INTERNATIONAL STANDARD

ISO 4223-1

Fourth edition
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Definitions of some terms used in the tyre industry —

Part 1: Pneumatic tyres

Définitions de certains termes utilisés dans l'industrie du pneumatique —

Partie 1: Pneumatiques

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

The main task of technical committees is to prepare International Standards. 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.

Attention is drawn to the possibility that some of the elements of this part of ISO 4223 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 4223-1 was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves*.

This fourth edition cancels and replaces the third edition (ISO 4223-1:1989), which has been technically revised.

ISO 4223 consists of the following parts, under the general title *Definitions of some terms used in the tyre industry*:

— *Part 1: Pneumatic tyres*

— *Part 2: Solid tyres*

Annex A forms a normative part of this part of ISO 4223.

Definitions of some terms used in the tyre industry —

Part 1:
Pneumatic tyres

1 Scope

This part of ISO 4223 defines a number of significant terms related to pneumatic tyres used in the tyre industry, together with corresponding codes, symbols and values.

NOTE For other terms used in this field and their equivalents in other languages, see ISO 3877-1 to ISO 3877-4. For terms and definitions relating to wheels/rims, see ISO 3911.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 4223. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 4223 are encouraged to investigate the possibility of applying the most recent edition of the normative document indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 4251-4:1992, *Tyres (ply rating marked series) and rims for agricultural tractors and machines — Part 4: Tyre classification and nomenclature.*

3 General terms and definitions

3.1 Category of use

3.1.1
normal
tyre for normal use

3.1.2
special
tyre intended for mixed use, both on or off road or for other special service

3.1.3
snow tyre
tyre whose tread pattern, tread compound and structure are primarily designed to achieve in snow conditions a performance better than that of a normal tyre with regard to its ability to initiate or maintain vehicle motion

3.1.4
temporary-use spare tyre
tyre different from the one intended to be fitted to a vehicle for normal driving conditions and intended only for temporary use under restricted driving conditions

3.1.5
T-type temporary-use spare tyre
temporary-use spare tyre designed for use at an inflation pressure higher than those established for standard and reinforced tyres

3.1.6
reinforced
EXTRA LOAD
description of a passenger car tyre designed for loads and an inflation pressure higher than those of the standard version

3.2 Service description

3.2.1
service description
tyre identification, additional to the **tyre size designation**, which consists of a load index (or two load indices in the case of single/dual fitments) and a speed symbol

3.2.1.1
load index
LI
numerical code associated with the maximum load a tyre can carry (except for loads at speeds above 210 km/h for passenger cars and motorcycle tyres) at the speed indicated by its speed symbol under service conditions specified by the tyre manufacturer

See Annex A, Table A.1.

3.2.1.2
speed symbol
maximum speed at which the tyre can carry a load corresponding to its load index (except for speeds above 210 km/h for passenger car and motorcycle tyres) under service conditions specified by the tyre manufacturer

See Annex A, Table A.2.

3.3 Other general terms and definitions

3.3.1
cold inflation pressure
internal pressure of the tyre at ambient temperature and not including any pressure build-up due to tyre usage

NOTE It is expressed in kilopascals (kPa).

3.3.2
grown tyre
tyre that has undergone expansion due to use in service

3.3.3
new tyre
tyre that has been neither used nor subjected to a retreading operation

NOTE Retreading is a generic term for used tyre reconditioning that extends the useful life of the tyre; it can cover the replacement of the tread rubber only or replacement of tread and sidewall rubbers.

3.3.4
rolling circumference
C_r
distance the centre of the tyre (axle) moves in one revolution of the tyre under specified conditions

3.3.5
rolling resistance
F_r
loss of energy (or energy consumed) per unit of distance

NOTE The SI unit conventionally used for the rolling resistance is the newton metre per metre (N m/m). This is equivalent to the drag force in newtons (N).

3.3.6
tyre contact area
A_c
area of the flat surface contained within the virtual perimeter of the tyre footprint

NOTE It is expressed in square metres (m^2).

3.3.7
tyre ground pressure
F/A_c
average unit load transmitted by the tyre through its contact area to the road surface, expressed, in kilonewtons per square metre (kN/m^2), as the ratio between the vertical force, F, in static conditions on the axis of the wheel, and the tyre contact area, A_c, and measured with the tyre inflated at the cold inflation pressure recommended for the intended type of service

3.3.8
virtual perimeter
⟨tyre footprint⟩ convex polygonal curve circumscribing the smallest area containing all points of contact between the tyre and ground

4 Structure

4.1
structure
⟨tyre⟩ technical characteristics of the tyre's carcass

EXAMPLES Diagonal (bias-ply), bias-belted, radial.

4.1.1
diagonal
bias-ply
cross-ply
structure in which the ply cords extend to the bead and are laid at alternate angles of substantially less than 90^o to the centreline of the tread

4.1.2
bias-belted
structure of diagonal (bias-ply) type in which the carcass is restricted by a belt comprising two or more layers of substantially inextensible cord material

4.1.3
radial
structure in which the ply cords extend to the beads and are laid substantially at 90^o to the centreline of the tread, the carcass being stabilized by an essentially inextensible circumferential belt

5 Main components

5.1
bead
part of the tyre shaped to fit the rim and having a core made of one or several essentially inextensible strands with the plies wrapped around the core

5.2
sidewall
part of the tyre, excluding the tread, visible when the tyre, fitted to a rim, is viewed from the side

5.3
sidewall rubber
rubber layer on the sidewall of the tyre and over the carcass, which may include ornamental or protective ribs and fitting lines

5.4
tread
part of a pneumatic tyre that normally comes in contact with the ground

5.5
cord
textile or non-textile strands (threads) used in various components of the tyre carcass, plies, belts, breakers, etc.

5.6
ply
layer of rubber-coated parallel cords

5.7
inner liner
layer of rubber on the inside of the carcass used especially in tubeless tyres to minimize air loss

5.8
carcass
part of a tyre other than the tread and the sidewall rubber which, when inflated, bears the load

5.9
breaker (diagonal)
intermediate ply not extending to the bead

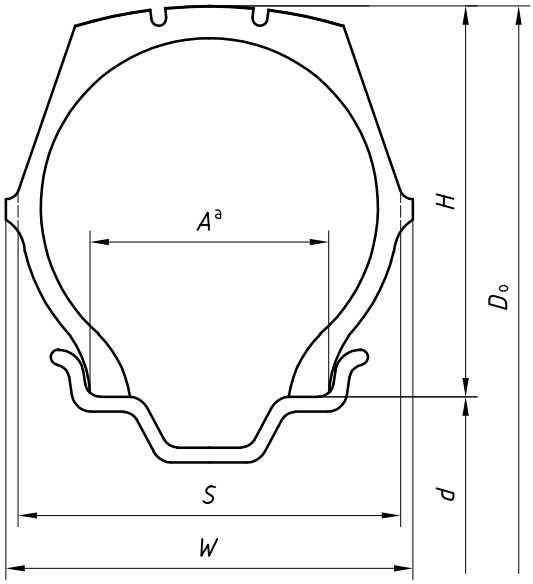
5.10
belt
bracing ply
layer of material underneath the tread, laid substantially in the direction of the tread centreline, that restricts the carcass circumferentially

5.11
lower sidewall
area below the line of maximum section width of the tyre, visible when the tyre, fitted to a rim, is viewed from the side

5.12
tread groove
space between the adjacent ribs or blocks in the tread pattern

5.13
tread wear indicators
projections within the tread grooves designed to give a visual indication of the degree of wear of the tread

6 Dimensions (see Figure 1)



[a] Specified rim width.

Figure 1 — Dimensions

6.1
section width
S
linear distance between the outside of the sidewalls of an inflated tyre excluding elevations due to labelling (markings), decorations, or protective bands or ribs

6.2
overall width
W
linear distance between the outside of the sidewalls of an inflated tyre including elevations due to labelling (markings), decorations, or protective bands or ribs

6.3
maximum overall tyre width in service
overall width plus

a) manufacturing tolerances, and

b) tolerance for service growth

6.4
section height
H
half the difference between the overall diameter and the nominal rim diameter

6.5
overall diameter
D_o
diameter of an inflated tyre at the outermost surface of the tread

6.6
static maximum overall tyre diameter in service
D_{os}
overall diameter plus

a) manufacturing tolerances, and

b) tolerance for service growth

6.7
dynamic maximum overall tyre diameter in service
D_{od}
overall diameter plus

a) manufacturing tolerances,

b) tolerance for service growth, and

c) allowance for dimensional changes due to centrifugal force

NOTE This definition applies only to motorcycle tyres; the allowance in c) is to be taken into account by the motorcycle manufacturer when designing for tyre clearances.

6.8
nominal aspect ratio
H/S
hundred times the ratio of the nominal section height to the nominal section width of the tyre on its theoretical rim

6.9
nominal rim diameter
D_r
conventional number corresponding to the diameter of the rim expressed either as a size code (number less than 100) or in millimetres (number greater than 100), but not as both

See Annex A, Tables A.3 and A.4.

7 Terms, definitions and symbols of designation

7.1
tyre size designation
designation identifying the characteristics of a tyre, as follows:

— the nominal section width [normally expressed in millimetres (mm)];

— the nominal aspect ratio, where applicable;

— the nominal rim diameter

EXAMPLE 165/80R15, 24.00-25.

7.1.1
additional tyre designation
letter or symbol that may also be part of the tyre size designation, identifying, for example, the type of tyre

7.1.1.1
T
letter placed immediately in front of the section width to identify a T-type temporary-use spare tyre

7.1.1.2
P
letter (optional) placed immediately in front of the section width to identify a passenger car tyre

7.1.1.3
IN
letters (optional) placed immediately in front of the section width to identify an industrial tyre

7.1.1.4
IMP
IMPLEMENT
designation identifying implement tyres

NOTE As an alternative to marking with agricultural implement tyre code I, in accordance with ISO 4251-4:1992.

8 Tyre testing

8.1
bead separation
breakdown of bond between components in the bead area

8.2
belt separation
parting of rubber compound between belt layers or between belts and plies

8.3
chunking
breaking away of pieces of rubber from the tread

8.4
cord separation
parting of the cords from their rubber coating

8.5
cracking
any parting within the tread, sidewall or innerliner of the tyre extending to cord material

8.6
inner line separation
parting of innerliner from cord material in the carcass

8.7
ply separation
parting of adjacent plies

8.8
test rim
rim on which a tyre is fitted for testing

8.9
tread separation
pulling away of the tread from the carcass

Annex A
(normative)

Loads, speeds and rim diameters

Table A.1 — Load indices (LI) and corresponding loads

LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	kg	LI	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 A.2 — Speed symbols and corresponding speeds

Symbol	Speed category km/h
A1	5
A2	10
A3	15
A4	20
A5	25
A6	30
A7	35
A8	40
B	50
C	60
D	65
E	70
F	80
G	90
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
U	200
H	210
V	240
W	270
Y	300

Table A.3 — Nominal rim diameters

Nominal rim diameter D_r	
code	mm [a]
5 degree rims	
4	102
5	127
6	152
7	178
8	203
9	229
10	254
12	305
13	330
14	356
15	381
16	406
17	432
18	457
19	483
20	508
21	533
22	559
23	584
24	610
25	635
26	660
27	686
28	711
29	737
30	762
31	787
32	813
33	838
34	864
35	889
36	914
37	940
38	965
39	991

Nominal rim diameter D_r	
code	mm [a]
5 degree rims	
40	1 016
41	1 041
42	1 067
43	1 092
44	1 118
45	1 143
46	1 168
47	1 194
48	1 219
49	1 245
50	1 270
51	1 295
52	1 321
54	1 372
57	1 448
15 degree rims	
17.5	445
19.5	495
20.5	521
22.5	572
24.5	622
26.5	673

[a] These are theoretical values to be used only for the calculation of the tyre overall diameters.

Table A.4 — Specified rim diameters recommended for use in ISO standards

Nominal rim diameter D_r code	Specified rim diameter [a] (Recommended) D mm
5 degree rims	
4	100,8
5	126,2
6	151,6
7	177,0
8	202,4
9	227,8
10	253,2
12	304,0
13	329,4
14	354,8
15	380,2
16	405,6
17	436,6
18	462,0
19	487,4
20	512,8
21	533,4
22	563,6
23	584,2
24	614,4
25	635,0
26	665,2
27	685,8
28	716,0
29	736,6
30	766,8
31	787,4
32	817,6
33	838,2
34	868,4
35	889,0
36	919,2
37	939,8
38	970,0
39	990,6
5 degree rims	
40	1 020,8
41	1 041,4
42	1 071,6
43	1 092,2
44	1 122,4
45	1 143,0
46	1 173,2
47	1 193,8
48	1 224,0
49	1 244,6
50	1 274,8
51	1 295,4
52	1 325,6
54	1 376,4
57	1 447,8
15 degree rims	
17.5	444, 5
19.5	495,3
20.5	520,7
22.5	571,5
24.5	622,3
26.5	673,1

In case of existing rims with common nominal rim diameter codes but different rim diameters, affecting tyre interchangeability, an International Standard for size designations for the relevant tyres and rims shall include special additional designations.

[a] These values are defined as follows.

5 degree

16 and below diameter: diameter × 25,4 − 0,8

17 to 20 diameter: diameter × 25,4 + 4,8

Over 20 — even: diameter × 25,4 + 4,8

Over 20 — odd: diameter × 25,4

15 degree

All diameters: diameter × 25,4

Bibliography

[1] ISO 3877 (all parts), *Tyres, valves and tubes — List of equivalent terms*

[2] ISO 3911, *Wheels and rims for pneumatic tyres — Vocabulary, designation and marking*

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