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Working Party on Brakes and Running Gear

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Item 3(f) of the provisional agenda

REGULATIONS Nos. 13 AND 13-H (Braking)

Clarifications

Proposal for draft amendments to Regulation No. 13
(Braking)

Submitted by the expert from Germany **

The text reproduced below was prepared by the expert from Germany to define certain requirements more precisely to avoid different interpretations by the industry, technical services and approval authorities. It is based on informal document No. GRRF-63-08, distributed at the sixty-third session of the Working Party on Brakes and Running Gear (GRRF) (see report ECE/TRANS/WP.29/GRRF/63, para. 13). The modifications to the existing text of the Regulation are marked in **bold** characters.

* Reissued for technical reasons.

** In accordance with the programme of work of the Inland Transport Committee for 2006-2010 (ECE/TRANS/166/Add.1, programme activity 02.4), the World Forum will develop, harmonize and update Regulations in order to enhance performance of vehicles. The present document is submitted in conformity with that mandate.

A. PROPOSAL

Add new paragraphs 2.35. and 2.36., to read:

"2.35. "Subject trailer" is a trailer representative of the trailer type for which type approval is sought.

2.36. The "brake factor (B_F)" is the input to output amplification ratio of the brake."

Add a new paragraph 12.1.8., to read:

"12.1.8. As from the official date of entry into force of the [12] series of amendments, no Contracting Party applying this Regulation shall refuse to grant approval under this Regulation as amended by the [12] series of amendments."

Add a new paragraph 12.2.5., to read:

"12.2.5. As from 48 months after the date of entry into force of the [12] series of amendments, Contracting Parties applying this Regulation shall grant approvals only if the vehicle type to be approved meets the requirements of this Regulation as amended by the [12] series of amendments."

Add a new paragraph 12.3.2., to read:

"12.3.2. Starting 84 months after the entry into force of the [12] series of amendments to this Regulation, Contracting Parties applying this Regulation may refuse first national registration (first entry into service) of a vehicle which does not meet the requirements of the [12] series of amendments to this Regulation."

Annex 11

Paragraph 2., amend to read:

"2. The term "identical", as used in paragraphs 1.1., 1.2. and 1.3. above, means identical as regards the geometric and mechanical characteristics and the materials used for the components of the vehicle referred to in those paragraphs.

In the case of trailers, these requirements are deemed to be fulfilled, with respect to paragraphs 1.1. and 1.2. above, if the identifiers referred to in Appendix 2, paragraph 3.7. of this annex for the axle / brake of the subject trailer are contained in a report for a reference axle / brake.

A "reference axle / brake" is an axle / brake for which a test report mentioned in Appendix 2, paragraph 3.9. of this annex exists."

Annex 11 - Appendix 1

Table I, amend to read (including footnote 1/):

"

	Axles of the vehicle			Reference axles		
	Static mass (P) 1/	Braking force needed at wheels	Speed	Test mass (P _e) 1/	Braking force developed at wheels	Speed
	kg	N	km/h	kg	N	km/h
Axle 1						
Axle 2						
Axle 3						
Axle 4						

1/ See paragraph 2.1. of Appendix 2 to this annex"

Table III, third row, amend to read (including the deletion of footnote 2/):

"

REFERENCE AXLE	REPORT NO.	Date
(copy attached)		
	Type-I	Type-III
Energy absorbed per axle (N) (see paragraph 4.2.1., Appendix 2)		
Axle 1	$T_1 = \dots \% F_e$	$T_1 = \dots \% F_e$
Axle 2	$T_2 = \dots \% F_e$	$T_2 = \dots \% F_e$
Axle 3	$T_3 = \dots \% F_e$	$T_3 = \dots \% F_e$
...

"

Annex 11 – Appendix 2

Insert a new paragraph 1.2.2., to read:

"1.2.2. Tests carried out in accordance with this appendix prior to the [12] series of amendments which, together with any supporting data from the vehicle/axle/brake manufacturer, provide sufficient information to meet the requirements of the [12] series of amendments can be used for a new report or the extension of an existing test report without the need to carry-out actual tests."

Paragraph 1.4.1., amend to read:

"1.4.1. In the case of air shall be adjusted to:
 $s_0 \geq 1.1 \cdot s_{re-adjust}$ (the upper limit by the manufacturer),"

Paragraph 2., amend to read:

"2. SYMBOLS AND DEFINITIONS

2.1. Symbols

P = part of the vehicle mass borne by the axle under static conditions
F = normal reaction of road surface on the axle under static conditions = $P \cdot g$
F_R = total normal static reaction of road surface on all wheels of trailer
F_e = test axle load
P_e = F_e / g
g = acceleration due to gravity: $g = 9.81 \text{ m/s}^2$
C = brake input torque
C₀ = brake input threshold torque, definition see paragraph 2.2.2.
C_{0,dec} = declared brake input threshold torque
C_{max} = declared maximum brake input torque
R = tyre rolling radius (dynamic)
T = brake force at tyre/road interface
T_R = total brake force at tyre/road interface of the trailer
M = brake torque = $T \cdot R$
z = braking rate = T/F or $M/(R \cdot F)$
s = actuator stroke (working stroke plus free stroke)
s_p = see Annex 19, Appendix 7
Th_A = see Annex 19, Appendix 7
l = lever length
r = internal radius of brake drums or effective radius of brake discs
p = brake actuation pressure

Note: Symbols with the suffix "e" relate to the parameters associated with the reference brake test and may be added to other symbols as appropriate.

2.2. Definitions

2.2.1. Mass of a disc or drum

2.2.1.1. The "**declared mass**" is the mass declared by the manufacturer which is a representative mass for the brake identifier (see paragraph 3.7.2.2. of this appendix).

2.2.1.2. The "**nominal test mass**" is the mass which the manufacturer specifies for the disc or drum with which the relevant test is carried out by the Technical Service.

- 2.2.1.3. The "actual test mass" is the mass measured by the Technical Service prior to the test.
- 2.2.2. "Brake input threshold torque":
- 2.2.2.1. The brake input threshold torque " C_0 " is the input torque necessary to produce a measurable brake torque. This torque may be determined by extrapolation of measurements within a range not exceeding 15 percent braking rate or other equivalent methods (e.g. Annex 10, paragraph 1.3.1.1.).
- 2.2.2.2. The brake input threshold torque " $C_{0,dec}$ " is the brake input threshold torque declared by the manufacturer which is a representative brake input threshold torque for the brake (see paragraph 3.7.2.2.1. of this appendix) and is needed to produce diagram 2 of Annex 19.
- 2.2.2.3. The brake input threshold torque " $C_{0,e}$ " is determined by the procedure as defined in paragraph 2.2.2.1. above, measured by the Technical Service at the end of the test.
- 2.2.3. "External diameter of a disc":
- 2.2.3.1. The "declared external diameter" is the external diameter of a disc declared by the manufacturer which is a representative external diameter for the disc (see paragraph 3.7.2.2.1. of this appendix).
- 2.2.3.2. The "nominal external diameter" is the external diameter which the manufacturer specifies for the disc on which the relevant test is carried out by the Technical Service.
- 2.2.3.3. The "actual external diameter" is the external diameter measured by the Technical Service prior to the test.
- 2.2.4. The "effective length of the cam shaft" is the distance from the centre line of the S-cam to the centre line of the operating lever."

Paragraph 3.4., amend to read:

"3.4. Test conditions (**general**)"

Paragraphs 3.7. to 3.7.3., should be deleted.

Insert new paragraphs 3.7. to 3.9.4., to read:

"3.7. **Identification**

- 3.7.1. The axle shall carry in a visible position at least the following identification information grouped together, in any order, in a legible and indelible manner:**
- a) Axle manufacturer and/or make**
 - b) Axle identifier (see paragraph 3.7.2.1. of this appendix)**
 - c) Brake identifier (see paragraph 3.7.2.2. of this appendix)**
 - d) F_c identifier (see paragraph 3.7.2.3. of this appendix)**
 - e) Base part of test report number (see paragraph 3.9. of this appendix).**

An example is given below:

Axle Manufacturer and/or make ABC
ID1-XXXXXX
ID2-YYYYYY
ID3-11200
ID4-ZZZZZZZ

- 3.7.1.1. A non-integrated automatic brake adjustment device shall carry in a visible position at least the following identification information grouped together, in a legible and indelible manner:**
- a) Manufacturer and/or make**
 - b) Type**
 - c) Version**

- 3.7.1.2. The make and type of each brake lining shall be visible when the lining/pad is mounted on the brake shoe / back plate in a legible and indelible manner.**

3.7.2. Identifiers

3.7.2.1. Axle identifier

The axle identifier categorizes an axle in terms of its braking force/torque capability as stated by the axle manufacturer.

The axle identifier shall be an alphanumeric number consisting of the four characters "ID1-" followed by a maximum of 20 characters.

3.7.2.2. Brake identifier

The brake identifier shall be an alphanumeric number consisting of the four characters "ID2-" followed by a maximum of 20 characters.

A brake with the same identifier is a brake which does not differ with regard to the following criteria:

- (a) Type of brake (e.g. drum (S-cam, wedge, etc.) or disc brake (fixed, floating, single or twin disc, etc.))**
- (b) Base material (e. g. ferrous or non ferrous) with respect to calliper housing, brake carrier, brake disc and brake drum**

- (c) Dimensions with the suffix "e" according to figures 2A and 2B of Appendix 5 of this annex
- (d) The basic method used within the brake to generate the braking force
- (e) In the case of disc brakes, the friction ring mounting method: fixed or floating
- (f) Brake factor B_F
- (g) Different brake characteristics with respect to the requirements of Annex 11 which are not covered by subparagraph 3.7.2.2.1.

3.7.2.2.1. Differences allowed within the same brake identifier

The same brake identifier may include different brake characteristics with regard to the following criteria:

- (a) Increase in maximum declared brake input torque C_{max}
- (b) Deviation of declared brake disc and brake drum mass m_{dec} : ± 20 per cent
- (c) Method of attachment of the lining / pad on the brake shoe / back plate
- (d) In the case of disc brakes, increase of maximum stroke capability of the brake
- (e) Effective length of the cam shaft
- (f) Declared threshold torque $C_{0,dec}$
- (g) ± 5 mm from the declared external diameter of the disc
- (h) Type of cooling of the disc (ventilated/non-ventilated)
- (i) Hub (with or without integrated hub)
- (j) Disc with integrated drum – with or without parking brake function
- (k) Geometric relationship between disc friction surfaces and disc mounting
- (l) Brake lining type
- (m) Material variations (excluding changes in base material, see paragraph 3.7.2.2.) for which the manufacturer confirms that such a material variation does not change the performance with respect to the required tests
- (n) Back plate and shoes

3.7.2.3. F_e identifier

The F_e identifier indicates the test axle load. It shall be an alphanumeric number consisting of the four characters "ID3-" followed by the F_e value in daN, without the "daN" unit identifier.

3.7.2.4. Test report identifier

The test report identifier shall be an alphanumeric number consisting of the four characters "ID4-" followed by the base part of the test report number.

3.7.3. Automatic brake adjustment device (integrated and non-integrated)

3.7.3.1. Types of automatic brake adjustment device

The same type of automatic brake adjustment device does not differ with regard to the following criteria:

- (a) Body: base material (e. g. ferrous or non ferrous, cast iron or forged steel)
- (b) Maximal permitted brake shaft moment
- (c) Adjustment operating principle, e.g. stroke (travel) dependent, force dependent or electronic/mechanical

3.7.3.2. Versions of automatic brake adjustment device, with respect to the adjustment behaviour

Automatic brake adjustment devices within a type that have an impact on the running clearance of the brake are considered to be different versions.

3.8. Test criteria

The testing shall demonstrate compliance with all the requirements laid down in Appendix 2 of this annex.

In the case that a new test report, or a test report extension, is required for a modified axle/brake within the limits specified in paragraph 3.7.2.2.1. the following criteria are used to determine the necessity for further testing taking into account worst case configurations agreed with the Technical Service.

Abbreviations shown below are used in the subsequent table:	
CT (complete test)	<u>Test according to Annex 11, Appendix 2:</u> 3.5.1.: Supplementary cold performance test 3.5.2.: Fade test (Type-I test) */ 3.5.3.: Fade test (Type-III test) */ <u>Test according to Annex 19:</u> 4.: Cold performance characteristics for trailer brakes*
FT (fade test)	<u>Test according to Annex 11, Appendix 2:</u> 3.5.1.: Supplementary cold performance test 3.5.2.: Fade test (Type-I test) */ 3.5.3.: Fade test (Type-III test) */

*/ if applicable

Differences according to paragraph 3.7.2.2.1. above	Test criteria
(a) Increase in maximum declared brake input torque C_{max}	Change allowed without additional testing
(b) Deviation of declared brake disc and brake drum mass m_{dec} : ± 20 per cent	CT: The lightest variant shall be tested if the nominal test mass for a new variant deviates less than 5 per cent from a previously tested variant with a higher nominal value then the test of the lighter version may be dispensed with. The actual test mass of the test specimen may vary ± 5 per cent from the nominal test mass.
(c) Method of attachment of the lining / pad on the brake shoe / back plate	The worst case specified by the manufacturer and agreed by the Technical Services conducting the test
(d) In the case of disc brakes, increase of maximum stroke capability of the brake	Change allowed without additional testing
(e) Effective length of the cam shaft	The worst case is considered to be the lowest cam shaft torsional stiffness and shall be verified by either: (i) FT or (ii) Change allowed without additional testing if by calculation the influence with respect to stroke and braking force can be shown. In this case the test report shall indicate the following extrapolated values: $s_e, C_e, T_e, T_e/F_e$
(f) Declared threshold torque $C_{0,dec}$	It shall be checked that the brake performance remains within the corridors of Diagram 2 of Annex 19.
(g) ± 5 mm from the declared external diameter of the disc	The worst case test is considered the smallest diameter The actual external diameter of the test specimen may vary ± 1 mm from the nominal external diameter specified by the axle manufacturer.
(h) Type of cooling of the disc (ventilated/non-ventilated)	Each type shall be tested
(i) Hub (with or without integrated hub)	Each type shall be tested
(j) Disc with integrated drum – with or without parking brake function	Testing is not required for this feature
(k) Geometric relationship between disc friction surfaces and disc mounting	Testing is not required for this feature
(l) Brake lining type	Each type of brake lining

Differences according to paragraph 3.7.2.2.1. above	Test criteria
(m) Material variations (excluding changes in base material, see paragraph 3.7.2.2.) for which the manufacturer confirms that such a material variation does not change the performance with respect to the required tests	Test not required for this condition
(n) Back plate and shoes	Worst case test conditions */: Back plate: minimum thickness Shoe: lightest brake shoe

***/ No test is required if the manufacturer can demonstrate that a change does not effect the stiffness**

3.8.1. If an automatic brake adjustment device deviates from a tested one according to paragraphs 3.7.3.1. and 3.7.3.2. an additional test according to paragraph 3.6.2. of this appendix is necessary.

3.9. Test report

3.9.1. Test report number

The test report number consists of two parts: a base part and a suffix which identifies the issue level of the test report.

The base part, consisting of a maximum of 20 characters, and suffix shall be clearly separated from each other using e.g. a dot or slash.

The base part of the test report number shall only cover brakes with the same brake identifier and the same brake factor (according to paragraph 4. of Annex 19 to this Regulation).

3.9.2. Test code

In addition to the test report number a "test code" consisting of up to eight characters (e.g. ABC123) shall indicate the test results applicable to the identifiers and the test specimen, which is described by the details given in paragraph 3.7. above.

3.9.3. Test results

3.9.3.1. The result of tests carried out in accordance with paragraphs 3.5. and 3.6.1. of this appendix shall be reported on a form, a model of which is shown in Appendix 3 to this annex.

3.9.3.2. In the case of a brake installed with an alternative brake adjustment device the results of tests carried out in accordance with paragraph 3.6.2. of this appendix shall be reported on a form, a model of which is shown in Appendix 4 to this annex.

3.9.4. Information document

An information document, provided by the axle or vehicle manufacturer, containing at least the information defined in Appendix 5 to this annex shall be part of the Test Report.

The information document shall identify, if applicable, the various variants of the brake/axle equipment with respect to the essential criteria listed in paragraph 3.7.2.2.1. above."

Paragraph 4.1., amend to read:

"4.1. Verification of components

The brake specification of the vehicle to be type approved shall **comply with the requirements laid down in paragraphs 3.7. and 3.8. above"**

Paragraphs 4.1.1. to 4.1.7., should be deleted.

Paragraph 4.3.1.4., the formula, amend to read:

$$T = (T_e - 0.01 \cdot F_e) \frac{C - C_o}{C_e - C_{oe}} \cdot \frac{R_e}{R} + 0.01 \cdot F$$

Paragraph 4.3.2., the formula, amend to read:

$$\frac{T_R}{F_R} = \frac{\Sigma T}{\Sigma F}$$

Annex 11 – Appendix 3, amend to read (including the deletion of figures 1A, 1B, 2A and 2B):

"Annex 11 – Appendix 3

**MODEL TEST REPORT FORM AS PRESCRIBED IN PARAGRAPH 3.9.
OF APPENDIX 2 TO THIS ANNEX**

TEST REPORT No.

Base part: ID4-

Suffix:

1. General

- 1.1. Axle manufacturer (name and address):**
- 1.1.1. Make of axle manufacturer:**.....
- 1.2. Brake manufacturer (name and address):**
- 1.2.1. Brake identifier ID2-:**
- 1.2.2. Automatic brake adjustment device: integrated/non-integrated 1/**
- 1.3. Manufacturer's Information Document:**

2. Test Record

The following data has to be recorded for each test:

- 2.1. Test code (see paragraph 3.9.2. of Appendix 2 of this annex):**
- 2.2. Test specimen: (precise identification of the variant tested related to the Manufacturer's Information Document. See also paragraph 3.9.2. of Appendix 2 of this annex)**
 - 2.2.1. Axle**
 - 2.2.1.1. Axle identifier: ID1-**
 - 2.2.1.2. Identification of tested axle:**
 - 2.2.1.3. Test axle load (Fe identifier): ID3- daN**
 - 2.2.2. Brake**
 - 2.2.2.1. Brake identifier: ID2-**
 - 2.2.2.2. Identification of tested brake:**
 - 2.2.2.3. Maximum stroke capability of the brake 2/:**
 - 2.2.2.4. Effective length of the cam shaft 3/:**
 - 2.2.2.5. Material variation as per paragraph 3.8 (m) of Appendix 2 of this annex:**
 - 2.2.2.6. Brake drum / disc 1/**
 - 2.2.2.6.1. Actual test mass of disc / drum 1/:**
 - 2.2.2.6.2. Nominal external diameter of disc 2/:**
 - 2.2.2.6.3. Type of cooling of the disc ventilated/non-ventilated 1/**
 - 2.2.2.6.4. With or without integrated hub 1/**
 - 2.2.2.6.5. Disc with integrated drum – with or without parking brake function 1/ 2/**
 - 2.2.2.6.6. Geometric relationship between disc friction surfaces and disc mounting:**
 - 2.2.2.6.7. Base material:**
 - 2.2.2.7. Brake lining or pad 1/**
 - 2.2.2.7.1. Manufacturer:**
 - 2.2.2.7.2. Make:.....**
 - 2.2.2.7.3. Type:.....**
 - 2.2.2.7.4. Method of attachment of the lining / pad on the brake shoe / back plate 1/:**
 - 2.2.2.7.5. Thickness of back plate, weight of shoes or other describing information (Manufacturer's Information Document) 1/:**
 - 2.2.2.7.6. Base material of brake shoe / back plate 1/:**

- 2.2.3. Automatic brake adjustment device (not applicable in the case of integrated automatic brake adjustment device) 1/
- 2.2.3.1. Manufacturer (name and address):
- 2.2.3.2. Make:.....
- 2.2.3.3. Type:.....
- 2.2.3.4. Version:

- 2.2.4. Wheel(s) (dimensions see Figures 1A and 1B in Appendix 5 of this annex)
- 2.2.4.1. Reference tyre rolling radius (R_e) at test axle load (F_e):
- 2.2.4.2. Data of the fitted wheel during testing:

Tyre size	Rim size	X_e (mm)	D_e (mm)	E_e (mm)	G_e (mm)
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- 2.2.5. Lever length l_e :
- 2.2.6. Brake actuator
- 2.2.6.1. Manufacturer:
- 2.2.6.2. Make:
- 2.2.6.3. Type:
- 2.2.6.4. (Test) Identification number:

2.3. Test results (corrected to take account of rolling resistance of $0.01 \cdot F_e$)

2.3.1. In the case of vehicles of categories O_2 and O_3

Test type:		0	I	
Annex 11, Appendix 2, paragraph:		3.5.1.2.	3.5.2.2./3.	3.5.2.4.
Test speed	km/h	40	40	40
Brake actuator pressure p_e	kPa	-	-	-
Braking time	min	-	2.55	-
Brake force developed T_e	daN	-	-	-
Brake efficiency T_e/F_e	-	-	-	-
Actuator stroke s_e	mm	-	-	-
Brake input torque C_e	Nm	-	-	-
Brake input threshold torque $C_{0,e}$		-	-	-

2.3.2. In the case of vehicles of category O_4

Test type:		0	III	
Annex 11, Appendix 2, para.:		3.5.1.2.	3.5.3.1.	3.5.3.2.
Test speed initial	km/h	60	-	60
Test speed final	km/h	-	-	-
Brake actuator pressure p_e	kPa	-	-	-
Number of brake applications	-	-	20	-
Duration of braking cycle	s	-	60	-
Brake force developed T_e	daN	-	-	-
Brake efficiency T_e/F_e	-	-	-	-
Actuator stroke s_e	mm	-	-	-
Brake input torque C_e	Nm	-	-	-
Brake input threshold torque $C_{0,e}$		-	-	-

2.3.3. This item is to be completed only when the brake has been subject to the test procedure defined in paragraph 4. of Annex 19 to this Regulation to verify the cold performance characteristics of the brake by means of the brake factor (BF).

2.3.3.1. Brake factor BF:

2.3.3.2. Declared threshold torque $C_{0,dec}$ Nm

2.3.4. Performance of the automatic brake adjustment device (if applicable)

2.3.4.1. Free running according to para. 3.6.3. of Annex 11, Appendix 2: yes / no 1/

3. Application range

The application range specifies the axle/brake variants that are covered in this test report, by showing which variables are covered by the individual test codes.

4. This test has been carried out and the results reported in accordance with Appendix 2 to Annex 11 and where appropriate paragraph 4. of Annex 19 to Regulation No. 13 as last amended by the series of amendments

At the end of the test defined in paragraph 3.6. of Annex 11, Appendix 2, 4/ the requirements of paragraph 5.2.2.8.1. of Regulation No. 13 were deemed to be fulfilled / not fulfilled 1/

Technical Service 5/ carrying out the test

Signed: Date:

5. Approval Authority 5/

Signed: Date:

1/ Strike out what does not apply.

2/ Applies to disc brakes only.

3/ Applies to drum brakes only.

4/ Only to be completed when an automatic brake wear adjustment device is installed.

5/ To be signed by different persons even when the Technical Service and Approval Authority are the same or alternatively, a separate Approval Authority authorization is issued with the report."

Annex 11 – Appendix 4, item 1.1., replace "Technically permissible axle load (P_e)" by "Test axle load (F_e identifier): ID3-"

Add a new Appendix 5 to Annex 11, to read:

"Annex 11 – Appendix 5

**TRAILER AXLE AND BRAKE INFORMATION DOCUMENT WITH RESPECT
TO THE ALTERNATIVE TYPE I AND TYPE III PROCEDURE**

1. GENERAL

1.1. Name and address of axle or vehicle manufacturer:

2. AXLE DATA

2.1. Manufacturer (name and address):

2.2. Type/variant:

2.3. Axle identifier: ID1-.....

2.4. Test axle load (F_e): daN

2.5. Wheel and brake data according to the following figures 1A and 1B

FIGURE 1A

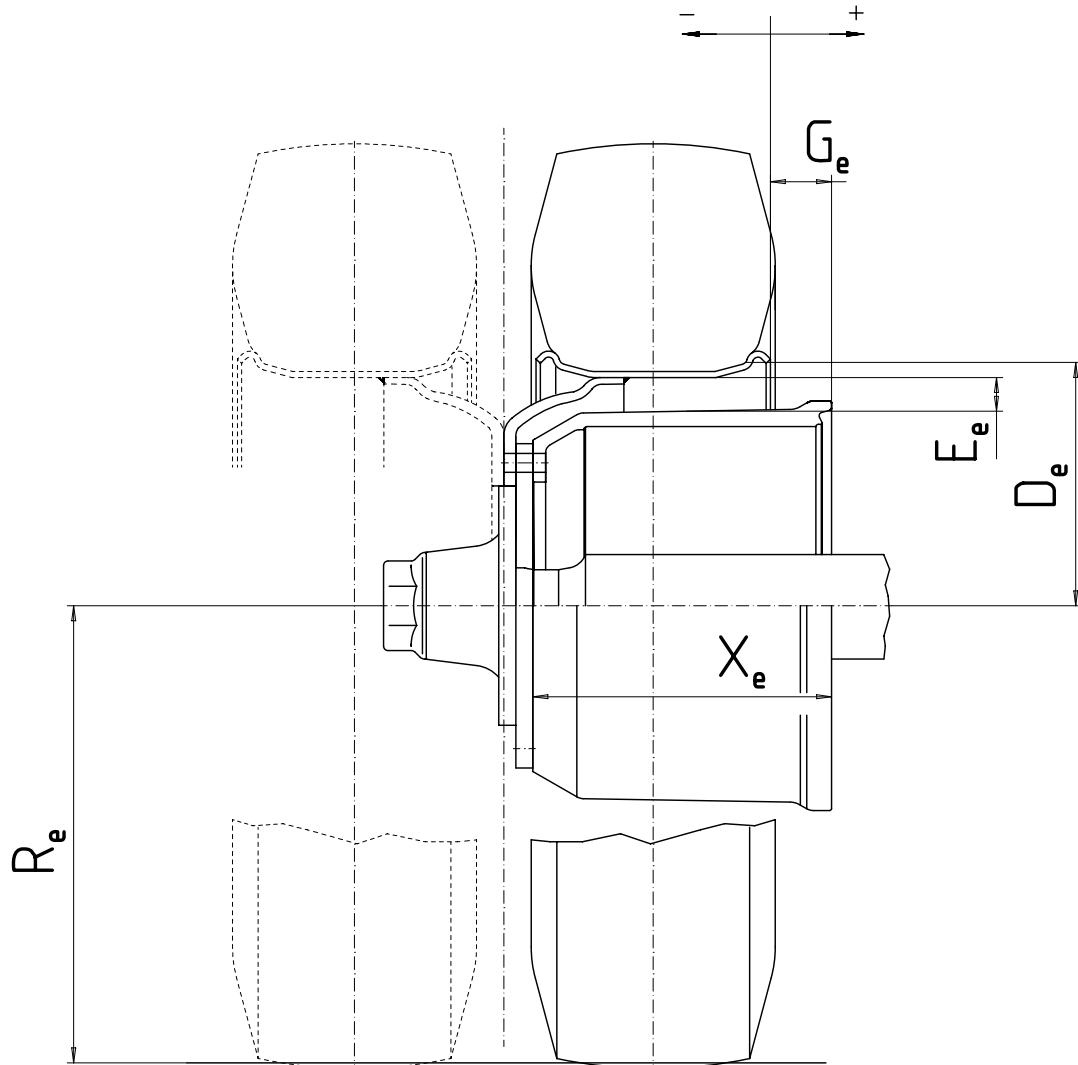
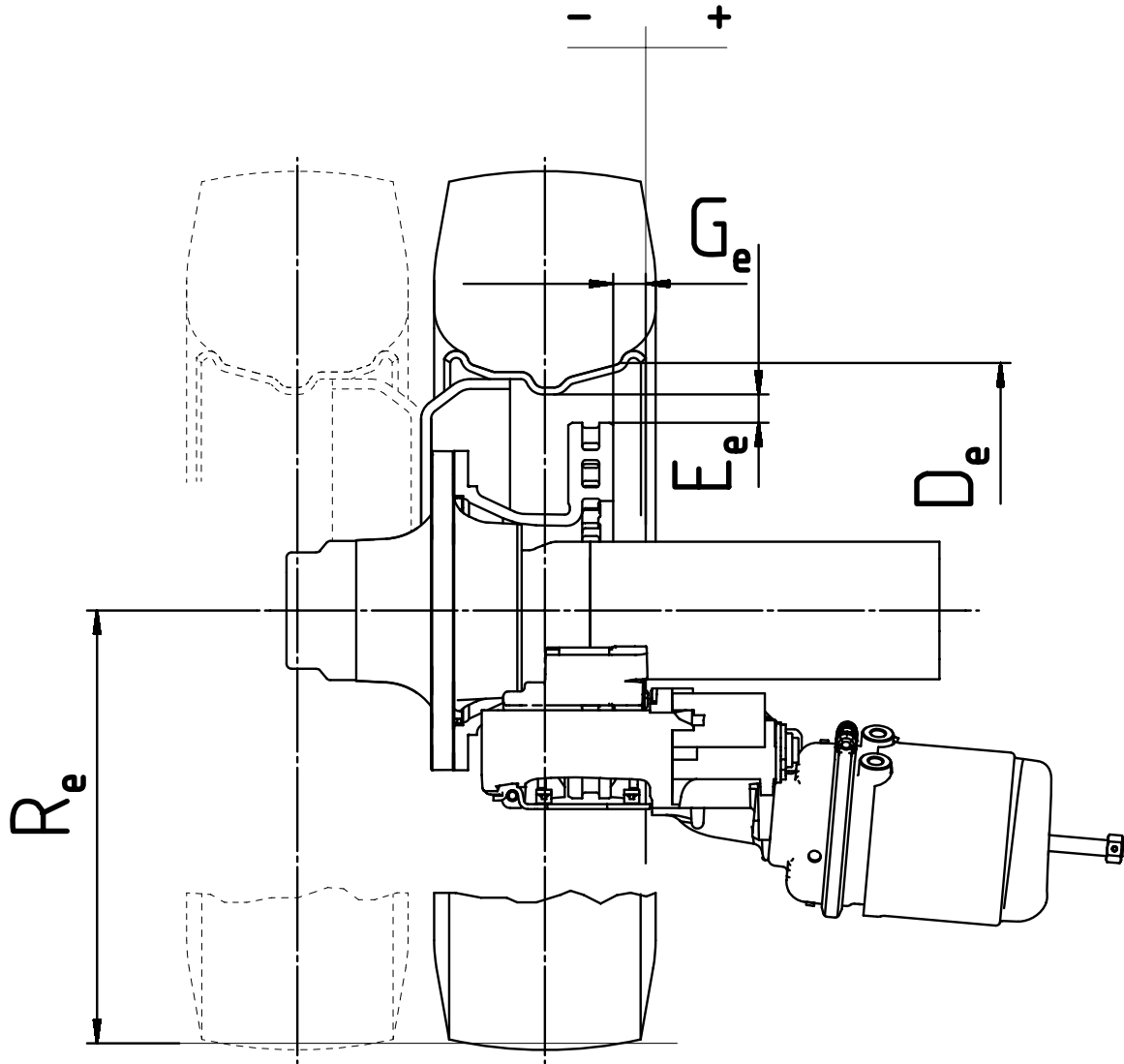


FIGURE 1B



- 3. BRAKE
- 3.1. General information
- 3.1.1. Make:
- 3.1.2. Manufacturer (name and address):
- 3.1.3. Type of brake (e.g. drum / disc):
- 3.1.3.1. Variant (e.g. S-cam, single wedge etc.):
- 3.1.4. Brake identifier: ID2-
- 3.1.5. Brake data according to the following figures 2A and 2B:

FIGURE 2A

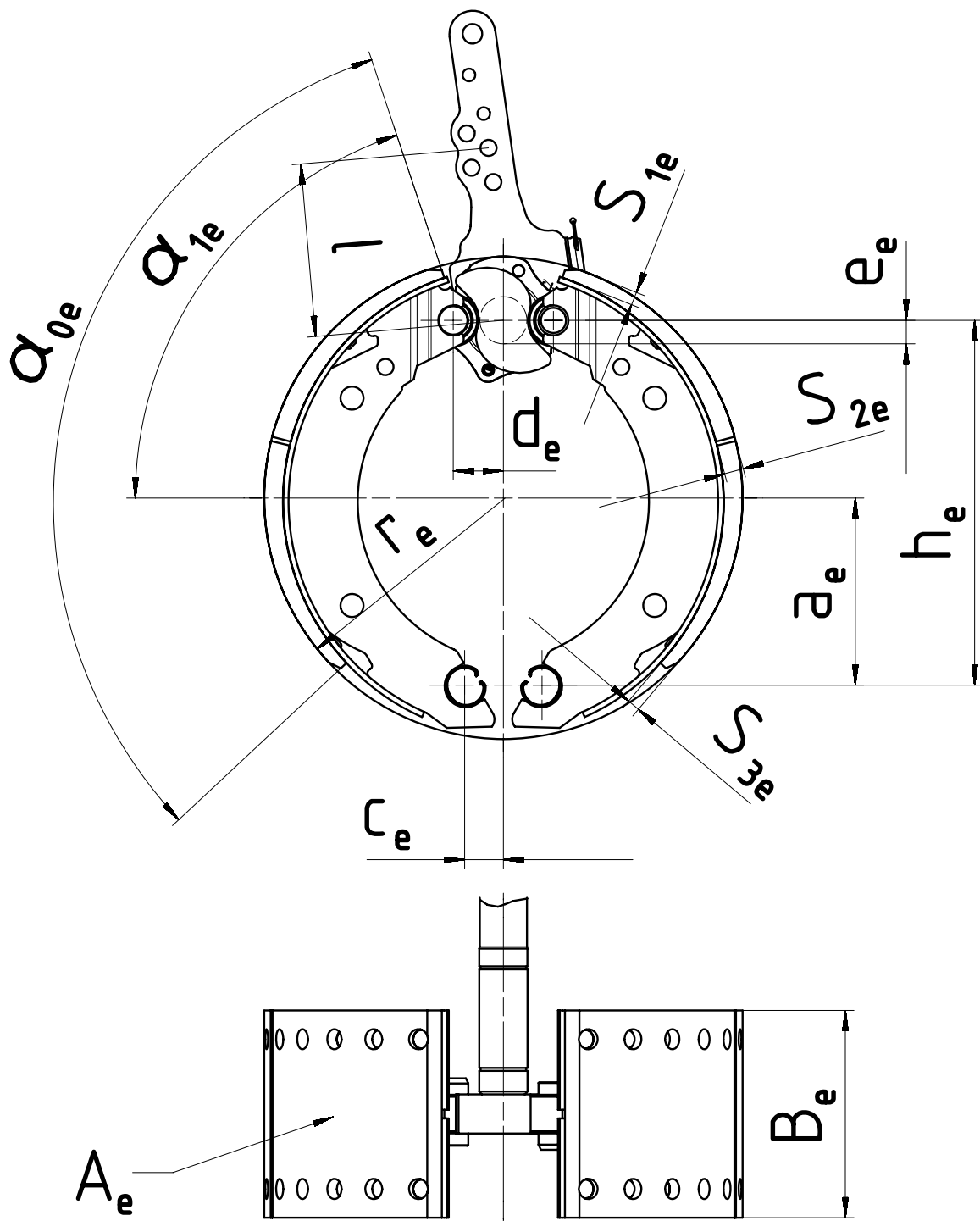
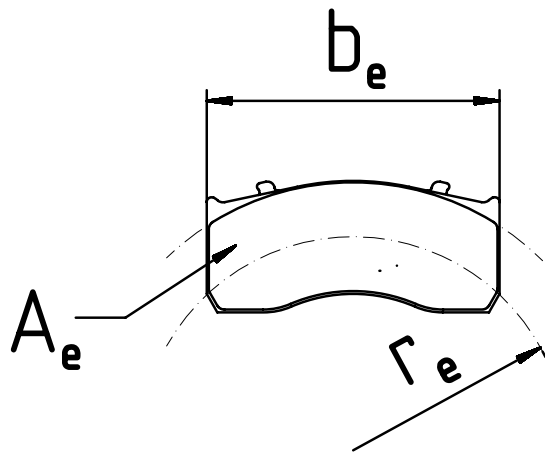
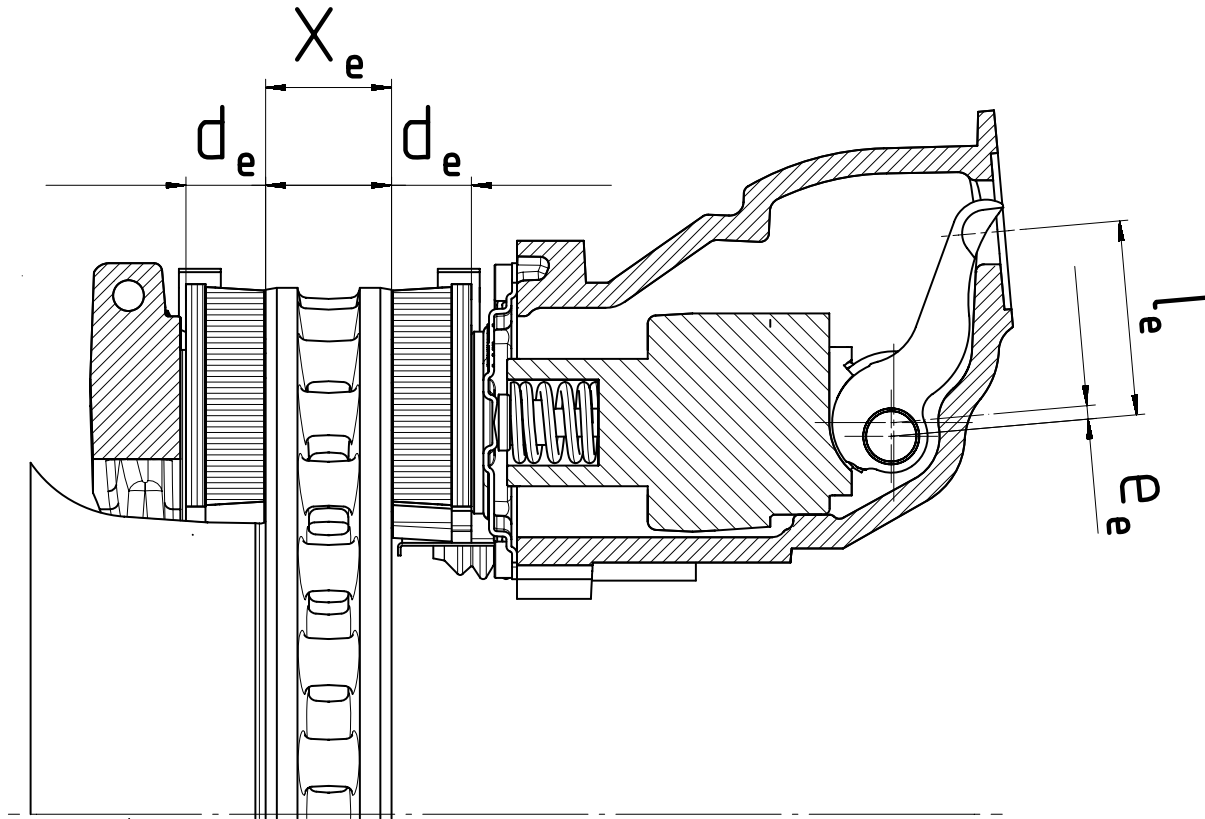


FIGURE 2B



x_e	a_e	h_e	c_e	d_e	e_e	α_{0e}	α_{1e}	b_e	r_e	A_e	S_{1e}	S_{2e}	S_{3e}
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)			(mm)	(mm)	(cm^2)	(mm)	(mm)	(mm)

- 3.2. Drum brake data**
- 3.2.1. Brake adjustment device (external/integrated):
- 3.2.2. Declared maximum brake input torque C_{max} : Nm
- 3.2.3. Mechanical efficiency: $\eta =$
- 3.2.4. Declared brake input threshold torque $C_{0,dec}$: Nm
- 3.2.5. Effective length of the cam shaft: mm

- 3.3. Brake drum**
- 3.3.1. Max diameter of friction surface (wear limit) mm
- 3.3.2. Base material:
- 3.3.3. Declared mass: kg
- 3.3.4. Nominal mass: kg

- 3.4. Brake lining**
- 3.4.1. Manufacturer and address
- 3.4.2. Make
- 3.4.3. Type
- 3.4.4. Identification (type identification on lining)
- 3.4.5. Minimum thickness (wear limit) mm
- 3.4.6. Method of attaching friction material to brake shoe:
- 3.4.6.1. Worst case of attachment (in the case of more than one):

- 3.5. Disc brake data**
- 3.5.1. Connection type to the axle (axial, radial, integrated, etc...):
- 3.5.2. Brake adjustment device (external/integrated):
- 3.5.3. Max. actuation stroke: mm
- 3.5.4. Declared maximum input force Th_{Amax} : daN
- 3.5.4.1. $C_{max} = Th_{Amax} \cdot l_e$: Nm
- 3.5.5. Friction radius: $r_e =$ mm
- 3.5.6. Lever length: $l_e =$ mm
- 3.5.7. Input/output ratio (l_e/e_e): $i =$
- 3.5.8. Mechanical efficiency: $\eta =$
- 3.5.9. Declared brake input threshold force $Th_{A0,dec}$: N
- 3.5.9.1. $C_{0,dec} = Th_{A0,dec} \cdot l_e$: Nm
- 3.5.10. Minimum rotor thickness (wear limit):mm

- 3.6. Brake disc data**
- 3.6.1. Disc type description:
- 3.6.2. Connection/mounting to the hub:
- 3.6.3. Ventilation (yes/no):
- 3.6.4. Declared mass: kg
- 3.6.5. Nominal mass: kg
- 3.6.6. Declared external diameter:mm
- 3.6.7. Minimum external diameter:mm
- 3.6.8. Inner diameter of friction ring:mm
- 3.6.9. Width of ventilation channel (if appl.):mm
- 3.6.10. Base material:

- 3.7. Brake pad data
- 3.7.1. Manufacturer and address:
- 3.7.2. Make:
- 3.7.3. Type:
- 3.7.4. Identification (type identification on pad back plate):
- 3.7.5. Minimum thickness (wear limit): mm
- 3.7.6. Method of attaching friction material to pad back plate:
- 3.7.6.1. Worst case of attachment (in the case of more than one):

Annex 19

Paragraph 4.2.2., amend to read:

"4.2.2. The brake factor is **determined by using the following formula:**

$$B_F = \frac{\Delta \text{Output torque}}{\Delta \text{Input torque}}$$

and shall be verified for each of the lining or pad materials specified in paragraph 4.3.1.3."

Paragraph 4.3.2.3., amend to read:

"4.3.2.3. The declared threshold torque $C_{0,dec}$ "

B. JUSTIFICATION

Background

The current wording of UNECE Regulation No. 13, Annex 11 makes it necessary to define certain requirements more precisely in order to avoid different interpretations by the industry, technical services and approval authorities.

When the requirements of Annex 11 were originally written, only the brake lining was considered to change the testing condition for an Annex 11 assessment on a particular brake.

Today the braking equipment (axle/brake) can be changed in many ways (e.g. brake/axle interface) which has led to the situation where technical services interpret in different ways which brake variants/versions can be covered by the results of a specific test report.

General

The proposal by the expert from Germany is aimed at defining in a more objective way what variations and versions of the brake can be covered, or cannot be covered, by a specific test and test report.

The proposal does not change the concept of Annex 11 as in use at the present time, it only aims to clarify today's process. Thus, the performance requirements (e.g. Type 0, I, III) do not change.

Overview

While the test report has an identifying number, typically the test report "Date" is used to identify the test results for a brake variant (e.g. a brake lining change) without the test report number changing. In this proposal the "Test Code" replaces the test report "Date" and provides a clear indication of what was tested. In addition, the structure of the test report number is defined so as to clearly indicate the issue level of the report.

With the test code it is possible to cover different axle/brake variants, and versions, and their test results at different times, in a single test report. It is currently required that the brake and the axle shall be identified (paragraph 3.7.2., Appendix 2 of Annex 11), and that particulars of the brakes, the axle, the technically permissible mass and the number of the corresponding Appendix 3 test report have to be marked on the axle. How this identification is to be carried out is not specified.

The proposal uses four identifiers so that the identification of the aforementioned particulars is done in an unambiguous and standard manner.

- (a) Axle identifier: ID1-... (braking force/torque capability)
- (b) Brake identifier: ID2-... (design/performance characteristics)
- (c) Fe identifier: ID3-... (test axle load)
- (d) Test report identifier: ID4-... (base number of the test report number)

An example of the axle marking is given to encourage uniformity.

The test code identifies the first three identifiers and clearly shows what is being/has been tested.

The test code also makes it easier for the industry to put the required particulars and test figures into their data base to carry out the calculations according to Regulation No. 13, Annex 10 and in particular the verification calculations according to section 4 of Appendix 2 to Annex 11 (which refer to the actual measured test results). Thus, in the data base of the various component and vehicle manufacturers all "Annex 11 calculation data" is allocated to a test report number and a test code which in turn defines unambiguously the equipment and test results on which the calculation is based.

Actual tests do not need to be repeated if an existing test report, together with any supporting data from the vehicle/axle/brake manufacturer, provides sufficient information for a test report or test report extension to be prepared confirming to the new requirements.

Major changes

Regulation, new paragraph 2.34.: the definition of a "subject trailer" added.

Regulation, new paragraph 2.35.: the definition of the "brake factor (B_F)" added to replace the two different wordings in Annex 11, Appendix 3, paragraph 2.3. and Annex 19, paragraph 4.2.2. and amending these paragraphs accordingly.

Annex 11, paragraph 2.: clarifies the term "identical" with respect to an axle/brake for a subject trailer and a reference axle/brake.

Annex 11, Appendix 1, Table I, line 2, columns 2 and 5, and the footnote: clarify the requirements

Annex 11, Appendix 1, Table III: symbol P_e changed to F_e , without any change to the definition, for clarification. P_e note deleted as not necessary.

Annex 11, Appendix 2, paragraph 1.2.2.: enables suitable test results from the previous series of amendments to be used in the preparation of a test report to this series of amendments.

Annex 11, Appendix 2, paragraph 1.4.1.: "x" in the formula replaced by a "dot" for consistency.

Annex 11, Appendix 2, paragraph 2.: renumbered as paragraph 2.1. and various new symbols added to support the proposed amendments. Definitions with regard to mass, input threshold torque and disc external diameter added under a new paragraph 2.2. to support the proposed amendments. The "effective length of the cam shaft" is specified in paragraph 2.2.4. as the distance from the centre line of the S-cam to the centre line of the operating lever.

Annex 11, Appendix 2, paragraph 3.4.: word "general" added to the title for clarification.

Annex 11, Appendix 2, paragraph 3.7.: specifies the minimum information to be carried on the axle (e.g. a label permanently fixed to the axle) to identify; the axle, the brake, the test axle load (F_e) and the test report. An example of the axle identification "label" is given. Similarly identification of a non-integrated automatic brake adjustment device is specified, together with the requirement that brake lining identification shall be visible when mounted on the brake shoe/back plate. The structure of the identifiers and what necessitates a new identifier is also specified.

Annex 11, Appendix 2, paragraph 3.8.: specifies the type of test required and the worst case criteria to be taken into account when determining the tests to be carried-out on a new brake variant.

Annex 11, Appendix 2, paragraph 3.9.: details the basic requirements regarding the test report and replaces the current paragraph 3.7. Paragraph 3.9.1. requires the test report number to consist of 2 parts and specifies the format to be used (a base number and a suffix which identifies the test report issue level). Paragraph 3.9.2. specifies the use of a test code to identify what was actually tested. Paragraph 3.9.3. requires that the test results are recorded in a form as shown in

Appendix 3 or Appendix 4 as appropriate (this is a current requirement). Paragraph 3.9.4. requires the axle or trailer manufacturer to provide an information document containing at least the information specified in Appendix 5 which becomes part of the test report.

Annex 11, Appendix 2, paragraphs 4.3.1.4. and 4.3.2., formulae: P and P_e changed to F and F_e in support of the symbol change from P to F.

Annex 11, Appendix 3: paragraph numbers in the title amended in line with this amendment.

Annex 11, Appendix 3: the information required to be recorded in the test report expanded to include the new features added under this amendment. Figures 1A, 1B, 2A and 2B moved to Appendix 5.

Annex 11, Appendix 4, paragraph 1.1.: P_e changed to F_e in support of the symbol change from P to F.

Annex 11, Appendix 5: clarifies what variants are covered by the test report and there is a standard format.

Annex 11, Appendix 5, figures 1A and 1B: dimension B_e deleted as not applicable. Symbol F_e replaced by G_e . – Dimension for D_e corrected. Plus and minus signs added for the dimension G_e .

Annex 11, Appendix 5, figures 2A and 2B: Symbol F_e replaced by A_e .

Annex 19, paragraph 4.3.2.3.: symbol for the declared threshold torque amended.

Annex 19, paragraph 4.2.2.: Brake factor formula $B_F = \frac{\Delta \text{Output torque}}{\Delta \text{Input torque}}$ added for clarification.

Transitional requirements

Although the proposed amendments do not affect the current testing requirements it will not be possible to make use of the existing reports. In order to give the industry sufficient time to replace all their existing test reports with new ones, Germany proposes to include this new set of requirements in a new series of amendments to Regulation No. 13 with a transitional period of 4 years.

If a new series of amendments is not considered appropriate for these amendments, and they are to be included with other amendments in a new series of amendments, then a transitional period of at least 4 years should be provided for the amendments of this proposal.
