INTERNATIONAL STANDARD

ISO 4209-1

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Truck and bus tyres and rims (metric series) —

Part 1:
Tyres

Pneumatiques et jantes (séries millimétriques) pour camions et autobus —

Partie 1: Pneumatiques

Reference number
ISO 4209-1:1993 (E)

Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 4209-1 was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves,* Sub-Committee SC 4, *Trucks and bus tyres and rims.*

This fifth edition cancels and replaces the fourth edition (ISO 4209-1:1988), of which it constitutes a technical revision.

ISO 4209 consists of the following parts, under the general title *Truck and bus tyres and rims (metric series)*:

— *Part 1: Tyres*

— *Part 2: Rims*

Annexes A, B and C of this part of ISO 4209 are given for information only.

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Truck and bus tyres and rims (metric series) —

Part 1:
Tyres

1 Scope

This part of ISO 4209 specifies the designation, dimensions and load ratings of the metric series of tyres primarily intended for trucks and buses.

It applies to bias-belted, diagonal and radial tyres for trucks and buses, mounted on 5° tapered rims and on 15° tapered (drop-centre) rims.

It is also applicable to different concepts and types of tyres and rims; in these cases, however, appropriate rim/section ratios K_1, coefficients K_2, K_3, C_R and construction codes have been added to tables 2 and 3.

ISO 4209-2 deals with requirements for rims.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this part of ISO 4209. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this part of ISO 4209 are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4223-1:1989, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres.*

3 Definitions

For the purposes of this part of ISO 4209, the definitions in ISO 4223-1 apply.

4 Tyre designation

The designation of the tyre shall be shown on its sidewall and shall include the following markings, to be shown close to each other:

— size and construction (see 4.1);

— service condition characteristics (see 4.2).

4.1 Size and construction

The size and construction characteristics shall be indicated as follows:

Nominal section width	/	Nominal aspect ratio	Tyre construction code	Nominal rim diameter code

or

Nominal section width	/	Nominal aspect ratio	Tyre construction code	Nominal rim diameter

(See 4.1.4.)

4.1.1 Nominal section width

The nominal section width shall be expressed in millimetres. For tyres fitted to 5° taper rims and 15° taper rims (code-designated), the nominal tyre section width shall end in 5.

4.1.2 Nominal aspect ratio

The nominal aspect ratio shall be expressed as a percentage and shall be a multiple of 5.

4.1.3 Tyre construction code

The tyre construction code shall be as follows:

B for bias-belted construction;

D for diagonal/bias construction;

R for radial construction.

NOTE — Other codes will be established for new concepts (constructions) of tyres.

4.1.4 Nominal rim diameter

The nominal rim diameter shall be expressed by a code for 5° tapered bead seat rims and 15° tapered bead seat (drop-centre) rims (see table 1 for code correlations).

However, it shall be expressed in millimetres for new and future concepts where the use of existing tyres on new concept rims or of new concept tyres on existing rims would be incompatible.

4.2 Service condition characteristics

The characteristics shall be indicated as follows:

Load index single / Load index dual Speed symbol

4.2.1 Load index

The load index is a numerical code associated with the maximum load a tyre can carry at the speed indicated by its speed symbol under the service conditions specified by the tyre manufacturer. See table 4.

4.2.2 Speed symbol

The speed symbol indicates the speed at which the tyre can carry the load corresponding to its load index under the service conditions specified by the tyre manufacturer. See table 5.

4.3 Other service characteristics

4.3.1 In the case of tubeless tyres, the marking "TUBELESS" shall be shown on the tyre.

4.3.2 In the case of a preferred direction of rotation of the tyre, an arrow shall be used to indicate that direction.

4.3.3 In the case of special tread tyres (see table 2), the symbol "ET" shall be shown on the tyre.

4.4 Example

A tyre having

a) a size and construction of:

— nominal section width 275 mm,

— nominal aspect ratio 70 %,

— radial construction,

— nominal rim diameter code 22.5;

b) service condition characteristics of:

— single load 2 500 kg,

— dual load 2 300 kg,

— reference speed 130 km/h;

c) other service characteristics:

— tubeless,

— special tread;

shall be marked

275/70 R 22.5 140/137 M

TUBELESS ET

5 Tyre dimensions

5.1 Calculation of "design tyre" dimensions

For the choice of coefficients K_1 (rim section ratio) and K_2, see table 2.

5.1.1 Theoretical rim width, R_{th}

The theoretical rim width, R_{th}, is equal to the product of the nominal section width, S_N, and the rim/section ratio, K_1:

$$R_{th} = K_1 S_N$$

5.1.2 Measuring rim width, R_m

The measuring rim width, R_m, is the width of the existing rim nearest to the theoretical rim width, R_{th}. See table 1 for rim widths of 5° tapered and 15° tapered (drop-centre) rims.

5.1.3 Design tyre section width, S

The design tyre section width, S, is the nominal section width, S_N, transferred from the theoretical rim, R_{th} to the measuring rim, R_m:

$$S = S_N + K_2 (R_m - R_{th})$$

rounded to the nearest whole number.

5.1.4 Design tyre section height, H

The design tyre section height, H, is equal to the product of the nominal section width, S_N, and the nominal ratio, H/S (H/S expressed as a percentage):

$$H = S_N \frac{H/S}{100}$$

rounded to the nearest whole number.

5.1.5 Design tyre overall diameter, D_o

The design tyre overall diameter, D_o, is the sum of the nominal rim diameter, D_r, plus twice the design tyre section height, H:

$$D_o = D_r + 2H$$

For those tyres using a nominal rim diameter code, see table 1 for the value of D_r to be used.

5.1.6 Values

The relevant dimensions for the metric series of truck and bus tyre measuring rim width, design section width and design section height are shown in annexes A and B; for tyres of a given series, with a nominal tyre section over 205, it is recommended that they be in increments larger than 10.

5.2 Calculation of "maximum overall tyre dimensions in service"

These calculations are for use by vehicle manufacturers in designing for tyre clearances.

5.2.1 Maximum overall width in service, W_{max}

The maximum overall width in service, W_{max}, is equal to the product of the design tyre section width, S, and the appropriate coefficient, a (see table 2):

$$W_{max} = Sa$$

It includes protective ribs, lettering, embellishments, manufacturing tolerances and growth due to service.

5.2.2 Maximum overall diameter in service, $D_{o,max}$

The maximum overall diameter in service, $D_{o,max}$, is equal to the nominal rim diameter, D_r, plus twice the product of the design tyre section height, H, and the appropriate coefficient, b (see table 2):

$$D_{o,max} = D_r + 2Hb$$

It includes manufacturing tolerances, the different types of tread patterns and growth due to service.

5.3 Minimum dual spacing, (MDS)

5.3.1 The minimum dual spacing is a guideline value equal to the product of the design tyre section width, S, and the appropriate coefficient, K_3 [see table 2 b)]:

$$MDS = SK_3$$

It is referred to a tyre load according to the load index, in dual application shown in the service characteristics on the tyre at an inflation pressure applicable for normal highway service.

5.3.2 The design tyre section width, S, will change 2,5 mm for each 0.25 change in rim width code. The minimum dual spacing shall be adjusted accordingly.

Table 1 — Nominal rim diameter code and rim width code

a) Nominal rim diameter code

Code		Nominal rim diameter, D_r mm
5° tapered rims	15° tapered (drop-centre) rims	
10	—	254
12	—	305
13	—	330
14	—	356
—	14.5	368
15	—	381
16	—	406
17	—	432
—	17.5	445
18	—	457
—	19.5	495
20	—	508
—	20.5	521
22	—	559
—	22.5	572
24	—	610
—	24.5	622

b) Rim width code

Code		Rim width mm
5° tapered rims	15° tapered (drop-centre) rims	
3.50	—	88,9
4.00	—	101,6
4.50	—	114,3
5.00	—	127
—	5.25	133,5
5.50	—	139,7
6.00	6.00	152,5
6.50	—	165,1
—	6.75	171,5
7.00	—	177,8
7.50	7.50	190,5
8.00	—	203,2
—	8.25	209,5
8.50	—	215,9
9.00	9.00	228,5
9.50	—	241,3
—	9.75	247,5
10.00	—	254
10.50	10.50	266,5
11.25	—	285,8
—	11.75	298,5
—	12.25	311
13.00	13.00	330
14.00	14.00	355,5
15.00	15.00	381
—	16.00	406,5
—	18.00	457

Table 2 — Coefficients for calculation of tyre dimensions

a) Coefficients K_2, b, a

Structure	Tyre construction code	Coefficients		
		K_2	b[1)]	a
Bias-belted	B	0,4	1,07	1,08
Diagonal	D	0,4	1,07	1,08
Radial	R	0,4	1,04	1,05

b) Coefficients K_1, K_3

Tyre construction code	Type of rim	Nominal aspect ratio H/S	Rim/section ratio K_1	Minimum dual spacing K_3
B, D, R	5° tapered	100 to 65[2)]	0,70	1,15
	15° tapered (drop-centre)	90 to 65[2)]	0,75	1,125

NOTE — Other factors may be established for new concepts (constructions) of tyres.

1) For special tread tyres (see 4.3.3):
Bias-belted: b = 1,09
diagonal: b = 1,09
radial: b = 1,06

2) For H/S lower than 65, further annexes will established.

5.4 Permitted rim widths

The range of permitted rim widths, in millimetres, is determined, for each nominal section width, by multiplying the nominal section width, S_N, by the coefficients, C_R, presented in table 3, i.e.

minimum rim width: $C_{R,\,min} \times S_N$

maximum rim width: $C_{R,\,max} \times S_N$

Table 3 — Coefficients for calculation of rim widths for truck and bus tyres related to nominal aspect ratio H/S

Type of rim	Nominal aspect ratio H/S	Nominal section width S_N mm	Coefficients for calculation of recommended rim width[1)] C_R	
			min.	max.
5° tapered	$100 \leq H/S \leq 65$	All	0,65	0,80
15° tapered	$90 \leq H/S \leq 75$	≤ 215	0,65	0,80
		≥ 225	0,675	0,80
	$70 \leq H/S \leq 65$	All	0,675	0,85

1) Other coefficients may be specified in relation to special services by agreement among tyre, rim, wheel and motor vehicle manufacturers.