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Truck and bus tyres and rims (Future series) — Part I : Tyres

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FOREWORD

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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.

International Standard ISO 4209/I was developed by Technical Committee ISO/TC 31, *Tyres, rims and valves*. The first edition (ISO 4209/I-1977) had been approved by the member bodies of the following countries :

Austria	Netherlands	Switzerland
Czechoslovakia	Poland	Turkey
France	Romania	United Kingdom
Italy	Spain	USSR
Japan	Sweden	Yugoslavia

The member bodies of the following countries had expressed disapproval of the document on technical grounds :

Canada
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Australia	Italy	Switzerland
Austria	Japan	Thailand
Brazil	Korea, Rep. of	United Kingdom
Chile	Netherlands	USA
Czechoslovakia	Poland	USSR
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Israel	Sweden	

The member bodies of the following countries expressed disapproval of the document on technical grounds :

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Truck and bus tyres and rims (Future series) — Part I : Tyres

1 SCOPE

This International Standard establishes the designation, dimensions and load ratings of future series of tyres primarily intended for trucks and buses.

ISO 4209/II will deal with requirements for rims.

2 FIELD OF APPLICATION

This International Standard applies to bias belted, diagonal, and radial tyres for trucks and buses mounted on 5° tapered rims and on 15° tapered rims (drop centre). It is also applicable to different concepts and types of tyres and rims; in that case, however, appropriate rim/section ratios K_1, coefficients K_2, and construction codes will be established and added to table 2.

3 REFERENCE

ISO 4223, *Definitions of some terms used in the tyre industry.*

4 DEFINITIONS

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

SECTION ONE : TYRE DESIGNATION AND DIMENSIONS

5 TYRE DESIGNATION

The designation of the tyre shall be shown on the sidewall of the tyre and shall include the following markings to be shown close to each other : "size and construction " (see 5.1) and "service condition characteristics" (see 5.2).

5.1 Size and construction

The characteristics shall be indicated as follows :

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

5.1.1 *Nominal section width*

The nominal section width shall be expressed in millimetres.

5.1.2 *Nominal aspect ratio*

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

5.1.3 *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.

5.1.4 *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 application of existing tyres on new concept rims would be incompatible or where the use of new concept tyres on existing rims would be incompatible.

5.2 Service condition characteristics

The characteristics shall be indicated as follows :

Load Index single /	Load Index dual	Speed code

5.2.1 *Load Indexes*

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 code under the specified service conditions. See table 3.

5.2.2 *Speed code*

The speed code 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 4.

5.3 Other service characteristics

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

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

5.4 Example

A tyre having

– a size and construction of :

nominal section width 275 mm,

nominal aspect ratio 70 %,

"radial" construction,

nominal rim diameter code 22.5;

– service condition characteristics of :

single load 2 500 kg,

dual load 2 300 kg,

reference speed 130 km/h;

– other service characteristics :

tubeless;

will be marked :

275/70 R 22.5 140/137 M

TUBELESS

6 TYRE DIMENSIONS

6.1 Calculation of "design new tyre" dimensions

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

6.1.1 *Theoretical rim width* (R_{Th})

The theoretical rim width is equal to the product of the nominal section width (S_N) and the rim/section ratio (K_1) :

$$R_{Th} = K_1 S_N$$

6.1.2 *Measuring rim width* (R_M)

The measuring rim width 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.

6.1.3 *Design new tyre section width* (S)

The design new tyre section width 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.

6.1.4 *Design new tyre section height* (H)

The design new tyre section height is equal to the product of the nominal section width (S_N) and the nominal aspect ratio (H/S, expressed as a percentage), divided by 100 :

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

rounded to the nearest whole number.

6.1.5 *Design new tyre overall diameter* (D_o)

The design new tyre overall diameter 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 in table 1 the value of D_r to be used.

6.1.6 *Values*

The relevant dimensions for future series of truck and bus tyres measuring rim width, design section width and design section height are shown in annexes A and B[1]; for tyres of a given series, having nominal tyre section over 205, it is recommended that they be in increments larger than 10.

6.2 Calculation of "maximum overall tyre dimensions in service"

(for use by vehicle manufacturers in designing for tyre clearances)

6.2.1 *Maximum overall width in service* (W_{max})

The maximum overall width in service 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.

6.2.2 *Maximum overall diameter in service* ($D_{o\,max}$)

The maximum overall diameter in service 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) :

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

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

7 TYRE DIMENSION 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).

8 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.

1) In preparation.

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
–	16.5	419
17	–	432
–	17.5	445
18	–	457
–	19.5	495
20	–	508
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
–	3.75	95,3
4.00	–	101,6
4.50	4.50	114,3
5.00	–	127,0
–	5.25	133,4
5.50	–	139,7
6.00	6.00	152,4
6.50	–	165,1
–	6.75	171,5
7.00	–	177,8
7.50	7.50	190,5
8.00	–	203,2
–	8.25	209,6
8.50	–	215,9
9.00	9.00	228,6
9.50	–	241,3
–	9.75	247,7
10.00	–	254,0
10.50	10.50	266,7
11.25	11.25	285,8
–	11.75	298,5
–	12.25	311,2
13.00	13.00	330,2
14.00	14.00	355,6
15.00	15.00	381,0

TABLE 2 – **Coefficients for the calculation of tyre dimensions**

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
...	...	..	..	..
...	...	..	..	..

Structure code	Type of rim	Tyre nominal aspect ratio	Rim/section ratio K_1
B, D, R	5° tapered	100 to 70*	0,70
	15° tapered (drop centre)	90 to 65*	0,75
	....		

* Lower aspect ratios are under study.

SECTION TWO : LOAD RATINGS

9 TYRE LOAD-CARRYING CAPACITY

Load Indices are shown in table 3.

10 SPEED CODE

Speed codes are shown in table 4.

11 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, convenient overloads or reduction of loads are granted in relation to the load corresponding to the Load Index.[1)]

1) Under study.

TABLE 3 – **Correlation between Load Index (LI) and tyre load-carrying capacity (TLCC)**

LI	TLCC kg	LI	TLCC kg	LI	TLCC kg	LI	TLCC kg	LI	TLCC kg	LI	TLCC kg	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 4 – **Correlation between speed code and speed catogory**

Speed code	Speed category km/h
*	50*
*	60*
*	70*
F	80
G	90
J	100
K	110
L	120
M	130
N	140

* Under study.

ANNEX A

GUIDELINE VALUES FOR FUTURE SERIES

(for information; see 6.1.6)

Design guide for new tyre dimensions mounted on drop centre 5° tapered rims (code-designated) with nominal rim diameter up to code 16 included[1)]

Nominal section width, S_N	Measuring rim width R_m	New tyre design dimensions, mm							
		Section width S	Section height, H,[2)] at nominal aspect ratios H/S:						
mm	code		100	95	90	85	80	75	70[3)]
125	3.50	126	125	119	113	106	100	94	88
135	3.50	133	135	128	122	115	108	101	95
145	4.00	145	145	138	131	123	116	109	102
155	4.50	157	155	147	140	132	124	116	109
165	4.50	165	165	157	149	140	132	124	116
175	5.00	177	175	166	158	149	140	131	123
185	5.00	184	185	176	167	157	148	139	130
195	5.50	196	195	185	176	166	156	146	137
205	5.50	203	205	195	185	174	164	154	144
215	6.00	216	215	204	194	183	172	161	151
225	6.00	223	225	214	203	191	180	169	158
235	6.50	235	235	223	212	200	188	176	165
245	7.00	248	245	233	221	208	196	184	172

1) For tyres mounted on different types of rims (mm-designated) other annexes will be established.
For tyres mounted on 15° tapered drop centre rims (code-designated) see annex B.

2) Figures based on normal tread pattern.

3) For H/S lower than 70 other annexes will be established.