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All-terrain (AT) tyres and rims — Symbol marked pneumatic tyres on 5° tapered rims — Designation, dimension, marking and load ratings

Pneumatiques et jantes tout terrains — Pneumatiques marqués par un symbole pour jantes à 5° — Désignation, côtes, marquage et capacités de charge

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ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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This document was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves*, SC 10, *Cycle, moped, motorcycle tyres and rims*.

This second edition cancels and replaces the first edition (ISO 29802:2009), which has been technically revised.

All-terrain (AT) tyres and rims — Symbol marked pneumatic tyres on 5° tapered rims — Designation, dimension, marking and load ratings

1 Scope

This document specifies the designations, dimensions, markings and load ratings of pneumatic tyres primarily intended for all-terrain vehicles (ATV). It also specifies the designation, marking and contours of rims.

The tyres meet the following parameters:

a) speeds not exceeding 130 km/h (Speed Symbol M);

b) fitted to (AT) 5° tapered drop centre rims;

c) nominal rim diameter codes of 7 to 14 inclusive.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3877-1, *Tyres, valves and tubes — List of equivalent terms — Part 1: Tyres*

ISO 4223-1:2002, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres*

ISO 80000-1, *Quantities and units — Part 1: General*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 4223-1 and ISO 3877-1 and the following apply.

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
NHS
NOT FOR HIGHWAY SERVICE
marking that identifies tyres for off-road applications

Note 1 to entry: The following terms may be used: “NOT FOR HIGHWAY SERVICE” or “NHS” or “NOT FOR HIGHWAY USE”.

4 Tyre size designations

4.1 Dimensional and constructional characteristics

4.1.1 General

The characteristics shall be indicated as follows:

	Prefix	Nominal overall diameter code		Nominal section width code	Tyre construction code	Nominal rim diameter code
EXAMPLE:	AT	23	x	10	R	10

NOTE Tyre construction code: “R” = Radial, “–” = Diagonal.

4.1.2 Prefix

AT (all-terrain) identifies tyres and rims designated for service on all-terrain vehicles (ATV).

4.1.3 Nominal overall diameter code

The code shall be as given in Table 1.

Table 1 — Nominal overall diameter code

Nominal overall diameter code	Design tyre overall diameter, D_o mm
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

4.1.4 Nominal section width code

The code shall be as given in Table 2.

Table 2 — Nominal section width code

Nominal section width code	Nominal section width, S_n mm
6	152
7	178
8	203
9	229
10	254
11	279
12	305
13	330

4.1.5 Tyre construction code

The tyre construction code shall be as follows:

— *D* or "–" (a dash) for diagonal ply construction

— *R* for radial ply construction

4.1.6 Nominal rim diameter code

The code shall be as given in Table 3.

Table 3 — Nominal rim diameter code

Nominal rim diameter code	Nominal rim diameter, D_r mm
7	178
8	203
9	229
10	254
11	279
12	305
13	330
14	356

4.2 Service condition

4.2.1 General

4.2.1.1 The tyre shall be marked with a symbol (see 4.2.2) and a service description.

4.2.1.2 Tyres restricted to off-road service also be marked with one of the following inscriptions: "NOT FOR HIGHWAY SERVICE" or "NHS" or "NOT FOR HIGHWAY USE".

4.2.2 Symbol of reference inflation pressure

Symbols shall be used to identify the reference inflation pressure given in Table 4.

Table 4 — Reference inflation pressures

Symbol	Inflation pressure kPa
☆	25
☆☆	35
☆☆☆	45

4.2.3 Service description

4.2.3.1 General

The service description shall be indicated as follows:

Load index Speed symbol (example 35 F)

4.2.3.2 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 service description specified by the tyre manufacturer.

The correlation between load indices and tyre load carrying capacities shall be as given in ISO 4223-1:2002, Annex A.

4.2.3.3 Speed symbol

The speed symbol shall be as given in Table 5. The speed symbol or speed category indicates the reference speed defined as the speed at which the tyre can carry the load corresponding to its load index under the specified service description.

Table 5 — Correlation between speed symbol and speed category

Speed symbol	Speed category km/h
F[a]	80[a]
[a] The reference speed for tyre load identification of all-terrain tyres shall be 80 km/h, i.e. speed symbol F.	

4.3 Other service characteristics

4.3.1 The word “TUBELESS” shall be used to characterize tyres that can be used without a tube.

4.3.2 Specific indications, if required, may be added to show, for example, the preferred direction of rotation, indicated by an arrow.

5 Marking

The marking shall consist of:

a) the designation of the dimensional and constructional characteristics;

b) service description;

c) other service characteristics.

The location of the marking of the service description (load index and speed symbol) and the symbol identifying the reference inflation pressure shall be distinct but in the vicinity of the marking of the dimensional and constructional characteristics.

No location is specified for the markings related to other service characteristics (see 4.3).

EXAMPLE AT 20 x 10 R 9 ☆☆ 34 F

The characteristics of a tyre with the above markings are as follows:

— AT: tyre designated for service intended for service on all-terrain vehicles (ATV);

— 20: nominal overall diameter code;

— 10: nominal section width code;

— R: radial ply construction;

— 9: nominal rim diameter code;

— ☆☆ : symbol to identify a reference inflation pressure of 35 kPa;

— 34: load index (LI) corresponding to a tyre load capacity of 118 kg;

— F: speed symbol corresponding to a speed category of 80 km/h;

6 Tyre dimensions

6.1 General

The formula-derived values for design tyre dimensions shall be rounded to the nearest millimetre according to ISO 80000-1.

6.2 Calculation of design tyre dimensions

6.2.1 Theoretical rim width, R_{th}

The theoretical rim width, R_{th}, is equal to the product of the nominal section width, S_n, (see Table 2) and the rim/section ratio, K_1, where the value of K_1 is 0,8 rounded to the nearest standardized rim width code.

$$R_{th} = K_1 \times S_n \quad (1)$$

6.2.2 Measuring rim width, R_m

Measuring rim width, R_m, enables one to select the nearest standardized rim width code from R_{th} (see Table 9).

6.2.3 Design tyre section width, S

The design tyre section width, S, is given in Table 9.

$$S = S_n + 0,4 \times (R_m - R_{th}) \quad (2)$$

For the values of S_n to be used see Table 2.

6.2.4 Design tyre overall diameter, D_o

The design tyre overall diameter, D_o, is given in Table 1.

6.2.5 Design tyre section height, H

The design tyre section height, H, is equal to half the value given by the design tyre overall diameter, D_o, minus the nominal rim diameter, D_r.

$$H = \frac{(D_o - D_r)}{2} \tag{3}$$

For the values of D_r to be used, see Table 3.

6.3 Calculation of "maximum overall tyre dimensions"

6.3.1 General

These dimensions shall be calculated with the coefficients appropriate to the tyre nominal section width code and the design tyre section height.

6.3.2 Maximum tyre overall width, W_{max}

The maximum tyre overall width, W_{max}, is equal to the product of the design tyre section width, S, and the appropriate coefficient a:

$$W_{max} = S \times a \tag{4}$$

where

a = 1,07 for nominal section width code ≤ 10;

a = 1,06 for nominal section width code ≥ 11.

6.3.3 Maximum tyre overall diameter, $D_{o,max}$

The maximum tyre overall diameter $D_{o,\,max}$, is equal to the nominal rim diameter, D_r, (see Table 3) plus twice the product of the design tyre section height, H, and the appropriate coefficient, rounded to the nearest millimetre:

$$D_{o,max} = D_r + (2 \times H \times b) \tag{5}$$

where b = 1,06.

6.4 Calculation of "maximum overall grown tyre dimensions"

6.4.1 General

This calculation is for use by vehicle manufacturers in designing for tyre clearance. These dimensions shall be calculated with the coefficients (see Table 6) appropriate to the tyre construction and maximum tyre dimensions.

Table 6 — Coefficients for calculation of maximum grown overall tyre dimensions in service

Tyre construction	Speed km/h	Coefficients	
		c	*d*
Diagonal / Radial	60	1,09	1,07
	80		1,09
	100		1,11
	>100	[a]	[a]

[a] Consult tyre manufacturer.

6.4.2 Maximum grown tyre overall width in service, W_G

The maximum grown tyre overall width in service, W_G, is equal to the product of the design tyre section width, S, and the appropriate coefficient, c, referring to the vehicle design maximum speed capability (see Table 6):

$$W_G = S \times c \tag{6}$$

6.4.3 Maximum dynamic tyre overall diameter in service, $D_{o,dyn}$

The maximum dynamic tyre overall diameter in service, $D_{o,dyn}$, is equal to the product of the maximum overall diameter in service, $D_{o,max}$, and the appropriate coefficient, d, referring to the vehicle design maximum speed capability (see Table 6):

$$D_{o,dyn} = D_{o,max} \times d \tag{7}$$

6.5 Calculation of "minimum tyre dimensions"

6.5.1 General

These dimensions shall be calculated with the coefficients appropriate to the design tyre section width and design tyre section height.

6.5.2 Minimum tyre section width, S_{min}

The minimum tyre section width, S_{min}, is equal to the product of the design tyre section width, S, and the appropriate coefficient, rounded to the nearest millimetre:

$$S_{min} = S \times 0,95 \tag{8}$$

6.5.3 Minimum tyre overall diameter, $D_{o,min}$

The minimum tyre overall diameter, $D_{o,min}$, is equal to the nominal rim diameter, D_r, plus twice the product of the design tyre section height, H, and the appropriate coefficient, rounded to the nearest millimetre:

$$D_{o,min} = D_r + (2 \times H \times 0,94) \tag{9}$$

6.6 Range of approved rims widths

The range of approved rim widths is calculated as the product of the nominal section width, S_n, and the coefficients shown in Table 7, and rounded to the nearest standardised rim width code.

Table 7 — Coefficient of approved rim widths

Coefficient of approved rim widths	
Minimum	Maximum
0,65	0,85

7 Method of measurement of tyre dimensions

Before being measured, the tyre shall be mounted on its measuring rim (see Table 9) inflated to the recommended pressure (see Table 8) and allowed to stand for a minimum or 24 h at normal room temperature, after which the inflation pressure shall be readjusted to the original value.

Table 8 — Inflation pressures to measure dimensions

Symbol	Inflation pressure kPa
☆	25
☆☆	35
☆☆☆	45

Table 9 — Tyre dimension and approved rims

Dimensions in millimetres

Nominal section width code	Measuring rim width code	Design section width	Maximum grown tyre overall width in service	Approved rim width code	
	R_m	S	W_G	minimum	maximum
6	5.00	154	168	4.0 AT	5.0 AT
7	5.50	177	193	4.5 AT	6.0 AT
8	6.50	204	222	5.0 AT	7.0 AT
9	7.00	227	247	6.0 AT	7.5 AT
10	8.00	254	277	6.5 AT	8.5 AT
11	9.00	281	306	7.0 AT	9.5 AT
12	9.50	304	331	8.0 AT	10.0 AT
13	10.50	331	361	8.5 AT	11.0 AT

8 Reference load carrying capacity

8.1 The 100 % reference load-carrying capacity is the load corresponding to the load index marked on the tyre. Load indices for AT tyres are given in Annex A.

8.2 The load-carrying capacities are calculated at inflation pressure of 25 kPa for the basic load version, and rounded to the nearest load index.

For different inflation pressures, the load capacities can be derived from Table 10:

Table 10 — Tyre load capacities versus inflation pressures of 25 kPa for tyres marked with speed symbol *F*

kPa	15	17,5	20	22,5	25	27,5	30	32,5	35	37,5	40	42,5	45
LI Step	−10	−7	−4	−2	0	+2	+4	+5	+7	+8	+10	+11	+12
NOTE If the load/inflation calculation results in a load index less than 0 (45 kg), use 3 % for each load index increment. Round to the nearest 0,1 kg.													

9 Load ratings

9.1 The permissible loads for AT tyres are based on their application according to vehicle type and speed capability and shall be as given in Table 11.

NOTE The data given in Table 11 may be reconsidered in light of additional field experience.

9.2 For 100 % reference, see Clause 8.

9.3 Calculated loads shall be rounded to the nearest kilogram.

10 Inflation pressures

Operating cold inflation pressures should be agreed between tyre and vehicle manufacturers taking into account not only the tyre load-carrying capacity (TLCC), but also the operating conditions, the maximum speed, the position of the tyre on the vehicle, service conditions and the construction and characteristics of the vehicle and operating surface.

Cold inflation pressure means the pressure taken with the tyre at ambient temperature; it does not include any pressure build-up due to tyre usage.

Table 11 — Tyre load capacities versus speed for tyres marked with speed symbol *F*

Maximum speed km/h	**Load variation** %
50	12
60	7
70	3
80	0
90	−5
100	−10
110	−15
120	−20
130	−25

11 Rims

11.1 Designation and marking

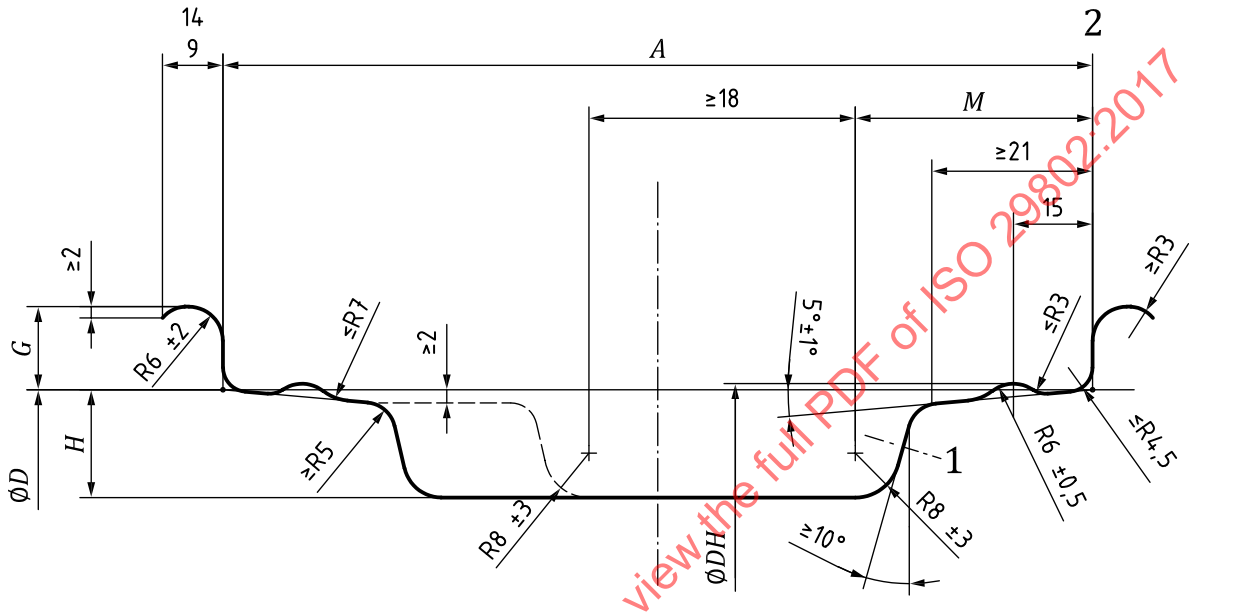
The rim shall be designated by its nominal rim diameter code, nominal rim width code and rim flange type.

	Nominal rim diameter code		Nominal rim width code	Suffix
EXAMPLE:	12	x	7.0	AT

11.2 Rim contours

Dimensions and tolerances of the AT rims shall be as given in Figure 1 and Table 12.

Dimensions in millimetres



Key

1 valve hole

2 tyre mounting side

NOTE The valve hole shown above is an example. A valve hole may be on either side of the rim. It is permissible to locate the valve hole in the area other than the bead seating area or on the bottom of the well, as long as the function of the valve hole or tyre mounting is not impeded.

Figure 1 — Contour of 5° tapered (drop-centre) AT rims

Table 12 — Dimensions of 5° tapered (drop-centre) AT rims

Dimensions in millimetres

Rim width code	A ± 1,5
4.0 AT	102
4.5 AT	114
5.0 AT	127
5.5 AT	140
6.0 AT	152
6.5 AT	165
7.0 AT	178
7.5 AT	191
8.0 AT	203
8.5 AT	216
9.0 AT	229

Table 12 *(continued)*

Rim width code	A ± 1,5
9.5 AT	241
10.0 AT	254
10.5 AT	267
11.0 AT	279

11.3 Rim diameter and hump circumference

The specified rim diameter, *D*, for nominal rim diameter codes and hump circumferences is given in Table 13.

Table 13 — Specified rim diameter and hump circumference of 5° tapered (drop-centre) AT rims

Dimensions in millimetres

Nominal rim diameter code	Specified rim diameter *D*	Circumference of *D*		Round hump circumference *D*H		*G*		H_{min}	M_{max}
		Dimension	Tolerance	Dimension	Tolerance	Dimension	Tolerance		
6	151,6	476,3	+1,0 −0,5	481,3	+1,0 −1,5	14,0	+0,5 0	20	40
7	177,0	556,1		561,1					
8	202,4	635,9		640,9					
9	227,8	715,7		720,7		16,0		23	50
10	253,2	795,5		800,5					
11	278,6	875,2		880,3					
12	304,0	955,0		960,1					
13	329,4	1034,8		1039,8					
14	354,8	1114,6		1119,6					

12 Valve hole

12.1 General

Valve hole edges on the tyre side of rims shall be rounded or chamfered; valve hole edges on the weather side of rims shall be free of burrs that could damage the valve.

12.2 Snap-in valves

To provide for adequate sealing, an unbroken smooth inside surface with a width of at least 0,75 mm or 25 % of rim thickness, whichever is greater, shall be maintained. Suitable valves shall be used. Valve hole details for snap-in valves shall be as shown in Figures 2 and 3.

Dimensions in millimetres

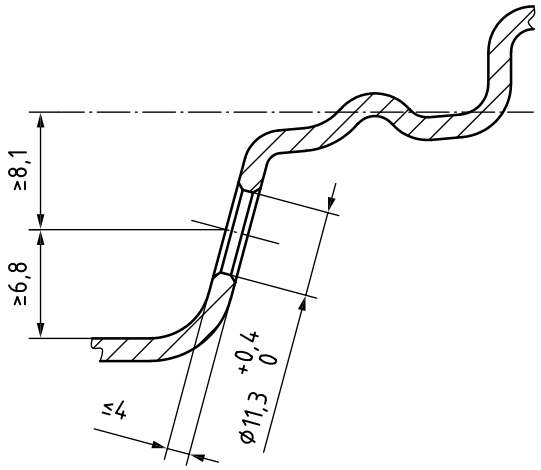
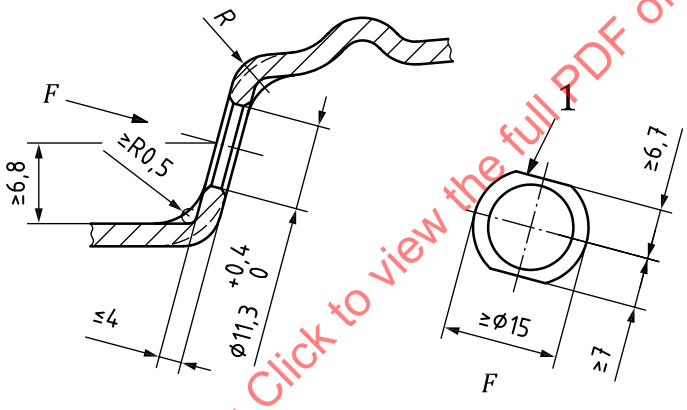


Figure 2 — Valve hole dimensions for snap-in valves

Dimensions in millimetres



Key

1 flat surface with no radial striations

Figure 3 — Valve hole dimension around valve hole

Annex A
(normative)

Load indices for all-terrain (AT) tyres

From Table A.1 to Table A.8 give tyre load indices, grouped by nominal rim diameter code, based on a reference pressure of 25 kPa for basic load version (☆).

Table A.1 — Load indices: Nominal rim diameter code 7

Nominal overall diameter code	Nominal section width code							
	6	7	8	9	10	11	12	13
16	–	4	9	13	17	20	24	28
17	3	7	12	16	20	23	27	30
18	–	10	14	19	22	26	30	33
19	–	14	17	21	25	29	32	35
20	–	–	20	24	27	31	35	38
21	–	–	23	26	30	33	37	40
22	–	–	–	29	32	35	39	42
23	–	–	–	32	35	38	41	43
24	–	–	–	–	37	40	42	45
25	–	–	–	–	–	42	44	47
26	–	–	–	–	–	44	46	48
27	–	–	–	–	–	–	48	51

Table A.2 — Load indices: Nominal rim diameter code 8

Nominal overall diameter code	Nominal section width code							
	6	7	8	9	10	11	12	13
16	–	4	8	13	17	20	24	28
17	1	7	11	16	19	23	27	30
18	5	10	14	19	22	26	29	33
19	–	13	17	21	25	28	32	35
20	–	16	20	24	28	31	35	38
21	–	–	22	26	30	33	37	40
22	–	–	25	29	32	36	39	42
23	–	–	–	31	35	38	41	43
24	–	–	–	34	37	40	42	45
25	–	–	–	–	39	42	44	47
26	–	–	–	–	–	43	46	49
27	–	–	–	–	–	46	48	51