INTERNATIONAL STANDARD

ISO 5751-1

Fourth edition
1994-12-15

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 5751-1:1994(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 voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard 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 fourth edition cancels and replaces the third edition (ISO 5751-1:1988), of which it constitutes a technical revision.

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*

Annexes A, B and C of this part of ISO 5751 are for information only.

International Organization for Standardization
Case Postale 56 • CH-1211 Genève 20 • Switzerland

Printed in Switzerland

Motorcycle tyres and rims (metric series) —

Part 1:
Design guides

1 Scope

This part of ISO 5751 specifies design guides, designation, dimensions and load-carrying capacity of the metric series of motorcycle tyres.

It applies to motorcycle tyres with reduced height/width ratio (100 and lower), that can be fitted on cylindrical bead seat rims or 5° tapered bead/seat rims.

It is also applicable to different concepts of tyres and rims; in this case, however, appropriate rim/section ratios K_1 and coefficients K_2, a and b (see clause 5) will be established.

NOTE 1 ISO 4249 deals with the requirements for motorcycle tyres and rims (code-designated series) for rim diameters code 13 and above. ISO 6054 deals with the requirements for motorcycle tyres and rims (code-designated series) for rim diameters code 12 and below.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 5751. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 5751 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 4000-2:1987, *Passenger car tyres and rims — Part 2: Rims.*

ISO 4223-1:1989, *Definitions of some terms used in the tyre industry — Part 1: Pneumatic tyres.*

ISO 4251-3:1994, *Tyres (ply rating marked series) and rims for agricultural tractors and machines — Part 3: Rims.*

3 Definitions

For the purposes of this part of ISO 5751, the definitions given in ISO 4223-1 apply.

4 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 4.1);

— service description (see 4.2).

4.1 Size and construction

The size and construction characteristics shall be indicated as follows:

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

4.1.1 Nominal section width

The nominal section width shall be expressed in millimetres.

4.1.2 Nominal aspect ratio

The nominal aspect ratio shall be expressed as a percentage: it shall be a multiple of 10 for aspect ratios 60 and higher, and a multiple of 5 for aspect ratios lower than 60.

4.1.3 Tyre construction code

The tyre construction code shall be as follows:

— "-" for diagonal ply tyres;

— "R" for radial ply tyres.

NOTE 2 See also 4.3.3. Other codes will be established for new concepts (constructions) of tyres.

4.1.4 Nominal rim diameter

The nominal rim diameter shall be expressed by a code. See table 1 for code correlations.

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.

4.2 Service description

The characteristics shall be indicated as follows:

Load index **Speed symbol**

4.2.1 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 the conditions specified by the tyre manufacturer. See table 3.

4.2.2 Speed symbol

The speed symbol indicates the speed category at which the tyre can carry the load corresponding to its load index under the service conditions specified by the tyre manufacturer. See table 4.

Table 1 — Nominal rim diameter code and rim width code

a) Nominal rim diameter code	
Code	**Nominal rim diameter**, D_r mm
8	203
10	254
12	305
13 M/C	330
14 M/C	356
15 M/C	381
16	406
17	432
18	457
19	483
20	508
21	533
23	584
b) Rim width code	
Code	**Measuring rim width**, R_m mm
1.50	38
1.60	40,5
1.85	47
2.15	55
2.50	63,5
2.75	70
3.00	76
3.50	89
3.75	95
4.00	101,5
4.50	114,5
5.00	127
5.50	139,5
6.00	152,5
6.50	165
7.00	178

4.3 Other service characteristics

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

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

4.3.3 Tyres designed for vehicles having a maximum speed capacity in excess of 240 km/h shall be identified by means of code letters:

"VB" for bias-belted construction;

"VR" for radial construction;

"ZB" for bias-belted construction;

"ZR" for radial construction;

where ZB and ZR are recommended for newly designed motorcycles with a maximum speed over 240 km/h.

This identification shall be placed inside the tyre designation (see 4.1) instead of in the tyre construction code, and precludes the marking of the service condition characteristics (see 4.2).

4.3.4 For nominal rim diameter codes 13 up to 19 inclusive, it is recommended to add the suffix "M/C" to the size and construction marking, to prevent confusion and misfitment of motorcycle tyres on rims having the same nominal diameters but designed primarily for passenger car tyres in accordance with ISO 4000-2 or agricultural tyres in accordance with ISO 4251-3.

4.4 Examples

4.4.1 A motorcycle tyre having

a) a size and construction of:

— nominal section width 120 mm,

— nominal aspect ratio 80,

— diagonal construction,

— nominal rim diameter code 18;

b) service description of:

— load-carrying capacity 290 kg,

— reference speed 180 km/h;

shall be marked

120/80 - 18 M/C

4.4.2 A motorcycle having

a) a size and construction of:

— nominal section width 140 mm,

— nominal aspect ratio 70,

— radial construction,

— nominal rim diameter code 17;

b) service description of:

— reference speed in excess of 240 km/h;

shall be marked

140/70 ZR 17 M/C

5 Tyre dimensions

5.1 Calculation of "design tyre" dimensions

5.1.1 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:

$$R_{th} = K_1 S_N$$

NOTE 3 For tyres of existing concepts, $K_1 = 0{,}6$ for aspect ratios 100, 90, 80; $K_1 = 0{,}7$ for aspect ratios 70, 60; $K_1 = 0{,}8$ for aspect ratios 55, 50. For aspect ratios below 50, K_1 will be defined later.

5.1.2 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 existing rims.

5.1.3 Design tyre section width, S

The design 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.

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

5.1.4 Design tyre section height, H

The design tyre section height, H, is equal to the product of the nominal section width, S_N, and the nominal aspect ratio, H/S divided by 100:

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

rounded to the nearest whole number.

5.1.5 Design tyre overall diameter, D_o

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

5.1.6 Values

Guidelines for the "design tyre" dimensions for the metric series of motorcycles are given in annex A.

5.2 Calculation of "maximum overall tyre dimensions in service"

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

5.2.1 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):

$$W_{max} = Sa$$

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

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

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

It includes manufacturing tolerances, growth due to service, and deformation due to centrifugal force.

5.3 Minimum dimensions: minimum 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:

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

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

6 Method of measurement of tyre dimensions

Before measuring, a tyre shall be mounted on the measuring rim ready for tyre fitment, 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.

7 Tread configurations

Figure 1 shows various tread configurations.

NOTE 5 These attributions of tread type configurations to the service are to be considered as examples only. The choice of a given tread type configuration for a given tyre depends on the tyre manufacturer alone.

Tread type A corresponds to highway service tyres manufactured in speed symbols P, S and higher.

Tread type B corresponds to highway service tyres (for high performance vehicles) manufactured in speed symbols S and higher.

Tread type C corresponds to tyres for on-and-off-road service manufactured in speed symbols up to H inclusive.

Tread type D corresponds to tyres for exclusive off-road service manufactured in speed symbol M.

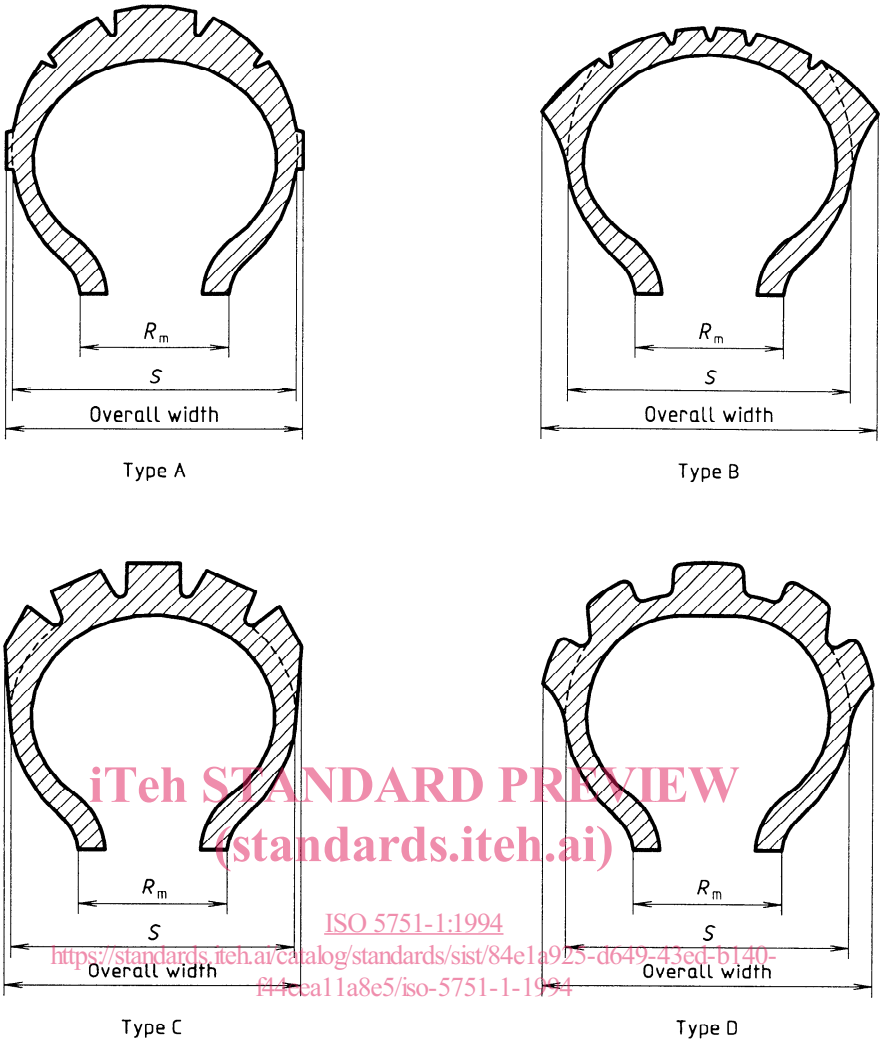

Figure 1 — Tread configurations

Table 2 — Coefficients for calculation of maximum overall tyre dimensions in service for diagonal and radial ply tyres

Tread configuration	Coefficient	
	a	b [1]
Type A	1,1 [2]	1,07 [3]
Type B	1,1	1,07 [3] [4]
Type C	1,1	1,12 [5] [6]
Type D	1,25	1,12 [5]

1) For service up to 150 km/h.

2) 1,08 for diameter codes 12 and below.

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

4) b is equal to 1,10, 1,13 and 1,16 instead of 1,07 in the case of tyres operating at maximum speeds of 180 km/h, 210 km/h and 240 km/h respectively.

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

6) b is equal to 1,15, and 1,18 instead of 1,12 in the case of tyres operating at maximum speeds of 180 km/h, 210 km/h respectively.

8 Tyre load-carrying capacity

8.1 Tyre load-carrying capacity (TLCC) corresponding to the load index (see table 3) applies for speeds up to and including 210 km/h.

Table 3 — Correlation between load index (LI) and tyre load-carrying capacity (TLCC)

Load index	TLCC kg	Load index	TLCC kg	Load index	TLCC kg
0	45	30	106	60	250
1	46,2	31	109	61	257
2	47,5	32	112	62	265
3	48,7	33	115	63	272
4	50	34	118	64	280
5	51,5	35	121	65	290
6	53	36	125	66	300
7	54,5	37	128	67	307
8	56	38	132	68	315
9	58	39	136	69	325
10	60	40	140	70	335
11	61,5	41	145	71	345
12	63	42	150	72	355
13	65	43	155	73	365
14	67	44	160	74	375
15	69	45	165	75	387
16	71	46	170	76	400
17	73	47	175	77	412
18	75	48	180	78	425
19	77,5	49	185	79	437
20	80	50	190	80	450
21	82,5	51	195	81	462
22	85	52	200	82	475
23	87,5	53	206	83	487
24	90	54	212	84	500
25	92,5	55	218	85	515
26	95	56	224	86	530
27	97,5	57	230	87	545
28	100	58	236	88	560
29	103	59	243	89	580

8.2 For speed symbol V between 210 km/h and 240 km/h, the load-carrying capacity is reduced with respect to the value corresponding to the load index as follows:

— up to 210 km/h: 100 % load;

— 220 km/h max.: 95 % load;

— 230 km/h max.: 90 % load;

— 240 km/h max.: 85 % load.

Between the above speeds linear interpolation is permitted.

8.3 For "VB" and "VR" tyres, the load-carrying capacity above 210 km/h is reduced by 5 % for each 10 km/h increase in speed, up to 280 km/h max. (65 % load).

8.4 For "ZR" tyres, the load-carrying capacity applies for speeds up to 240 km/h inclusive. The load-carrying capacity above 240 km/h is reduced as follows:

— 250 km/h: 95 % load;

— 260 km/h: 85 % load;

— 270 km/h: 75 % load.

For speeds over 270 km/h, consult the tyre manufacturer concerned.

9 Speed symbol

Speed symbols shall be as shown in table 4.

Table 4 — Correlation between speed symbol and speed category

Speed symbol	Speed category km/h
J	100
K	110
L	120
M	130
N	140
P	150
Q	160
R	170
S	180
T	190
H	210
V	240[1)]

1) Tyres designed for operations at speeds in excess of 240 km/h are identified as in 4.3.3. For the maximum speed capability, consult the tyre manufacturer concerned.

Annex A
(informative)

Guideline values for metric series

Nominal section width	Aspect ratios 100, 90, 80: Rim/section ratio $K_1 = 0,6$			Aspect ratios 70, 60: Rim/section ratio $K_1 = 0,7$			Aspect ratios 55, 50: Rim/section ratio $K_1 = 0,8$		
	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 mm	R_{th} mm	R_m	S mm	R_{th} mm	R_m	S mm	R_{th} mm	R_m	S mm
60	36	1.5	61	42	1.6	59			
70	42	1,6	69	4.	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	104	4.00	129
140	84	3.50	142	98	4.00	141	112	4.50	141
150	90	3.50	150	105	4.00	149	120	4.50	148
160	96	4.00	162	112	4.50	161	128	5.00	160
170	102	4.00	170	119	4.50	168	136	5.50	171
180	108	4.50	183	126	5.00	180	144	5.50	178
190	—	—	—	—	—	—	152	6.00	190

Dimensions in millimetres

Nominal section width	Design section height, H, at various nominal aspect ratios, H/S (%) :						
S_N mm	100	90	80	70	60	55	50
60	60	54	—	—	—	—	—
70	70	63	56	—	—	—	—
80	80	72	64	56	—	—	—
90	90	81	72	63	54	—	—
100	100	90	80	70	60	—	50
110	110	99	88	77	66	—	55
120	120	108	96	84	72	—	60
130	130	117	104	91	78	72	—
140	140	126	112	98	84	77	—
150	150	135	120	105	90	83	—
160	160	144	128	112	96	88	80
170	170	153	136	119	102	94	85
180	180	162	144	126	108	99	90
190	—	—	—	—	—	105	95