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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Truck and bus tyres and rims (metric series) —

Part 1 :
Tyres

Pneumatiques et jantes pour véhicules utilitaires (séries millimétriques) —

Partie 1 : Pneumatiques

Reference number
ISO 4209-1 : 1988 (E)

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 4209-1 was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves.*

This fourth edition cancels and replaces the third edition (ISO 4209-1 : 1986); clauses 2.2.3, 2.2.4 and 3.4 [referring to tables 2b), 3 and 4] are basically new; table A.1 has been extended to higher nominal section widths of tyres and the nominal aspect ratio of 65.

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.

Truck and bus tyres and rims (metric series) —

Part 1 :
Tyres

Section 1 : General

1.1 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.

1.2 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. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4223-1 : 1978, *Definitions of some terms used in the tyre industry — Part 1 : Pneumatic tyres.*

1.3 Definitions

For definitions of terms relating to tyres, see ISO 4223-1.

Section 2 : Tyre designation and dimensions

2.1 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 2.1.1);

— service condition characteristics (see 2.1.2).

2.1.1 Size and construction

The characteristics shall be indicated as follows :

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

2.1.1.1 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.

2.1.1.2 Nominal aspect ratio

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

2.1.1.3 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.

2.1.1.4 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.

2.1.2 Service condition characteristics

The characteristics shall be indicated as follows :

Load Index single / **Load Index dual** **Speed symbol**

2.1.2.1 Load Index

The Load Index is a numerical code associated with the maximum load a tyre can carry in the single or dual application at the speed indicated by its speed symbol under the specified service conditions. See table 5.

2.1.2.2 Speed symbol

The speed symbol represents the speed category, which is the reference speed defined as the speed at which the tyre can carry the load corresponding to its Load Index under the specified service conditions. See table 6.

2.1.3 Other service characteristics

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

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

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

2.1.4 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	

2.2 Tyre dimensions

2.2.1 Calculation of "design new tyre" dimensions

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

2.2.1.1 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 :

$$R_{th} = K_1 S_N$$

2.2.1.2 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.

2.2.1.3 Design new tyre section width, S

The design new 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.

For factor K_2, see table 2.

2.2.1.4 Design new tyre section height, H

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

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

rounded to the nearest whole number.

2.2.1.5 Design new tyre overall diameter, D_o

The design new tyre overall diameter, D_o, is the sum of the nominal rim diameter, D_r, plus twice the design new 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.

2.2.1.6 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.

2.2.2 Calculation of "maximum overall tyre dimensions in service"

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

2.2.2.1 Maximum overall width in service, W_{max}

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

$$W_{max} = S a$$

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

2.2.2.2 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 new tyre section height, H, and the appropriate coefficient b (see table 2) :

$$D_{o,max} = D_r + 2H b$$

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

2.2.3 Minimum dual spacing, MDS

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

$$MDS = S K_3$$

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.

2.2.3.2 The design new 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
5° tapered rims	15° tapered (drop-centre) rims	mm
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		Measuring rim width, R_m
5° tapered rims	15° tapered (drop-centre) rims	mm
3.50	—	88,9
4.00	—	101,6
4.50	—	114,3
5.00	—	127,0
—	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	—	254,0
10.50	10.50	266,5
11.25	—	285,8
—	11.75	298,5
—	12.25	311,0
13.00	13.00	330,0
14.00	14.00	355,5
15.00	15.00	381,0
—	16.00	406,5
—	18,00	457,0

Table 2 — Coefficients for calculation of tyre dimensions

a) Coefficients K_2, b, a

Structure	Tyre construction code	Coefficients		
		K_2	b	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
...	...	...	...	...
...	...	...	...	...

NOTE — For special tread tyres (see 2.1.3.3) :

Bias-belted .... b = 1,09

Diagonal .... b = 1,09

Radial .... b = 1,06

b) Coefficients K_1, K_3

Tyre construction code	Tyre of rim	Nominal aspect ratio H/S	Rim/section ratio K_1	Minimum dual spacing[1] 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
	...			

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

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

2.2.4 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[1]	Nominal aspect ratio H/S	Nominal section width S_N mm	Coefficients for calculation of recommended rim width[2] C_R	
			min.	max.
5° tapered	$100 \leqslant H/S \leqslant 70$	all	0,65	0,80
15° tapered	$90 \leqslant H/S \leqslant 75$	$\leqslant 215$	0,65	0,80
		$\geqslant 225$	0,675	0,80
	$70 \leqslant H/S \leqslant 65$	all	0,675	0,85

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

2) The coefficients shown in this table apply to the nominal section width of the tyre.

2.3 Tyre dimensions tables

Examples of a few sizes in a tyre dimension table are shown in annex C. The figures shown in the column headed "Rim" are codes related to measuring rim width, R_m (see table 1 for code correlations).

2.4 Method of measurement of tyre dimensions

Before measuring, tyres shall be mounted on the measuring rim, inflated to the recommended pressure, and allowed to stand for a minimum of 24 h at normal room temperature, after which the inflation pressure shall be readjusted to the original value.

Section 3 : Load ratings

3.1 Tyre load-carrying capacity

Load Indexes are shown in table 5.

3.2 Speed symbol

Speed symbols are shown in table 6.

3.4 Load-carrying capacity at various speeds

When the tyre is fitted on a vehicle with a maximum speed capability different from the tyre reference speed, variations of load are granted in relation to the load corresponding to the Load Index (see table 4). To obtain improved operating performance under these conditions, inflation pressures higher than the basic pressure may be required.

Table 4 — Load-carrying capacity at various speeds

NOTES

1 The inflation pressure shall be increased for load adjustments above 125%, in consultation with the tyre manufacturer.

2 For 70 km/h and above, "speed" means the speed capability of the vehicle (maximum speed under fully laden conditions). For 65 km/h and below, "speed" means the operating speed of the vehicle.

3 Load adjustments are valid for use on improved surface only.

4 Consult rim and wheel manufacturers for confirmation of the strength of the rim/wheel for the intended service.

a) Tyres with Load Index (single) < 121, speed symbols L, M and N

Speed km/h	Load %
static	210
10	175
15	160
30	135
50	120
70	112,5
85	108,5
100	105
120	100
140[1]	90[1]

1) Applicable to tyres with speed symbol L.

b) Tyres with Load Index (single) ≥ 122 speed symbols J to M

Speed km/h	Load %
static	—
10	—
15	—
30	125
50	112
65	108,5
80	104
100	100
120[1]	88[1]

1) Applicable to tyres with speed symbol J.

Table 5 — Correlation between Load Index and tyre load-carrying capacity (TLCC)

Load Index (LI)	TLCC kg	Load Index (LI)	TLCC kg	Load Index (LI)	TLCC kg	Load Index (LI)	TLCC kg	Load Index (LI)	TLCC kg	Load Index (LI)	TLCC kg	Load Index (LI)	TLCC kg
0	45	40	140	80	450	120	1 400	160	4 500	200	14 000	240	45 000
1	46,2	41	145	81	462	121	1 450	161	4 625	201	14 500	241	46 250
2	47,5	42	150	82	475	122	1 500	162	4 750	202	15 000	242	47 500
3	48,7	43	155	83	487	123	1 550	163	4 875	203	15 500	243	48 750
4	50	44	160	84	500	124	1 600	164	5 000	204	16 000	244	50 000
5	51,5	45	165	85	515	125	1 650	165	5 150	205	16 500	245	51 500
6	53	46	170	86	530	126	1 700	166	5 300	206	17 000	246	53 000
7	54,5	47	175	87	545	127	1 750	167	5 450	207	17 500	247	54 500
8	56	48	180	88	560	128	1 800	168	5 600	208	18 000	248	56 000
9	58	49	185	89	580	129	1 850	169	5 800	209	18 500	249	58 000
10	60	50	190	90	600	130	1 900	170	6 000	210	19 000	250	60 000
11	61,5	51	195	91	615	131	1 950	171	6 150	211	19 500	251	61 500
12	63	52	200	92	630	132	2 000	172	6 300	212	20 000	252	63 000
13	65	53	206	93	650	133	2 060	173	6 500	213	20 600	253	65 000
14	67	54	212	94	670	134	2 120	174	6 700	214	21 200	254	67 000
15	69	55	218	95	690	135	2 180	175	6 900	215	21 800	255	69 000
16	71	56	224	96	710	136	2 240	176	7 100	216	22 400	256	71 000
17	73	57	230	97	730	137	2 300	177	7 300	217	23 000	257	73 000
18	75	58	236	98	750	138	2 360	178	7 500	218	23 600	258	75 000
19	77,5	59	243	99	775	139	2 430	179	7 750	219	24 300	259	77 500
20	80	60	250	100	800	140	2 500	180	8 000	220	25 000	260	80 000
21	82,5	61	257	101	825	141	2 575	181	8 250	221	25 750	261	82 500
22	85	62	265	102	850	142	2 650	182	8 500	222	26 500	262	85 000
23	87,5	63	272	103	875	143	2 725	183	8 750	223	27 250	263	87 500
24	90	64	280	104	900	144	2 800	184	9 000	224	28 000	264	90 000
25	92,5	65	290	105	925	145	2 900	185	9 250	225	29 000	265	92 500
26	95	66	300	106	950	146	3 000	186	9 500	226	30 000	266	95 000
27	97,5	67	307	107	975	147	3 075	187	9 750	227	30 750	267	97 500
28	100	68	315	108	1 000	148	3 150	188	10 000	228	31 500	268	100 000
29	103	69	325	109	1 030	149	3 250	189	10 300	229	32 500	269	103 000
30	106	70	335	110	1 060	150	3 350	190	10 600	230	33 500	270	106 000
31	109	71	345	111	1 090	151	3 450	191	10 900	231	34 500	271	109 000
32	112	72	355	112	1 120	152	3 550	192	11 200	232	35 500	272	112 000
33	115	73	365	113	1 150	153	3 650	193	11 500	233	36 500	273	115 000
34	118	74	375	114	1 180	154	3 750	194	11 800	234	37 500	274	118 000
35	121	75	387	115	1 215	155	3 875	195	12 150	235	38 750	275	121 000
36	125	76	400	116	1 250	156	4 000	196	12 500	236	40 000	276	125 000
37	128	77	412	117	1 285	157	4 125	197	12 850	237	41 250	277	128 500
38	132	78	425	118	1 320	158	4 250	198	13 200	238	42 500	278	132 000
39	136	79	437	119	1 360	159	4 375	199	13 600	239	43 750	279	136 000

Table 6 — Correlation between speed symbol and speed category

Speed symbol	Speed category km/h
B	50
C	60
D	65
E	70
F	80
G	90
J	100
K	110
L	120
M	130
N	140