INTERNATIONAL STANDARD

ISO 5751-1

Seventh edition
2010-11-15

Motorcycle tyres and rims (metric series) —

Part 1: Design guides

Pneumatiques et jantes pour motocycles (séries millimétriques) —

Partie 1: Guide de conception

Reference number
ISO 5751-1:2010(E)

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Published in Switzerland

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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 2.

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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 5751-1 was prepared by Technical Committee ISO/TC 31, *Tyres, rims and valves*, Subcommittee SC 10, *Cycle, moped, motorcycle tyres and rims*.

This seventh edition cancels and replaces the sixth edition (ISO 5751-1:2004, including ISO 5751-1:2004/Cor.1:2006), which has been technically revised.

ISO 5751 consists of the following parts, under the general title *Motorcycle tyres and rims (metric series)*:

— *Part 1: Design guides*

— *Part 2: Tyre dimensions and load-carrying capacities*

— *Part 3: Range of approved rim contours*

Motorcycle tyres and rims (metric series) —

Part 1:
Design guides

1 Scope

This part of ISO 5751 gives guidelines for the design of, and specifies the designation and calculation of the dimensions for metric series motorcycle tyres. It is applicable to motorcycle tyres with a reduced height/width ratio (100 and lower) that can be fitted on cylindrical bead-seat or 5° tapered bead-seat rims. It is also applicable to other concepts of tyre and rim, provided the appropriate rim/section ratios and coefficients are established for them.

NOTE See ISO 4249 for motorcycle tyres and rims (code-designated series) of rim diameter codes 13 and above, and ISO 6054 for those of codes 12 and below.

2 Normative references

The following referenced documents are indispensable for the application 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 4223-1:2002, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres*

ISO 4249-3, *Motorcycle tyres and rims (code-designated series) — Part 3: Rims*

3 Terms and definitions

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

4 Tyre designation

4.1 General

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

— size and construction (see 4.2);

— service description (see 4.3).

4.2 Size and construction

4.2.1 Characteristics

The size and construction characteristics shall be indicated as follows:

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

4.2.2 Nominal section width

The nominal section width shall be expressed in millimetres.

4.2.3 Nominal aspect ratio

The nominal aspect ratio shall be expressed as a percentage. It shall be a multiple of 10 for aspect ratios 80 and higher, and a multiple of 5 for aspect ratios lower than 80.

4.2.4 Tyre construction code

The tyre construction code shall be:

— “B” for bias-belted construction;

— “–” for diagonal-ply tyres; and

— “R” for radial-ply tyres.

NOTE 1 See also 4.4.3 for codes adopted for tyres suitable for speeds in excess of 240 km/h. Other codes will be established for new concepts (construction) of tyres.

NOTE 2 The term “bias-belted construction” describes a pneumatic tyre structure of diagonal (bias ply) type in which the carcass is restricted by a substantially inextensible circumferential belt.

NOTE 3 With reference to the definition of radial-ply tyre given in ISO 4223-1, for the purposes of this part of ISO 5751, “substantially at 90°” means angles between 65° and 90° as measured from the centreline of the tread.

4.2.5 Nominal rim diameter

The nominal rim diameter shall normally be expressed by a code (see Table 1). However, it shall be expressed in millimetres for new and future concepts where the application either of existing tyres on new-concept rims or of new-concept tyres on existing rims would be incompatible.

4.3 Service description

The characteristics shall be indicated as follows:

Load index **Speed symbol**

For load indices and speed symbols and their corresponding loads and speeds, see ISO 4223-1:2002, Tables A.1 and A.2.

Table 1 — Nominal rim diameter codes

Dimensions in millimetres

Nominal rim diameter code	
Code	**Nominal rim diameter** D_r
8	203
10	254
11	279
12	305
13 M/C	330
14 M/C	356
15 M/C	381
16 M/C	406
17 M/C	432
18 M/C	457
19 M/C	483
20 M/C	508
21 M/C	533
23 M/C	584
24 M/C	610

4.4 Other service characteristics

4.4.1 In the case of tubeless tyres, the marking “TUBELESS” shall be shown on the tyre.

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

4.4.3 Tyres designed for vehicles having a maximum speed capacity in excess of 240 km/h shall be identified by means of the following speed categories, and not by the tyre construction code:

— “VB” or “ZB” for bias-belted construction;

— “VR” or “ZR” for radial construction.

“ZB” and “ZR” should be used for the equipment of newly designed motorcycles with a maximum speed over 240 km/h.

This identification shall be placed inside the tyre designation (see 4.2.1) instead of in the tyre construction code, as follows.

a) For speed category “V”, “VB” or “VR” tyres suitable for speeds over 240 km/h, a service description shall be marked with the speed symbol “V” between parentheses, e.g. “120/60 VR 17 (55 V)”.

b) For speed category “ZB” or “ZR” tyres suitable for speeds up to 270 km/h, a service description shall be marked with the speed symbol “W”, e.g. “120/60 ZR 17 55 W”.

c) For speed category “ZB” or “ZR” tyres suitable for speeds over 270 km/h, the service description shall be marked with the speed symbol “W” between parentheses, e.g. “120/60 ZR 17 (55 W)”.

The maximum speed approved by the tyre manufacturer may also be marked on the tyre, e.g. “V250” to identify a maximum speed of 250 km/h.

4.4.4 The symbol “MST” may be used to identify special-service tyres.

4.4.5 The symbol “DP” may be used to identify tread type C tyres.

4.5 Designation examples

4.5.1 A motorcycle tyre having:

a) a size and construction of

- nominal section width, 120 mm,
- nominal aspect ratio, 80,
- diagonal construction, and
- nominal rim diameter code 18, with

b) a service description consisting of:

- a load-carrying capacity of 290 kg, corresponding to load index “65”, and
- a maximum speed of 180 km/h, corresponding to speed symbol “S”,

shall be marked:

120/80 - 18 M/C	65 S

4.5.2 A motorcycle tyre having:

a) a size and construction of

- nominal section width, 140 mm,
- nominal aspect ratio, 70,
- radial construction, and
- nominal rim diameter code 17, with

b) a service description consisting of

- a reference speed in excess of 240 km/h,
- a reference load-carrying capacity of 300 kg, corresponding to load index “66”, and
- a maximum speed of 270 km/h, corresponding to speed symbol “W”,

shall be marked:

140/70 ZR 17 M/C	66 W

The same tyre approved for speeds in excess of 270 km/h shall be marked:

140/70 ZR 17 M/C	(66 W)

5 Tyre dimensions

5.1 Calculation of design tyre dimensions

5.1.1 Theoretical rim width, R_{th}

The theoretical rim width, R_{th}, shall be calculated as follows:

$$R_{th} = K_1 \times S_N$$

where

K_1 is the rim/section ratio;

S_N is the nominal section width.

For tyres of existing concepts, K_1 shall be equal to:

— 0,6 for aspect ratios 100, 90, 80;

— 0,65 for aspect ratios 75;

— 0,7 for aspect ratios 70, 65, 60;

— 0,8 for aspect ratios 55, 50;

— 0,9 for aspect ratios 45, 40, 35, 30.

NOTE K_1 will be defined later for aspect ratios below 30.

5.1.2 Measuring rim width, R_m

The measuring rim width, R_m, is width A of the existing rim width nearest to R_{th}. See ISO 4249-3 for widths of existing rims.

5.1.3 Design tyre section width, S

The design tyre section width, S, shall be the nominal section width, S_N, transferred from R_{th} to R_m, calculated as follows:

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

rounded to the nearest whole number.

For tyres of existing concepts, $K_2 = 0{,}4$.

5.1.4 Design tyre section height, H

The design tyre section height, H, shall be calculated as follows:

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

rounded to the nearest whole number,

where

S_N is the nominal section width;

H/S is the nominal aspect ratio.

5.1.5 Design tyre overall diameter, D_o

The design tyre overall diameter, D_o, shall be calculated as follows:

$$D_o = D_r + 2H$$

where

D_r is the nominal rim diameter;

H is the design tyre section height.

NOTE 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

Guideline values for the design tyre dimensions for metric-series motorcycle tyres are given in Annex A.

5.2 Calculation of maximum overall tyre dimensions in service

5.2.1 General

The calculations of 5.2.2 and 5.2.3, as well as Clause 9, are for use by vehicle manufacturers in designing tyre clearances.

5.2.2 Maximum overall width in service, W_{max}

The maximum overall width in service, W_{max}, shall be calculated as follows:

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

where

S is the design tyre section width;

a is the appropriate coefficient (see Table 2).

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

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

The maximum overall diameter in service, $D_{o,max}$, shall be calculated as follows:

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

where

D_r is the nominal rim diameter;

H is the design tyre section height;

b is the appropriate coefficient (see Table 2).

It includes manufacturing tolerances and growth due to service (for deformation due to centrifugal force, see Clause 9).

5.3 Calculation of minimum dimensions — Section width, S_{min}

The minimum section width, S_{min}, shall be equal to the product of the design tyre section width, S, and the appropriate coefficient:

$$S_{min} = 0{,}96S$$

$S - S_{min}$ shall be at least 4 mm.

NOTE For tyres having a tread width wider than the section width, refer to the tread width for the minimum section width.

5.4 Measuring tyre dimensions — Procedure

Before measuring, mount the tyre on the measuring rim ready for tyre fitment, inflate to the recommended pressure, and allow to stand for a minimum of 24 h at normal room temperature, after which readjust the inflation pressure to the original value.

6 Tread configurations

These attributions of tread type configurations to the type of service are to be regarded as examples only. The choice of a given tread type configuration for a given tyre is at the discretion of the tyre manufacturer alone.

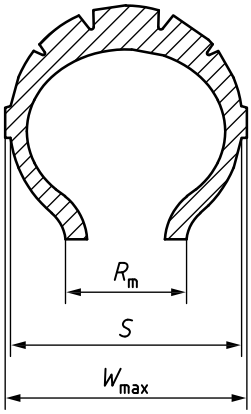
Figure 1 shows various tread configurations:

— tread type A is commonly adopted for highway-service low-speed tyres;

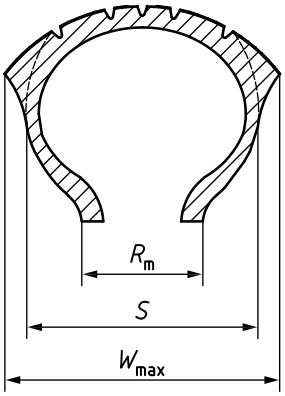
— tread type B is commonly adopted for highway-service high-speed tyres;

— tread type C is commonly adopted for tyres used in both on- and off-road service;

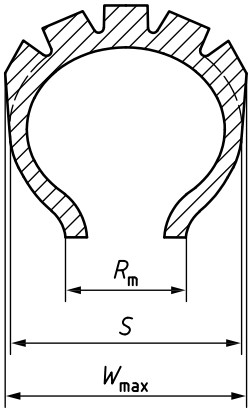
— tread type D is commonly adopted for tyres exclusively in off-road service.



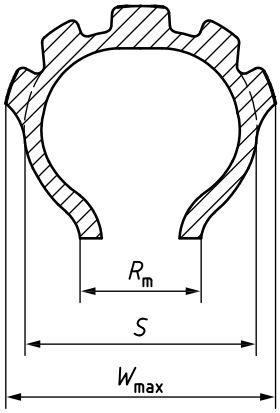
a) Type A



b) Type B



c) Type C



d) Type D

Figure 1 — Tread configurations

Table 2 — Coefficients for calculation of maximum overall tyre dimensions in service

Tread configuration	Coefficient	
	a	b
Type A	1,1[a]	1,07[b]
Type B	1,1[a]	1,07[b]
Type C	1,1[a]	1,12[c]
Type D	1,25	1,12[c]

NOTE Coefficients for diagonal tyres are also applicable to tyres of bias-belted construction.

[a] 1,08 for tyres on rim diameter code 12 and below and 1,07 for radial tyres.

[b] Subject to the condition that $D_{o,max} - D_o$ is at least 6 mm.

[c] Subject to the condition that $D_{o,max} - D_o$ is at least 8 mm.

7 Tyre load-carrying capacity

7.1 Tyre load-carrying capacity (TLCC), corresponding to the load index (see ISO 4223-1:2002, Table A.1), is applicable for speeds up to and including 210 km/h.

7.2 For speed symbol "V" tyres, between 210 km/h and 240 km/h, the applicable load-carrying capacity shall be reduced with respect to the value corresponding to the load index, and shall be obtained by applying the following percentages.

Up to 210 km/h: 100 % of TLCC

220 km/h max.: 95 % of TLCC

230 km/h max.: 90 % of TLCC

240 km/h max.: 85 % of TLCC

Between these speeds, linear interpolation is permitted.

7.3 For "VB" and "VR" tyres, the load-carrying capacity above 240 km/h shall be further reduced by 5 % for each 10 km/h increase in speed.

7.4 For speed symbol "W" tyres, the load-carrying capacity is applicable for speeds up to and including 240 km/h. The applicable load-carrying capacity above 240 km/h shall be reduced with respect to the value corresponding to the load index, and shall be obtained by applying the following percentages.

250 km/h max.: 95 % of TLCC

260 km/h max.: 85 % of TLCC

270 km/h max.: 75 % of TLCC

7.5 For "ZR" and "ZB" tyres at speeds over 270 km/h, consult the tyre manufacturer.

8 Speed symbols

Speed symbols up to "H" (corresponding to speed category 210 km/h) shall be in accordance with ISO 4223-1:2002, Table A.2.

9 Centrifugal radius

The maximum centrifugal radius, R_{dyn}, caused by centrifugal force, is related to the maximum speed of the vehicle, and shall be calculated as follows:

$$R_{dyn} = 0{,}5D_r + Hc$$

where

D_r is the nominal rim diameter;

H is the design tyre section height;

c is the appropriate coefficient (see Table 3).

For vehicles having maximum speeds in excess of 240 km/h, consult the tyre manufacturer.

Table 3 — Coefficients for calculation of maximum centrifugal radius at various maximum driving speeds

Tread configuration	Coefficient c		
	Up to 180 km/h	Up to 210 km/h	Up to 240 km/h
Types A and B	1,10	1,13	1,16
Types C and D	1,15	1,18	—

Annex A
(informative)

Guideline values for metric series

Guideline values for tyre dimensions are given in Tables A.1 and A.2.

Table A.1 — Guideline values of R_{th}, R_m and S for different values of S_N

Dimensions in millimetres

Nominal section width	Aspect ratios 100, 90, 80: rim/section ratio $K_1 = 0,6$			Aspect ratios 75: rim/section ratio $K_1 = 0,65$			Aspect ratios 70, 65, 60: rim/section ratio $K_1 = 0,7$		
	Theoretical rim width	Measuring rim width code	Design section width	Theoretical rim width	Measuring rim width code	Design section width	Theoretical rim width	Measuring rim width code	Design section width
S_N	R_{th}	R_m	S	R_{th}	R_m	S	R_{th}	R_m	S
50	30	1.20	50	—	—	—	—	—	—
60	36	1.40	60	—	—	—	42	1.60	59
70	42	1.60	69	—	—	—	49	1.85	69
80	48	1.85	80	—	—	—	56	2.15	80
90	54	2.15	90	—	—	—	63	2.50	90
100	60	2.50	101	—	—	—	70	2.75	100
110	66	2.50	109	—	—	—	77	3.00	110
120	72	2.75	119	—	—	—	84	3.50	122
130	78	3.00	129	—	—	—	91	3.50	129
140	84	3.50	142	91	3.50	139	98	3.75	139
150	90	3.50	150	—	—	—	105	4.25	151
160	96	4.00	162	—	—	—	112	4.50	161
170	102	4.00	170	—	—	—	119	4.50	168
180	108	4.50	183	—	—	—	126	5.00	180
190	—	—	—	—	—	—	133	5.00	188
200	—	—	—	—	—	—	140	5.50	200
210	—	—	—	—	—	—	147	6.00	212
230	—	—	—	—	—	—	161	6.25	229

Table A.1 (*continued*)

Dimensions in millimetres

Nominal section width	Aspect ratios 55, 50: rim/section ratio $K_1 = 0{,}8$			Aspect ratios 30, 35, 40, 45: rim/section ratio $K_1 = 0{,}9$		
	Theoretical rim width	Measuring rim width code	Design section width	Theoretical rim width	Measuring rim width code	Design section width
S_N	R_{th}	R_m	S	R_{th}	R_m	S
130	104	4.00	129	—	—	—
140	112	4.50	141	—	—	—
150	120	4.50	148	—	—	—
160	128	5.00	160	—	—	—
170	136	5.50	171	—	—	—
180	144	5.50	178	—	—	—
190	152	6.00	190	—	—	—
200	160	6.25	200	180	7.00	199
210	168	6.50	209	189	7.50	211
220	176	7.00	221	198	8.00	222
230	184	7.00	228	207	8.00	228
240	192	7.50	239	216	8.50	240
250	200	8.00	251	225	9.00	251
260	—	—	—	234	9.00	258
280	—	—	—	252	10.00	281
300	—	—	—	270	10.50	299
330	—	—	—	297	11.50	328
360	—	—	—	324	13.00	362

Table A.2 — Guideline values of H for different values of H/S and S_N

Dimensions in millimetres

Nominal section width	Design section height H at various nominal aspect ratios H/S (%)												
S_N	100	90	80	75	70	65	60	55	50	45	40	35	30
50	50	45	—	—	—	—	—	—	—	—	—	—	—
60	60	54	48	—	—	—	—	—	—	—	—	—	—
70	70	63	56	—	—	—	—	—	—	—	—	—	—
80	80	72	64	—	56	—	—	—	—	—	—	—	—
90	90	81	72	—	63	59	54	—	—	—	—	—	—
100	100	90	80	—	70	65	60	55	50	—	—	—	—
110	110	99	88	—	77	72	66	61	55	—	—	—	—
120	120	108	96	—	84	78	72	66	60	—	—	—	—
130	130	117	104	—	91	85	78	72	65	—	—	—	—
140	140	126	112	105	98	91	84	77	70	—	—	—	—
150	150	135	120	—	105	98	90	83	75	—	—	—	—
160	160	144	128	—	112	104	96	88	80	—	—	—	—
170	170	153	136	—	119	111	102	94	85	—	—	—	—
180	180	162	144	—	126	117	108	99	90	—	—	—	—
190	—	—	—	—	133	124	114	105	95	—	—	—	—
200	—	—	—	—	140	130	120	110	100	90	80	—	—
210	—	—	—	—	—	—	126	116	105	95	84	—	—
220	—	—	—	—	—	—	132	121	110	99	88	—	—
230	—	—	—	—	—	—	138	127	115	104	92	—	—
240	—	—	—	—	—	—	144	132	120	108	96	—	—
250	—	—	—	—	—	—	150	138	125	113	100	—	—
260	—	—	—	—	—	—	—	—	—	—	104	91	—
280	—	—	—	—	—	—	—	—	—	—	112	98	—
300	—	—	—	—	—	—	—	—	—	—	120	105	—
330	—	—	—	—	—	—	—	—	—	—	—	—	99
360	—	—	—	—	—	—	—	—	—	—	—	—	108

Bibliography

[1] ISO 4000-2, *Passenger car tyres and rims — Part 2: Rims*

[2] ISO 4249-1, *Motorcycle tyres and rims (Code-designated series) — Part 1: Tyres*

[3] ISO 4249-2, *Motorcycle tyres and rims (Code-designated series) — Part 2: Tyre load ratings*

[4] ISO 5751-2, *Motorcycle tyres and rims (metric series) — Part 2: Tyre dimensions and load-carrying capacities*

[5] ISO 5751-3, *Motorcycle tyres and rims (metric series) — Part 3: Range of approved rim contours*

[6] ISO 6054-1, *Motorcycle tyres and rims (Code-designated series) — Diameter codes 4 to 12 — Part 1: Tyres*

[7] ISO 6054-2, *Motorcycle tyres and rims (Code-designated series) — Diameter codes 4 to 12 — Part 2: Rims*

ICS 43.140; 83.160.10

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