

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States relating to the braking devices of certain categories of motor vehicles and of their trailers (71/320/EEC) (repealed)

[^{F1}ANNEX XV

EC type-approval of replacement brake lining assemblies as separate technical units

Textual Amendments

- F1** Inserted 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. SCOPE

- 1.1 This Annex applies to the type-approval as separate technical units within the meaning of Article 2 of Directive 70/156/EEC, of brake lining assemblies to be installed on motor vehicles and trailers of categories $M_1 \leq 3,5$ tonnes, $M_2 \leq 3,5$ tonnes, N_1 , O_1 and O_2 as replacement parts.
- 1.2 Approvals are only mandatory for those replacement brake lining assemblies intended to be fitted to such motor vehicles and trailers which were approved pursuant to Directive 71/320/EEC as amended by this Directive.

2. DEFINITIONS

For the purpose of this Annex,

- 2.1. 'braking equipment' has the meaning assigned in point 1.2 of Annex 1 to this Directive;
- 2.2. 'friction brake' means the part of the braking equipment in which the forces opposing the movement of a vehicle develop by friction between a brake lining and a wheel disc or drum moving relatively to each other;
- 2.3. 'brake lining assembly' means a component of a friction brake which is pressed against a drum or disc, respectively, to produce the friction force;
- 2.3.1. 'shoe assembly' means a brake lining assembly of a drum brake;
- 2.3.1.1. 'shoe' means a component of a shoe assembly which carries the brake lining;
- 2.3.2. 'pad assembly' means a brake lining assembly of a disc brake;
- 2.3.2.1. 'backplate' means a component of a pad assembly which carries the brake lining;
- 2.3.3. 'brake lining' means the friction material component of a brake lining assembly;
- 2.3.4. 'friction material' means the product of a specified mixture of materials and processes which together determine the characteristics of a brake lining;
- 2.4. 'brake lining type' means a category of brake linings which do not differ in friction material characteristics;
- 2.5. 'brake lining assembly type' means wheel sets of brake lining assemblies which do not differ in brake lining type, dimension or functional characteristics;
- 2.6. 'original brake lining' means a brake lining type referenced in the vehicle type-approval certificate, Annex IX, Addendum to Appendix 1, point 1.2 and subpoints;

- 2.7. 'original brake lining assembly' means a brake lining assembly conforming to the data submitted in a vehicle information document;
- 2.8. 'replacement brake lining assembly' means a brake lining assembly of a type approved under this Directive as a suitable service replacement for an original brake lining assembly;
- 2.9. 'manufacturer' means the organisation which can assume technical responsibility for the brake lining assemblies and can demonstrate that it possesses the necessary means to achieve conformity of production.

3. APPLICATION FOR EC TYPE-APPROVAL

- 3.1. An application for EC type-approval pursuant to Article 3(4) of Directive 0/156/EEC of a replacement brake lining assembly type for (a) specific vehicle type(s) shall be submitted by the manufacturer of the replacement brake lining assembly.
- 3.2. An application may be submitted by the holder of (a) vehicle type-approval(s) to this Directive in respect of replacement brake lining assemblies conforming to the type referenced in the vehicle type-approval certificate, Annex IX, Addendum to Appendix 1, point 1.2 and subpoints.
- 3.3. A model for the information document is given in Annex XVII.
- 3.4. The following must be submitted to the technical service responsible for the type-approval tests:
- 3.4.1 Brake lining assemblies of the type for which approval is sought in sufficient quantity to perform the approval tests. The samples shall be clearly and indelibly marked with the applicant's trade name or mark and the type designation.
- 3.4.2 The suitable representative vehicle(s) and/or brake(s).

4. GRANTING OF EC TYPE-APPROVAL

- 4.1. If the relevant requirements are satisfied, EC Type-Approval pursuant to Article 4(3) and, if applicable, Article 4(4) of Directive 70/156/EEC shall be granted.
- 4.2. A model for the EC type-approval certificate is given in Annex XVI.
- 4.3. An approval number in accordance with Annex VII to Directive 70/156/EEC shall be assigned to each type of replacement brake lining assembly approved. The same Member State shall not assign the same number to another brake lining assembly type. The same type-approval number may cover the use of that brake lining assembly type on a number of differing vehicle types.

4.4. MARKING

- 4.4.1. Every replacement brake lining conforming to the type approved under this Directive as a separate technical unit shall bear an EC type-approval mark.
- 4.4.2. This mark shall consist of a rectangle surrounding the letter 'e' followed by the distinguishing number or letters of the Member State which has granted the type-approval:

- 1 for Germany
2 for France
3 for Italy

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4	for the Netherlands
5	for Sweden
6	for Belgium
[^{F2} 7	for Hungary
8	for the Czech Republic]
9	for Spain
11	for the United Kingdom
12	for Austria
13	for Luxembourg
17	for Finland
18	for Denmark
[^{F3} 19	for Romania]
[^{F2} 20	for Poland]
21	for Portugal
23	for Greece
[^{F4} 25	for Croatia]
[^{F2} 26	for Slovenia
27	for Slovakia
29	for Estonia
32	for Latvia
[^{F3} 34	for Bulgaria]
36	for Lithuania
CY	for Cyprus]
IRL	for Ireland[^{F5} .]
[^{F2} MT	for Malta.]

Textual Amendments

- F2** Inserted by Act concerning the conditions of accession of the Czech Republic, the Republic of Estonia, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Republic of Hungary, the Republic of Malta, the Republic of Poland, the Republic of Slovenia and the Slovak Republic and the adjustments to the Treaties on which the European Union is founded.
- F3** Inserted by Council Directive 2006/96/EC of 20 November 2006 adapting certain Directives in the field of free movement of goods, by reason of the accession of Bulgaria and Romania.
- F4** Inserted by Council Directive 2013/15/EU of 13 May 2013 adapting certain directives in the field of free movement of goods, by reason of the accession of the Republic of Croatia.
- F5** Deleted by Act concerning the conditions of accession of the Czech Republic, the Republic of Estonia, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Republic of Hungary, the Republic of Malta, the Republic of Poland, the Republic of Slovenia and the Slovak Republic and the adjustments to the Treaties on which the European Union is founded.

It must also include in the vicinity of the rectangle the ‘base approval number’ contained in section 4 of the type-approval number referred to in Annex VII of Directive 70/156/EEC, preceded by the two figures indicating the sequence number assigned to the most recent major technical amendment to Directive 71/320/EEC on the date EC type-approval was granted. In this Directive the sequence number is 01. The additional three digits arranged in the vicinity of the rectangle shall be used to designate the shoe or backplate.

- 4.4.3. The approval mark referred to in point 4.4.2 above shall be clearly legible and be indelible.

4.4.4. Appendix 1 to this Annex gives examples of arrangements of the approval mark and approval data referred to above and in point 6.5 below.

5. SPECIFICATIONS AND TESTS

5.1. *General*

A replacement brake lining assembly shall be so designed and constructed that when substituted for the assembly originally fitted to a vehicle the braking efficiency of that vehicle accords with that of the approved vehicle type in compliance with the provisions of Annex II to this Directive.

Specifically:

- (a) a vehicle equipped with replacement brake lining assemblies shall satisfy the relevant braking requirements of this Directive;
- (b) a replacement brake lining assembly shall display performance characteristics similar to that of the original brake lining assembly it is intended to replace;
- (c) a replacement brake lining assembly must possess adequate mechanical characteristics;

5.2. Replacement brake lining assemblies conforming to the type specified in vehicle type-approval documentation to this Directive are deemed to satisfy the requirements of paragraph 5 of this Annex.

5.3. *Performance requirements*

5.3.1. Replacement brake lining assemblies for vehicles of categories M₁, M₂ and N₁

Replacement brake lining assemblies shall be tested according to the prescriptions of Appendix 2 and must satisfy the requirements stated in this appendix. For speed sensitivity and cold performance equivalence one of the two methods describes in Appendix 2 shall be used.

5.3.2. Replacement brake lining assemblies for vehicles of categories O₁ and O₂

Replacement brake lining assemblies shall be tested according to the prescriptions of Appendix 3 and shall satisfy the requirements stated in Appendix 3 and Appendix 4 of this Annex.

5.4. *Mechanical characteristics*

5.4.1. Replacement brake lining assemblies of the type for which approval is requested shall be tested for shear strength according to ISO 6312: (1981) standard.

The minimum acceptable shear strength is 250 N/cm² for pad assemblies and 100 N/cm² for shoe assemblies.

5.4.2. Replacement brake lining assemblies of the type for which approval is requested shall be tested for compressibility according to ISO 6310: (1981) standard.

The compressibility values shall not exceed 2 % at ambient temperature and 5 % at 400 °C for pad assemblies and 2 % at ambient temperature and 4 % at 200 °C for shoe assemblies.

6. PACKAGING AND MARKING

6.1. [F⁶Replacement brake lining assemblies conforming to a type approved in accordance with this Directive shall be packaged in axle sets.]

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Textual Amendments

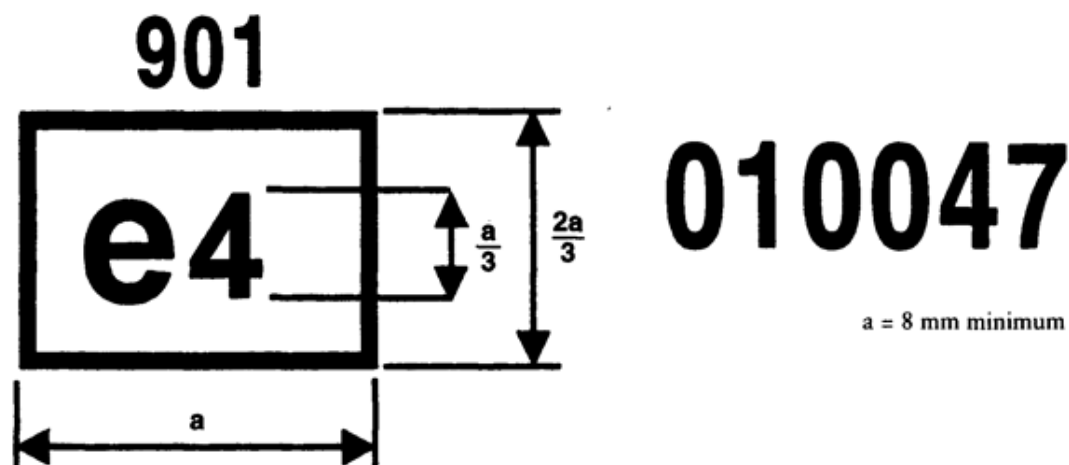
F6 Substituted by [Commission Directive 2002/78/EC](#) of 1 October 2002 adapting to technical progress [Council Directive 71/320/EEC](#) on the approximation of the laws of the Member States relating to the braking devices of certain categories of motor vehicles and their trailers.

- 6.2. Each axle set shall be contained in a sealed package constructed to show previous opening.
- 6.3. Each package shall display the following information:
 - 6.3.1. the quantity of replacement brake lining assemblies in the package;
 - 6.3.2. manufacturer's name or trade mark;
 - 6.3.3. make and type of replacement brake-lining assemblies;
 - 6.3.4. [^{F6}sufficient for the customer to identify the vehicles/axles/brakes for which the contents are approved;]
 - 6.3.5. the approval mark.
- 6.4. Each package shall contain fitting instructions:
 - 6.4.1. with particular reference to ancillary parts;
 - 6.4.2. stating that replacement brake lining assemblies should be replaced in axle sets.
- 6.5. Each replacement brake lining assembly shall display permanently one set of approval data:
 - 6.5.1. the approval mark;
 - 6.5.2. the date of manufacture, at least month and year;
 - 6.5.3. make and type of brake lining.
- 7. MODIFICATIONS OF THE TYPE AND AMENDMENTS TO APPROVALS
 - 7.1. In the case of modifications of the type approved pursuant to this Directive, the provisions of Article 5 of Directive 70/156/EEC shall apply.
- 8. CONFORMITY OF PRODUCTION
 - 8.1. As a general rule measures to ensure the conformity of production shall be taken pursuant to Article 10 of 70/156/EEC.
 - 8.2. Original brake lining assemblies being the subject of an application under point 3.2. are deemed to satisfy the requirements of point 8.
 - 8.3. The tests referred to in point 2.3.5 of Annex 10 to 70/156/EEC are those prescribed in point 5.4. and in Appendix 4 to this Annex.
 - 8.4. The normal frequency of inspections authorised by the competent authority shall be one per year.

Appendix 1

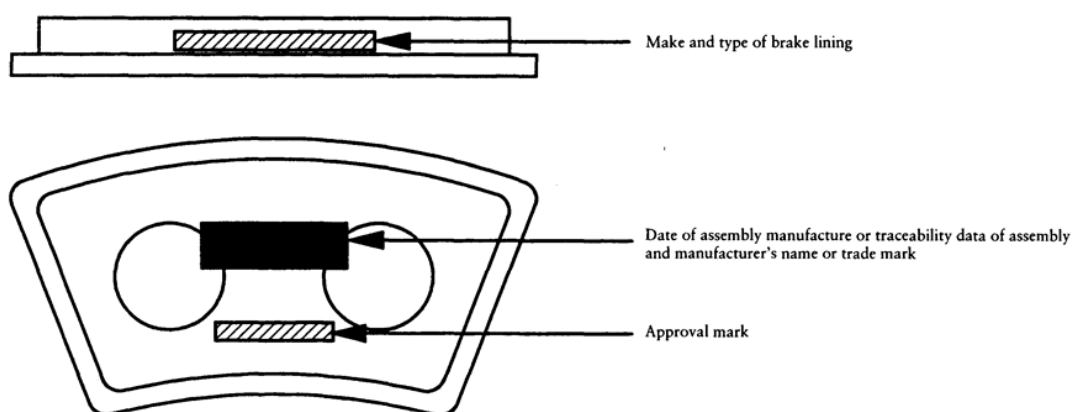
Arrangements of the approval mark and approval data

(see point 4.4 and 6.5 of this Annex)



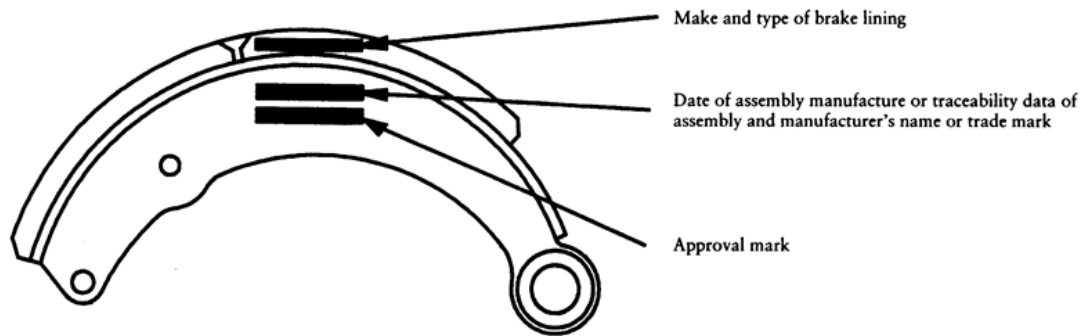
The above approval mark shows that the item concerned has been approved in the Netherlands (e 4), pursuant to this Directive. In this illustration the first two digits (01) refer to the sequence number assigned to the most recent technical amendments made to Council Directive 71/320/EEC; the following four digits (0047) are those allocated by the approval authority to the brake lining type as the base approval number, and the additional three digits (901) arranged in the vicinity of the rectangle are those allocated by the approval authority to the shoe or backplate. All nine digits together comprise the approval mark for that replacement brake lining assembly type.

Example of pad assembly marking



Example of the shoe assembly marking

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Note:

Positions of any these markings shown in the examples above are not mandatory

Appendix 2

Requirements for replacement brake lining assemblies for vehicles of categories M₁, M₂ and N₁

1. CONFORMANCE WITH THIS DIRECTIVE

Compliance with the requirements of this Directive shall be demonstrated in a vehicle test.

1.1. *Test vehicle*

A vehicle which is representative of the type(s) for which the replacement brake lining assembly approval is required shall be equipped with the replacement brake lining assemblies of the type for which approval is requested and instrumented for brake testing as required by the Directive.

Brake linings assemblies submitted for test shall be fitted to the relevant brakes and, until a fixed burnishing procedure is established, shall be burnished to the manufacturer's instructions in agreement with the technical service.

1.2. The braking system of the vehicle shall be tested according to the requirements for the vehicle category in question (M₁, M₂ or N₁) in Annex II, points 1 and 2. The applicable requirements or tests are:

1.2.1. *Service braking system*

1.2.1.1. Type 0 test with engine disconnected, vehicle laden

1.2.1.2. Type 0 test with engine connected, vehicle unladen and laden, according to Annex II, points 1.2.3.1 (stability test) and 1.2.3.2 (only the test with initial speed $v = 0,8 v_{\max}$)

1.2.1.3. Type I test

1.2.2. *Secondary braking system*

1.2.2.1. Type 0 test with engine disconnected, vehicle laden (this test may be omitted in cases where it is obvious that the requirements are met, e. g. diagonal split braking system)

1.2.3. *Parking braking system*

(Only applicable if the brakes for which lining approval is sought are used for parking).

1.2.3.1. Downhill test at 18 % gradient, vehicle laden.

1.3. The vehicle must satisfy all the relevant requirements stated in Annex II, point 2 for that category of vehicles.

2. ADDITIONAL REQUIREMENTS

Compliance with the additional requirements shall be demonstrated by using one of the two following methods:

2.1. *Vehicle test (split axle test)*

For this test the vehicle shall be fully laden and all brake applications made with engine disconnected, on a level road.

The vehicle service brake control system shall be equipped with a means of isolating front and rear axle brakes so that either may be used independently of the other.

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Where brake lining assembly approval is required for front axle brakes the rear axle brakes shall remain inoperative throughout the test.

Where brake lining assembly approval is required for rear axle brakes the front axle brakes shall remain inoperative throughout the test.

2.1.1. *Cold performance equivalence test*

A comparison of the cold performance of the replacement brake lining assembly and the original brake lining assembly shall be made by comparing the results of testing to the following method:

- 2.1.1.1. Make a minimum of six brake applications at spaced increments of pedal effort or line pressure up to wheel lock or, alternatively, up to a mean fully developed deceleration of 6 m/s^2 or up to the allowed maximum pedal force for the category of vehicle in question from an initial speed as given in the table below:

Vehicle category	Test speed in km/h	
	front axle	rear axle
M ₁	70	45
M ₂	50	40
N ₁	65	50

The initial brake temperature at the start of each application shall be $\leq 100 \text{ }^\circ\text{C}$.

- 2.1.1.2. Note and plot pedal force or line pressure and mean fully developed deceleration for each application, and determine the pedal force or line pressure required to achieve (if possible) a mean fully developed deceleration of 5 m/s^2 for front axle brakes and 3 m/s^2 for rear axle brakes. If these values cannot be achieved with the maximum allowed pedal force determine alternatively the pedal force or line pressure required to achieve maximum deceleration.

- 2.1.1.3. The replacement brake lining assembly shall be considered to show similar performance characteristics to the original brake lining assembly if the achieved mean fully developed decelerations at the same control force or line pressure in the upper two thirds of the generated curve are within 15 % of these obtained with the original brake lining assembly.

2.1.2. *Speed sensitivity test*

- 2.1.2.1. Using the pedal force derived from item 2.1.1.2 of this Appendix and with initial brake temperature $\leq 100 \text{ }^\circ\text{C}$, make three brake applications from each of the following speeds:

Front axle 65 km/h, 100 km/h and 135 km/h where v_{max} exceeds 150 km/h.

Rear axle 45 km/h, 65 km/h and 90 km/h where v_{max} exceeds 150 km/h.

- 2.1.2.2. Average the results for each group of three applications and plot speed against corresponding mean fully developed deceleration.

- 2.1.2.3. Mean fully developed decelerations recorded for the higher speeds shall lie within 15 % of those recorded for the lowest speed.

2.2. *Inertia dynamometer test*

2.2.1. *Test equipment*

For the tests an inertia dynamometer shall be equipped with the vehicle brake in question. The dynamometer shall be instrumented for continuous recording of rotational speed, brake torque, pressure in the brake line, number of rotations after brake application, braking time and brake rotor temperature.

2.2.2. Test conditions

2.2.2.1. The rotational mass of the dynamometer shall correspond to half the axle portion of the maximum vehicle mass as listed in the table below and to the rolling radius of the largest tyre that is authorised for that vehicle type(s).

Vehicle category	Axle portion of maximum vehicle mass	
	front	rear
M ₁	0,77	0,32
M ₂	0,69	0,44
N ₁	0,66	0,39

2.2.2.2. The initial dynamometer rotational speed shall correspond to the linear vehicle speed as stated in points 2.2.3 and 2.2.4 of this Appendix and shall be based on the dynamic rolling radius of the tyre.

2.2.2.3. Brake linings submitted for test shall be fitted to the relevant brakes and, until a fixed burnishing procedure is established, shall be burnished to the manufacturer's instructions in agreement with the technical service.

2.2.2.4. If cooling air is used, the speed of the airflow at the brake must not be higher than 10 km/h.

2.2.3. Cold performance equivalence test

A comparison of the cold performance of the replacement brake lining assembly and the original brake lining assembly shall be made by comparing the results of testing to the following method.

2.2.3.1. From the initial speed of 80 km/h for M₁ and N₁ and 60 km/h for M₂ and with brake temperature ≤ 100 °C at the start of each application make a minimum of six brake applications at spaced intervals of line pressure up to a mean fully developed deceleration of 6 m/s².

2.2.3.2. Note and plot line pressure and mean fully developed deceleration for each application, and determine line pressure required to achieve 5 m/s².

2.2.3.3. The replacement brake lining assembly shall be considered to show similar performance characteristics to the original brake lining assembly if the achieved mean fully developed decelerations at the same control force or line pressure in the upper two thirds of the generated curve are within 15 % of those obtained with original brake lining assembly.

2.2.4. Speed sensitivity test

2.2.4.1. Using the line pressure derived from point 2.2.3.2. and with initial brake temperature ≤ 100 °C make three brake applications from rotational speeds corresponding to vehicle linear speeds of:

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75 km/h, 120 km/h and 160 km/h where v_{\max} exceeds 150 km/h

- 2.2.4.2. Average the results for each group of three applications and plot speed against corresponding mean fully developed deceleration.
- 2.2.4.3. Mean fully developed decelerations recorded for the higher speeds shall lie within 15 % of that recorded for the lowest speed.

Appendix 3

Requirements for replacement brake lining assemblies for vehicles of categories O₁ and O₂

1. GENERAL

The test method described in this Appendix is based on an inertia dynamometer test. Alternatively the tests may be carried out on a test vehicle or on a rolling road test bench provided that the same test conditions are achieved and the same parameters measured as in the inertia dynamometer test.

2. TEST EQUIPMENT

For the tests an inertia dynamometer shall be equipped with the vehicle brake in question. The dynamometer shall be instrumented for continuous recording of rotational speed, brake torque, pressure in the brake line or actuation force, number of rotations after brake application, braking time and brake rotor temperature.

2.1. *Test conditions*

2.1.1. The rotational mass of the dynamometer shall correspond to half the relevant axle portion of the maximum vehicle mass and the rolling radius of the largest tyre that is authorised for that vehicle type(s).

2.1.2. The initial dynamometer rotational speed shall correspond to the linear vehicle speed as stated in point 3.1. of this Appendix and shall be based on the dynamic rolling radius of the smallest tyre that is authorised for that vehicle(s).

2.1.3. Brake lining assemblies submitted for the test shall be fitted to the relevant brake and, until a fixed burnishing procedure is established, shall be burnished to the manufacturer's instruction in agreement with the technical service.

2.1.4. If cooling air is used the speed of the airflow at the brake must not be higher than 10 km/h.

2.1.5. The actuation device fitted to the brake must correspond to the vehicle installation.

3. TESTS AND REQUIREMENTS

3.1. *Test 0 test*

From the initial speed of 60 km/h with a brake temperature ≤ 100 °C at the start of each application make a minimum of six consecutive brake applications at spaced intervals of line pressure or application force up to the maximum line pressure or up to 6 m/s^2 deceleration. Repeat the last brake application using an initial speed of 40 km/h.

3.2. *Type I test*

3.2.1. *Heating procedure*

The brake shall be heated with continuous braking according to the requirement of Annex II, point 1.3.2. starting with a brake rotor temperature ≤ 100 °C.

3.2.2. *Hot performance*

On completion of the heating procedure the hot performance from an initial speed of 40 km/h shall be measured under the conditions of point 3.1 above using the same line pressure or

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application force (the temperature conditions may be different). The mean fully developed deceleration with the heated brake must not be less than 60 % of the value achieved with the cold brake or 3,5 m/s².

3.3. *Cold performance equivalence test*

A comparison of the cold performance of the replacement brake lining assembly and the original brake lining assembly shall be made by comparing the results of the Type 0 test as described in point 3.1.

- 3.3.1. The Type 0 test as prescribed in point 3.1. shall be performed with one set of the original brake lining assembly.
- 3.3.2. The replacement brake lining assembly shall be considered to show similar performance characteristics to the original brake lining assembly if the achieved mean fully developed decelerations at the same line pressure or application force in the upper two thirds of the generated curve within 15 % of those obtained with the original brake lining assembly.

Appendix 4

Determination of friction behaviour by machine testing

1. INTRODUCTION

- 1.1. Samples of a replacement brake lining assembly type shall be tested on a machine capable of generating the test conditions and applying the test procedures described in this Appendix.
- 1.2. Test results shall be evaluated to determine sample friction behaviour.
- 1.3. The friction behaviour of samples shall be compared to assess conformity with the standard registered for a replacement brake lining assembly type.

2. EQUIPMENT

- 2.1. The machine shall be designed to accept and operate a full size brake similar to those fitted to the vehicle axle used for approval testing to point 5 of this Annex.
- 2.2. The disc or drum rotational speed shall be $660 \pm 10 \text{ min}^{-1}$ without load and shall not fall below 600 min^{-1} on full load.
- 2.3. The test cycles and brake applications during the cycles shall be adjustable and automatic.
- 2.4. Output torque or brake pressure (constant torque method) and working surface temperature shall be recorded.
- 2.5. Provisions shall be made to direct cooling air across the brake at a rate of $600 \pm 60 \text{ m}^3/\text{h}$.

3. TEST PROCEDURE

3.1. *Sample preparation*

The manufacturer's bedding schedule shall ensure a minimum of 80 % surface contact area for pad assemblies without exceeding a surface temperature of 300 °C and 70 % surface contact area for the leading shoe assemblies without exceeding a surface temperature of 200 °C.

3.2. *Test schedule*

The test schedule comprises a number of consecutive braking cycles each containing χ braking intervals of 5 seconds brake applied followed by 10 seconds brake released.

The following two methods may be used alternatively:

3.2.1. Test schedule with constant pressure

3.2.1.1. Pad assemblies

The hydraulic pressure p under the piston(s) of the calliper shall be constant following the formula:

$$p = M_d 0,57 \times r_w \times A_k$$

$$M_d = 150 \text{ Nm for } A_k \leq 18,1 \text{ cm}^2$$

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M_d = 300 Nm for $A_k > 18,1 \text{ cm}^2$
 A_k = area of calliper piston(s)
 r_w = effective radius of disc

No of cycle	Number of brake applications χ	Initial brake rotor temperature(°C) y	Maximum brake rotor temperature(°C)	Forced cooling
1	1×10	≤ 60	open	no
2-6	5×10	100	open (350)	no
7	1×10	100	open	yes

3.2.1.2 Shoe assemblies

The mean contact pressure at the brake lining working surface shall be constant at $22 \pm 6 \text{ N/cm}^2$ calculated for a static brake without self-energising.

No of cycle	Number of brake applications χ	Initial brake rotor temperature(°C)	Maximum brake rotor temperature(°C)	Forced cooling
1	1×10	≤ 60	200	yes
2	1×10	100	open	no
3	1×10	100	200	yes
4	1×10	100	open	no

3.2.2. Test schedule with constant torque

This method applies only for pad assemblies. The brake torque shall be constant within a tolerance of $\pm 5 \%$ and adjusted to guarantee the maximum brake rotor temperatures given in the table below.

No of cycle	Number of brake applications χ	Initial brake rotor temperature(°C) y	Maximum brake rotor temperature(°C)	Forced cooling
1	1×5	≤ 60	300-350	no
2-4	3×5	100	300-350	no
5	1×10	100	500-600	no
6-9	4×5	100	300-350	no
10	1×10	100	500-600	no
11-13	3×5	100	300-350	no
14	1×5	≤ 60	300-350	no

3.3. Evaluation of test results

Friction behaviour is determined from the brake torque noted at selected points in a test schedule. Where brake factor is constant, e.g. a disc brake, brake torque may be translated to coefficient of friction.

3.3.1. Pad assemblies

3.3.1.1. The operational coefficient of friction (μ_{op}) is the mean of the values recorded during cycles two to seven (constant pressure method) or during cycles 2-4, 6-9 and 11-13 (constant torque method); measurement being made one second after commencing the first brake application of each cycle.

3.3.1.2. The maximum coefficient of friction (μ_{max}) is the lowest value recorded during all cycles.

3.3.1.3. The minimum coefficient of friction (μ_{min}) is the lowest value recorded during all cycles.

3.3.2. Shoe assemblies

3.3.2.1. The mean torque (M_{mean}) is the average of the maximum and minimum values of brake torque recorded during the fifth brake application of cycles one and three.

3.3.2.2. The hot torque (M_{hot}) is the minimum brake torque developed during cycles two and four. If the temperature exceeds 300 °C during these cycles the value at 300 °C is to be taken as M_{hot} .

3.4. Acceptance criteria

3.4.1. With each application for approval of a brake lining assembly type there shall be submitted:

3.4.1.1. for pad assemblies, values for (μ_{op}), (μ_{min}) en (μ_{max})

3.4.1.2. for shoe assemblies, values for M_{mean} and M_{hot} .

3.4.2. During production of an approved brake lining assembly type, test samples must demonstrate compliance with the values registered under point 3.4.1. of this Appendix with the following tolerances:

3.4.2.1. for disc brake pads:

$\mu_{op} \pm 15\%$ of registered value

$\mu_{min} \geq$ registered value

$\mu_{max} \leq$ registered value

3.4.2.2. for simplex drum brake linings:

$M_{mean} \pm 20\%$ of registered value

$M_{hot} \geq$ registered value.]