

COUNCIL DIRECTIVE**of 16 December 1980****on the approximation of the laws of the Member States relating to the fuel consumption of motor vehicles****(80/1268/EEC)**

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

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

Having regard to the proposal from the Commission ⁽¹⁾,

Having regard to the opinion of the European Parliament ⁽²⁾,

Having regard to the opinion of the Economic and Social Committee ⁽³⁾,

Whereas the technical requirements which motor vehicles must satisfy pursuant to certain national laws relate *inter alia* to the method of measuring fuel consumption which must be used to indicate the fuel consumption of a vehicle type;

Whereas those requirements differ from one Member State to another; whereas this results in technical barriers to trade which must be eliminated by all Member States adopting the same requirements either in addition to or in place of their existing rules, in order in particular to allow the EEC type-approval procedure which was the subject 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 ⁽⁴⁾, as last amended by Directive 80/1267/EEC ⁽⁵⁾, to be introduced in respect of each type of vehicle;

Whereas it is of paramount importance to establish a method of measuring fuel consumption by motor vehicles for inclusion in Community requirements;

Whereas a Community method of measuring fuel consumption is also necessary to ensure, in particular, that customers and users are supplied with objective and precise information;

Whereas the requirements of this Directive apply only to motor vehicles in international motor vehicle classification category M₁ as set out in Directive 70/156/EEC; whereas a method of measuring the fuel consumption of the other categories of motor vehicles will be established as soon as certain technical difficulties can be resolved,

HAS ADOPTED THIS DIRECTIVE:

Article 1

For the purpose of this Directive, 'vehicle' means any motor vehicle intended for use on the road, with or without bodywork, having at least four wheels and a maximum design speed exceeding 25 km/h, with the exception of vehicles which run on rails and of agricultural tractors and machinery.

Article 2

No Member State may refuse to grant EEC type-approval or national type-approval in respect of a vehicle, or refuse or prohibit the sale, registration, entry into service or use of a vehicle, on grounds relating to its fuel consumption if the consumption figures have been determined in accordance with Annexes I and II and are set out in a document given to the vehicle owner at the time of purchase in a manner and form decided on by each Member State.

Article 3

Any amendments necessary for adapting the requirements of the Annexes to take account of technical progress shall be adopted in accordance with the procedure laid down in Article 13 of Directive 70/156/EEC.

⁽¹⁾ OJ No C 104, 28. 4. 1980, p. 1.

⁽²⁾ OJ No C 265, 13. 10. 1980, p. 76.

⁽³⁾ OJ No C 182, 21. 7. 1980, p. 3.

⁽⁴⁾ OJ No L 42, 23. 2. 1970, p. 1.

⁽⁵⁾ See page 34 of this Official Journal.

Article 4

1. Member States shall bring into force the provisions necessary in order to comply with this Directive within 18 months of its notification. They shall forthwith inform the Commission thereof.

2. Member States shall ensure that the texts of the main provisions of national law which they adopt in the field covered by this Directive are communicated to the Commission.

Article 5

This Directive is addressed to the Member States.

Done at Brussels, 16 December 1980.

For the Council

The President

Colette FLESCH

ANNEX I**DETERMINATION OF FUEL CONSUMPTION**

1. **EEC TYPE-APPROVAL**
 - 1.1. **Application for EEC type-approval**
 - 1.1.1. The application for EEC type-approval for a vehicle type in respect of the fuel consumption of the engine is submitted by the vehicle manufacturer or his authorized representative
 - 1.1.2. It must be accompanied by three copies of the document mentioned below and of the following:
 - 1.1.2.1. Information sheet duly completed;
 - 1.1.2.2. Information necessary to prepare the document provided for in Annex II.
 - 1.1.3. If the technical service responsible for the type-approval tests carries out the tests itself, a vehicle representative of the vehicle type to be approved must be provided.
 - 1.2. **Documents**

Where an application within the meaning of 1.1 is accepted, the competent authority must prepare the document, the model for which is contained in Annex II. In order to draw up this document, the competent authority of the Member State conducting the EEC type-approval tests may use the report prepared by an approved or recognized laboratory in accordance with the provisions of this Directive.
2. **SCOPE**

This method applies to category M₁ vehicles equipped with internal combustion engines.
3. **GENERAL SPECIFICATIONS**
 - 3.1. Fuel consumption is determined by the following tests:
 - 3.1.1. Cycle simulating urban driving, as described in Annex III to Council Directive 70/220/EEC of 20 March 1970 on the approximation of the laws of the Member States relating to measures to be taken against air pollution by gases from positive-ignition engines of motor vehicles ⁽¹⁾, as last amended by Directive 78/665/EEC ⁽²⁾ (see section 5);
 - 3.1.2. Constant speed test at 90 km/h (see section 6);
 - 3.1.3. Constant speed test at 120 km/h (see section 6). This test is not performed if the vehicle's maximum design speed is less than 130 km/h.
 - 3.2. The results of the tests must be expressed in l/100 km rounded off to the nearest 0.1.
 - 3.3. Distances must be measured to within an accuracy of 0.5 % and times to within an accuracy of 0.2 s.

⁽¹⁾ OJ No L 76, 6. 4. 1970, p. 1.

⁽²⁾ OJ No L 223, 14. 8. 1978, p. 48.

3.4. Test fuel

The fuel used must be either the reference fuel specified in Annex VI to Directive 70/220/EEC or that specified in Annex V to Council Directive 72/306/EEC, of 2 August 1972 on the approximation of the laws of the Member States relating to the measures to be taken against the emission of pollutants from diesel for use in vehicles ⁽¹⁾, as appropriate.

4. TEST CONDITIONS**4.1. General condition of the vehicle**

4.1.1. The vehicle must be clean and the windows and air intakes closed, with only the equipment necessary for the functioning of the vehicle during the test being in operation. If there is a manually controlled device on the carburettor inlet for air heating, it must be in the 'summer' position. In general, the auxiliary equipment required for the normal running of the vehicle must be in operation.

4.1.2. If the radiator fan is temperature controlled, it must be operating as it would normally on the vehicle. The passenger compartment heating system must not be operating, nor must the air conditioning system, although its compressor must be operating normally.

4.1.3. If a pressure charging device is fitted, it must be operating as it would normally for the test speed.

4.1.4. The vehicle must have been run in and have covered at least 3 000 km before the test.

4.2. Lubricants

All lubricants must be those recommended by the manufacturer of the vehicle and must be indicated in the test report.

4.3. Tyres

The tyres must be of one of the types specified as original equipment by the vehicle manufacturer, inflated to the pressure recommended for the test load and speeds (adjusted, where necessary, for test-bed operation under test conditions). The pressures used must be indicated in the test report.

4.4. Measurement of fuel consumption

4.4.1. The fuel must be supplied to the engine through a device capable of measuring the quantity consumed to within $\pm 2\%$; this device must not interfere with normal supply. If the system of measurement is volumetric, the temperature of the fuel must be measured at the volume measuring point.

4.4.2. There must be a valve system to permit rapid change-over from the general fuel supply system to the measuring system. This change-over must not take longer than 0.2 s.

4.5. Reference conditions

Pressure: $H_0 = 1\,000$ mbar

Temperature: $T_0 = 293$ K (20 °C)

4.5.1. Air density

4.5.1.1. The air density when the vehicle is tested, calculated as described in 4.5.1.2 below, must not differ by more than 7.5 % from the air density under the reference conditions.

⁽¹⁾ OJ No L 190, 20. 8. 1972, p. 1.

- 4.5.1.2. The air density is calculated using the formula:

$$d_T = d_o \cdot \frac{H_T}{H_o} \cdot \frac{T_o}{T_T}, \text{ where}$$

- d_T = air density under test conditions;
 d_o = air density under reference conditions;
 H_T = pressure during the test;
 T_T = absolute temperature during the test (K).

5. MEASUREMENT OF FUEL CONSUMPTION OVER A CYCLE SIMULATING URBAN DRIVING

- 5.1. The test cycle is as described in Annex III to Directive 70/220/EEC

- 5.1.1. In the case of diesel-powered vehicles the load adjustment is determined for the corresponding petrol-driven model or by an alternative method recognized as equivalent

5.1.2. *Reference mass of the vehicle*

The mass of the vehicle is the reference mass, as defined in section 1.2 of Annex I to Directive 70/220/EEC

- 5.2. The dynamometer is set to the equivalent inertia, as stipulated in section 4.2 of Annex III to Directive 70/220/EEC.

5.3. Measurement of consumption

- 5.3.1. Consumption is calculated on the basis of the quantity of fuel consumed during two consecutive cycles.

- 5.3.2. Before the measurements are made, the engine must be warmed up from cold by the completion of five full test cycles. The measurements may also be carried out immediately following the type I and type II tests described in Directive 70/220/EEC. The temperature is kept within the normal operating range for that engine, if necessary by using the auxiliary cooling device.

- 5.3.3. The idling period between two consecutive cycles may be extended by not more than 60 s to facilitate fuel consumption measurement.

5.4. Calculation of fuel consumption

- 5.4.1. If the fuel consumption is measured gravimetrically, the consumption is expressed (in litres/100 km) by converting the measurement M (fuel consumed expressed in kilograms) using the following formula:

$$C = \frac{100 M}{D \cdot S_g} \text{ (l/100 km)}$$

where:

- S_g = density of the fuel under the reference conditions (kg/dm^3);
 D = distance covered during the test (km).

- 5.4.2. If the fuel consumption is measured volumetrically, the consumption is expressed (in litres/100 km) by the following formula:

$$C = \frac{V (1 + \alpha (T_o - T_F))}{D} 100 \text{ (l/100 km)}$$

where:

- V = volume in litres of fuel consumed;
 α = coefficient of volumetric expansion for the fuel. For both diesel and petrol fuel, this is 0.001 per $^{\circ}\text{C}$;
 T_o = reference temperature expressed in $^{\circ}\text{C}$;
 T_F = fuel temperature in $^{\circ}\text{C}$ measured at the volume measuring point.

5.5. **Expression of results**

5.5.1. The standard consumption in urban driving is the arithmetic mean of three consecutive measurements carried out in accordance with the procedure described above.

5.5.2. If the extreme measurements differ by more than 5 % from the mean, further tests must be carried out in accordance with this procedure until a degree of accuracy of at least 5 % is obtained.

5.5.3. The accuracy of measurement is calculated using the formula:

$$\text{Accuracy} = k \cdot \frac{S}{\sqrt{n}} \cdot \frac{100}{\bar{C}} \%$$

where:

\bar{C} is derived from the formula in 5.4;

\bar{C} is the arithmetic mean of n values of C ;

n is the number of measurements taken;

$$S = \sqrt{\frac{\sum_{i=1}^n (\bar{C} - C_i)^2}{n-1}}$$

k is given by the following table:

Number of measurements	4	5	6	7	8	9	10
k	3.2	2.8	2.6	2.5	2.4	2.3	2.3

5.5.4. If at least 5 % accuracy has not been attained after 10 measurements, the consumption is determined by using another vehicle of the same type.

6. **MEASUREMENT OF FUEL CONSUMPTION AT CONSTANT SPEED**

6.1. These tests may be carried out either on a dynamometer or on the road.

6.1.1. *Mass of the vehicle*

6.1.1.1. The mass of the vehicle is the mass in running order, as defined in 6.1.1.2, plus 180 kg, or plus half the full load if that figure exceeds 180 kg, including measuring equipment and occupants. The suspension height of the vehicle is that obtained when the centre of gravity of the load is in the middle of the straight line joining the R points of the front (side) seats.

6.1.1.2. For the purposes of this Directive, 'mass of the vehicle in running order' means its total unladen mass with all tanks except the fuel tank full, the fuel tank being filled to 90 % of the capacity specified by the manufacturer, and with a set of tools and the spare wheel on board.

6.2. **Gearbox**

If the vehicle is fitted with a manual gear change, the gear ratio used is the highest recommended by the manufacturer for driving at each of the test speeds.

6.3. **Test procedure**

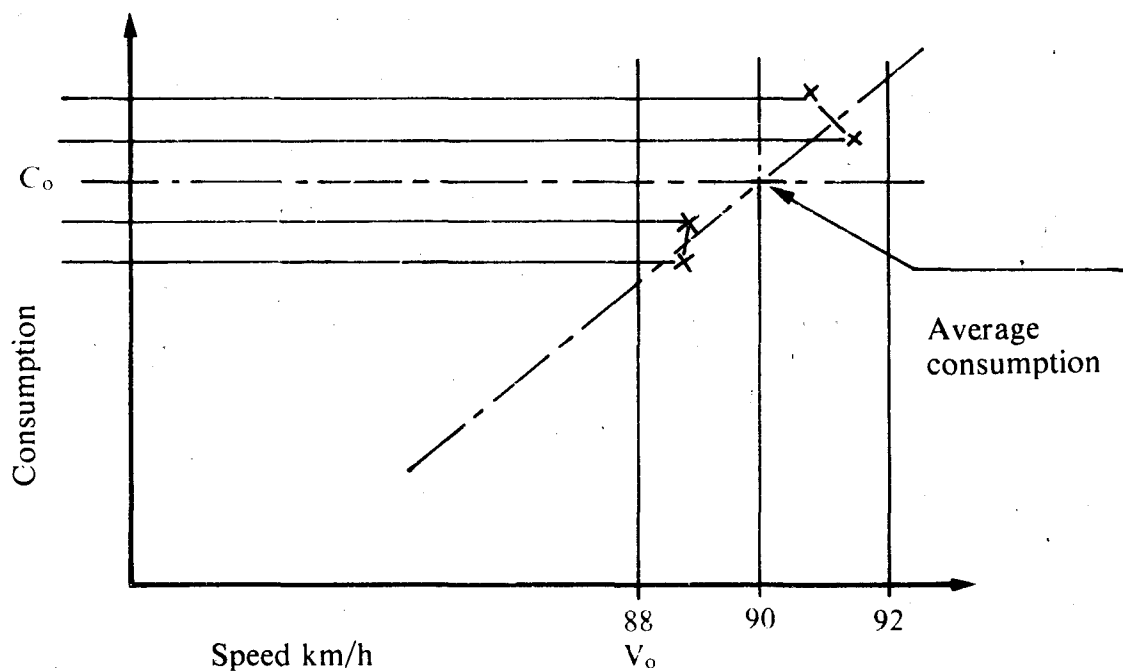
6.3.1. *Road test*

6.3.1.1. *Weather conditions*

6.3.1.1.1. The relative humidity must be less than 95 %; the road must be dry; the road surface may, however, bear traces of moisture, provided that there is no appreciable film of water at any one place.

- 6.3.1.1.2. The average wind speed must be less than 3 m/s and gusts less than 8 m/s.
- 6.3.1.2. Before the measurements are taken, the vehicle must travel on the chosen circuit, at a speed close to the test speed, a sufficient distance for the running temperature to be reached; in no case, however, must this distance be less than 10 km.
- 6.3.1.3. Test run
The test run must be such as to allow a steady speed to be maintained and must be at least 2 km in length. It must form a closed circuit and the surface must be in good condition. A straight road may be used provided that a run of 2 km is made in both directions. The gradient must not exceed 2 % between any two points.
- 6.3.1.4. During each test run, the speed must be kept steady to within ± 2 km/h. The average speed for each test must not differ from the reference speed by more than 2 km/h.
- 6.3.1.5. To determine the consumption at each reference speed (see graph below), four tests are performed; two at an average speed less than the reference speed and two at an average speed exceeding the reference speed.
- 6.3.1.6. The fuel consumption for each test run is calculated from the formulae in 5.4.
- 6.3.1.7. The difference between the two lower calculated values must not exceed 5 % of their average value, this same condition applying also to the two higher calculated values. The value of the fuel consumption at the appropriate reference speed is calculated by linear interpolation as shown on the graph below.
- 6.3.1.7.1. If the conditions in 6.3.1.7 are not achieved for either pair of calculated values, the four test runs must be repeated. If after ten attempts the required consistency has not been achieved, another vehicle must be selected and subjected to all the tests specified in this procedure.

Example: Calculation for an average speed of 90 km/h.



The four crosses correspond to the calculated values for each test run. C_0 is the value calculated for the consumption at the reference speed V_0 over the test distance.

6.3.2. *Dynamometer test*

6.3.2.1. Dynamometer setting

The dynamometer must be set as described in section 4.1 of Annex III to Directive 70/220/EEC with the following amendments:

- the dynamometer must be set for the appropriate test speed;
- the condition of the vehicle during the test runs must be as specified in sections 4.1 to 4.3, and the weather conditions during the road test must be as specified in 6.3.1.1 to enable the correct inlet manifold depression setting to be determined.

In the case of diesel-powered vehicles, the dynamometer must be set as specified in 5.1.1.

6.3.2.2. Cooling

Additional air-cooling devices may be used to keep the operating conditions and the temperature of the lubricants and coolant within the range normally obtained at the same speed on the road.

6.3.2.3. Before any measurements are taken, the vehicle must cover, at a speed close to the test speed, a sufficient distance on the dynamometer for the running temperatures to be reached; this distance must in no case be less than 10 km.

6.3.2.4. The test distance must not be less than 2 km, as measured by a revolution counter on the dynamometer.

6.4. The type of dynamometer used must be indicated in the test report.

6.5. **Expression of results**

Whatever the method of measurement used, the results must be expressed in litres/100 km under the reference conditions specified in 4.5.

ANNEX II

Name of Administration

MODEL

Annex to the EEC type-approval certificate for a vehicle type in respect of its fuel consumption

(Article 4 (2) and Article 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)

EEC type-approval No:

1. Trade name or mark of the vehicle:

2. Type and trade description of the vehicle:

3. Manufacturer's name and address:

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

5. Description of the vehicle:

5.1. Mass (in accordance with 6.1.1.2 of Annex I):

5.2. Maximum authorized mass:

5.3. Type of bodywork: Saloon, Estate, Coupé (1)

5.4. Drive wheels: front, rear, 4 x 4 (1)

5.5. Engine:

5.5.1. Cubic capacity:

5.5.2. Fuel supply system: carburettor/injection (1)

5.5.3. Fuel recommended by the manufacturer:

5.5.4. Maximum power: kW at r/min

5.5.5. Pressure charging device: yes/no (1)

5.5.6. Ignition system: diesel/conventional or electronic ignition (1)

5.6. Transmission:

5.6.1. Type of gearbox: manual/automatic (1)

5.6.2. Number of gear ratios:

(1) Delete where inapplicable.

- 5.6.3. Overall gear ratios (including the rolling circumferences of the tyres under load): Road speeds per 1 000 r/min in km/h
 - 1st gear: 4th gear:
 - 2nd gear: 5th gear:
 - 3rd gear: overdrive:
- 5.6.4. Final drive ratio:
- 5.6.5 Tyres:
 - Type: Dimensions:
 - Rolling circumference under load:
- 6. EEC type-approval No granted on the basis of Directive 70/220/EEC or 72/306/EEC ..
.....
- 7. Fuel consumption:
 - on urban cycle: 1/100 km
 - at constant 90 km/h: 1/100 km
 - at constant 120 km/h: 1/100 km.
- 8. Date vehicle submitted for EEC type-approval:
- 9. Technical service or approved or recognized laboratory which carried out the consumption tests:
- 10. Number of report:
- 11. Date of the report:
- 12. Place:
- 13. Date:
- 14. Signature: