

Council Directive of 26 July 1971 on the approximation of the laws of the Member States relating to the braking devices of certain categories of motor vehicles and of their trailers (71/320/EEC) (repealed)

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[^{F1}ANNEX XII

Inertia dynamometer test method for brake linings

Textual Amendments

- F1** Substituted by [Commission Directive 98/12/EC of 27 January 1998](#) adapting to technical progress [Council Directive 71/320/EEC on the approximation of the laws of the Member States relating to the braking devices of certain categories of motor vehicles and their trailers](#) (Text with EEA relevance).

1. GENERAL

- 1.1. The procedure described in this Annex may be applied in the event of a modification of vehicle-type resulting from the fitting of brake linings of another type to vehicles which have been approved in accordance with this Directive.
- 1.2. The alternative types of brake linings shall be checked by comparing their performance with that obtained from the brake linings with which the vehicle was equipped at the time of approval and conforming to the components identified in the relevant information document, a model of which is given in Annex XVIII or Annex XIX.
- 1.3. The technical authority responsible for conducting approval tests may, at its discretion, require comparison of the performance of the brake linings to be carried out in accordance with the relevant provisions contained in Annex II.
- 1.4. Application for approval by comparison shall be made by the vehicle manufacturer.
- 1.5. In the context of this Annex 'vehicle' means the vehicle-type approved according to this Directive and for which it is requested that the comparison shall be considered satisfactory.

2. TEST EQUIPMENT

- 2.1. A dynamometer having the following characteristics shall be used:
 - 2.1.1. it shall be capable of generating the inertia required by point 3.1 of this Annex, and have the capacity to meet the requirements prescribed by points 1.3, 1.4 and 1.6 of Annex II with respect to Type I, Type II and Type III fade tests;
 - 2.1.2. the test brakes fitted shall be identical with those of the original vehicle-type concerned;
 - 2.1.3. air cooling, if provided, shall be in accordance with point 3.4 of this Annex;
 - 2.1.4. the instrumentation for the test shall be capable of providing at least the following data:
 - 2.1.4.1. a continuous recording of disc or drum rotational speed;
 - 2.1.4.2. number of revolutions completed during a stop, to resolution not greater than one eighth of a revolution;
 - 2.1.4.3. stop time;
 - 2.1.4.4. a continuous recording of the temperature measured in the centre of the path swept by the lining or a mid-thickness of the disc or drum or lining;
 - 2.1.4.5. a continuous recording of brake application control line pressure or force;

2.1.4.6. a continuous recording of brake output torque.

3. TEST CONDITIONS

3.1. The dynamometer shall be set as close as possible, with $\pm 5\%$ tolerance, to the rotary inertia equivalent to that part of the total inertia of the vehicle braked by the appropriate wheel(s) according to the following formula:

$$I = MR^2$$

where:

| | | |
|---|---|--|
| I | = | rotary inertia (kgm^2) |
| R | = | dynamic tyre rolling radius(m) |
| M | = | that part of the maximum mass of the vehicle braked by the appropriate wheel(s). |

In the case of a single-ended dynamometer, this part shall be calculated from the design braking distribution in the case of motor vehicles when deceleration corresponds to the appropriate value given in point 2.1.1.1.1 of Annex II; in the case of trailers, the value of M shall correspond to the load on the ground for the appropriate wheel when the vehicle is stationary and loaded to its maximum mass.

3.2. The initial rotational speed of the inertia dynamometer shall correspond to the linear speed of the vehicle as prescribed in Annex II and shall be based on the rolling radius of the tyre;

3.3. Brake linings shall be at least 80 % bedded and shall not have exceeded a temperature of 180 °C during the bedding procedure, or alternatively, at the vehicle manufacturer's request, be bedded in accordance with his recommendations.

3.4. Cooling air may be used, flowing over the brake in a direction perpendicular to its axis of rotation. The velocity of the cooling air flowing over the brake shall not be greater than 10 km/h. The temperature of the cooling air shall be the ambient temperature.

4. TEST PROCEDURE

4.1. Five sample sets of the brake lining shall be subjected to the comparison test. They shall be compared with five sets of linings conforming to the original components identified in the information document concerning the first approval of the vehicle-type concerned.

4.2. Brake lining equivalence shall be based on a comparison of the results achieved using the test procedures prescribed in this Annex and in accordance with the following requirements:

4.3. *Type 0 cold performance test*

4.3.1. Three brake applications shall be made when the initial temperature is below 100 °C. The temperature shall be measured in accordance with the provisions of point 2.1.4.4.

4.3.2. In the case of brake linings intended for use on vehicles of categories M and N, brake applications shall be made from an initial rotational speed equivalent to that given in point 2.1.1.1.1 of Annex II and the brake shall be applied to achieve a mean torque equivalent to the mean fully developed deceleration prescribed in that item. In addition, tests shall be carried out at several rotational speeds, the lowest

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being equivalent to 30 % of the maximum speed of the vehicle and the highest being equivalent to 80 % of that speed.

- 4.3.3. In the case of brake linings intended for use on vehicles of category O, brake applications shall be made from an initial rotational speed equivalent to 60 km/h, and the brake shall be applied to achieve a mean torque equivalent to that prescribed in point 2.2.1 of Annex II. A supplementary cold performance test from an initial rotational speed equivalent to 40 km/h shall be carried out for comparison with the Type I test result as described in point 2.2.1.2.1 of Annex II.
- 4.3.4. The mean braking torque during the above cold performance tests on the linings being tested for the purpose of comparison shall, for the same input measurement, be within the test limits ± 15 % of the mean braking torque recorded with the brake linings conforming to the component identified in the relevant application for vehicle type approval.
- 4.4. *Type I test*
- 4.4.1. *With repeated braking*
- 4.4.1.1. Brake linings for vehicles of categories M and N shall be tested according to the procedure given in point 1.3.1 of Annex II.
- 4.4.2. *With continuous braking*
- 4.4.2.1. Brake linings for trailers of category O shall be tested in accordance with point 1.3.2 of Annex II.
- 4.4.3. *Hot performance*
- 4.4.3.1. On completion of the tests required under points 4.4.1 and 4.4.2 above, the hot braking performance test specified in point 1.3.3 of Annex II shall be carried out.
- 4.4.3.2. The mean braking torque during the above hot performance tests on the linings being tested for the purpose of comparison shall, for the same input measurement, be within the test limits ± 15 % of the mean braking torque recorded with the brake linings conforming to the component identified in the relevant application for vehicle type approval.
- 4.5. *Type II test*
- 4.5.1. This test shall be required only if, on the vehicle-type in question, the friction brakes are used for the Type II test.
- 4.5.2. Brake linings for motor vehicles of category M₃ and N₃ (except those required under point 2.2.1.19 of Annex I to undergo a Type IIA test), shall be tested according to the procedure set out in point 1.4.1 of Annex II. Trailers of category O₄ shall be tested according to the procedure set out in point 1.6. of Annex II
- 4.5.3. *Hot performance*
- 4.5.3.1. On completion of the test required under point 4.5.2 above, the hot performance test specified in point 1.4.3 of Annex II shall be carried out.
- 4.5.3.2. The mean braking torque during the above hot performance tests on the linings being tested for the purpose of comparison shall, for the same input measurement, be within the test limits ± 15 % of the mean braking torque recorded with the brake linings

conforming to the component identified in the relevant application for vehicle type approval.

4.6. *Fade test (Type III test)*

4.6.1. *Test with repeated braking*

4.6.1.1. Brake linings for trailers of category O₄, shall be tested according to the procedure given in point 1.6 of Annex II to this Directive.

4.6.3. *Hot performance*

4.6.3.1. On completion of the tests required under points 4.6.1 and 4.6.2 of this Annex, the hot-braking performance test specified in point 1.6.2 of Annex II to this Directive shall be completed.

4.6.3.2. The mean braking torque during the above hot performance test on the linings being tested for the purpose of comparison shall, for the same input measurement, be within the test limits $\pm 15\%$ of the mean braking torque recorded with the brake linings conforming to the component identified in the relevant application for vehicle type approval.

5. INSPECTION OF BRAKE LININGS

5.1. Brake linings shall be visually inspected on completion of the tests outlined above to check that they are in satisfactory condition for continued use in normal service.]