
**Aircraft tyres and rims —
Part 1:
Specifications**

*Pneumatiques et jantes pour aéronefs —
Partie 1: Spécifications*

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

ISO 3324-1:2013

<https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>



iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 3324-1:2013

<https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

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.org
Web www.iso.org

Published in Switzerland

Contents

	Page
Foreword	iv
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 New tyres	2
4.1 Tyre size designation	2
4.2 Tyre markings	2
4.3 Dimensions and symbols	3
4.4 Bias tyre dimensions and growth allowances	3
4.5 Radial tyre dimensions and dimensional tolerances	6
4.6 Determination of clearance allowances	7
5 Retread tyres	13
5.1 Tyre size designation	13
5.2 Tyre markings	13
5.3 Retread tyre dimensions	13
6 Rims	14
6.1 Fundamental rim standards	14
6.2 Inspection tolerances of rims	18
6.3 Valve, fuse plug and over pressure hole locations, V_{min}	21
Annex A (informative) Aircraft tyre size designations	23
Bibliography	30

ISO 3324-1:2013

<https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>

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.

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. www.iso.org/directives

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received. www.iso.org/patents

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

The committee responsible for this document is ISO/TC 31, *Tyres, rims and valves*, Subcommittee SC 8, *Aircraft tyres and rims*.

This fifth edition cancels and replaces the fourth edition (ISO 3324-1:1997), which has been technically revised.

ISO 3324 consists of the following parts, under the general title *Aircraft tyres and rims*:

- *Part 1: Specifications*
- *Part 2: Test methods for tyres*

iTeh STANDARD PREVIEW
(standards.iteh.ai)
ISO 3324-1 title
<https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>

Aircraft tyres and rims —

Part 1: Specifications

1 Scope

This part of ISO 3324 gives specifications for new and retread aircraft tyres and rims.

These specifications are for new designs. Refer to regional standards for prior designs.

2 Normative references

The following referenced documents, in whole or in part, are normatively referenced in this document and are indispensable for the application of its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Not applicable to this part of ISO 3324.

3 Terms and definitions (standards.iteh.ai)

3.1

aspect ratio

AR

ratio of section height to section width

ISO 3324-1:2013
<https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>

3.2

balance mark

identifying red dot, located on the sidewall at the light spot of the tyre

3.3

chine

annular protuberance located around the shoulder area of the tyre, designed to deflect water

3.4

ply rating

PR

index of relative tyre strength, used to identify a given tyre with its maximum load when used in a specific type of service

3.5

skid depth (mould)

depth of the deepest tread grooves in the mould

3.6

venting mark

identification dot, other than red, located at the vents of tyres

3.7

retread tyre

tyre which has been subjected to a retreading operation

4 New tyres

4.1 Tyre size designation

The tyre size designation for new design tyres in accordance with this part of ISO 3324 shall include a three-part size marking as follows:

Overall diameter × Overall section width – Nominal rim diameter

- tyre overall diameter and overall section width, both expressed in millimetres (mm) or both expressed in inches (in);
- nominal rim diameter, expressed as a code (see [Table 1](#)).

For radial-ply tyres, the letter “R” shall be inserted between the overall section width and nominal rim diameter in the tyre size designation replacing the hyphen (“-”).

The size designation may also include one of the following letter prefixes:

- “B” indicates tyres for 15° taper bead seat rims with 60 % to 70 % rim width to tyre section width ratio;
- “H” indicates tyres for 5° taper bead seat rims with 60 % to 70 % rim width to tyre section width ratio.

See ETRTO Aircraft Data Book and TRA Aircraft Year Book for sizing conventions.

4.2 Tyre markings

iTeh STANDARD PREVIEW
(standards.iteh.ai)

The marking of new tyres shall include the following:

- a) tyre size designation;
- b) ply rating (optional); <https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>
- c) maximum speed rating, expressed in miles per hour (mile/h, also sometimes written mph) (civil only);
- d) skid depth (mould), expressed in millimetres (mm) or inches(in) (civil only);
- e) unique serial number and date of manufacture;-
- f) the words “TUBELESS” or “TUBE TYPE” if applicable;
- g) manufacturer’s (or brand) name, and country of manufacture;
- h) balance mark;
- i) venting mark, if applicable;
- j) rated load (kg or lb);
- k) manufacturer’s part number;
- l) manufacturer’s designated casing code (if applicable);
- m) manufacturer’s designated tread code (if applicable).

4.3 Dimensions and symbols

The following dimensions and symbols are used [also see [Figures 2a](#)] and 2b]):

	Inflated new tyre	Inflated growth tyre
Maximum section width ¹⁾	W	W_G
Maximum shoulder width ²⁾	W_S	W_{SG}
Maximum overall diameter	D_O	D_G
Maximum shoulder diameter	D_S	D_{SG}
Maximum section height	H	—
Maximum shoulder height	H_S	—
Aspect ratio		AR
Ply rating		PR
Specified rim diameter		D
Nominal rim diameter code		D_r
Section height growth factor		G_H
Section width growth factor		G_W
Minimum lateral distance required from wheel centreline to adjacent structure		W_X
Minimum radial distance required from axle centreline to adjacent structure		R_X
Minimum lateral clearance ³⁾		C_W
Minimum radial clearance ³⁾		C_R
Minimum shoulder clearance ³⁾		S_X
Width between flanges		A

1) Maximum section width includes protective side ribs, lettering bars and decorations but does not include chines (water deflectors) present on certain types of nose wheel (or auxiliary gear) tyres.

2) Maximum shoulder width does not include chines (water deflectors) present on certain types of nose wheel (or auxiliary gear) tyres.

3) These are minimum clearance allowances between the maximum grown tyre and the adjacent structure.

4.4 Bias tyre dimensions and growth allowances

4.4.1 Tyre dimensions

New inflated tyre dimensional tolerances shall be calculated using the factors shown in [Figures 3](#) or [4](#). When used, the size designation as defined in [4.1](#) determines the maximum overall diameter and

maximum section width of the new inflated tyre. Therefore, tolerances shall be specified as a minus from the permitted maximum dimensions.

Tyre dimensions shall be measured after the new tyre has been mounted on the specified rim, inflated to its rated inflation pressure, and allowed to stand for a minimum of 12 h at normal room temperature and the inflation pressure readjusted to the original value. The maximum section width includes elevations due to labelling (marking, decorations, and all protective bands or ribs except chines).

4.4.2 Determination of growth allowances

4.4.2.1 General

Growth allowances provide for the increase in tyre dimensions over the maximum new inflated tyre dimensions to allow for growth or stretch of the tyre during service.

4.4.2.2 Calculations

4.4.2.2.1 Determine grown dimensions as follows, using the appropriate growth factor given in [4.4.2.2.2](#):

$$W_G = G_W \times W$$

$$W_{SG} = G_W \times W_S$$

$$D_G = D + 2 \times G_H \times H$$

$$D_{SG} = D + 2 \times G_H \times H_S$$

$$H = \frac{D_o - D}{2}$$

$$H_s = \frac{D_s - D}{2}$$

iTeh STANDARD PREVIEW
(standards.iteh.ai)

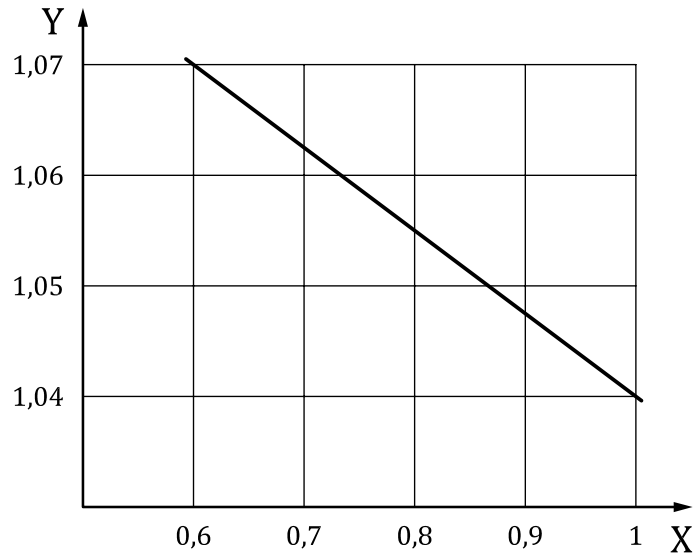
ISO 3324-1:2013

<https://standards.iteh.ai/catalog/standards/sist/90c81c22-a19d-4088-b9f5-e52e9a535cb6/iso-3324-1-2013>

4.4.2.2.2 Growth factors are expressed in [Figure 1](#).

Section width growth factor, $G_W = 1,04$

Section height growth factor, $G_H = 1,115 - (0,075 \times AR)$

**Key**

X aspect ratio (AR)

Y section height growth factor, G_H **Figure 1 — Growth factors**

iTeh STANDARD PREVIEW

4.4.2.2.3 Obtain the new tyre dimensions D_0 , D_S , W and W_S , as shown in the tyre tables (see [Annex A](#)); such dimensions should be considered maximum.

4.4.2.2.4 The maximum shoulder width, W_S , and the maximum shoulder height, H_S , are determined by the formulae:

$$W_S = 0,9 W$$

$$H_S = 0,9 H$$

4.4.2.2.5 Nominal rim diameters are shown in [Table 1](#).

Table 1 — Nominal rim diameter code

Code, D_r	Nominal rim diameter	
	in	mm
4	4	102
5	5	127
6	6	152
7	7	178
8	8	203
9	9	229
10	10	254
11	11	279
12	12	305
13	13	330
14	14	356
15	15	381
16	16	406
17	17	432
18	18	457
19	19	483
20	20	508
21	21	533
22	22	559
23	23	584
24	24	610

4.5 Radial tyre dimensions and dimensional tolerances

4.5.1 Tyre dimensions

The dimensions to be specified for radial tyres are the grown tyre dimensions. They include:

- the maximum overall diameter, D_G ;
- the maximum section width, W_G ;
- the maximum shoulder diameter, D_{SG} ;
- the maximum shoulder width, $W_{SG}^{1)}$;
- the minimum static loaded radius, $SLR_{G,min}$;
- the maximum static loaded radius, $SLR_{G,max}$.

D_G , W_G , D_{SG} , W_{SG} are the maximum permitted grown inflated tyre dimensions. SLR_G is the loaded radius when the grown tyre is inflated to its rated inflation pressure, and loaded to its rated load against a flat surface.

1) For tyre size designations expressed in millimetres, the maximum shoulder width should be calculated using the formula: $W_{SG} = 0,88 W_G$ Consult the tyre manufacturer for application recommendation.

Grown dimensions shall be measured on tyres that have completed 50 take-off cycles. Tyres shall be allowed to cool to room temperature and shall be measured at the rated inflation pressure.

The size designation defined in 4.1 determines the maximum dimensions of an equivalent new inflated bias tyre that would have the same grown dimensions as calculated in 4.4.2.

4.5.2 Calculations

Dimensions “ W_G ” includes all protective side ribs, lettering, bars and decorations, except chines. Determine radial tyre “maximum grown tyre envelope” dimension as follows based on Inch code or Metric designation:

Dimension		Formula	
Inch code tyres	Metric tyres	Inch code tyres	Metric tyres
W_G	W'_G	$1,04 \times W_T$	$1,04 \times W_T$
W_{SG}	W'_{SG}	$0,90 \times W_G$	$0,88 \times W_G$
D_G	D'_G	$(D_T - D) \times G_H + D$	$(D'_T - D) \times G'_H + D$
D_{SG}	D'_{SG}	$0,90 \times (D_G - D) + D$	$0,90 (D'_G - D) + D$
G_H	G'_H	$1,115 - (0,075 \times AR)$	$1,115 - (0,075 \times AR')$
AR	AR'	$(D_T - D)/(2 \times W_T)$	$[D'_T - (25,4 \times D)]/(2 \times W'_T)$

D_T = Theoretical maximum new tyre outside diameter of Inch code radial tyre (maximum new tyre diameter of bias equivalent).

D'_T = Theoretical maximum new tyre outside diameter of metric radial tyre used in calculation of maximum grown overall diameter.

W_T = Theoretical maximum new tyre width (maximum new tyre width of bias equivalent).

W'_T = Theoretical maximum new tyre width (metric radial tyre) (maximum new tyre width of bias equivalent).

4.6 Determination of clearance allowances

4.6.1 Clearances around individual tyres — Bias (diagonal) ply tyres

Clearance allowances between the tyre and the adjacent parts of the aircraft shall be provided by the aircraft manufacturer. These allowances are to be based on the maximum overall tyre dimensions plus growth allowances due to service, plus the increase in diameter due to centrifugal force. Minimum distances to adjacent parts of the aircraft are determined as specified in 4.6.1.1 to 4.6.1.3.

4.6.1.1 Determine the maximum grown tyre envelope as specified in 4.4.2 for bias tyres. This is the dotted line labelled “grown (used) inflated tyre” in Figure 2a).

4.6.1.2 Obtain the radial (C_R) and lateral (C_W) clearances from the formulae in a) or b) below as appropriate.

a) For dimensions in millimetres and speed in km/hour:

$$C_R = \left[\frac{17,02 + 0,5306 \cdot (\text{Speed} / 100)^{3,348}}{1000} \right] \cdot W_G + 10$$

$$C_W = 0,019 W_G + 6$$

b) For dimensions in inches and speed in miles/hour:

$$C_R = \left[\frac{17,02 + 2,61 * (\text{Speed} / 100)^{3,348}}{1000} \right] * W_G + 0,4$$

$$C_W = 0,019 W_G + 0,23$$

4.6.1.3 Determine the distance to adjacent parts as follows:

a) The radial distance from the axle centreline to the adjacent part, $R_{X,min}$, is given by:

$$R_{X,min} = \frac{D_G}{2} + C_R$$

b) The lateral distance from the wheel centreline to the adjacent part, $W_{X,min}$, is given by:

$$W_{X,min} = \frac{W_G}{2} + C_W$$

c) The radius or clearance allowed between tyre shoulder area and adjacent part, $S_{X,min}$, is given by:

$$S_{X,min} = \frac{C_W + C_R}{2}$$

NOTE The radial clearance, $S_{X,min}$, includes allowances for increase in tyre diameter due to centrifugal force.

4.6.2 Clearance around individual tyres-radial ply tyres

Clearance allowances between the tyre and the adjacent parts of the aircraft must be made by the aircraft manufacturer. These allowances are to be based on the maximum overall tyre dimensions shown in the tables, plus growth allowances due to service, plus the increase in diameter due to centrifugal force, and tyre deformation above the horizontal centreline due to load. Minimum distances to adjacent parts of the aircraft are determined as follows:

4.6.2.1 Determine maximum grown tyre envelope as instructed in 4.4.2. This is the dotted line labelled “maximum grown tire envelope” in Figure 2b).

4.6.2.2 Obtain radial clearance C_R and lateral clearance C_W from the following formulae:

NOTE Radial tyres require less clearance between the grown tyre (“maximum grown tire envelope”) dimension and the surrounding aircraft structure than bias tyres. Aircraft designed for RADIAL TYRE USE ONLY can apply the clearance values below.

Radial Tyre Only Envelope

(millimetres)

$$C_R = [0,11528 \times (D_G - D)^{.5} \times (W_G - A)^{.5} \times (\text{SPEED}/D_G)^{.5}] + 3,8$$

$$\text{SPEED} = \text{km/hour}$$

$$C_W = 0,01 \times W_G \quad (2,54 \text{ min.})$$

(inches)

$$C_R = [0,029 \times (D_G - D)^{.5} \times (W_G - A)^{.5} \times (\text{SPEED}/D_G)^{.5}] + 0,15$$

$$\text{SPEED} = \text{miles/hour}$$

$$C_W = 0,01 \times W_G \quad (0,10 \text{ min.})$$

Determine distance to adjacent parts as follows: