 cm<sup>3</sup> inclusive, and from 1 October 1994 in the case of types of vehicle of the same capacity fitted with compression-ignition engines of the direct injection type,

- no longer issue the document provided for in the last indent of Article 10 (1) of Directive 70/156/EEC in respect of a type of motor vehicle, and
- refuse national type-approval for a type of motor vehicle,

which emits gaseous pollutants at levels which do not meet the requirements of the Annexes to Directive 70/220/EEC, as amended by this Directive.

3. From 1 October 1989 in the case of types of vehicle which have an engine capacity above 2 000 cm<sup>3</sup>,

from 1 October 1991 in the case of types of vehicle which have an engine capacity below 1 400 cm<sup>3</sup>,

from 1 October 1993 in the case of types of vehicle which have an engine capacity of 1 400 to 2 000 cm<sup>3</sup> inclusive and from 1 October 1996 in the case of types of vehicle of the same capacity fitted with compression-ignition engines of the direct injection type,

Member States may prohibit the entry into service of vehicles where the gaseous pollutants emitted from such vehicles and their engine fuel requirements do not meet the requirements of the Annexes to Directive 70/220/EEC, as amended by this Directive.

#### Article 3

1. Member States may refuse national type-approval, EEC type-approval or the document provided for in the second indent of Article 10 (1) of Directive 70/156/EEC for a type of motor vehicle with a positive ignition engine whose engine fuel requirements do not meet the provisions of the Annexes to Directive 70/220/EEC, as amended by this Directive:

- from 1 October 1988, for types of vehicle having an engine capacity greater than 2 000 cm<sup>3</sup>, except for those defined in section 8.1,
- from 1 October 1989, for the other types.

2. From 1 October 1990, Member States may prohibit the entry into service of vehicles fitted with a positive ignition engine whose fuel requirements do

not meet the provisions of the Annexes to Directive 70/220/EEC, as amended by this Directive, except where the manufacturer provides a certificate accepted by the technical service which issued the initial emission type-approval stating that adapting such vehicles to the new fuel requirement entails major engineering changes, namely a change in material specification of the inlet or exhaust valve seats or a reduction in the compression ratio, or an increase in the engine capacity to compensate for power loss; in which case, such a ban is possible only from the dates laid down in Article 2 (3).

#### Article 4

By 31 December 1987 at the latest, the Council, on a proposal from the Commission, shall:

- decide on a further reduction in the limit values to be applied to vehicles with an engine capacity of less than 1 400 cm<sup>3</sup> at the latest in 1992 for the issue of new national type-approvals and 1993 for the entry of vehicles into service,
- amend the test contained in Annex III to Directive 70/220/EEC in order to adapt to present conditions, in particular by the addition of non-urban driving sequences,
- decide on the procedures for the entry into force of the amended test contained in Annex III and on the conditions for repealing the present Annex III and Annex IIIA to Directive 70/220/EEC, as amended by this Directive including the transitional period.

#### Article 5

Member States shall bring into force the provisions necessary to comply with this Directive by 1 July 1988 and shall forthwith inform the Commission thereof.

#### Article 6

This Directive is addressed to the Member States.

Done at Brussels, 3 December 1987.

For the Council  
The President  
Chr. CHRISTENSEN

## ANNEX

## ANNEX I

## 1. Add the following :

'with the exception of those vehicles of category N<sub>1</sub>, for which type-approval has been granted under Directive 88/76/EEC (1).

At the request of the manufacturers, type-approval to this Directive may be extended from M<sub>1</sub> or N<sub>1</sub> vehicles equipped with compression-ignition engines which have already been type-approved to M<sub>2</sub> and N<sub>2</sub> vehicles having a reference mass not exceeding 2 840 kg and meeting the conditions of section 6 of this Annex (extension of EEC type-approval).

(1) OJ No L 36, 9. 2. 1988, p. 1.'

## 2.2. The existing text is replaced by the following :

'For the purposes of Annex IIIA "reference mass" means the mass of the vehicle in running order less the uniform mass of the driver of 75 kg and increased by a uniform mass of 136 kg.'

The following new section 2.8 is added :

'2.8. "Engine capacity" means :

2.8.1. for reciprocating piston positive-ignition engines, the nominal engine swept volume,

2.8.1.1. for rotary piston (Wankel) positive-ignition engines, double the nominal engine swept volume.'

The following new section 3.2.4 is added :

'3.2.4. a description of the measures taken to ensure that a vehicle equipped with a positive-ignition engine is so constructed that it can only be supplied with unleaded petrol in accordance with Directive 85/210/EEC.

This condition is deemed to be met if it can be demonstrated that the inlet orifice of the fuel tank is so designed that it prevents the tank from being filled from a petrol pump delivery nozzle which has an external diameter of 23,6 mm or greater.'

In section 5.1, the existing text is given the number 5.1.1 and is supplemented as follows :

'The technical measures taken by the manufacturer must be such as to ensure that the emission of air-polluting gases is effectively limited throughout the normal life of the vehicle and under normal conditions of use.

5.1.2. A vehicle equipped with a positive-ignition engine must be designed to be capable of running on unleaded petrol as specified by Directive 85/210/EEC.'

Section 5.2.1.1.4 reads as follows :

'5.2.1.1.4. Subject to 5.2.1.1.4.2 and 5.2.1.1.5, the test is repeated three times. The mass of the carbon monoxide, the combined mass of the hydrocarbons and the nitrogen oxides and the mass of the nitrogen oxides obtained must be less than the amounts given below for the corresponding vehicle categories :

| Engine capacity         | Mass of carbon monoxide | Combined mass of hydrocarbons and nitrogen oxides | Mass of nitrogen oxides |
|-------------------------|-------------------------|---|-------------------------|
| C<br>(cm <sup>3</sup> ) | L1<br>(g/test)          | L2<br>(g/test)                                    | L3<br>(g/test)          |
| C > 2 000               | 25                      | 6,5   | 3,5                     |
| 1 400 ≤ C ≤ 2 000       | 30                      | 8   |                         |
| C < 1 400               | 45                      | 15  | 6                       |

Vehicles equipped with compression-ignition engines with a capacity exceeding 2 000 cm<sup>3</sup> must comply with the limit values corresponding to the 1 400 cm<sup>3</sup> to 2 000 cm<sup>3</sup> inclusive engine capacity category.'

In sections 5.2.1.1.4.1, 5.2.1.1.4.2, 5.2.1.1.5.1 and 5.2.1.1.5.2 the words 'and the mass of nitrogen oxides' or 'and the emissions of nitrogen oxides' are to be added after any reference to combined figures for hydrocarbons and nitrogen oxides.

The following new section 6.5 is added :

**6.5. Positive-ignition engined vehicle types with different engine fuel requirements.**

6.5.1. Approval shall be extended to vehicle types modified for engine fuel requirement purposes, provided the conditions set out in section 8.4.'

The following new section 6.6 is added :

**6.6. Vehicle types with automatic or continuously variable transmissions.**

6.6.1. Approval granted to a vehicle type with a manual transmission may under the following conditions be extended to vehicle types with automatic or continuously variable transmissions :

6.6.1.1. the same basic forms of components and systems (other than the transmission) liable to affect the emissions of gaseous pollutants must be fitted and operational. However differences in detail to allow for the different operating characteristics of automatic or continuously variable transmissions are acceptable;

6.6.1.2. the vehicle type must have a reference mass within  $\pm 5\%$  of the reference mass of the vehicle type with the manual transmission;

6.6.1.3. the vehicle type must be tested and satisfy the requirements of section 5 modified as follows :

the limit values for the nitrogen oxides are those resulting from the multiplication of the L3 values given in the table in section 5.2.1.1.4 by a factor of 1,3 and the limit values for the combined mass of the hydrocarbons and the nitrogen oxides are those resulting from the multiplication of the L2 values given in the table in section 5.2.1.1.4 by a factor of 1,2.'

The table in section 7.1.1.1 is replaced by the following :

| 'Engine capacity<br>C<br>(cm <sup>3</sup> ) | Mass of carbon<br>monoxide<br>L1<br>(g/test) | Combined mass of<br>hydrocarbons<br>and nitrogen oxides<br>L2<br>(g/test) | Mass of nitrogen oxides<br>L3<br>(g/test) |
|---|--|---|---|
| C > 2 000                                   | 30   | 8,1   | 4,4                                       |
| 1 400 ≤ C ≤ 2 000                           | 36   | 10  |   |
| C < 1 400                                   | 54   | 19  | 7,5                                       |

Vehicles equipped with compression-ignition engines with a capacity exceeding 2 000 cm<sup>3</sup> must comply with the limit values corresponding to the 1 400 to 2 000 cm<sup>3</sup> inclusive engine capacity category.'

The second paragraph of section 7.1.1.2 reads as follows :

'L = the limit value laid down in section 7.1.1.1 for the emissions of carbon monoxide, the combined emissions of hydrocarbons and nitrogen oxides and the emissions of nitrogen oxides;'

The following new section 7.2 is added :

7.2. Where type approval is extended under the provisions of section 6.6 (automatic and continuously variable transmissions) the limit values for the nitrogen oxides are those resulting from the multiplication of the values L3 given in the table in section 7.1.1.1 by a factor of 1,3, and the limit values for the combined mass of the hydrocarbons and the nitrogen oxides are those resulting from the multiplication of the values L2 given in the table in section 7.1.1.1 by a factor of 1,2.'

Section 8.1 reads as follows :

- 8.1. For the type-approval and verification of conformity of
- vehicles other than those of category M<sub>1</sub>,
  - passenger vehicles of category M<sub>1</sub> designed to carry more than six occupants including the driver or whose maximum mass exceeds 2 500 kg,
  - off-road vehicles as defined in Annex I to Directive 70/156/EEC as last amended by Directive 87/403/EEC <sup>(1)</sup>,

the limit values shown in the tables in sections 5.2.1.1.4 (type-approval) and 7.1.1.1 (conformity check) of Directive 70/220/EEC, as last amended by Directive 83/351/EEC, are applicable as from 1 October 1989 in the case of new vehicle types and from 1 October 1990 in the case of vehicles entering into service for the first time.

(1) OJ No L 220, 8. 8. 1987, p. 44.

The following new sections 8.3 and 8.4 are added :

- 8.3. **Test equivalent to the type I test for verifying emissions after a cold start.**
- 8.3.1. For the type-approval and verification of production of vehicles of category M<sub>1</sub> equipped with an engine whose capacity  $\geq 1\,400\text{ cm}^3$ , the technical service may, at the request of a manufacturer, carry out the equivalent test described in Annex IIIA (EPA cycle) instead of that described in 5.2.1.1. In that event, the following provisions apply:
- 8.3.1.1. For vehicle type-approval, the limit values specified in the table in section 5.2.1.1.4 are replaced by the following:
- mass of carbon monoxide (L1): 2,11 g/km,
  - mass of hydrocarbons: 0,25 g/km,
  - mass of nitrogen oxides (L3): 0,62 g/km.

These limit values are deemed to be met if they are not exceeded by the results of tests on a vehicle type when the masses of each pollutant are multiplied by the appropriate deterioration factor from the following table:

| Emission control system  | Deterioration factor |     |                 |
|--|----------------------|-----|-----------------|
|  | CO                   | HC  | NO <sub>x</sub> |
| 1. Positive-ignition engine with oxidizing catalytic converter | 1,2                  | 1,3 | 1,0             |
| 2. Positive-ignition engine without catalytic converter        | 1,2                  | 1,3 | 1,0             |
| 3. Positive-ignition engine with three-way catalytic converter | 1,2                  | 1,3 | 1,1             |
| 4. Compression-ignition engine                                 | 1,1                  | 1,0 | 1,0             |

Where a manufacturer has obtained evidence of deterioration factors specific to the vehicle type using the certification procedures of Community export markets, those factors may be used as an alternative when establishing compliance with the limit values set out in this section.

- 8.3.1.2. For the verification of production conformity, vehicles may be taken from the series and subjected to the test described in Annex IIIA.
- 8.3.1.2.1. A failed vehicle is one whose test results, when adjusted by the deterioration factors established for the type approved in accordance with section 8.3.1 lead to one or more of the limit values in section 8.3.1.1 being exceeded.
- 8.3.1.2.2. The production of the series is deemed to conform or not to conform by testing vehicles comprising a test sample until a pass decision is reached for all limit values or a fail decision is reached for one limit value. A pass decision is reached when the cumulative number of failed vehicles as defined in section 8.3.1.2.1 for each limit value is less than or equal to the pass decision number appropriate to the cumulative number of vehicles tested. A fail decision is reached when the cumulative number of failed vehicles for one limit value is greater than or equal to the fail decision number appropriate to the cumulative number of vehicles tested. Once a pass decision has been made for a particular limit value the number of vehicles whose final deteriorated test results exceed that limit value must not be considered any further for the purposes of checking conformity of production.

The pass and fail decision numbers associated with the cumulative number of vehicles tested are given in the following table :

| Cumulative number of vehicles tested | Pass decision<br>(number of failures) | Fail decision<br>(number of failures) |
|--------------------------------------|---------------------------------------|---------------------------------------|
| 1                                    | (1)                                   | (2)                                   |
| 2                                    | (1)                                   | (2)                                   |
| 3                                    | (1)                                   | (2)                                   |
| 4                                    | (1)                                   | (2)                                   |
| 5                                    | 0                                     | (2)                                   |
| 6                                    | 0                                     | 6                                     |
| 7                                    | 1                                     | 7                                     |
| 8                                    | 2                                     | 8                                     |
| 9                                    | 2                                     | 8                                     |
| 10                                   | 3                                     | 9                                     |
| 11                                   | 3                                     | 9                                     |
| 12                                   | 4                                     | 10                                    |
| 13                                   | 4                                     | 10                                    |
| 14                                   | 5                                     | 11                                    |
| 15                                   | 5                                     | 11                                    |
| 16                                   | 6                                     | 12                                    |
| 17                                   | 6                                     | 12                                    |
| 18                                   | 7                                     | 13                                    |
| 19                                   | 7                                     | 13                                    |
| 20                                   | 8                                     | 14                                    |
| 21                                   | 8                                     | 14                                    |
| 22                                   | 9                                     | 15                                    |
| 23                                   | 9                                     | 15                                    |
| 24                                   | 10                                    | 16                                    |
| 25                                   | 11                                    | 16                                    |
| 26                                   | 11                                    | 17                                    |
| 27                                   | 12                                    | 17                                    |
| 28                                   | 12                                    | 18                                    |
| 29                                   | 13                                    | 19                                    |
| 30                                   | 13                                    | 19                                    |
| 31                                   | 14                                    | 20                                    |
| 32                                   | 14                                    | 20                                    |
| 33                                   | 15                                    | 21                                    |
| 34                                   | 15                                    | 21                                    |
| 35                                   | 16                                    | 22                                    |
| 36                                   | 16                                    | 22                                    |
| 37                                   | 17                                    | 23                                    |
| 38                                   | 17                                    | 23                                    |
| 39                                   | 18                                    | 24                                    |
| 40                                   | 18                                    | 24                                    |
| 41                                   | 19                                    | 25                                    |
| 42                                   | 19                                    | 26                                    |
| 43                                   | 20                                    | 26                                    |
| 44                                   | 21                                    | 27                                    |
| 45                                   | 21                                    | 27                                    |
| 46                                   | 22                                    | 28                                    |
| 47                                   | 22                                    | 28                                    |
| 48                                   | 23                                    | 29                                    |
| 49                                   | 23                                    | 29                                    |
| 50                                   | 24                                    | 30                                    |
| 51                                   | 24                                    | 30                                    |
| 52                                   | 25                                    | 31                                    |
| 53                                   | 25                                    | 31                                    |
| 54                                   | 26                                    | 32                                    |
| 55                                   | 26                                    | 32                                    |
| 56                                   | 27                                    | 33                                    |
| 57                                   | 27                                    | 33                                    |
| 58                                   | 28                                    | 33                                    |
| 59                                   | 28                                    | 33                                    |
| 60                                   | 32                                    | 33                                    |

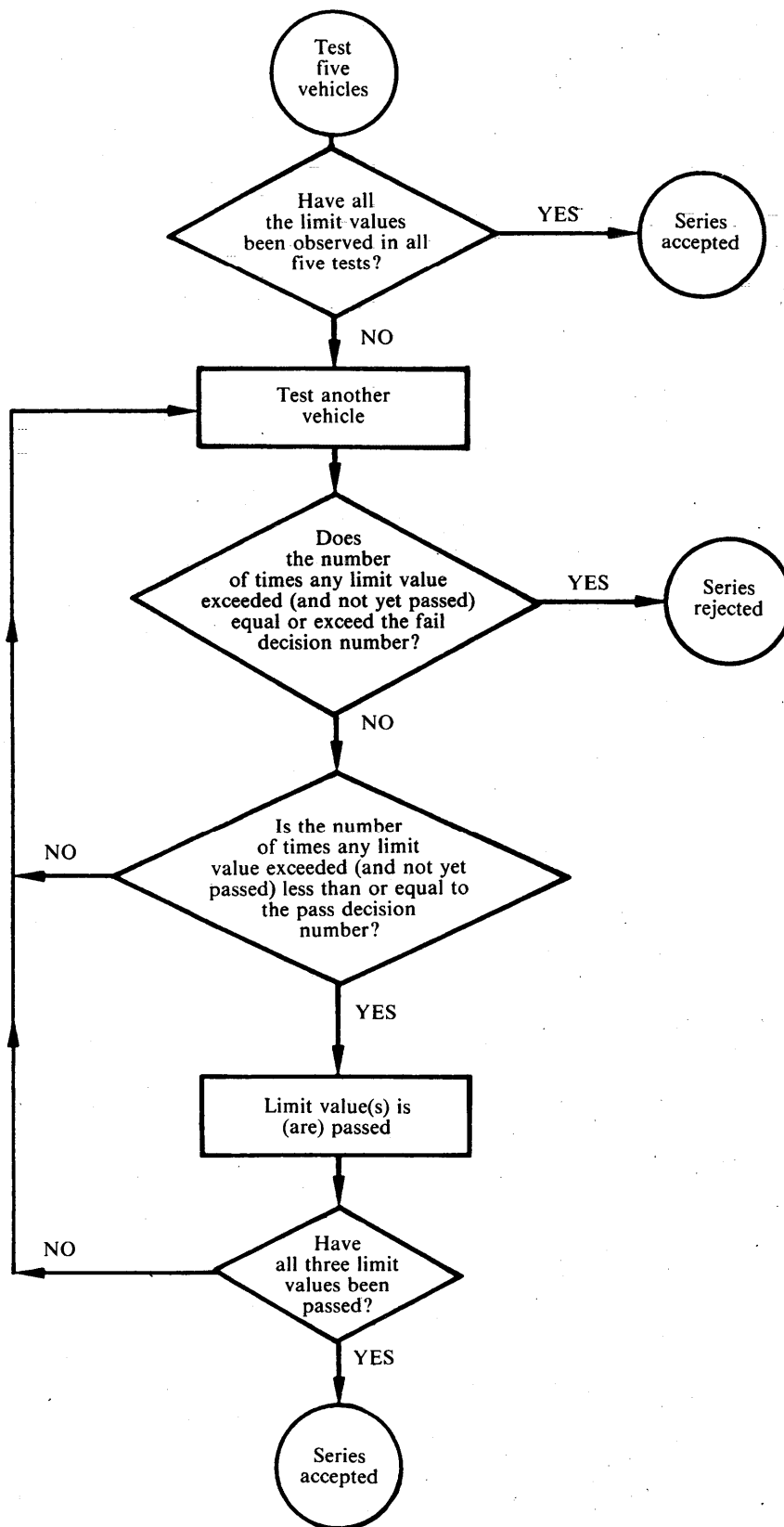
(1) Series not able to pass at this stage.

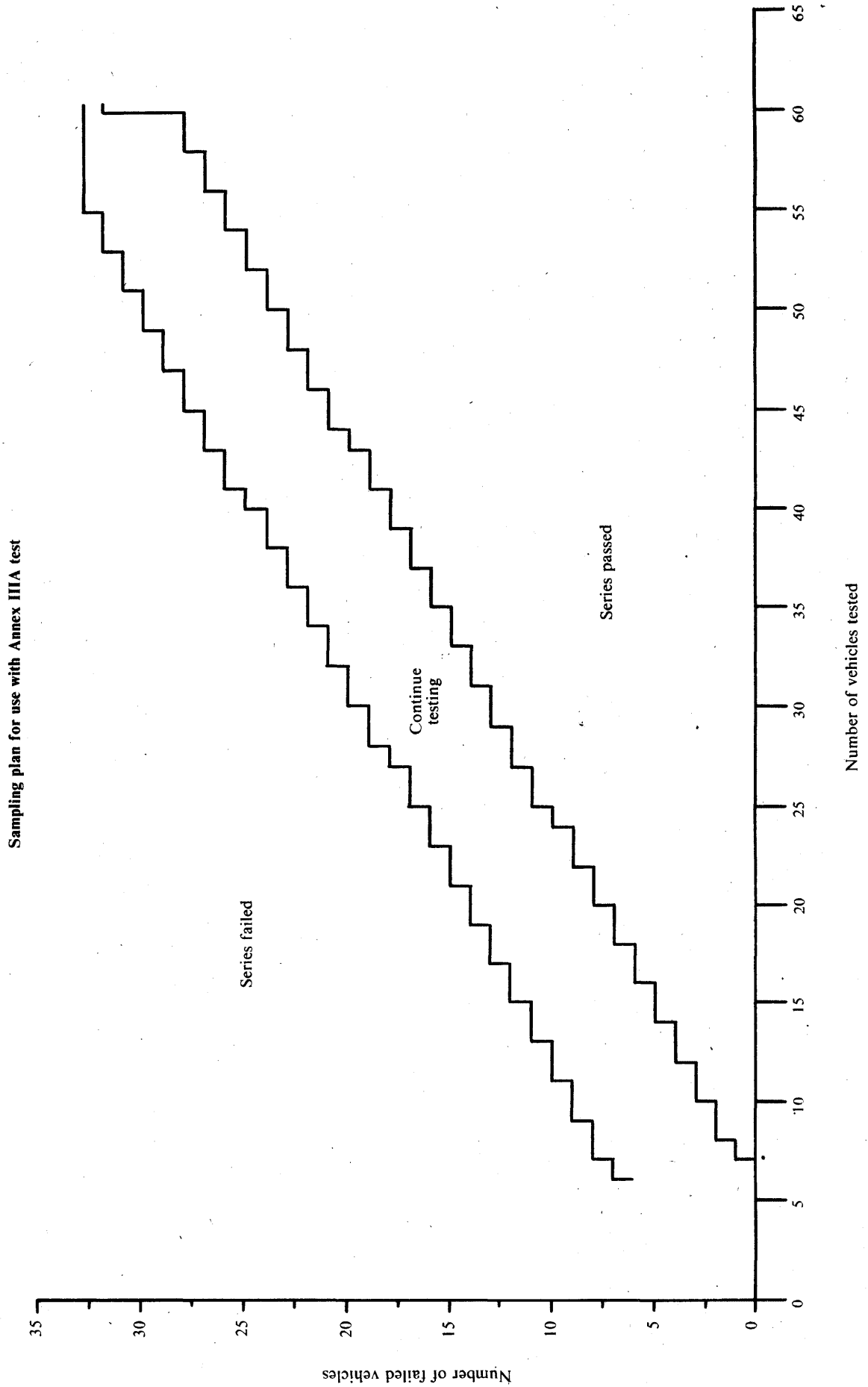
(2) Series not able to fail at this stage.

- 8.3.1.3. Manufacturers of vehicles in possession of certificates issued by government authorities in Community export markets incorporating results of tests equivalent to those set out in Annex IIIA to this Directive may present such results.
- 8.4. For the extension of EEC type-approval to vehicles approved in accordance with the provisions of Directive 70/220/EEC, as last amended by Directive 83/351/EEC, but modified to satisfy the engine fuel requirements of this Directive, the manufacturers are to certify that :
- 8.4.1. the vehicle type conforms with the requirement of section 5.1.2 regarding engine fuel requirements,  
and
- 8.4.2. the vehicle continues to meet the production conformity limits in accordance with Directive 70/220/EEC, as last amended by Directive 83/351/EEC.'
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Sampling plan for use with Annex IIIA test





*ANNEX II*

A footnote reference '(4)' is inserted after sections 1.4 and 1.5.

A footnote reference '(5)' is inserted after section 1.7.

The following footnotes are added :

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(4) This figure must be rounded off to the nearest tenth of a millimetre.

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

Add the following subsection to section 7 :

**'Information to be supplied for the tests provided for in Annex IIIA'**

Gear change-over point (for first to second, etc.): .....

Method of cold starting : .....

**ANNEX III**

Delete section 3.1.7.

The following new Annex IIIA is added :

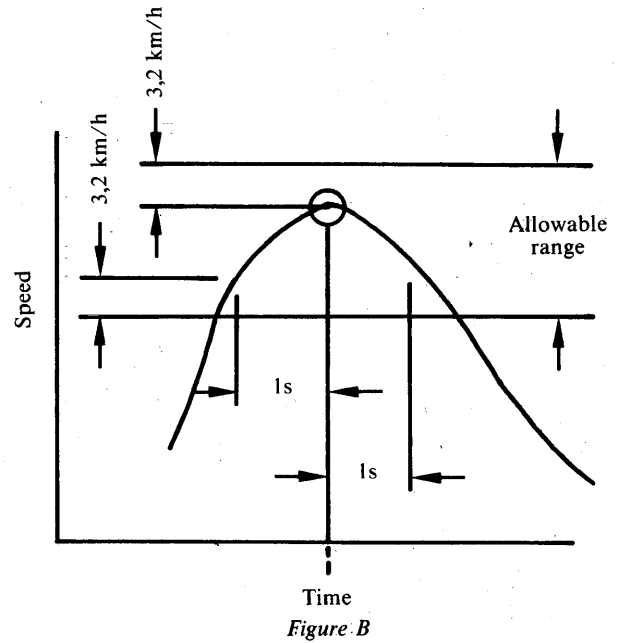
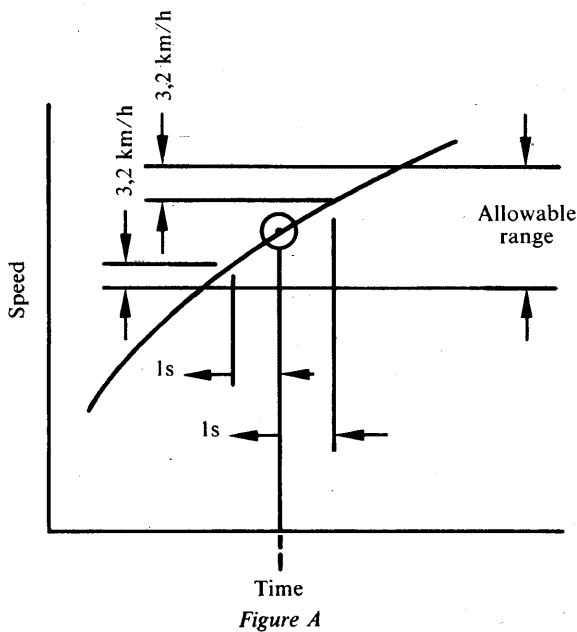
**ANNEX IIIA****TEST EQUIVALENT TO THE TYPE I TEST FOR VERIFYING  
EMISSIONS AFTER A COLD START**

1. **INTRODUCTION**  
See section 8.3 of Annex I.
2. **OPERATING CYCLE ON THE CHASSIS DYNAMOMETER**
  - 2.1. **Description of the cycle**  
The operating cycle to be applied on the chassis dynamometer is that indicated in the following table and depicted in the graph in Appendix 1. The breakdown by operations is also given in that table.
  - 2.2. *Idem* section 2.2 of Annex III.
  - 2.3. **Transmissions**
    - 2.3.1. All test conditions, except as noted, will be run according to the manufacturer's recommendations.
    - 2.3.2. Vehicles equipped with free wheeling or overdrive, except as noted, will be tested with these features operated according to the manufacturer's recommendations.
    - 2.3.3. Idle modes are to be run with automatic transmission in "drive" and the wheels braked: manual transmissions to be in gear with the clutch disengaged, except in the first idle mode.  
The vehicle must be driven with minimum accelerator pedal movement to maintain the desired speed.
    - 2.3.4. Acceleration must be smooth, following representative gear speeds and procedures. For manual transmissions, the operator must release the accelerator pedal during each gear change and complete the change in the minimum amount of time. If the vehicle cannot accelerate at the specified rate, it is to be operated at maximum available power until its speed reaches the value prescribed for that time in the driving schedule.
    - 2.3.5. The deceleration modes must be run in gear using brakes or accelerator pedal as necessary to maintain the desired speed. Manual transmission vehicles must have the clutch engaged and must not change gears from the previous mode. For those modes which decelerate to zero, manual transmission clutches must be depressed when the speed drops below 24,1 km/h, when engine roughness is evident, or when engine stalling is imminent.
    - 2.3.6. *Manual transmission*
      - 2.3.6.1. In the case of test vehicles equipped with manual transmission, the transmission must be shifted according to the procedures recommended by the manufacturer, subject to the agreement of the technical service responsible for the tests.
  - 2.4. **Tolerances**
    - 2.4.1. The dynamometer driving schedule is listed in Appendix 1. The driving schedule is defined by a smooth trace drawn through the specified speed versus time relationships. It consists of a non-repetitive series of idle, acceleration, cruise, and deceleration modes of various time sequences and rates.

2.4.2.

The speed tolerances are :

- the upper limit is 3,2 km/h higher than the highest point on the trace within one second of the given time,
- the lower limit is 3,2 km/h lower than the lowest point on the trace within one second of the given time,
- speed variations greater than the tolerances (such as may occur during gear changes) are acceptable provided they do not occur for more than 2 seconds on any occasion,
- speeds lower than those prescribed are acceptable provided the vehicle is operated at maximum available power during such occurrences,
- the speed tolerance must be as specified above, except the upper and lower limits which are 6,4 km/h,
- the following figures show the range of acceptable speed tolerances for typical points. Figure A is typical of portions of the speed curve which are increasing throughout the 2-second time interval. Figure B is typical of portions of the speed curve which include a maximum or minimum.



3. VEHICLE AND FUEL

3.1. Test vehicles

- 3.1.1.
  - 3.1.2.
  - 3.1.3.
  - 3.1.4.
  - 3.1.5.
  - 3.1.6.
- } *Idem* sections 3.1.1 to 3.1.6 of Annex III.

3.2. Fuel

The appropriate reference fuel as defined in Annex VI must be used for testing, or the equivalent reference fuels used by the competent authorities in Community export markets.

4. TEST EQUIPMENT

4.1. Chassis dynamometer

4.1.1. *Idem* section 4.1.1 of Annex III but add the following subparagraph :

'Dynamometers with adjustable load curve may be considered as having a fixed load curve if they meet the requirements of a fixed load curve dynamometer and are used as a fixed load curve dynamometer.'

- 4.1.2. } *Idem* sections 4.1.1, 4.1.2 and 4.1.3 of Annex III.  
 4.1.3. }
- 4.1.4. *Accuracy*  
 4.1.4.1. *Idem* 4.1.4.1 Annex III.  
 4.1.4.2. In the case of a dynamometer with a fixed load curve, the accuracy of matching dynamometer load to road must be 5% at 80,5 km/h.  
 In the case of a dynamometer with adjustable load curve, the accuracy of matching dynamometer load to road must be 5% at 80,5 km/h, 60 and 40 km/h and 10% at 20 km/h. Below this, dynamometer absorption must be positive.  
 4.1.4.3. } *Idem* sections 4.1.4.3 and 4.1.4.4 of Annex III.  
 4.1.4.4. }
- 4.1.5. *Load and inertia setting*  
 4.1.5.1. Dynamometers with fixed load curve: the load simulator must be adjusted to absorb the power exerted on the driving wheels at a steady speed of 80,5 km/h. The alternative means by which this load is determined and set are described in Appendix 2, section 3 and Appendix 3.  
 4.1.5.2. Dynamometers with adjustable load curve: the load simulator must be adjusted in order to absorb the power exerted on the driving wheels at steady speeds of 20, 40, 60 and 80,5 km/h. The means by which these loads are determined and set are described in Appendix 2, point 3 and Appendix 3.  
 4.1.5.3. *Idem* section 4.1.5.3 of Annex III.
- 4.2. }  
 4.3. } *Idem* sections 4.2 to 4.7 of Annex III.  
 4.4. }  
 4.5. }  
 4.6. }  
 4.7. }
5. **PREPARING THE TEST**  
 5.1. **Adjustment of inertia simulators to the vehicle's translatory inertias**

| Reference mass of the vehicle<br>(kg) | Equivalent inertia mass<br>(kg) |
|---------------------------------------|---------------------------------|
| Pr ≤ 480                              | 450                             |
| 480 < Pr ≤ 540                        | 510                             |
| 540 < Pr ≤ 600                        | 570                             |
| 600 < Pr ≤ 650                        | 620                             |
| 650 < Pr ≤ 710                        | 680                             |
| 710 < Pr ≤ 770                        | 740                             |
| 770 < Pr ≤ 820                        | 800                             |
| 820 < Pr ≤ 880                        | 850                             |
| 880 < Pr ≤ 940                        | 910                             |
| 940 < Pr ≤ 990                        | 960                             |
| 990 < Pr ≤ 1 050                      | 1 020                           |
| 1 050 < Pr ≤ 1 110                    | 1 080                           |
| 1 110 < Pr ≤ 1 160                    | 1 130                           |
| 1 160 < Pr ≤ 1 220                    | 1 190                           |
| 1 220 < Pr ≤ 1 280                    | 1 250                           |
| 1 280 < Pr ≤ 1 330                    | 1 300                           |
| 1 330 < Pr ≤ 1 390                    | 1 360                           |
| 1 390 < Pr ≤ 1 450                    | 1 420                           |
| 1 450 < Pr ≤ 1 500                    | 1 470                           |
| 1 500 < Pr ≤ 1 560                    | 1 530                           |
| 1 560 < Pr ≤ 1 620                    | 1 590                           |
| 1 620 < Pr ≤ 1 670                    | 1 640                           |
| 1 670 < Pr ≤ 1 730                    | 1 700                           |
| 1 730 < Pr ≤ 1 790                    | 1 760                           |
| 1 790 < Pr ≤ 1 870                    | 1 810                           |
| 1 870 < Pr ≤ 1 980                    | 1 930                           |
| 1 980 < Pr ≤ 2 100                    | 2 040                           |
| 2 100 < Pr ≤ 2 210                    | 2 150                           |
| 2 210 < Pr ≤ 2 320                    | 2 270                           |
| 2 320 < Pr ≤ 2 440                    | 2 380                           |
| 2 440 < Pr                            | 2 490                           |

Flywheels, electrical or other means of simulating test mass as shown in the table may be used. If the equivalent test mass specified is not available on the dynamometer being used, the next higher equivalent test mass (not exceeding 115 kg) available is to be used.

*Note :*

The reference mass of the vehicle is the mass of the vehicle in running order less the uniform mass of the driver and increased by a uniform mass of 136 kg.

5.2. *Idem* section 5.2 of Annex III.

5.3. **Conditioning of vehicle**

5.3.1. Before the test, the vehicle must be kept in a room in which the temperature remains relatively constant between 20 and 30 °C.

This conditioning must continue for at least six hours if the engine oil temperature is measured or for at least 12 hours if it is not.

If the manufacturer so requests, the test must be carried out not later than 36 hours after the vehicle has been run at its normal temperature.

5.3.2. *Idem* section 5.3.2 of Annex III.

6. **PROCEDURE FOR BENCH TESTS**

6.1. }  
6.1.2. } *Idem* sections 6.1 to 6.1.4 of Annex III.  
6.1.3. }  
6.1.4. }

6.2. **Test and sampling**

6.2.1. The vehicle must be stored prior to the emission test in such a manner that precipitation (e.g., rain or dew) does not occur on the vehicle. The complete dynamometer test consists of a cold start drive of 12,1 km and simulates a hot start drive of 12,1 km. The vehicle is allowed to stand on the dynamometer during the 10-minute time period between the cold and hot start tests. The cold start test is divided into two periods. The first period, representing the cold start 'transient' phase, terminates at the end of the deceleration which is scheduled to occur at 505 seconds of the driving schedule. The second period, representing the 'stabilized' phase, consists of the remainder of the driving schedule including engine shutdown. The hot start test similarly consists of two periods. The first period, representing the hot start 'transient' phase, terminates at the same point in the driving schedule as the first period of the cold start test. The second period of the hot start test, 'stabilized' phase, is assumed to be identical to the second period of the cold start test. Therefore the hot start test terminates after the first period (505 seconds) is run.

6.2.2. The following steps shall be taken for each test :

6.2.2.1. Place drive wheels of vehicle on dynamometer without starting engine. Reset and enable the roll revolution counter.

6.2.2.2. Open the vehicle engine compartment cover and position the cooling fan.

6.2.2.3. With the sample selector valves in the 'standby' position, connect evacuated sample collection bags to the dilute exhaust and dilution air sample collection systems.

6.2.2.4. Start the CVS (constant volume sampler) (if not already on), the sample pumps, the temperature recorder, the vehicle cooling fan and the heated hydrocarbon analysis recorder (diesel only). (The heat exchanger of the constant volume sampler if used, should be preheated to its operating temperature.) The diesel hydrocarbon analyser continuous sample line and filter (if applicable) should be preheated to 190 °C ± 10 °C.

6.2.2.5. Adjust the sample flowrates to the desired flowrate (minimum of 0,28 m<sup>3</sup>/h) and set the gas flow measuring devices to zero.

*Note :*

CFV-CVS sample flowrate is fixed by the venturi design.

6.2.2.6. Attach the flexible exhaust tube to the vehicle tailpipe(s).

6.2.2.7. Start the gas flow measuring device, position the sample selector valves to direct the sample flow into the 'transient' exhaust sample bag and the 'transient' dilution air sample bag (turn on the diesel hydrocarbon analyser system integrator and mark the recorder chart, if applicable), turn the ignition key on and start the engine.

6.2.2.8. Fifteen seconds after the engine starts, place the transmission in gear.

6.2.2.9. Twenty seconds after the engine starts, begin the initial vehicle acceleration of the driving schedule.

- 6.2.2.10. Operate the vehicle according to the dynamometer driving schedule.
- 6.2.2.11. At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously switch the sample flows from the 'transient' bags to the 'stabilized' bags, switch off gas flow measuring device No 1 (and the diesel hydrocarbon integrator No 1, mark the diesel hydrocarbon recorder chart) and start gas flow measuring device No 2 (and diesel hydrocarbon integrator No 2). Before the acceleration which is scheduled to occur at 510 seconds, record the measured roller or shaft revolutions and reset the counter or switch to a second counter. As soon as possible transfer the 'transient' exhaust and dilution air samples to the analytical system and process the samples so as to obtain a stabilized reading of the exhaust sample on all analysers within 20 minutes of the end of the sample collection part of the test.
- 6.2.2.12. Turn the engine off 2 seconds after the end of the last deceleration (at 1 369 seconds).
- 6.2.2.13. Five seconds after the engine stops running, simultaneously turn off gas flow measuring device No 2 (the diesel hydrocarbon integrator No 2 and mark the hydrocarbon recorder chart, if applicable) and position the sample selector valves to the 'standby' position. Record the measured roller or shaft revolutions and reset the counter. As soon as possible transfer the 'stabilized' exhaust and dilution air samples to the analytical system and process the samples in order to obtain a stabilized reading of the exhaust sample on all analysers within 20 minutes of the end of the sample collection part of the test.
- 6.2.2.14. Immediately after the end of the sample period turn off the cooling fan and close the engine compartment cover.
- 6.2.2.15. Turn off the CVS or disconnect the exhaust tube from the tailpipe of the vehicle.
- 6.2.2.16. Repeat the steps in sections 6.2.2.2 to 6.2.2.10 for the hot start test, except that only one evacuated sample bag is required for sampling exhaust gas and one for dilution air. The key-on operation step described in section 6.2.2.7 begins between 9 and 11 minutes after the end of the sample period for the cold start test.
- 6.2.2.17. At the end of the deceleration which is scheduled to occur at 505 seconds, simultaneously turn off gas flow measuring device No 1 (and diesel hydrocarbon integrator No 1, mark the diesel hydrocarbon recorder chart, if applicable) and position the sample selector valve to the 'standby' position (engine shutdown is not part of the hot start test sample period). Record the measured roller or shaft revolutions.
- 6.2.2.18. As soon as possible transfer the hot start 'transient' exhaust and dilution air samples to the analytical system and process the samples in order to obtain a stabilized reading of the exhaust sample on all analysers within 20 minutes of the end of the sample collection part of the test.
- 6.3. **Engine starting and restarting**
- 6.3.1. *Petrol-engined vehicles*
- This section applies to petrol-engined vehicles.
- 6.3.1.1. The engine must be started according to the manufacturer's instructions as set out in the handbook for series-produced vehicles. The initial 20-second idle period begins when the engine starts.
- 6.3.1.2. **Choke operation**
- Vehicles equipped with automatic chokes must be operated according to the manufacturer's instructions as set out in the handbook for series-produced vehicles.
- Vehicles equipped with manual chokes must be operated according to the manufacturer's instructions as set out in the handbook for series-produced vehicles.
- 6.3.1.3. The transmission must be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.
- 6.3.1.4. The operator may use the choke, accelerator pedal, etc. where necessary to keep the engine running.
- 6.3.1.5. If the manufacturer's instructions as set out in the handbook for series-produced vehicles do not specify a warm engine starting procedure, the engine (automatic-and-manual-choke engines) must be started by depressing the accelerator pedal about half way and letting the engine turn over until it starts.
- 6.3.2. *Diesel vehicles*
- The engine must be started according to the manufacturer's instructions as set out in the handbook for series-produced vehicles. The initial 20-second idle period begins when the engine starts. The transmission must be placed in gear 15 seconds after the engine is started. If necessary, braking may be employed to keep the drive wheels from turning.
- 6.3.3. If the vehicle does not start after 10 seconds' use of the starter, the attempt is to cease and the reason for failure to start determined. The gas flow measuring device on the constant volume sampler (usually a revolution counter) or CFV (and the hydrocarbon integrator when testing diesel vehicles) must be turned off and the sampler selector valves placed in the 'standby' position during this diagnostic period. In addition,



either the CVS should be turned off, or the exhaust tube disconnected from the tailpipe during the diagnostic period. If failure to start is due to an operational error, the vehicle must be rescheduled for testing from a cold start.

- 6.3.3.1. If a failure to start occurs during the cold portion of the test and is caused by a vehicle malfunction, corrective action of less than 30 minutes duration may be taken and the test continued. All sampling system(s) must be reactivated at the same time as the engine begins to turn. When the engine starts, the driving schedule timing sequence begins. If failure to start is caused by vehicle malfunction and the vehicle cannot be started, the test is void.
- 6.3.3.2. If a failure to start occurs during the hot start portion of the test and is caused by vehicle malfunction, the vehicle must be started within one minute of key on. All sampling system(s) must be reactivated at the same time as the engine begins to turn. When the engine starts, the driving schedule timing sequence begins. If the vehicle cannot be started within one minute of key on, the test is void.
- 6.3.4. If the engine 'false starts' the operator must repeat the recommended starting procedure (such as resetting the choke, etc.).
- 6.3.5. *Stalling* <sup>(1)</sup>  
If the engine stalls during an idle period, the engine must be restarted immediately and the test continued. If the engine cannot be started soon enough to allow the vehicle to follow the next acceleration as prescribed, the driving schedule indicator must be stopped. When the vehicle restarts, the driving schedule indicator must be reactivated.

## 7. PROCEDURE FOR ANALYSES

- 7.1. *Idem* section 7.2.2 of Annex III.
- 7.2. *Idem* section 7.2.3 of Annex III.
- 7.3. *Idem* section 7.2.4 of Annex III.
- 7.4. *Idem* section 7.2.5 of Annex III.
- 7.5. *Idem* section 7.2.6 of Annex III.
- 7.6. *Idem* section 7.2.7 of Annex III.
- 7.7. *Idem* section 7.2.8 of Annex III.

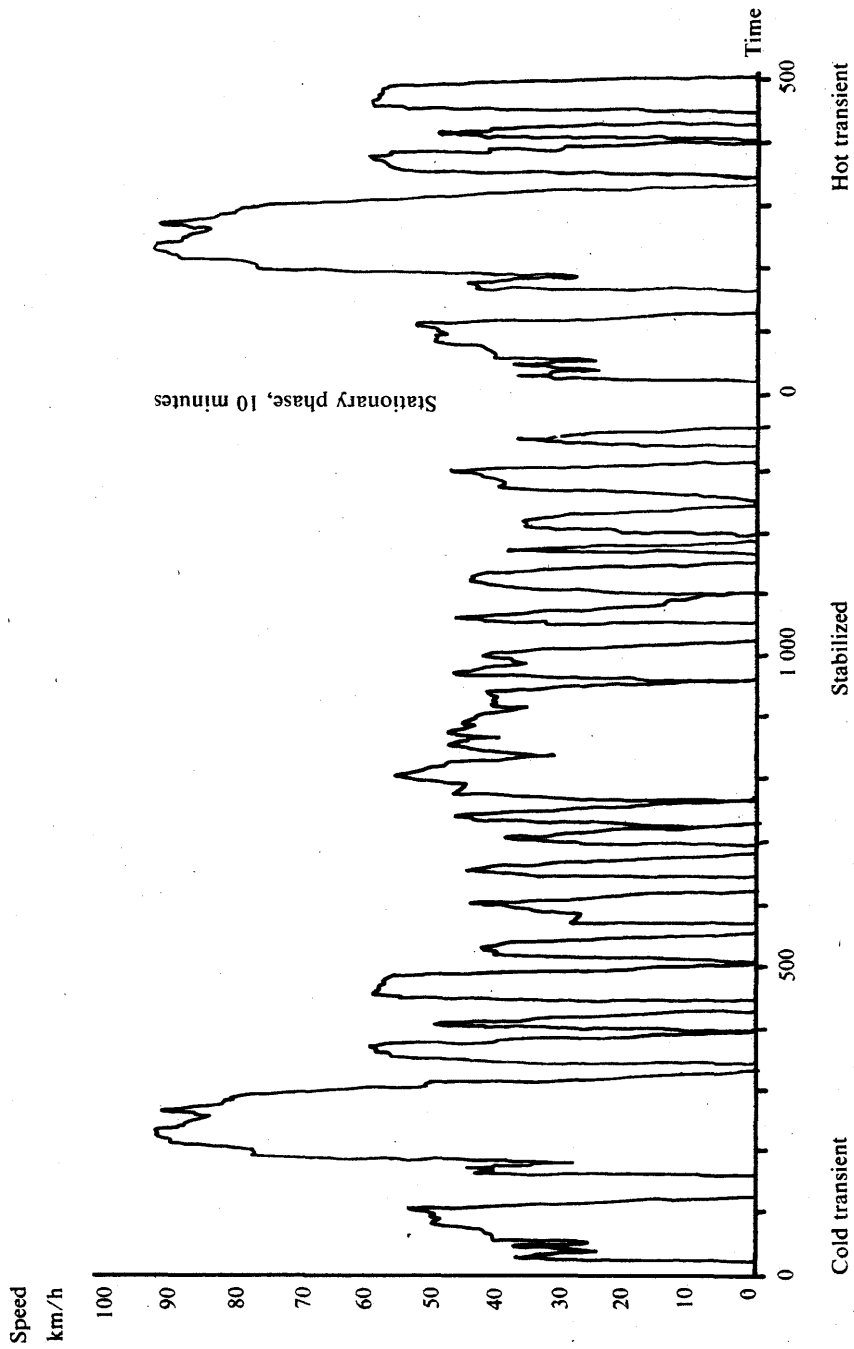
## 8. DETERMINATION OF THE QUANTITY OF GASEOUS POLLUTANTS

- 8.1. } *Idem* sections 8.1 and 8.2 of Annex III.
- 8.2. }

<sup>(1)</sup> If the engine stalls during some operating mode other than idle, the driving schedule must be stopped; the vehicle is then restarted and accelerated to the speed required at that point in the driving schedule and the test continued.  
If the vehicle will not restart within one minute, the test is void.

Appendix 1

OPERATING CYCLE



|     |     |     |      |     |      |     |      |     |      |     |      |     |      |
|-----|-----|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|
| 0   | 0,0 | 20  | 0,0  | 40  | 24,0 | 60  | 38,9 | 80  | 41,4 | 100 | 48,8 | 120 | 24,8 |
| 1   | 0,0 | 21  | 4,8  | 41  | 24,5 | 61  | 39,6 | 81  | 42,0 | 101 | 49,4 | 121 | 19,5 |
| 2   | 0,0 | 22  | 9,5  | 42  | 24,9 | 62  | 40,1 | 82  | 43,0 | 102 | 49,7 | 122 | 14,2 |
| 3   | 0,0 | 23  | 13,8 | 43  | 25,7 | 63  | 40,2 | 83  | 43,3 | 103 | 49,9 | 123 | 8,9  |
| 4   | 0,0 | 24  | 16,5 | 44  | 27,5 | 64  | 39,6 | 84  | 46,0 | 104 | 49,7 | 124 | 3,5  |
| 5   | 0,0 | 25  | 23,0 | 45  | 30,7 | 65  | 39,4 | 85  | 47,2 | 105 | 48,9 | 125 | 0,0  |
| 6   | 0,0 | 26  | 27,2 | 46  | 34,0 | 66  | 39,8 | 86  | 48,0 | 106 | 48,0 | 126 | 0,0  |
| 7   | 0,0 | 27  | 27,8 | 47  | 36,5 | 67  | 39,9 | 87  | 48,4 | 107 | 48,1 | 127 | 0,0  |
| 8   | 0,0 | 28  | 29,1 | 48  | 36,9 | 68  | 39,8 | 88  | 48,9 | 108 | 48,6 | 128 | 0,0  |
| 9   | 0,0 | 29  | 33,3 | 49  | 36,5 | 69  | 39,6 | 89  | 49,4 | 109 | 49,4 | 129 | 0,0  |
| 10  | 0,0 | 30  | 34,9 | 50  | 36,4 | 70  | 39,6 | 90  | 49,4 | 110 | 50,2 | 130 | 0,0  |
| 11  | 0,0 | 31  | 36,0 | 51  | 34,3 | 71  | 40,4 | 91  | 49,1 | 111 | 51,2 | 131 | 0,0  |
| 12  | 0,0 | 32  | 36,2 | 52  | 30,6 | 72  | 41,2 | 92  | 48,9 | 112 | 51,8 | 132 | 0,0  |
| 13  | 0,0 | 33  | 35,6 | 53  | 27,5 | 73  | 41,4 | 93  | 48,8 | 113 | 52,1 | 133 | 0,0  |
| 14  | 0,0 | 34  | 34,6 | 54  | 25,4 | 74  | 40,9 | 94  | 48,9 | 114 | 51,8 | 134 | 0,0  |
| 15  | 0,0 | 35  | 33,6 | 55  | 25,4 | 75  | 40,1 | 95  | 49,6 | 115 | 51,0 | 135 | 0,0  |
| 16  | 0,0 | 36  | 32,8 | 56  | 28,5 | 76  | 40,2 | 96  | 48,9 | 116 | 46,0 | 136 | 0,0  |
| 17  | 0,0 | 37  | 31,9 | 57  | 31,9 | 77  | 40,9 | 97  | 48,1 | 117 | 40,7 | 137 | 0,0  |
| 18  | 0,0 | 38  | 27,4 | 58  | 34,8 | 78  | 41,8 | 98  | 47,5 | 118 | 35,4 | 138 | 0,0  |
| 19  | 0,0 | 39  | 24,0 | 59  | 37,3 | 79  | 41,8 | 99  | 48,0 | 119 | 30,1 | 139 | 0,0  |
| 140 | 0,0 | 160 | 0,0  | 180 | 41,5 | 200 | 67,8 | 220 | 80,5 | 240 | 91,2 | 260 | 87,1 |
| 141 | 0,0 | 161 | 0,0  | 181 | 43,8 | 201 | 70,0 | 221 | 81,4 | 241 | 91,2 | 261 | 86,6 |
| 142 | 0,0 | 162 | 0,0  | 182 | 42,6 | 202 | 72,6 | 222 | 82,1 | 242 | 90,9 | 262 | 85,9 |
| 143 | 0,0 | 163 | 0,0  | 183 | 38,6 | 203 | 74,0 | 223 | 82,9 | 243 | 90,9 | 263 | 85,3 |
| 144 | 0,0 | 164 | 5,3  | 184 | 36,5 | 204 | 75,3 | 224 | 84,0 | 244 | 90,9 | 264 | 84,7 |
| 145 | 0,0 | 165 | 10,6 | 185 | 31,2 | 205 | 76,4 | 225 | 85,6 | 245 | 90,9 | 265 | 83,8 |
| 146 | 0,0 | 166 | 15,9 | 186 | 28,5 | 206 | 76,4 | 226 | 87,1 | 246 | 90,9 | 266 | 84,3 |
| 147 | 0,0 | 167 | 21,2 | 187 | 27,7 | 207 | 76,1 | 227 | 87,9 | 247 | 90,9 | 267 | 83,7 |
| 148 | 0,0 | 168 | 26,6 | 188 | 29,1 | 208 | 76,0 | 228 | 88,4 | 248 | 90,8 | 268 | 83,5 |
| 149 | 0,0 | 169 | 31,9 | 189 | 29,9 | 209 | 75,6 | 229 | 88,5 | 249 | 90,3 | 269 | 83,2 |
| 150 | 0,0 | 170 | 35,7 | 190 | 32,2 | 210 | 75,6 | 230 | 88,4 | 250 | 89,8 | 270 | 82,9 |
| 151 | 0,0 | 171 | 39,1 | 191 | 35,7 | 211 | 75,6 | 231 | 87,9 | 251 | 88,7 | 271 | 83,0 |
| 152 | 0,0 | 172 | 41,5 | 192 | 39,4 | 212 | 75,6 | 232 | 87,9 | 252 | 87,9 | 272 | 83,4 |
| 153 | 0,0 | 173 | 42,5 | 193 | 43,9 | 213 | 75,6 | 233 | 88,2 | 253 | 87,2 | 273 | 83,8 |
| 154 | 0,0 | 174 | 41,4 | 194 | 49,1 | 214 | 76,0 | 234 | 88,7 | 254 | 86,9 | 274 | 84,5 |
| 155 | 0,0 | 175 | 40,4 | 195 | 53,9 | 215 | 76,3 | 235 | 89,3 | 255 | 86,4 | 275 | 85,3 |
| 156 | 0,0 | 176 | 39,8 | 196 | 58,3 | 216 | 77,1 | 236 | 89,6 | 256 | 86,3 | 276 | 86,1 |
| 157 | 0,0 | 177 | 40,2 | 197 | 60,0 | 217 | 78,1 | 237 | 90,3 | 257 | 86,7 | 277 | 86,9 |
| 158 | 0,0 | 178 | 40,6 | 198 | 63,2 | 218 | 79,0 | 238 | 90,6 | 258 | 86,9 | 278 | 88,4 |
| 159 | 0,0 | 179 | 40,9 | 199 | 65,2 | 219 | 79,7 | 239 | 91,1 | 259 | 87,1 | 279 | 89,2 |

|     |      |     |      |     |      |     |      |     |      |     |      |     |      |
|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|-----|------|
| 280 | 89,5 | 300 | 79,0 | 320 | 44,3 | 340 | 0,0  | 360 | 49,0 | 380 | 58,7 | 400 | 0,0  |
| 281 | 90,1 | 301 | 78,2 | 321 | 39,9 | 341 | 0,0  | 361 | 50,9 | 381 | 58,6 | 401 | 0,0  |
| 282 | 90,1 | 302 | 77,4 | 322 | 34,6 | 342 | 0,0  | 362 | 51,7 | 382 | 57,9 | 402 | 0,0  |
| 283 | 89,8 | 303 | 76,0 | 323 | 32,3 | 343 | 0,0  | 363 | 52,3 | 383 | 56,5 | 403 | 4,2  |
| 284 | 88,8 | 304 | 74,2 | 324 | 30,7 | 344 | 0,0  | 364 | 54,1 | 384 | 54,9 | 404 | 9,5  |
| 285 | 87,7 | 305 | 72,4 | 325 | 29,8 | 345 | 0,0  | 365 | 55,5 | 385 | 53,9 | 405 | 14,5 |
| 286 | 86,3 | 306 | 70,5 | 326 | 27,4 | 346 | 0,0  | 366 | 55,7 | 386 | 50,5 | 406 | 20,1 |
| 287 | 84,5 | 307 | 68,6 | 327 | 24,9 | 347 | 1,6  | 367 | 56,2 | 387 | 46,7 | 407 | 25,4 |
| 288 | 82,9 | 308 | 66,8 | 328 | 20,1 | 348 | 6,9  | 368 | 56,0 | 388 | 41,4 | 408 | 30,7 |
| 289 | 82,9 | 309 | 64,9 | 329 | 17,4 | 349 | 12,2 | 369 | 55,5 | 389 | 37,0 | 409 | 36,0 |
| 290 | 82,9 | 310 | 62,0 | 330 | 12,9 | 350 | 17,5 | 370 | 55,8 | 390 | 32,7 | 410 | 40,2 |
| 291 | 82,2 | 311 | 59,5 | 331 | 7,6  | 351 | 22,9 | 371 | 57,1 | 391 | 28,2 | 411 | 41,2 |
| 292 | 80,6 | 312 | 56,6 | 332 | 2,3  | 352 | 27,8 | 372 | 57,9 | 392 | 23,3 | 412 | 44,3 |
| 293 | 80,5 | 313 | 54,4 | 333 | 0,0  | 353 | 32,2 | 373 | 57,9 | 393 | 19,3 | 413 | 46,7 |
| 294 | 80,6 | 314 | 52,3 | 334 | 0,0  | 354 | 36,2 | 374 | 57,9 | 394 | 14,0 | 414 | 48,3 |
| 295 | 80,5 | 315 | 50,7 | 335 | 0,0  | 355 | 38,1 | 375 | 57,9 | 395 | 8,7  | 415 | 48,4 |
| 296 | 79,8 | 316 | 49,2 | 336 | 0,0  | 356 | 40,6 | 376 | 57,9 | 396 | 3,4  | 416 | 48,3 |
| 297 | 79,7 | 317 | 49,1 | 337 | 0,0  | 357 | 42,8 | 377 | 57,9 | 397 | 0,0  | 417 | 47,8 |
| 298 | 79,7 | 318 | 48,3 | 338 | 0,0  | 358 | 45,2 | 378 | 58,1 | 398 | 0,0  | 418 | 47,2 |
| 299 | 79,7 | 319 | 46,7 | 339 | 0,0  | 359 | 46,3 | 379 | 58,6 | 399 | 0,0  | 419 | 46,3 |
| 420 | 45,1 | 440 | 0,0  | 460 | 54,1 | 480 | 56,6 | 500 | 21,2 | 520 | 25,7 | 540 | 40,6 |
| 421 | 40,2 | 441 | 0,0  | 461 | 56,0 | 481 | 56,3 | 501 | 16,6 | 521 | 28,5 | 541 | 40,2 |
| 422 | 34,9 | 442 | 0,0  | 462 | 56,5 | 482 | 56,5 | 502 | 11,6 | 522 | 30,6 | 542 | 40,2 |
| 423 | 29,6 | 443 | 0,0  | 463 | 57,3 | 483 | 56,6 | 503 | 6,4  | 523 | 32,3 | 543 | 40,2 |
| 424 | 24,3 | 444 | 0,0  | 464 | 58,1 | 484 | 57,1 | 504 | 1,6  | 524 | 33,6 | 544 | 39,3 |
| 425 | 19,0 | 445 | 0,0  | 465 | 57,9 | 485 | 56,6 | 505 | 0,0  | 525 | 35,4 | 545 | 37,2 |
| 426 | 13,7 | 446 | 0,0  | 466 | 58,1 | 486 | 56,3 | 506 | 0,0  | 526 | 37,0 | 546 | 31,9 |
| 427 | 8,4  | 447 | 0,0  | 467 | 58,3 | 487 | 56,3 | 507 | 0,0  | 527 | 38,3 | 547 | 26,6 |
| 428 | 3,1  | 448 | 5,3  | 468 | 57,9 | 488 | 56,3 | 508 | 0,0  | 528 | 39,4 | 548 | 21,2 |
| 429 | 0,0  | 449 | 10,6 | 469 | 57,5 | 489 | 56,0 | 509 | 0,0  | 529 | 40,1 | 549 | 15,9 |
| 430 | 0,0  | 450 | 15,9 | 470 | 57,9 | 490 | 55,7 | 510 | 0,0  | 530 | 40,2 | 550 | 10,6 |
| 431 | 0,0  | 451 | 21,2 | 471 | 57,9 | 491 | 55,8 | 511 | 1,9  | 531 | 40,2 | 551 | 5,3  |
| 432 | 0,0  | 452 | 26,6 | 472 | 57,3 | 492 | 53,9 | 512 | 5,6  | 532 | 40,2 | 552 | 0,0  |
| 433 | 0,0  | 453 | 31,0 | 473 | 57,1 | 493 | 51,5 | 513 | 8,9  | 533 | 40,2 | 553 | 0,0  |
| 434 | 0,0  | 454 | 37,2 | 474 | 57,0 | 494 | 46,4 | 514 | 10,5 | 534 | 40,2 | 554 | 0,0  |
| 435 | 0,0  | 455 | 42,5 | 475 | 56,6 | 495 | 45,1 | 515 | 13,7 | 535 | 40,2 | 555 | 0,0  |
| 436 | 0,0  | 456 | 44,7 | 476 | 56,6 | 496 | 41,0 | 516 | 15,4 | 536 | 41,2 | 556 | 0,0  |
| 437 | 0,0  | 457 | 46,8 | 477 | 56,6 | 497 | 36,2 | 517 | 16,9 | 537 | 41,5 | 557 | 0,0  |
| 438 | 0,0  | 458 | 50,7 | 478 | 56,6 | 498 | 31,9 | 518 | 19,2 | 538 | 41,8 | 558 | 0,0  |
| 439 | 0,0  | 459 | 53,1 | 479 | 56,6 | 499 | 26,6 | 519 | 22,5 | 539 | 41,2 | 559 | 0,0  |

|     |   |   |      |     |   |   |      |     |   |   |      |     |   |   |      |     |   |   |      |     |   |   |      |     |   |   |      |
|-----|---|---|------|-----|---|---|------|-----|---|---|------|-----|---|---|------|-----|---|---|------|-----|---|---|------|-----|---|---|------|
| 560 | t | v | 0,0  | 580 | t | v | 28,5 | 600 | t | v | 34,8 | 620 | t | v | 0,0  | 640 | t | v | 0,0  | 660 | t | v | 41,2 | 680 | t | v | 0,0  |
| 561 | t | v | 0,0  | 581 | t | v | 28,2 | 601 | t | v | 35,4 | 621 | t | v | 0,0  | 641 | t | v | 0,0  | 661 | t | v | 41,8 | 681 | t | v | 0,0  |
| 562 | t | v | 0,0  | 582 | t | v | 27,4 | 602 | t | v | 36,0 | 622 | t | v | 0,0  | 642 | t | v | 0,0  | 662 | t | v | 43,9 | 682 | t | v | 0,0  |
| 563 | t | v | 0,0  | 583 | t | v | 27,2 | 603 | t | v | 36,2 | 623 | t | v | 0,0  | 643 | t | v | 0,0  | 663 | t | v | 43,1 | 683 | t | v | 0,0  |
| 564 | t | v | 0,0  | 584 | t | v | 26,7 | 604 | t | v | 36,2 | 624 | t | v | 0,0  | 644 | t | v | 0,0  | 664 | t | v | 42,3 | 684 | t | v | 0,0  |
| 565 | t | v | 0,0  | 585 | t | v | 27,4 | 605 | t | v | 36,2 | 625 | t | v | 0,0  | 645 | t | v | 0,0  | 665 | t | v | 42,5 | 685 | t | v | 0,0  |
| 566 | t | v | 0,0  | 586 | t | v | 27,5 | 606 | t | v | 36,5 | 626 | t | v | 0,0  | 646 | t | v | 3,2  | 666 | t | v | 42,6 | 686 | t | v | 0,0  |
| 567 | t | v | 0,0  | 587 | t | v | 27,4 | 607 | t | v | 38,1 | 627 | t | v | 0,0  | 647 | t | v | 7,2  | 667 | t | v | 42,6 | 687 | t | v | 0,0  |
| 568 | t | v | 0,0  | 588 | t | v | 26,7 | 608 | t | v | 40,4 | 628 | t | v | 0,0  | 648 | t | v | 12,6 | 668 | t | v | 41,8 | 688 | t | v | 0,0  |
| 569 | t | v | 5,3  | 589 | t | v | 26,6 | 609 | t | v | 41,8 | 629 | t | v | 0,0  | 649 | t | v | 16,4 | 669 | t | v | 41,0 | 689 | t | v | 0,0  |
| 570 | t | v | 10,6 | 590 | t | v | 26,6 | 610 | t | v | 42,6 | 630 | t | v | 0,0  | 650 | t | v | 20,1 | 670 | t | v | 38,0 | 690 | t | v | 0,0  |
| 571 | t | v | 15,9 | 591 | t | v | 26,7 | 611 | t | v | 43,5 | 631 | t | v | 0,0  | 651 | t | v | 22,5 | 671 | t | v | 34,4 | 691 | t | v | 0,0  |
| 572 | t | v | 20,9 | 592 | t | v | 27,4 | 612 | t | v | 42,0 | 632 | t | v | 0,0  | 652 | t | v | 24,6 | 672 | t | v | 29,8 | 692 | t | v | 0,0  |
| 573 | t | v | 23,5 | 593 | t | v | 28,3 | 613 | t | v | 36,7 | 633 | t | v | 0,0  | 653 | t | v | 28,2 | 673 | t | v | 26,4 | 693 | t | v | 0,0  |
| 574 | t | v | 25,7 | 594 | t | v | 29,8 | 614 | t | v | 31,4 | 634 | t | v | 0,0  | 654 | t | v | 31,5 | 674 | t | v | 23,3 | 694 | t | v | 2,3  |
| 575 | t | v | 27,4 | 595 | t | v | 30,9 | 615 | t | v | 26,1 | 635 | t | v | 0,0  | 655 | t | v | 33,8 | 675 | t | v | 18,7 | 695 | t | v | 5,3  |
| 576 | t | v | 27,4 | 596 | t | v | 32,5 | 616 | t | v | 20,8 | 636 | t | v | 0,0  | 656 | t | v | 35,7 | 676 | t | v | 14,0 | 696 | t | v | 7,1  |
| 577 | t | v | 21,4 | 597 | t | v | 33,8 | 617 | t | v | 15,4 | 637 | t | v | 0,0  | 657 | t | v | 37,5 | 677 | t | v | 9,3  | 697 | t | v | 10,5 |
| 578 | t | v | 28,2 | 598 | t | v | 34,0 | 618 | t | v | 10,1 | 638 | t | v | 0,0  | 658 | t | v | 39,4 | 678 | t | v | 5,6  | 698 | t | v | 14,8 |
| 579 | t | v | 28,5 | 599 | t | v | 34,1 | 619 | t | v | 4,8  | 639 | t | v | 0,0  | 659 | t | v | 40,7 | 679 | t | v | 3,2  | 699 | t | v | 18,2 |
| 700 | t | v | 21,7 | 720 | t | v | 24,1 | 740 | t | v | 41,0 | 760 | t | v | 15,1 | 780 | t | v | 44,3 | 800 | t | v | 45,1 | 820 | t | v | 50,9 |
| 701 | t | v | 23,5 | 721 | t | v | 19,3 | 741 | t | v | 42,6 | 761 | t | v | 10,0 | 781 | t | v | 45,1 | 801 | t | v | 45,9 | 821 | t | v | 50,7 |
| 702 | t | v | 26,4 | 722 | t | v | 14,5 | 742 | t | v | 43,6 | 762 | t | v | 4,8  | 782 | t | v | 45,5 | 802 | t | v | 48,3 | 822 | t | v | 49,2 |
| 703 | t | v | 26,9 | 723 | t | v | 10,0 | 743 | t | v | 44,4 | 763 | t | v | 2,4  | 783 | t | v | 46,5 | 803 | t | v | 49,9 | 823 | t | v | 48,3 |
| 704 | t | v | 26,6 | 724 | t | v | 7,2  | 744 | t | v | 44,9 | 764 | t | v | 2,4  | 784 | t | v | 46,5 | 804 | t | v | 51,5 | 824 | t | v | 48,1 |
| 705 | t | v | 26,6 | 725 | t | v | 4,8  | 745 | t | v | 45,5 | 765 | t | v | 0,8  | 785 | t | v | 46,5 | 805 | t | v | 53,1 | 825 | t | v | 48,1 |
| 706 | t | v | 29,3 | 726 | t | v | 3,4  | 746 | t | v | 46,0 | 766 | t | v | 0,0  | 786 | t | v | 46,3 | 806 | t | v | 53,1 | 826 | t | v | 48,1 |
| 707 | t | v | 30,9 | 727 | t | v | 0,8  | 747 | t | v | 46,0 | 767 | t | v | 4,8  | 787 | t | v | 45,9 | 807 | t | v | 54,1 | 827 | t | v | 48,1 |
| 708 | t | v | 32,3 | 728 | t | v | 0,8  | 748 | t | v | 45,5 | 768 | t | v | 10,1 | 788 | t | v | 45,5 | 808 | t | v | 54,7 | 828 | t | v | 47,6 |
| 709 | t | v | 34,6 | 729 | t | v | 5,1  | 749 | t | v | 45,4 | 769 | t | v | 15,4 | 789 | t | v | 45,5 | 809 | t | v | 55,2 | 829 | t | v | 47,5 |
| 710 | t | v | 36,2 | 730 | t | v | 10,5 | 750 | t | v | 45,1 | 770 | t | v | 20,8 | 790 | t | v | 45,5 | 810 | t | v | 55,0 | 830 | t | v | 47,5 |
| 711 | t | v | 36,2 | 731 | t | v | 15,4 | 751 | t | v | 44,3 | 771 | t | v | 25,4 | 791 | t | v | 45,4 | 811 | t | v | 54,7 | 831 | t | v | 47,2 |
| 712 | t | v | 35,6 | 732 | t | v | 20,1 | 752 | t | v | 43,1 | 772 | t | v | 28,2 | 792 | t | v | 44,4 | 812 | t | v | 54,7 | 832 | t | v | 46,5 |
| 713 | t | v | 36,5 | 733 | t | v | 22,5 | 753 | t | v | 41,0 | 773 | t | v | 29,6 | 793 | t | v | 44,3 | 813 | t | v | 54,6 | 833 | t | v | 45,4 |
| 714 | t | v | 37,5 | 734 | t | v | 25,7 | 754 | t | v | 37,8 | 774 | t | v | 31,4 | 794 | t | v | 44,3 | 814 | t | v | 54,1 | 834 | t | v | 44,6 |
| 715 | t | v | 37,8 | 735 | t | v | 29,0 | 755 | t | v | 34,6 | 775 | t | v | 33,3 | 795 | t | v | 44,3 | 815 | t | v | 53,3 | 835 | t | v | 43,5 |
| 716 | t | v | 36,2 | 736 | t | v | 31,5 | 756 | t | v | 30,6 | 776 | t | v | 35,4 | 796 | t | v | 44,3 | 816 | t | v | 53,1 | 836 | t | v | 41,0 |
| 717 | t | v | 34,8 | 737 | t | v | 34,6 | 757 | t | v | 26,6 | 777 | t | v | 37,3 | 797 | t | v | 44,3 | 817 | t | v | 52,3 | 837 | t | v | 38,1 |
| 718 | t | v | 33,0 | 738 | t | v | 37,2 | 758 | t | v | 24,0 | 778 | t | v | 40,2 | 798 | t | v | 44,3 | 818 | t | v | 51,5 | 838 | t | v | 35,4 |
| 719 | t | v | 29,0 | 739 | t | v | 39,4 | 759 | t | v | 20,1 | 779 | t | v | 42,6 | 799 | t | v | 44,4 | 819 | t | v | 51,3 | 839 | t | v | 33,0 |

|     |      |      |      |      |      |      |      |      |      |      |      |      |      |
|-----|------|------|------|------|------|------|------|------|------|------|------|------|------|
| 840 | 30,9 | 860  | 46,7 | 880  | 46,8 | 900  | 43,3 | 920  | 36,4 | 940  | 40,2 | 960  | 3,2  |
| 841 | 30,9 | 861  | 46,8 | 881  | 46,7 | 901  | 42,8 | 921  | 37,7 | 941  | 39,6 | 961  | 8,5  |
| 842 | 32,3 | 862  | 46,7 | 882  | 46,5 | 902  | 42,6 | 922  | 38,6 | 942  | 39,6 | 962  | 13,8 |
| 843 | 33,6 | 863  | 45,2 | 883  | 45,9 | 903  | 42,6 | 923  | 38,9 | 943  | 38,8 | 963  | 19,2 |
| 844 | 34,4 | 864  | 44,3 | 884  | 45,2 | 904  | 42,6 | 924  | 39,3 | 944  | 39,4 | 964  | 24,5 |
| 845 | 35,4 | 865  | 43,5 | 885  | 45,1 | 905  | 42,3 | 925  | 40,1 | 945  | 40,4 | 965  | 28,2 |
| 846 | 36,4 | 866  | 41,5 | 886  | 45,1 | 906  | 42,2 | 926  | 40,4 | 946  | 41,2 | 966  | 29,9 |
| 847 | 37,3 | 867  | 40,2 | 887  | 44,4 | 907  | 42,2 | 927  | 40,6 | 947  | 40,4 | 967  | 32,2 |
| 848 | 38,6 | 868  | 39,4 | 888  | 43,8 | 908  | 41,7 | 928  | 40,7 | 948  | 38,6 | 968  | 34,0 |
| 849 | 40,2 | 869  | 39,9 | 889  | 42,8 | 909  | 41,2 | 929  | 41,0 | 949  | 35,4 | 969  | 35,4 |
| 850 | 41,8 | 870  | 40,4 | 890  | 43,5 | 910  | 41,2 | 930  | 40,6 | 950  | 32,3 | 970  | 37,0 |
| 851 | 42,8 | 871  | 41,0 | 891  | 44,3 | 911  | 41,7 | 931  | 40,2 | 951  | 27,2 | 971  | 39,4 |
| 852 | 42,8 | 872  | 41,4 | 892  | 44,7 | 912  | 41,5 | 932  | 40,3 | 952  | 21,9 | 972  | 42,3 |
| 853 | 43,1 | 873  | 42,2 | 893  | 45,1 | 913  | 41,0 | 933  | 40,2 | 953  | 16,6 | 973  | 44,3 |
| 854 | 43,5 | 874  | 43,3 | 894  | 44,7 | 914  | 39,6 | 934  | 39,8 | 954  | 11,3 | 974  | 45,2 |
| 855 | 43,8 | 875  | 44,3 | 895  | 45,1 | 915  | 37,8 | 935  | 39,4 | 955  | 6,0  | 975  | 45,7 |
| 856 | 44,7 | 876  | 44,7 | 896  | 45,1 | 916  | 35,7 | 936  | 39,1 | 956  | 0,6  | 976  | 45,9 |
| 857 | 45,2 | 877  | 45,7 | 897  | 45,1 | 917  | 34,8 | 937  | 39,1 | 957  | 0,0  | 977  | 45,9 |
| 858 | 46,3 | 878  | 46,7 | 898  | 44,6 | 918  | 34,8 | 938  | 39,4 | 958  | 0,0  | 978  | 45,9 |
| 859 | 46,5 | 879  | 47,0 | 899  | 44,1 | 919  | 34,9 | 939  | 40,2 | 959  | 0,0  | 979  | 44,6 |
| 980 | 44,3 | 1000 | 37,8 | 1020 | 12,2 | 1040 | 0,0  | 1060 | 32,2 | 1080 | 29,0 | 1100 | 0,0  |
| 981 | 43,8 | 1001 | 38,6 | 1021 | 6,9  | 1041 | 0,0  | 1061 | 35,1 | 1081 | 24,1 | 1101 | 0,2  |
| 982 | 43,1 | 1002 | 39,6 | 1022 | 1,6  | 1042 | 0,0  | 1062 | 37,0 | 1082 | 19,8 | 1102 | 1,0  |
| 983 | 42,6 | 1003 | 39,9 | 1023 | 0,0  | 1043 | 0,0  | 1063 | 38,6 | 1083 | 17,9 | 1103 | 2,6  |
| 984 | 41,8 | 1004 | 40,4 | 1024 | 0,0  | 1044 | 0,0  | 1064 | 39,9 | 1084 | 17,1 | 1104 | 5,8  |
| 985 | 41,4 | 1005 | 41,0 | 1025 | 0,0  | 1045 | 0,0  | 1065 | 41,2 | 1085 | 16,1 | 1105 | 11,1 |
| 986 | 40,6 | 1006 | 41,2 | 1026 | 0,0  | 1046 | 0,0  | 1066 | 42,6 | 1086 | 15,3 | 1106 | 16,1 |
| 987 | 38,6 | 1007 | 41,0 | 1027 | 0,0  | 1047 | 0,0  | 1067 | 43,1 | 1087 | 14,6 | 1107 | 20,6 |
| 988 | 35,4 | 1008 | 40,2 | 1028 | 0,0  | 1048 | 0,0  | 1068 | 44,1 | 1088 | 14,0 | 1108 | 22,5 |
| 989 | 34,6 | 1009 | 38,8 | 1029 | 0,0  | 1049 | 0,0  | 1069 | 44,9 | 1089 | 13,8 | 1109 | 23,3 |
| 990 | 34,6 | 1010 | 38,1 | 1030 | 0,0  | 1050 | 0,0  | 1070 | 45,5 | 1090 | 14,2 | 1110 | 25,7 |
| 991 | 35,1 | 1011 | 37,3 | 1031 | 0,0  | 1051 | 0,0  | 1071 | 45,1 | 1091 | 14,5 | 1111 | 29,1 |
| 992 | 36,2 | 1012 | 36,9 | 1032 | 0,0  | 1052 | 0,0  | 1072 | 44,3 | 1092 | 14,0 | 1112 | 32,2 |
| 993 | 37,0 | 1013 | 36,2 | 1033 | 0,0  | 1053 | 1,9  | 1073 | 43,5 | 1093 | 13,8 | 1113 | 33,8 |
| 994 | 36,7 | 1014 | 35,4 | 1034 | 0,0  | 1054 | 6,4  | 1074 | 43,5 | 1094 | 12,9 | 1114 | 34,1 |
| 995 | 36,7 | 1015 | 34,8 | 1035 | 0,0  | 1055 | 11,7 | 1075 | 42,3 | 1095 | 11,3 | 1115 | 34,3 |
| 996 | 37,0 | 1016 | 33,0 | 1036 | 0,0  | 1056 | 17,1 | 1076 | 39,4 | 1096 | 8,0  | 1116 | 34,4 |
| 997 | 36,5 | 1017 | 28,2 | 1037 | 0,0  | 1057 | 22,4 | 1077 | 36,2 | 1097 | 6,8  | 1117 | 34,9 |
| 998 | 36,5 | 1018 | 22,9 | 1038 | 0,0  | 1058 | 27,4 | 1078 | 34,6 | 1098 | 4,2  | 1118 | 36,2 |
| 999 | 36,5 | 1019 | 17,5 | 1039 | 0,0  | 1059 | 29,8 | 1079 | 33,2 | 1099 | 1,6  | 1119 | 37,0 |

|      |      |      |      |      |      |      |      |      |      |      |      |      |     |
|------|------|------|------|------|------|------|------|------|------|------|------|------|-----|
| 1120 | 38,3 | 1140 | 41,8 | 1160 | 0,0  | 1180 | 32,2 | 1200 | 10,5 | 1220 | 34,6 | 1240 | 9,7 |
| 1121 | 39,4 | 1141 | 41,0 | 1161 | 0,0  | 1181 | 26,9 | 1201 | 15,8 | 1221 | 35,1 | 1241 | 6,4 |
| 1122 | 40,2 | 1142 | 39,6 | 1162 | 0,0  | 1182 | 21,6 | 1202 | 19,3 | 1222 | 35,4 | 1242 | 4,0 |
| 1123 | 40,1 | 1143 | 37,8 | 1163 | 0,0  | 1183 | 16,3 | 1203 | 20,8 | 1223 | 35,2 | 1243 | 1,1 |
| 1124 | 39,9 | 1144 | 34,6 | 1164 | 0,0  | 1184 | 10,9 | 1204 | 20,9 | 1224 | 34,9 | 1244 | 0,0 |
| 1125 | 40,2 | 1145 | 32,2 | 1165 | 0,0  | 1185 | 5,6  | 1205 | 20,3 | 1225 | 34,6 | 1245 | 0,0 |
| 1126 | 40,9 | 1146 | 28,2 | 1166 | 0,0  | 1186 | 0,3  | 1206 | 20,6 | 1226 | 34,6 | 1246 | 0,0 |
| 1127 | 41,5 | 1147 | 25,7 | 1167 | 0,0  | 1187 | 0,0  | 1207 | 21,1 | 1227 | 34,4 | 1247 | 0,0 |
| 1128 | 41,8 | 1148 | 22,5 | 1168 | 0,0  | 1188 | 0,0  | 1208 | 21,1 | 1228 | 32,3 | 1248 | 0,0 |
| 1129 | 42,5 | 1149 | 17,2 | 1169 | 3,4  | 1189 | 0,0  | 1209 | 22,5 | 1229 | 31,4 | 1249 | 0,0 |
| 1130 | 42,8 | 1150 | 11,9 | 1170 | 8,7  | 1190 | 0,0  | 1210 | 24,9 | 1230 | 30,9 | 1250 | 0,0 |
| 1131 | 43,3 | 1151 | 6,6  | 1171 | 14,0 | 1191 | 0,0  | 1211 | 27,4 | 1231 | 31,5 | 1251 | 0,0 |
| 1132 | 43,5 | 1152 | 1,3  | 1172 | 19,3 | 1192 | 0,0  | 1212 | 29,9 | 1232 | 31,9 | 1252 | 1,6 |
| 1133 | 43,5 | 1153 | 0,0  | 1173 | 24,6 | 1193 | 0,0  | 1213 | 31,7 | 1233 | 32,2 | 1253 | 1,6 |
| 1134 | 43,5 | 1154 | 0,0  | 1174 | 29,9 | 1194 | 0,0  | 1214 | 33,8 | 1234 | 31,4 | 1254 | 1,6 |
| 1135 | 43,3 | 1155 | 0,0  | 1175 | 34,0 | 1195 | 0,0  | 1215 | 34,6 | 1235 | 28,2 | 1255 | 1,6 |
| 1136 | 43,1 | 1156 | 0,0  | 1176 | 37,0 | 1196 | 0,0  | 1216 | 35,1 | 1236 | 24,9 | 1256 | 1,6 |
| 1137 | 43,1 | 1157 | 0,0  | 1177 | 37,8 | 1197 | 0,3  | 1217 | 35,1 | 1237 | 20,9 | 1257 | 2,6 |
| 1138 | 42,6 | 1158 | 0,0  | 1178 | 37,0 | 1198 | 2,4  | 1218 | 34,6 | 1238 | 16,1 | 1258 | 4,8 |
| 1139 | 42,5 | 1159 | 0,0  | 1179 | 36,2 | 1199 | 5,6  | 1219 | 34,1 | 1239 | 12,9 | 1259 | 6,4 |
| 1260 | 8,0  | 1280 | 39,4 | 1300 | 45,5 | 1320 | 0,0  | 1340 | 13,0 | 1360 | 26,6 | 1380 | 0,0 |
| 1261 | 10,1 | 1281 | 38,6 | 1301 | 46,7 | 1321 | 0,0  | 1341 | 18,3 | 1361 | 24,9 | 1381 | 0,0 |
| 1262 | 12,9 | 1282 | 37,8 | 1302 | 46,8 | 1322 | 0,0  | 1342 | 21,2 | 1362 | 22,5 | 1382 | 0,0 |
| 1263 | 16,1 | 1283 | 37,8 | 1303 | 46,7 | 1323 | 0,0  | 1343 | 24,3 | 1363 | 17,7 | 1383 | 0,0 |
| 1264 | 16,9 | 1284 | 37,8 | 1304 | 45,1 | 1324 | 0,0  | 1344 | 27,0 | 1364 | 12,9 | 1384 | 0,0 |
| 1265 | 15,3 | 1285 | 37,8 | 1305 | 39,8 | 1325 | 0,0  | 1345 | 29,5 | 1365 | 6,4  | 1385 | 0,0 |
| 1266 | 13,7 | 1286 | 37,8 | 1306 | 34,4 | 1326 | 0,0  | 1346 | 31,4 | 1366 | 4,0  | 1386 | 0,0 |
| 1267 | 12,2 | 1287 | 37,8 | 1307 | 29,1 | 1327 | 0,0  | 1347 | 32,7 | 1367 | 0,0  | 1387 | 0,0 |
| 1268 | 14,2 | 1288 | 38,6 | 1308 | 23,8 | 1328 | 0,0  | 1348 | 34,3 | 1368 | 0,0  | 1388 | 0,0 |
| 1269 | 17,7 | 1289 | 38,8 | 1309 | 18,5 | 1329 | 0,0  | 1349 | 35,2 | 1369 | 0,0  | 1389 | 0,0 |
| 1270 | 22,5 | 1290 | 39,4 | 1310 | 13,2 | 1330 | 0,0  | 1350 | 35,6 | 1370 | 0,0  | 1390 | 0,0 |
| 1271 | 27,4 | 1291 | 39,8 | 1311 | 7,9  | 1331 | 0,0  | 1351 | 36,0 | 1371 | 0,0  | 1391 | 0,0 |
| 1272 | 31,4 | 1292 | 40,2 | 1312 | 2,6  | 1332 | 0,0  | 1352 | 35,4 | 1372 | 0,0  | 1392 | 0,0 |
| 1273 | 33,8 | 1293 | 40,9 | 1313 | 0,0  | 1333 | 0,0  | 1353 | 34,8 | 1373 | 0,0  | 1393 | 0,0 |
| 1274 | 35,1 | 1294 | 41,2 | 1314 | 0,0  | 1334 | 0,0  | 1354 | 34,0 | 1374 | 0,0  | 1394 | 0,0 |
| 1275 | 35,7 | 1295 | 41,4 | 1315 | 0,0  | 1335 | 0,0  | 1355 | 33,0 | 1375 | 0,0  | 1395 | 0,0 |
| 1276 | 37,0 | 1296 | 41,8 | 1316 | 0,0  | 1336 | 0,0  | 1356 | 32,2 | 1376 | 0,0  | 1396 | 0,0 |
| 1277 | 38,0 | 1297 | 42,2 | 1317 | 0,0  | 1337 | 0,0  | 1357 | 31,5 | 1377 | 0,0  | 1397 | 0,0 |
| 1278 | 38,8 | 1298 | 43,5 | 1318 | 0,0  | 1338 | 2,4  | 1358 | 29,8 | 1378 | 0,0  | 1398 | 0,0 |
| 1279 | 39,4 | 1299 | 44,7 | 1319 | 0,0  | 1339 | 7,7  | 1359 | 28,2 | 1379 | 0,0  | 1399 | 0,0 |

## Appendix 2

## CHASSIS DYNAMOMETER

## 1. DEFINITION

- 1.1. *Idem* section 1.1 of Appendix 2 to Annex III, but replace '50 km/h' by '80,5 km/h'.

## 2. METHOD OF CALIBRATING THE DYNAMOMETER

- 2.1. *Idem* section 2.1 of Appendix 2 to Annex III.

- 2.2. Calibrating the power indicator to 80,5 km/h.

- 2.2.1. The dynamometer must be calibrated at least once each month or performance verified at least once each week with a view to calibration if required. Calibration must be carried out at 80,5 km/h in accordance with the procedure described below. The measured absorbed power comprises the power absorbed by frictional effects and the power absorbed by the power absorption device. The dynamometer is driven above the test speed range. The device used for starting up the dynamometer is then disengaged from the dynamometer and the roller(s) is (are) allowed to coast down. The kinetic energy of the roller is dissipated by the power absorption device and frictional effects. This method disregards variations in the internal friction of the rollers when carrying a load or running free. The frictional effects of the rear roll shall be disregarded when this is free.

- 2.2.1.1. Measure the rotational speed of the drive roller if this has not already been done. A fifth wheel, a revolution counter or other suitable means may be used.

- 2.2.1.2. Place a vehicle on the dynamometer or use another method of starting up the dynamometer.

- 2.2.1.3. Engage the flywheel or other system of inertia simulation for the most common vehicle mass category for which the dynamometer is used. In addition other vehicle mass categories may be calibrated, if desired.

- 2.2.1.4. Drive the dynamometer up to 80,5 km/h.

- 2.2.1.5. Record indicated road power.

- 2.2.1.6. Drive the dynamometer up to 96,9 km/h.

- 2.2.1.7. Disengage the device used to drive the dynamometer.

- 2.2.1.8. Record the time for the dynamometer drive roller to coast down from 88,5 km/h to 72,4 km/h.

- 2.2.1.9. Adjust the power absorption device to a different level.

- 2.2.1.10. Repeat 2.2.1.1 to 2.2.1.9 above a sufficient number of times to cover the range of absorbed power used.

- 2.2.1.11. Calculate the power absorbed. See section 2.2.3.

- 2.2.1.12. Plot power indicated at 80,5 km/h versus absorbed power (as shown in figure A).

- 2.2.2. The performance check consists of conducting a dynamometer coastdown at one or more inertia-horsepower settings and comparing the coastdown time to that recorded during the last calibration. If the coastdown times differ by more than 1s, a new calibration is required.

## 2.2.3. Calculations

The power actually absorbed by the dynamometer is calculated from the following equation :

$$P_a = W \frac{V_1^2 - V_2^2}{2000 t}$$

where :

$P_a$  = power (kW)

$W$  = equivalent inertia (kg)

$V_1$  = initial velocity (m/s)

$V_2$  = final velocity (m/s)

$t$  = elapsed time for rollers to coast from 88,5 to 72,4 km/h.



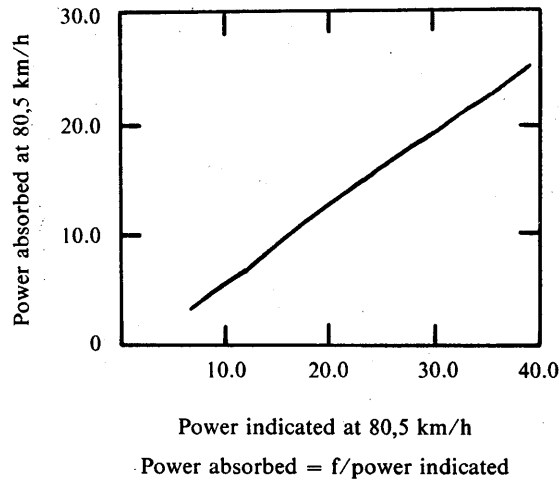


Figure A

2.3. *Idem* section 2.3 of Appendix 2 to Annex III.

2.4. Deleted.

### 3. SETTING OF THE DYNAMOMETER

#### 3.1. Vacuum method

*Idem* section 3.1 of Appendix 2 to Annex III, but replace 'at the speed of 50 km/h' by 'at the speed of 80,5 km/h'.

#### 3.2. Other setting method

*Idem* section 3.2 of Appendix 2 to Annex III, but replace 'at the speed of 50 km/h' by 'at the speed of 80,5 km/h'.

#### 3.3. Alternative method

3.3.1. The power absorption device is adjusted to reproduce power absorbed at 80,5 km/h true speed. The dynamometer power absorption must take into account the dynamometer friction.

The following method has been established for small twin-roll dynamometers having a nominal roll diameter of 220 mm and a nominal roll spacing of 432 mm and large single-roll dynamometers having a nominal roll-diameter of 1 219 mm. Dynamometers with other roll specifications may be used if approved by the technical service.

3.3.2. The dynamometer road load setting is determined from the equivalent test mass, the reference frontal area, the body shape, the vehicle protuberances and the tyre type according to the following equations.

3.3.2.1. For light-duty vehicles to be tested on a twin-roller dynamometer :

$$P_A = aA + P + tw$$

where :

$P_A$  = setting at 80,5 km/h (kW)

$A$  = the vehicle reference frontal area (m<sup>2</sup>). The vehicle reference frontal area is defined as the area of the orthogonal projection of the vehicle including tyres and suspension components, but excluding vehicle protuberances, on to a plane perpendicular to both the longitudinal plane of the vehicle and the surface upon which the vehicle is positioned. Measurements of this area are computed to the nearest hundredth of a square metre using a method approved in advance by the technical service responsible for the tests

$P$  = the protuberance power correction factor from table 1 of this section

$w$  = vehicle equivalent test mass (kg)

$a$  = 3,45 for fastback-shaped vehicles; = 4,01 for all other light-duty vehicles

$t$  = 0,0 for vehicles equipped with radial-ply tyres; =  $4,93 \times 10^{-4}$  for all other vehicles

A vehicle is considered to have a fastback shape if the rearward projection of that portion of the rear surface ( $A_2$ ) which slopes at an angle of less than 20° from the horizontal is at least 25 % as large as the vehicle reference frontal area. In addition, this surface must be smooth, continuous, and free from any local transitions greater than 4°. An example of a fastback shape is presented in Figure 1.

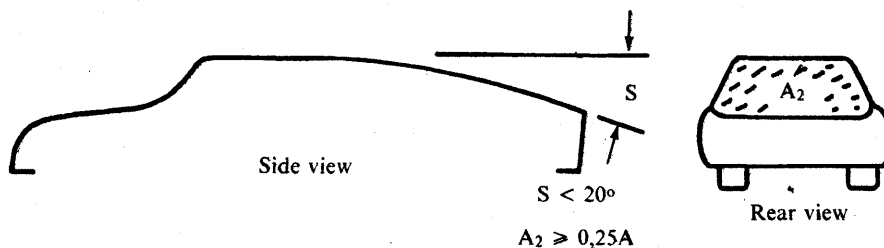


Figure 1

TABLE I

Protuberance power (P) versus total protuberance frontal area (Ap)

| Ap (m <sup>2</sup> ) | P    |
|----------------------|------|
| Ap < 0,03            | 0,0  |
| 0,03 ≤ Ap < 0,06     | 0,30 |
| 0,06 ≤ Ap < 0,08     | 0,52 |
| 0,08 ≤ Ap < 0,11     | 0,75 |
| 0,11 ≤ Ap < 0,14     | 0,97 |
| 0,14 ≤ Ap < 0,17     | 1,19 |
| 0,17 ≤ Ap < 0,19     | 1,42 |
| 0,19 ≤ Ap < 0,22     | 1,64 |
| 0,22 ≤ Ap < 0,25     | 1,87 |
| 0,25 ≤ Ap < 0,28     | 2,09 |
| 0,28 ≤ Ap            | 2,31 |

The protuberance frontal area, Ap, is defined in a manner analogous to the definition of the vehicle reference frontal area, i.e. the total area of the orthogonal projections of the vehicle mirrors, handles, roof racks, and other protuberances on to a plane perpendicular to both the longitudinal plane of the vehicle and the surface upon which the vehicle is positioned. A protuberance is defined as any fixture attached to the vehicle protruding more than 2,54 cm from the vehicle surface and having a projected area greater than 0,00093 m<sup>2</sup> with the area calculated by a method approved in advance by the technical service responsible for the tests. Included in the total protuberance frontal area are all fixtures which occur as standard equipment. The area of any optional equipment is also included if it is expected that more than 33 % of the vehicle range sold will be equipped with this option.

3.3.2.2. The dynamometer power absorber setting for light-duty vehicles is rounded off to the nearest 0,1 kW.

3.3.2.3. The equation to be used for testing light-duty vehicles on a single large-roller dynamometer is as follows :

$$P_A = aA + P + (8,22 \times 10^{-4} + 0,33 t)w$$

All symbols in the above equation are defined in section 3.3.2.1.

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*Appendix 3***RESISTANCE TO PROGRESS OF A VEHICLE —  
MEASUREMENT METHOD ON THE ROAD AND ON A CHASSIS DYNAMOMETER**

*(Idem Appendix 3 to Annex III)*

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*Appendix 4***VERIFICATION OF INERTIAS OTHER THAN MECHANICAL**

*(Idem Appendix 4 of Annex III)*

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*Appendix 5***DEFINITION OF GAS SAMPLING SYSTEMS**

*(Idem Appendix 5 of Annex III, but six bags (instead of two) are necessary on the CVS)*

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*Appendix 6***METHOD OF CALIBRATING THE EQUIPMENT**

*(Idem Appendix 6 to Annex III)*

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*Appendix 7***TOTAL SYSTEM VERIFICATION**

*(Idem Appendix 7 to Annex III)*

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## Appendix 8

## CALCULATION OF THE MASS EMISSIONS OF POLLUTANTS

The mass emissions of pollutants are calculated by the following equation :

$$M_i = 0,43 \frac{M_{icT} M_{is}}{S_{cT} + S_s} + 0,57 \frac{M_{iHT} + M_{is}}{S_{HT} + S_s}$$

where :

- $M_i$  = mass emission of the pollutant, i, in grams per kilometre
- $M_{icT}$  = mass emission of the pollutant, i, in grams, during the first phase (transient cold)
- $M_{iHT}$  = mass emission of the pollutant, i, in grams, during the last phase (transient hot)
- $M_{is}$  = mass emission of the pollutant, i, in grams, during the second phase (stabilized)
- $S_{cT}$  = distance (in km) which has been run during the first phase
- $S_{HT}$  = distance (in km) which has been run during the last phase
- $S_s$  = distance (in km) which has been run during the second phase

The mass emissions of pollutants are calculated by means of the following :

$$M_i = V_{mix} \times Q_i \times k_H \times C_i \times 10^{-6}$$

where :

- $M_i$  = mass emission of the pollutant, i, in grams, per phase
- $V_{mix}$  = volume of the diluted exhaust gas, expressed in litres, per phase 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)
- $k_H$  = humidity correction factor used for the calculation of the mass emissions of oxides of nitrogen. There is no humidity correction for HC and CO
- $C_i$  = concentration of the pollutant, i, in the diluted exhaust gas expressed in parts per million and corrected by the amount of the pollutant, i, contained in the dilution air

## ANNEX VI

The table in section 1 is replaced by the following table:

1. TECHNICAL DATA OF THE REFERENCE FUEL TO BE USED FOR TESTING VEHICLES EQUIPPED WITH POSITIVE-IGNITION ENGINES

CEC reference fuel RF-08-A-85

Type: Premium petrol, unleaded

|                           | Limits and units                     |                  | ASTM method                 |
|---------------------------|--------------------------------------|------------------|-----------------------------|
|                           | minimum                              | maximum          |                             |
| Research octane number    | 95,0                                 |                  | D 2699                      |
| Motor octane number       | 85,0                                 |                  | D 2700                      |
| Density at 15 °C          | 0,748                                | 0,762            | D 1298                      |
| Reid vapour pressure      | 0,56 bar                             | 0,64 bar         | D 323                       |
| Distillation:             |                                      |                  |                             |
| — initial boiling point   | 24 °C                                | 40 °C            | D 86                        |
| — 10 % vol point          | 42 °C                                | 58 °C            | D 86                        |
| — 50 % vol point          | 90 °C                                | 110 °C           | D 86                        |
| — 90 % vol point          | 155 °C                               | 180 °C           | D 86                        |
| — final boiling point     | 190 °C                               | 215 °C           | D 86                        |
| Residue                   |                                      | 2 %              | D 86                        |
| Hydrocarbon analysis:     |                                      |                  |                             |
| — olefins                 |                                      | 20 % vol         | D 1319                      |
| — aromatics               | (Including max. 5 % vol benzene (1)) |                  | D 1319                      |
| — saturates               |                                      | 45 % vol balance | (1) D 3606/D 2267<br>D 1319 |
| Carbon/hydrogen ratio     |                                      | ratio            |                             |
| Oxidation stability       | 480 min.                             |                  | D 525                       |
| Existent gum              |                                      | 4 mg/100 ml      | D 381                       |
| Sulphur content           |                                      | 0,04 % mass      | D 1266/D 2622/<br>D 2785    |
| Copper corrosion at 50 °C |                                      | 1                | D 130                       |
| Lead content              |                                      | 0,005 g/l        | D 3237                      |
| Phosphorus content        |                                      | 0,0013 g/l       | D 3231                      |

(1) Addition of oxygenates prohibited.

Section 2 is replaced by the following:

2. TECHNICAL DATA OF THE REFERENCE FUEL TO BE USED FOR TESTING VEHICLES EQUIPPED WITH A DIESEL ENGINE

CEC reference fuel RF-03-A-84 (1) (3) (7)

Type: Diesel fuel

|                       | Limits and units           | ASTM Method |
|-----------------------|----------------------------|-------------|
| Cetane number (4)     | min. 49<br>max. 53         | D 613       |
| Density 15 °C (kg/l)  | min. 0,835<br>max. 0,845   | D 1298      |
| Distillation (2):     |                            |             |
| — 50 % point          | min. 245 °C                | D 86        |
| — 90 % point          | min. 320 °C<br>max. 340 °C |             |
| — final boiling point | max. 370 °C                |             |
| Flash point           | min. 55 °C                 | D 93        |

|                                     | Limits and units   | ASTM Method             |
|-------------------------------------|--|-------------------------|
| CFPP                                | min. —<br>max. -5 °C                                       | EN 116 (CEN)            |
| Viscosity 40 °C                     | min. 2,5 mm <sup>2</sup> /s<br>max. 3,5 mm <sup>2</sup> /s | D 445                   |
| Sulphur content                     | min. (to be reported)<br>max. 0,3 % mass                   | D 1266/D 2622<br>D 2785 |
| Copper corrosion                    | max. 1   | D 130                   |
| Conradson carbon residue (10 % DR)  | max. 0,2 % mass  | D 189                   |
| Ash content                         | max. 0,01 % mass   | D 482                   |
| Water content                       | max. 0,05 % mass   | D 95/D 1744             |
| Neutralization (strong acid) number | max. 0,20 mg KOH/g   |                         |
| Oxidation stability (6)             | max. 2,5 mg/100 ml   | D 2274                  |
| Additives (5)                       |  |                         |

(1) Equivalent ISO methods will be adopted when issued for all properties listed above.

(2) The figures quoted show the total evaporated quantities (% recovered + % loss).

(3) The values quoted in the specification are "true values".

In establishment of their limit values the terms of ASTM D 3244, *Defining a Basis for Petroleum Product Quality Disputes*, have been applied and in fixing a maximum value, a minimum difference of 2R above zero has been taken into account; in fixing a maximum and minimum value, the minimum difference is 4R (R = reproducibility).

Notwithstanding this measure, which is necessary for statistical reasons, the manufacturer of a fuel should nevertheless aim at a zero value where the stipulated maximum value is 2R and at the mean value in the case of quotations of maximum and minimum limits.

Should it be necessary to clarify the question as to whether a fuel meets the requirements of the specification, the terms of ASTM D 3244 should be applied.

(4) The range for cetane is not in accordance with the requirement of a minimum range of 4R. However, in cases of dispute between fuel supplier and user, the terms in ASTM D 3244 can be used to resolve such disputes provided replicate measurements, of sufficient number to achieve the necessary precision, are made in preference to single determinations.

(5) This fuel should be based on straight run and cracked hydrocarbon distillate components only; desulphurization is allowed. It must not contain any metallic additives or cetane improver additives.

(6) Even though oxidation stability is controlled it is likely that shelf life will be limited. Advice should be sought from the supplier as to storage conditions and life.

(7) If it is required to calculate the thermal efficiency of an engine or vehicle, the calorific value of the fuel can be calculated from:

$$\text{Specific energy (calorific value) (net) in MJ/kg} = (46,423 - 8,792d^2 + 3,170d)(1 - (x + y + s)) + 9,420s - 2,499x$$

where:

d = the density at 15 °C

x = the proportion by mass of water (% divided by 100)

y = the proportion by mass of ash (% divided by 100)

s = the proportion by mass of sulphur (% divided by 100).

Annex VII is replaced by the following :

ANNEX VII

MODEL

Maximum size : A 4 (210 x 297 mm)

Name of administration

ANNEX TO THE EEC VEHICLE TYPE-APPROVAL CERTIFICATE WITH REGARD TO THE EMISSION OF GASEOUS POLLUTANTS FROM THE ENGINE

(Articles 4 (2) and 10 of Council Directive 70/156/EEC of 6 February 1970 on the approximation of the laws of the Member States relating to the type-approval of motor vehicles and their trailers)

In the light of the amendments made pursuant to Directive 83/351/EEC

EEC type-approval No : .....

1. Category of the vehicle type (M1, N1, etc.) : .....

2. Trademark or trade name of the vehicle : .....

3. Vehicle type : ..... Engine type : .....

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

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

6. Engine capacity (in cm³) : .....

7. Mass of vehicle in running order : .....

7.1. Reference mass of vehicle : .....

8. Technically permissible maximum mass of vehicle : .....

9. Gearbox : .....

9.1. Manual or automatic (1) (2) : .....

9.2. Number of gear ratios : .....

9.3. Transmission ratios (1) : first gear N/V : .....

second gear N/V : .....

third gear N/V : .....

fourth gear N/V : .....

fifth gear N/V : .....

Final drive ratio : .....

Tyres : dimensions : .....

dynamic rolling circumference : .....

Wheel drive : front, rear, 4 x 4 (1)

(1) Delete as inapplicable.

(2) In the case of vehicles equipped with automatic-shift gearboxes, give all pertinent technical data.

- 9.4. Check of performance referred to in section 3.1.6 of Annex III to this Directive : .....
- .....
- 10. Date vehicle submitted for approval : .....
- 11. Technical service responsible for type-approval tests : .....
- .....
- 12. Date of test report issued by that service : .....
- 13. Number of test report issued by that service : .....
- 14. EEC type-approval granted/refused (1)
- 15. Results of approval tests carried out in accordance with Annex III/Annex III A (1) :
  - Inertia equivalent mass : ..... kg
  - Absorbed power  $P_a$  : ..... kW at 50 km/h
  - Method of setting : .....
- 15.1 Test type I carried out in accordance with Annex III :
  - CO : ..... g/test                      HC : ..... g/test                      NO<sub>x</sub> : ..... g/test
- 15.2 Test type I carried out in accordance with Annex III A :
  - CO : ..... g/km                      HC : ..... g/km                      NO<sub>x</sub> : ..... g/km
- 15.3. Test type II :
  - CO : ..... % vol                      at : ..... idle rev./min
- 15.4. Test type III :
  - .....
- 16. Gas sampling system used :
  - 16.1. PDP/CVS (1)
  - 16.2. CFV/CVS (1)
  - 16.3. CFO/CVS (1)
- 17. Place : .....
- 18. Date : .....
- 19. Signature : .....
- 20. The following documents, bearing the EEC type-approval number shown above are attached to this Annex :
  - one copy of Annex II to this Directive, duly completed and with the drawings and diagrams referred to attached,
  - one photograph of the engine and its compartment,
  - .....

(1) Delete as inapplicable.