

Council Directive of 20 March 1970 on the approximation of the laws of the Member States on measures to be taken against air pollution by emissions from motor vehicles (70/220/EEC) (repealed)

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## [<sup>F1</sup>ANNEX VII

### TYPE VI TEST

#### Textual Amendments

- F1** Inserted by [Directive 98/69/EC of the European Parliament and of the Council of 13 October 1998 relating to measures to be taken against air pollution by emissions from motor vehicles and amending Council Directive 70/220/EEC](#).

(Verifying the average low ambient temperature carbon monoxide and hydrocarbon tailpipe emissions after a cold start)

#### 1. INTRODUCTION

[<sup>F2</sup>This Annex applies only to vehicles with positive-ignition engines as defined in section 5.3.5. of Annex I.] It describes the equipment required and the procedure for the Type VI test defined in section 5.3.5 of Annex I in order to verify the emissions of carbon monoxide and hydrocarbons at low ambient temperatures. Topics addressed in this Annex include:

#### Textual Amendments

- F2** Substituted by [Directive 2001/100/EC of the European Parliament and of the Council of 7 December 2001 amending Council Directive 70/220/EEC on the approximation of the laws of the Member States on measures to be taken against air pollution by emissions from motor vehicles \(Text with EEA relevance\)](#).

1. Equipment requirements;
2. Test conditions;
3. Test procedures and data requirements.

#### 2. TEST EQUIPMENT

##### 2.1. Summary

[<sup>F2</sup>2.1.1. This chapter deals with the equipment needed for low ambient temperature exhaust emission tests on vehicles equipped with positive-ignition engines, as defined in section 5.3.5. of Annex I.] Equipment required and specifications are equivalent to the requirements for the Type I test as specified in Annex III, with appendices, if specific requirements for the Type VI test are not prescribed. Sections 2.2 to 2.6 describe deviations applicable to Type VI low ambient temperature testing.

##### 2.2. Chassis dynamometer

2.2.1. The requirements of section 4.1 of Annex III apply. The dynamometer must be adjusted to simulate the operation of a vehicle on the road at 266 °K (-7 ° C). Such adjustment may be based on a determination of the road load force profile at 266 °K (-7 ° C). Alternatively the driving resistance determined according to Appendix 3 of Annex III may be adjusted for a 10 % decrease of the coast-down time. The technical service may approve the use of other methods of determining the driving resistance.

2.2.2. For calibration of the dynamometer the provisions of Appendix 2 of Annex III apply.

##### 2.3. Sampling system

- 2.3.1. The provisions of section 4.2 of Annex III and Appendix 5 of Annex III apply. Section 2.3.2 in Appendix 5 is modified to read: ‘The piping configuration, flow capacity of the CVS, and the temperature and specific humidity of the dilution air (which may be different from the vehicle combustion air source) must be controlled so as to virtually eliminate water condensation in the system (a flow of 0,142 to 0,165 m<sup>2</sup>/s is sufficient for most vehicles).’
- 2.4. Analytical equipment
- 2.4.1. The provisions of section 4.3 of Annex III apply, but only for carbon monoxide, carbon dioxide, and hydrocarbon testing.
- 2.4.2. For calibrations of the analytical equipment the provisions of Appendix 6 of Annex III apply.
- 2.5. Gases
- 2.5.1. The provisions of section 4.5 of Annex III apply, where they are relevant.
- 2.6. Additional equipment
- 2.6.1. For equipment used for the measurement of volume, temperature, pressure and humidity the provisions in sections 4.4 and 4.6 of Annex III apply.
3. TEST SEQUENCE AND FUEL
- 3.1. General requirements
- 3.1.1. The test sequence in Figure VII.1 shows the steps encountered as the test vehicle undergoes the procedures for the Type VI test. Ambient temperature levels encountered by the test vehicle must average: 266 °K (-7 °C) ± 3 °K and must:  
not be less than 260 °K (-13 °C), no more than 272 °K (-1 °C).  
The temperature may:  
not fall below 263 °K (-10 °C), or exceed 269 °K (-4 °C)  
for more than three consecutive minutes.
- 3.1.2. The test cell temperature monitored during testing must be measured at the output of the cooling fan (section 5.2.1 of this Annex). The ambient temperature reported must be an arithmetic average of the test cell temperatures measured at constant intervals no more than one minute apart.
- 3.2. Test procedure
- The part one urban driving cycle according to Figure III.1.1 in Annex III - Appendix 1, consists of four elementary urban cycles which together makes a complete part one cycle.
- 3.2.1. Start of engine, start of the sampling and the operation of the first cycle must be in accordance with Table III.1.2 and Figure III.1.2.
- 3.3. Preparation for the test
- 3.3.1. For the test vehicle the provisions of section 3.1 of Annex III apply. For setting the equivalent inertia mass on the dynamometer the provisions of section 5.1 of Annex III apply.

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### 3.4. Test fuel

[<sup>F3</sup>3.4.1. The test fuel must comply with the specifications given in section C of Annex IX.]

#### Textual Amendments

**F3** Substituted by [Commission Directive 2002/80/EC of 3 October 2002 adapting to technical progress Council Directive 70/220/EEC relating to measures to be taken against air pollution by emissions from motor vehicles \(Text with EEA relevance\)](#).

## 4. VEHICLE PRECONDITIONING

### 4.1. Summary

4.1.1. To ensure reproducible emission tests, the test vehicles must be conditioned in a uniform manner. The conditioning consists of a preparatory drive on a chassis dynamometer followed by a soak period before the emission test according to 4.3.

### 4.2. Preconditioning

4.2.1. The fuel tank(s) must be filled with the specified test fuel. If the existing fuel in the fuel tank(s) does not meet the specifications contained in 3.4.1, the existing fuel must be drained prior to the fuel fill. The test fuel must be at a temperature less than or equal to 289 °K (+ 16 °C). For the above operations the evaporative emission control system must neither be abnormally purged nor abnormally loaded.

4.2.2. The vehicle is moved to the test cell and placed on the chassis dynamometer.

4.2.3. The preconditioning consists of the driving cycle according to Annex III — Appendix 1 Figure III.1.1, parts one and two. At the request of the manufacturer, vehicles with a positive-ignition engine may be preconditioned with one Part I and two Part II driving cycles.

4.2.4. During the preconditioning the test cell temperature must remain relatively constant and not be higher than 303 °K (30 °C).

4.2.5. The drive-wheel tyre pressure must be set in accordance with the provisions of section 5.3.2 of Annex III.

4.2.6. Within ten minutes of completion of the preconditioning, the engine must be switched off.

4.2.7. If requested by the manufacturer and approved by the technical service, additional preconditioning may in exceptional cases be allowed. The technical service may also choose to conduct additional preconditioning. The additional preconditioning consists of one or more driving schedules of the part one cycle as described in Annex III — Appendix 1. The extent of such additional preconditioning must be recorded in the test report.

### 4.3. Soak methods

4.3.1. One of the following two methods, to be selected by the manufacturer, must be utilized to stabilize the vehicle before the emission test.

4.3.2. *Standard method.* The vehicle is stored for not less than 12 hours nor for more than 36 hours prior to the low ambient temperature tailpipe emission test. The

ambient temperature (dry bulb) during this period must be maintained at an average temperature of:

266 °K (-7 °C) ± 3 °K during each hour of this period and must not be less than 260 °K (-13 °C) nor more than 272 °K (-1 °C). In addition, the temperature may not fall below 263 °K (-10 °C) nor more than 269 °K (-4 °C) for more than three consecutive minutes.

4.3.3. *Forced method.* The vehicle must be stored for not more than 36 hours prior to the low ambient temperature tailpipe emission test.

4.3.3.1. The vehicle must not be stored at ambient temperatures which exceed 303 °K (30 °C) during this period.

4.3.3.2. Vehicle cooling may be accomplished by force-cooling the vehicle to the test temperature. If cooling is augmented by fans, the fans must be placed in a vertical position so that the maximum cooling of the drive train and engine is achieved and not primarily the sump. Fans must not be placed under the vehicle.

4.3.3.3. The ambient temperature need only be stringently controlled after the vehicle has been cooled to:

266 °K (-7 °C) ± 2 °K,

as determined by a representative bulk oil temperature. A representative bulk oil temperature is the temperature of the oil measured near the middle of the oil, not at the surface or at the bottom of the oil sump. If two or more diverse locations in the oil are monitored, they must all meet the temperature requirements.

4.3.3.4. The vehicle must be stored for at least one hour after it has been cooled to 266 °K (-7 °C) ± 2 °K, prior to the low ambient temperature tailpipe emission test. The ambient temperature (dry bulb) during this period must average 266 °K (-7 °C) ± 3 °K, and must:

not be less than 260 °K (-13 °C) nor more than 272 °K (-1 °C),

In addition, the temperature may:

not fall below 263 °K (-10 °C) or exceed 269 °K (-4 °C),

for more than three consecutive minutes.

4.3.4. If the vehicle is stabilized at 266 °K (-7 °C), in a separate area and is moved through a warm area to the test cell, the vehicle must be restabilized in the test cell for at least six times the period the vehicle is exposed to warmer temperatures. The ambient temperature (dry bulb) during this period

must average 266 °K (-7 °C) ± 3 °K and must not be less than 260 °K (-13 °C) nor more than 272 °K (-1 °C).

In addition, the temperature may:

not fall below 263 °K (-10 °C) or exceed 269 °K (-4 °C), for more than three consecutive minutes.

## 5. DYNAMOMETER PROCEDURE

### 5.1. Summary

5.1.1. The emission sampling is performed over a test procedure consisting of the part one cycle (Annex III — Appendix 1 Figure III.1.1). Engine start-up, immediate sampling,

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operation over the part one cycle and engine shut-down make a complete low ambient temperature test, with a total test time of 780 seconds. The tailpipe emissions are diluted with ambient air and a continuously proportional sample is collected for analysis. The exhaust gases collected in the bag are analysed for hydrocarbons, carbon monoxide, and carbon dioxide. A parallel sample of the dilution air is similarly analysed for carbon monoxide, hydrocarbons and carbon dioxide.

## 5.2. Dynamometer operation

### 5.2.1. Cooling fan

5.2.1.1. A cooling fan is positioned so that cooling air is appropriately directed to the radiator (water cooling) or to the air intake (air-cooling) and to the vehicle.

5.2.1.2. For front-engined vehicles, the fan must be positioned in front of the vehicle, within 300 mm of it. In the case of rear-engined vehicles or if the above arrangement is impractical, the cooling fan must be positioned so that sufficient air is supplied to cool the vehicle.

5.2.1.3. The fan speed must be such that, within the operating range of 10 km/h to at least 50 km/h, the linear velocity of the air at the blower outlet is within  $\pm 5$  km/h of the corresponding roller speed. The final selection of the blower must have the following characteristics:

- area: at least 0,2 m<sup>2</sup>,
- height of the lower edge above ground: approximately 20 cm.

As an alternative the blower speed must be at least 6 m/s (21,6 km/h). At the request of the manufacturer, for special vehicles (e. g. vans, off-road) the height of the cooling fan may be modified.

5.2.1.4. The vehicle speed as measured from the dynamometer roll(s) must be used (section 4.1.4.4 of Annex III).

5.2.3. Preliminary testing cycles may be carried out if necessary, to determine how best to actuate the accelerator and brake controls so as to achieve a cycle approximating to the theoretical cycle within the prescribed limits, or to permit sampling system adjustment. Such driving must be carried out before 'START' according to Figure VII.1.

5.2.4. Humidity in the air must be kept low enough to prevent condensation on the dynamometer roll(s).

5.2.5. The dynamometer must be thoroughly warmed as recommended by the dynamometer manufacturer, and using procedures or control methods that assure stability of the residual frictional horsepower.

5.2.6. The time between dynamometer warming and the start of the emission test must be no longer than 10 minutes if the dynamometer bearings are not independently heated. If the dynamometer bearings are independently heated, the emission test must begin no longer than 20 minutes after dynamometer warming.

5.2.7. If the dynamometer horsepower must be adjusted manually, it must be set within one hour prior to the tailpipe emission test phase. The test vehicle may not be used to make the adjustment. The dynamometer, using automatic control of preselectable power settings, may be set at any time prior to the beginning of the emission test.

- 5.2.8. Before the emission test driving schedule may begin, the test cell temperature must be  $266 \text{ °K} (-7 \text{ °C}) \pm 2 \text{ °K}$ , as measured in the air stream of the cooling fan with a maximum distance of 1 m-1,5 m from the vehicle.
- 5.2.9. During operation of the vehicle the heating and defrosting devices must be shut off.
- 5.2.10. The total driving distance or roller revolutions measured are recorded.
- 5.2.11. A four-wheel drive vehicle must be tested in a two-wheel drive mode of operation. The determination of the total road force for dynamometer setting is performed while operating the vehicle in its primary designed driving mode.

### 5.3. Performing the test

- 5.3.1. The provisions of sections 6.2 to 6.6, excluding 6.2.2, of Annex III apply in respect of starting the engine, carrying out the test and taking the emission samples. The sampling begins before or at the initiation of the engine start-up procedure and ends on conclusion of the final idling period of the last elementary cycle of the part one (urban driving cycle), after 780 seconds.

The first driving cycle starts with a period of 11 seconds idling as soon as the engine has started.

- 5.3.2. For the analysis of the sampled emissions the provisions of section 7.2 of Annex III apply. In performing the exhaust sample analysis the technical service must exercise care to prevent condensation of water vapour in the exhaust gas sampling bags.
- 5.3.3. For the calculations of the mass emissions the provisions of section 8 of Annex III apply.

## 6. OTHER REQUIREMENTS

### 6.1. Irrational emission control strategy

- 6.1.1. Any irrational emission control strategy which results in a reduction in effectiveness of the emission control system under normal operating conditions at low temperature driving, so far as not covered by the standardized emission tests, may be considered a defeat device.]