INTERNATIONAL STANDARD

**ISO 5751-1**

Fifth edition
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# Motorcycle tyres and rims (metric series) —

## Part 1: Design guides

*Pneumatiques et jantes pour motocycles (séries millimétriques) —*

*Partie 1: Guide de conception*



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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

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# Contents

Page

## 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 5751 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 fifth edition cancels and replaces the fourth edition (ISO 5751-1:1994), 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*

Annex A of this part of ISO 5751 is for information only.

# Motorcycle tyres and rims (metric series) —

# Part 1:
# Design guides

## 1 Scope

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

This part of ISO 5751 is applicable to motorcycle tyres with a 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 other concepts of tyre and rim, in which case, however, the appropriate rim/section ratios and coefficients will have to be established.

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



## 2 Normative references



The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 5751. 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 5751 are encouraged to investigate the possibility of applying the most recent editions of the normative documents 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 4000-2, *Passenger car tyres and rims — Part 2: Rims*

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

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

## 3 Terms and definitions

For the purposes of this part of ISO 5751, 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 70 and higher, and a multiple of 5 for aspect ratios lower than 70.

### 4.2.4 Tyre construction code

The tyre construction code shall be

— “B” for bias belted type constructions,

— “-” for diagonal ply tyres, and

— “R” for radial ply tyres.



NOTE 1 See also 4.4.3. Other codes will be established for new concepts (constructions) 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 70° 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**

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 in clause 7 (see Table 3).

The speed symbol indicates the speed category in which the tyre can carry the load corresponding to its load index under the service conditions specified in clause 7 (see Table 4).

**Table 1 — Nominal rim diameter and rim width codes**

Dimensions in millimetres

| Nominal rim diameter code | | Rim width code | |
|---|---|---|---|
| Code | Nominal rim diameter $D_r$ | Code | Measuring rim width $R_m$ |
| 8 | 203 | 1.50 | 38 |
| 10 | 254 | 1.60 | 40,5 |
| 12 | 305 | 1.85 | 47 |
| 13 M/C | 330 | 2.15 | 55 |
| 14 M/C | 356 | 2.50 | 63,5 |
| 15 M/C | 381 | 2.75 | 70 |
| 16 M/C | 406 | 3.00 | 76 |
| 17 M/C | 432 | 3.50 | 89 |
| 18 M/C | 457 | 3.75 | 95 |
| 19 M/C | 483 | 4.00 | 101,5 |
| 20 M/C | 508 | 4.50 | 114,5 |
| 21 M/C | 533 | 5.00 | 127 |
| 23 M/C | 584 | 5.50 | 139,5 |
| | | 6.00 | 152,5 |
| | | 6.25 | 159 |
| | | 6.50 | 165 |
| | | 7.00 | 178 |



## 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 code letters

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

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

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

This identification shall be placed inside the tyre designation (see 4.2) instead of in the tyre construction code.

For speed category “V”, “VB” or “VR” tyres suitable for speeds of over 240 km/h, a service description with the speed symbol “V” shall be marked in parentheses.

EXAMPLE 1 120/60 VR 17 (55 V)

For speed category “ZB” or “ZR” tyres suitable for speeds up to 270 km/h, a service description with the speed symbol “W” shall be marked.

EXAMPLE 2 120/60 ZR 17 55 W

If the same tyres are suitable for speeds of over 270 km/h, the service description shall be marked in parentheses.

EXAMPLE 3 120/60 ZR 17 (55 W)

**4.4.4** For nominal rim diameter codes 13 and above, the suffix “M/C” shall be added to the size and construction marking, to prevent confusion and misfitting 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.

**4.4.5** The maximum speed approved by the tyre manufacturer may be marked on the tyre.

EXAMPLE “V250” to identify a maximum speed of 250 km/h.

**4.4.6** The symbol “MST” may be used to identify special service tyres.

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

## 4.5 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 (code letter “ZR”),
- 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 |
|---|---|

In the case of “VR” and “VB” tyres approved for speeds in excess of 240 km/h or “ZR” and “ZB” tyres approved for speeds in excess of 270 km/h, the service description shall be marked in parentheses.

EXAMPLE 1 140/70 ZR 17 M/C (66 W)

The actual maximum speed certified by the tyre manufacturer may be marked on the tyre.

EXAMPLE 2 “V280” to identify a maximum speed of 280 km/h.

# 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:



$$R_{th} = K_1 S_N$$



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,

— 0,7 for aspect ratios 70, 65, 60, and

— 0,8 for aspect ratios 55, 50.

NOTE $K_1$ will be defined later for aspect ratios below 50.

### 5.1.2 Measuring rim width, $R_m$

The measuring rim width, $R_m$, is the width of the existing rim nearest to $R_{th}$. See Table 1 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.



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 motorcycles are given in annex A.

### 5.2 Maximum overall tyre dimensions in service

#### 5.2.1 General

The calculations of 5.2.2 and 5.2.3 are for use by vehicle manufacturers in designing for tyre clearances.

#### 5.2.2 Max. overall width in service, $W_{max}$

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

$$W_{max} = Sa$$

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 Max. 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, growth due to service, and deformation due to centrifugal force.

### 5.3 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.



### 5.4 Measuring tyre dimensions — Procedure

Before measuring, mount the tyre on the measuring rim ready for tyre fitting, 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 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.

Figure 1 shows various tread configurations:

— tread type A corresponds to highway service tyres manufactured for speed symbols P, S and higher;

— tread type B corresponds to highway service tyres (for high-performance vehicles) manufactured for speed symbols S and higher;

— tread type C corresponds to tyres for on- and off-road service manufactured for speed symbols up to and including H;

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