BS ISO 3324-1:2013

BSI Standards Publication

Aircraft tyres and rims

Part 1: Specifications

bsi.

...making excellence a habit.™

National foreword

This British Standard is the UK implementation of ISO 3324-1:2013. It supersedes BS 4M 45-1:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ACE/1, International and European Aerospace Policy and Processes.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

ISBN 978 0 580 70875 6

ICS 49.035; 83.160.20

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 July 2013.

Amendments issued since publication

Date	Text affected

BS ISO 3324-1:2013

INTERNATIONAL STANDARD

ISO 3324-1

Fifth edition
2013-07-01

Aircraft tyres and rims —

Part 1: **Specifications**

Pneumatiques et jantes pour aéronefs —
Partie 1: Spécifications

Reference number
ISO 3324-1:2013(E)

COPYRIGHT PROTECTED DOCUMENT

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

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*

INTERNATIONAL STANDARD **ISO 3324-1:2013(E)**

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

3.1
aspect ratio
AR
ratio of section height to section width

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

The marking of new tyres shall include the following:

a) tyre size designation;

b) ply rating (optional);

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:

$W_G = G_W \times W$

$W_{SG} = G_W \times W_S$

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

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

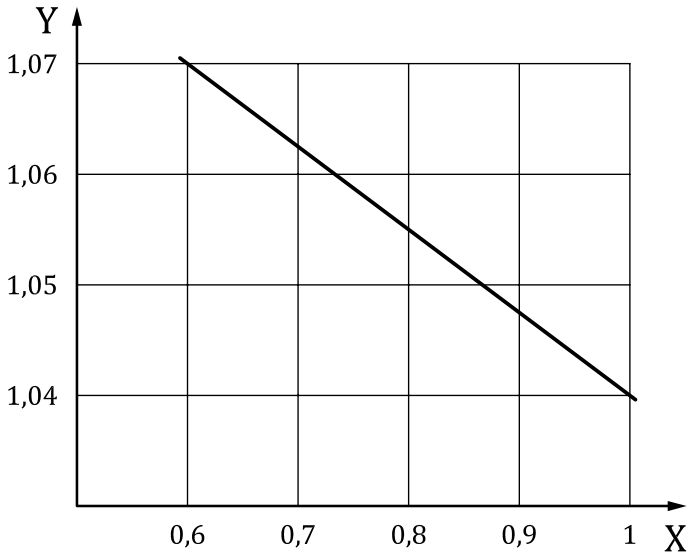
$$H = \frac{D_o - D}{2}$$

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

4.4.2.2.2 Growth factors are expressed in Figure 1.

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

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



Key

X aspect ratio (AR)

Y section height growth factor, G_H

Figure 1 — Growth factors

4.4.2.2.3 Obtain the new tyre dimensions D_O, 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:

a) the maximum overall diameter, D_G;

b) the maximum section width, W_G;

c) the maximum shoulder diameter, D_{SG};

d) the maximum shoulder width, W_{SG}[1)] ;

e) the minimum static loaded radius, $SLR_{G,min}$;

f) 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:WSG = 0,88 WGConsult 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	
Inche 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:

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

$C_W = 0{,}019\ W_G + 6$

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)

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

SPEED = km/hour

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

(inches)

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

SPEED = miles/hour

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

Determine distance to adjacent parts as follows:

R_X(min) = Radial distance from axle centreline to adjacent part = $(D_G/2) + C_R$

W_X(min) = Lateral distance from the centreline to adjacent part = $(W_G/2) + C_W$

S_X Radius (min.) = Clearance allowed between tire shoulder area and adjacent part

= $(C_W + C_R)$ /2

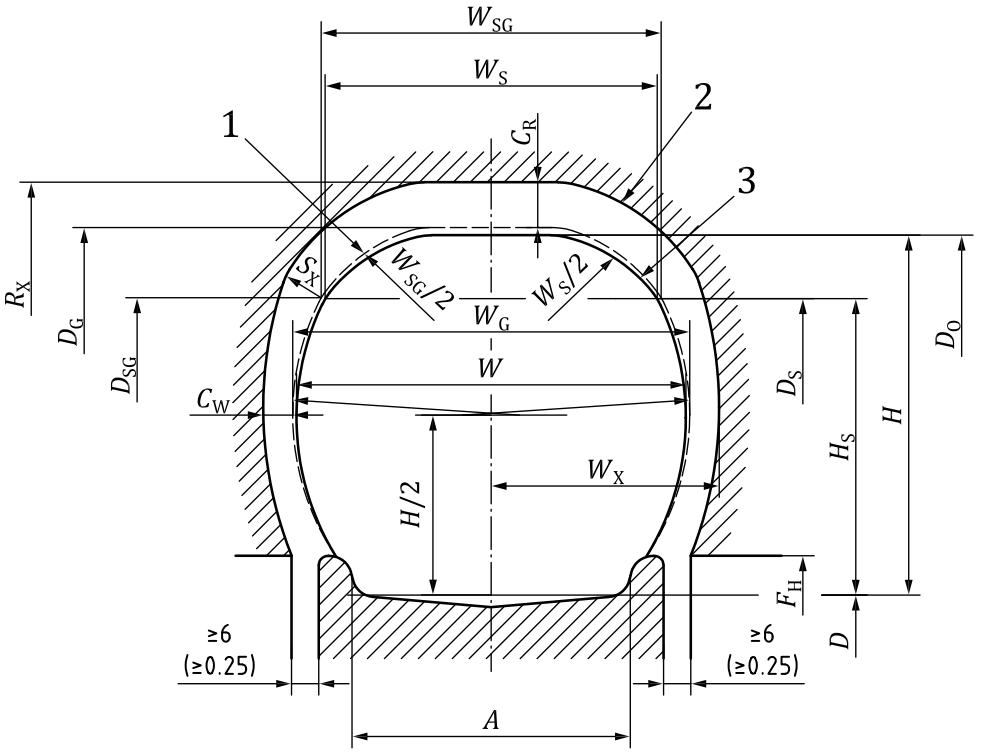
4.6.3 Spacing between twin tyres

The minimum distance between the tyre tread centrelines shall be 1,18 × W_G, where W_G is the maximum grown width of the tyre.

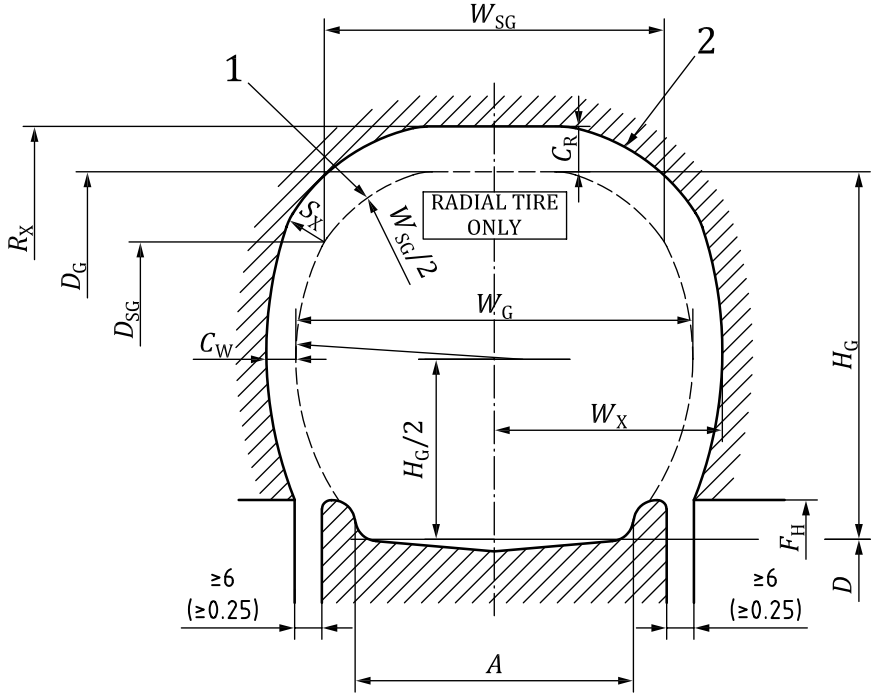
4.6.4 Spacing between tyres in tandem

The minimum distance between axle centres shall be $D_G + 2C_R$, where D_G is the maximum grown tyre diameter and C_R is the tyre radial clearance allowance for the maximum aircraft ground speed.

Dimensions in millimetres



a) Grown and clearance allowances for bias (diagonal) ply tyres



b) Grown and clearance allowances for radial ply tyres

Key

1 maximum grown tyre envelope

2 airframe clearance envelope

3 new inflated tyre

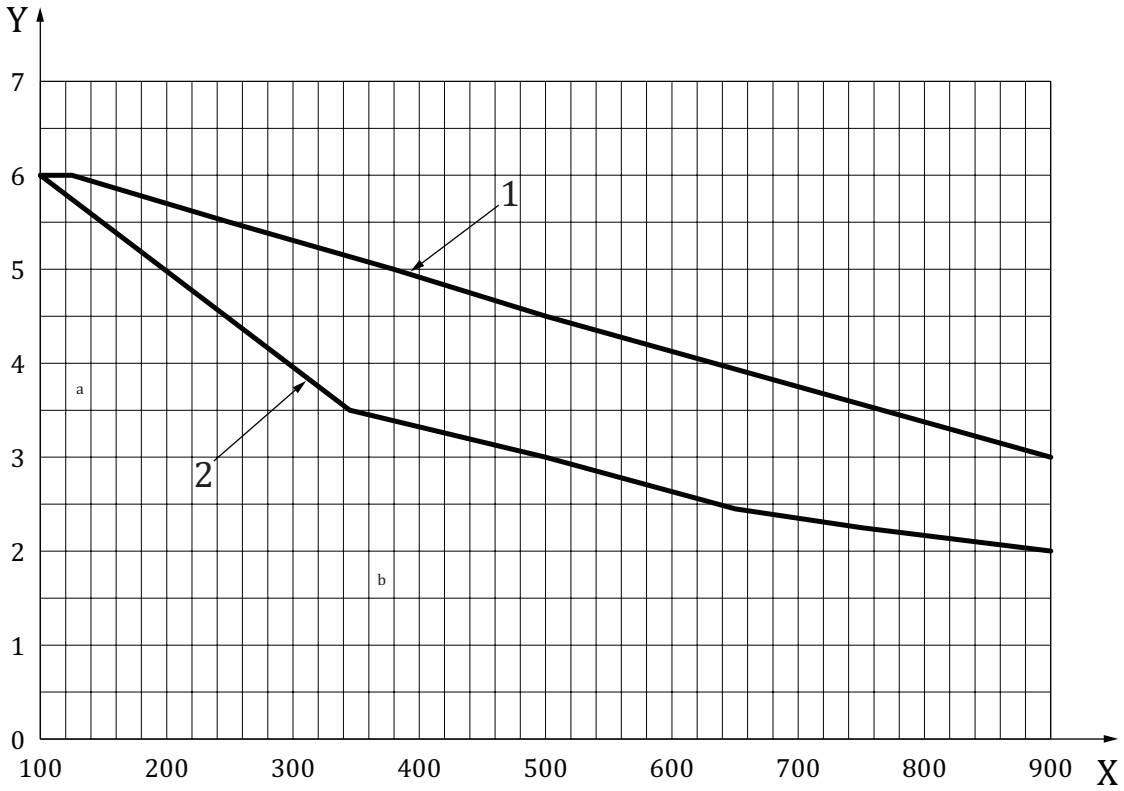
Figure 2 — Grown and clearance allowances

NOTE 1 Radii $W_S/2$ and $W_{SG}/2$ are drawn through their respective shoulder points tangent to D_O and D_G respectively. Radii below the shoulder points pass through the shoulder points and are tangent to W and W_G respectively. Dimensions W and W_G include all protective side ribs, lettering, bars, and decorations, but do not include chines.

NOTE 2 The above drawing represents clearance required for an unloaded free-spinning tire or a loaded tire above the axle centreline.

NOTE 3 Radii $W_{SG}/2$ is drawn through its respective shoulder point tangent to D_G. Radii below the shoulder points pass through the shoulder points and are tangent to W_G.

NOTE 4 Allow increasing clearance from C_W to C_R.



Key

X maximum section height or width, in millimetres (mm)

Y percentage tolerance maximum to minimum - section height or width

1 New tyre design tolerance - section width.

2 New tyre design tolerance - section height.

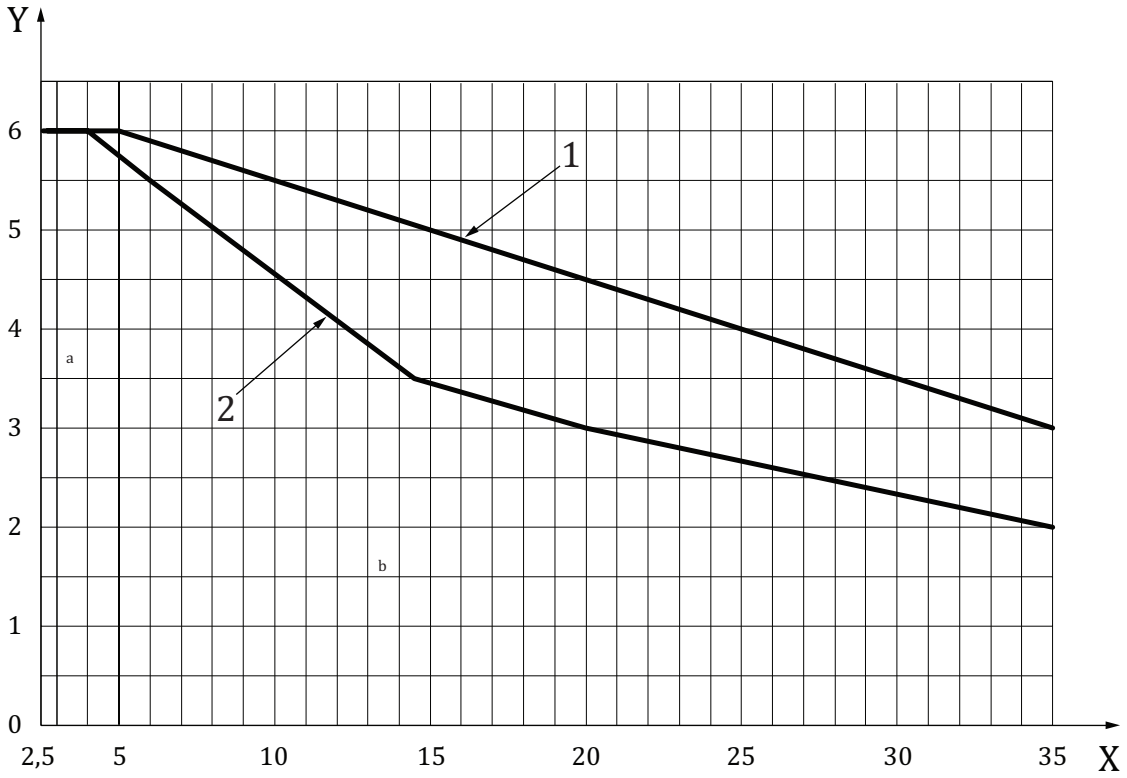
a Below 100 mm. section height and width tolerance is constant at 6%.

b Round all minimum type diameters and section widths to nearest millimetre.

Figure 3 — Dimensional tolerances for new aircraft tyre section height and width: millimetres

Percentage tolerance

Maximum section width, W mm	**Formula** **%**
$0 < W \leq 127$	6
$127 < W \leq 890$	$6{,}5 - 0{,}004W$
Maximum section height, H mm	
$0 < H \leq 100$	6
$100 < H \leq 355$	$7 - 0{,}01H$
$355 < H \leq 635$	$(1\,335 - H)/280$
$635 < H \leq 890$	$3{,}75 - 0{,}002H$



Key

X maximum section height or width, in inches (in)

Y percentage tolerance maximum to minimum - section height or width

1 New tyre design tolerance - section width.

2 New tyre design tolerance - section height.

a Below 4 in section height and width tolerance is constant at 6%.

b Round all minimum type diameters and section widths to nearest 0,05 in.

Figure 4 — Dimensional tolerances for new aircraft tyre section height and width: inches

Percentage tolerance

Maximum section width, W in	**Formula** %
$0 < W \leq 5$	6
$5 < W \leq 35$	$6{,}5 - 0{,}1\ W$
Maximum section height, H in	
$0 < H \leq 4$	6
$4 < H \leq 14$	$7 - 0{,}25H$
$14 < H \leq 25$	$(52{,}5 - H)/11$
$25 < H \leq 35$	$3{,}75 - 0{,}05H$

5 Retread tyres

5.1 Tyre size designation

Designation is the same as the new tyre size designation, as detailed in 4.1.

5.2 Tyre markings

The tyre markings may be original carcass markings and/or retread markings.

The marking of retread tyres shall include the following:

a) original tyre size designation;

b) ply rating, if marked on original tyre;

c) maximum speed rating, expressed in miles per hour (mile/h is also sometimes written mph) (civil only);

d) original serial number;

e) original casing date of manufacture unless part of original serial number;

f) the words “TUBELESS” or “TUBE TYPE” if applicable;

g) original manufacturer’s (or brand) name, and country of manufacture;

h) retreader’s name;

i) retreader’s factory location;

j) date of retread: specify month and year of retreading;

k) retread level: letter R located separately from the tyre size designation followed by the total number of times the tyre has been retreaded (for example, R-3);

l) balance mark – applicable to retread tyres;

m) skid depth (retread mould), expressed in millimetres or inches;

n) venting marks, if applicable;

o) rated load (kg) or (lb);

p) retreader’s designated tread code (if applicable).

5.3 Retread tyre dimensions

Retread tyre dimensional tolerances shall be in accordance with the new tyre grown dimensional tolerances as detailed in 4.4.

6 Rims

6.1 Fundamental rim standards

6.1.1 Symbols

The following symbols for dimensions are used:

A width between flanges

B_{min} minimum flange width

G_{min} minimum ledge width

F_H Flange height

D_F flange diameter

I_{min} minimum well depth

F_R flange radius

J_R heel radius (redesigned or recently designed rims may follow rim heel compound radius clearance envelope in Figure 6)

r_R flange edge radius

D specified rim diameter

D_i sharp diameter (diameter at intersection of flange vertical and bead seat taper) common to both conventional and compound bead seats

D_P diameter locator for P_R

D_W well diameter

Y_R primary (blend) radius of compound heel contour (see Figure 6) tangent to bead taper at distance T from vertical flange

P_R secondary radius of compound heel contour (see Figure 6) tangent to both flange vertical and Y_R

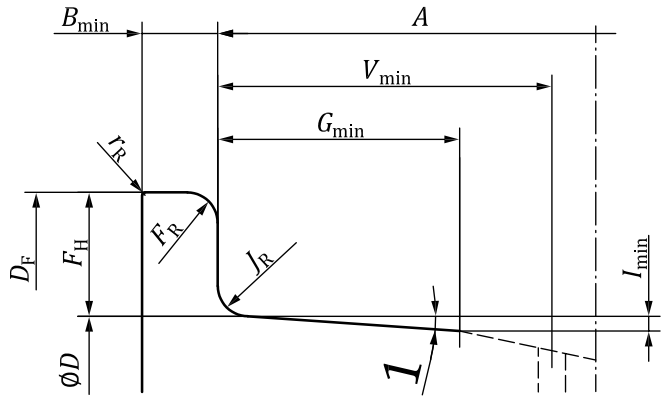
T horizontal distance from flange vertical to tangent of bead seat taper and Y_R

V_{min} valve hole location for tube-type tyre (see Figure 9)

6.1.2 Rim dimensions

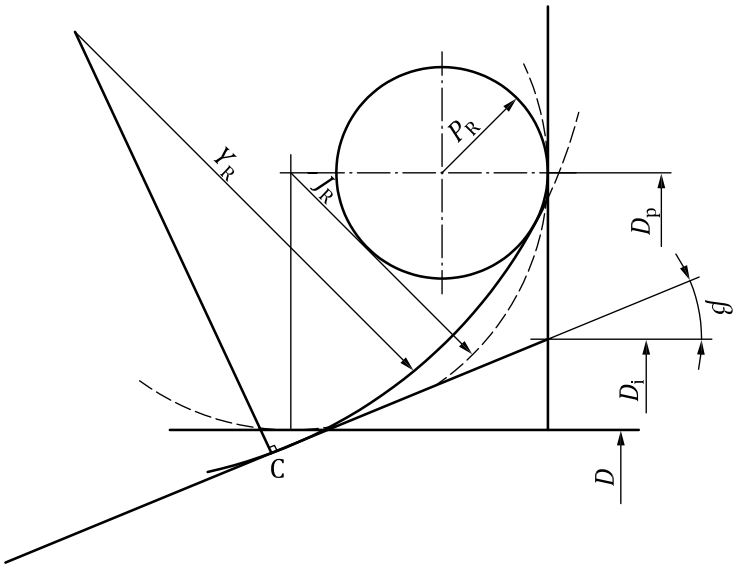
Figure 5 shows the contour of the bead seat area.

Figure 6 shows the design envelope for compound heel radii of the existing series.



Key
1 bead seat taper

Figure 5 — Contour of bead seat area



Key
C tangent of Y_R to bead seat

NOTE Y_R, P_R, D_P and D_i are design dimensions. For maximum values use maximum J_R and D dimensions.

Figure 6 — Design envelope for compound heel radii

6.1.2.1 Rim dimensions in millimetres

For rim dimensions in millimetres, multiply the final values determined from Table 4 by 25,4 and round to one less decimal place than the original rounded inch values.

6.1.2.2 Rim dimensions in inches

Rim dimensions of the inch series shall be as given in Table 2.

Table 2 — Rim dimensions in inches

Wheel details	Ratio of rim width to maximum tyre — Section width [1]	
	60 % to 70 %	70 % and over
Size designation prefix	"H" prefix	No prefix
Bead seat taper	5°	5°
Specified rim diameter, *D*	For 1 inch increments of the code, diameter to end in whole number (examples: 20, 21).	For 1 inch increments of the code, diameter to end in whole number (examples: 15, 16).
Flange height, F_H	For PR/D > 1,4, 0,85 selected F_H rounded to nearest 0,025 inch, for PR/D ≤ 1.4, 0,875 selected F_H rounded to nearest, 025 inch.	See 6.1.4
Flange radius, F_R	For PR/D > 1,4, 0,60 F_H rounded down to nearest 0,05 inch, for PR/D ≤ 1,4, 0,55 F_H rounded down to nearest 0,05 inch	0,5 × flange height. Round down to nearest 0,05 inch
Heel radius J_R	**For FH ≤ 1,25** 0,30 * flange height round up to nearest 0,001 inch. **For FH > 1,25** 0,025D+ 0,100 rounded to nearest 0,001 inch.	**For FH ≤ 1,25** 0,25 * flange height round up to nearest 0,001 inch. **For FH > 1,25** 0,025D+ 0,100 rounded to nearest 0,001 inch.
Minimum flange width, B_{min}	1,3 × flange radius rounded to the nearest 0,001 inch.	1,3 × flange radius rounded to the nearest 0,001 inch.
Width between flanges – increments, *A*	max. tyre width × 0,65 Round to nearest 0,25 inch	Maximum tyre width × 0,775. Round to nearest 0,25 inch.
Flange edge radius, r_R	0,062 inch min.	
Minimum well depth, I_{min}	0,0875 × G min+0,0025D – ((Di-D)/2), round to closest 0,001 inch.	
Sharp Diameter, D_i	1,0047 × D + 0,0104	
Primary Compound heel blend radius, Y_R	2 x J_R	
Secondary Compound heel blend radius, P_R	J_R/3 (0,062 min.)	
P_R Diameter locator, D_P	D + 2 x J_R	

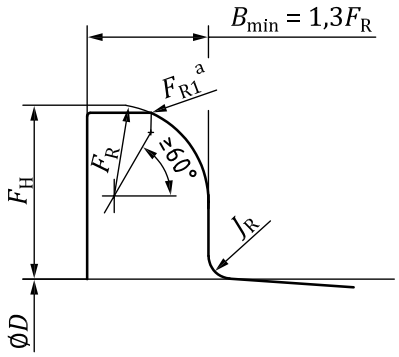
1)For new designs the preferred ratio of rim width to maximum tyre section width for "H" type tyres is 65 % (adjusted to the nearest appropriate rim increment as shown above).

2)See Tables 5 and 6 for specified rim diameters and tolerances.

3)New tires for use on an existing rim interface should use the existing rim dimensions per the regional standard.

6.1.3 Alternate asymmetric rim flange contours

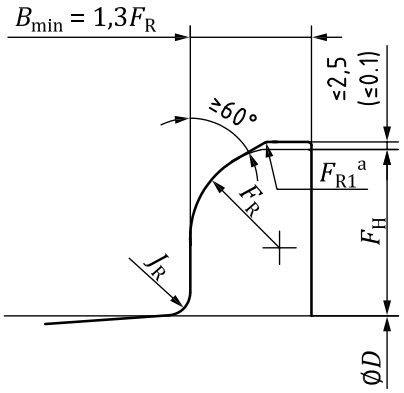
Aircraft applications may require the use of alternate rim flange contours as shown in Figures 7 and 8.



Key

a F_{R1}= 0,2 F_H or 5 mm (0,2 in) min., whichever is greater.

Figure 7 — Flange height decrease from specified dimension



Key

a F_{R1}= 0,2 F_H or 5 mm (0,2 in) min., whichever is greater.

Figure 8 — Flange height increase from specified dimension

6.1.4 Rim flange height — Inches

The rim flange height is calculated using the following formula, in inches:

$$FH = \frac{a + b\times(PR+4) + c\times(PR+4)^2 + d\times(PR+4)^3 + e\times(H/L_R) + f\times(H/L_R)^2}{1 + g\times(PR+4) + h\times(PR+4)^2 + i\times(H/L_R) + j\times(H/L_R)^2 + k\times(H/L_R)^3}$$

where

a is 0,54959;

b is 0,0053275;

c is 0,00034202;

d is 0,0000034138;

e is −0,05286;

f is 0,0024187;

g is −0,0041179;

h is 0,00023336;

i is −0,14303;

j is 0,0079038;

k is −0,00017005;

L_R is $(D_O + D_{min})/2D$;

D_{min} is obtained from Figures 3 and 4.

NOTE Round up to nearest 0,125 inch increment.

6.2 Inspection tolerances of rims

Inspection tolerances for the rims given in 6.1.2.1 and 6.1.2.2 shall be as given in 6.2.1 and 6.2.2 respectively.

6.2.1 Inspection tolerances for dimensions in millimetres

Inspection tolerances for rim dimensions of the millimetre series shall be as given in Table 3.

Table 3 — Rim inspection tolerances in millimetres

Dimensions in millimetres

Dimension (see 6.1.1)	Tolerance	
	plus	minus
A	1,6	1,6
B_{min}	(Minimum dimension)	
D[1)]	See Table 5	
D_i	0,05[2)]	0,05[2)]
G_{min}	(Minimum dimension)	
J_R	0,25	—[3)]
F_R	0,4	0,4
D_F	1,02	Zero
Bead seat taper	30’	30’
Compound heel radii	[4)]	[4)]

1) D is used as a minimum value for calculations unless otherwise stated.

2) Add to the rim diameter tolerances given in Table 5.

3) J_R can vary between J_R max and zero.

4) Y_R, P_R and D_i are design dimensions. For maximum values use J_R and D dimensions. Compound heel dimensions can vary between maximum and zero.

6.2.2 Inspection tolerances for dimensions in inch

Inspection tolerances for rim dimensions of the inch series shall be as given in Table 4.

Table 4 — Rim inspection tolerances in inches

Dimensions in inches

Dimension (see 6.1.1)	Tolerance	
	plus	minus
A	0,063	0,063
B_{min}	(Minimum dimension)	
D[1)]	See Table 6	
D_i	0,002[2)]	0,002[2)]
G_{min}	(Minimum dimension)	
J_R	0,01	[3)]
F_R	0,016	0,016
D_F	0,040	zero
Bead seat taper	30’	30’
Compound heel radii	[4)]	[4)]

1) D is used as a minimum value for calculations unless otherwise stated.

2) Add to the rim diameter tolerances given in Table 6.

3) J_R can vary between J_R max and zero.

4) Y_R, P_R and D_i are design dimensions. For maximum values use J_R and D dimensions. Compound heel dimensions can vary between maximum and zero.

Table 5 — Specified rim diameters in millimetres

Dimensions in millimetres

Nominal rim diameter(D_r) code	**Specified rim diameter**		
	D	Tolerances on *D*	
		Plus	Minus
3	76,20	0,25	zero
4	101,60	0,33	
5	127,00	0,41	
6	152,40	051	
7	177,80	0,51	
8	203,20	0,51	
9	228,60	0,51	
10	254,00	0,53	
11	279,40	0,53	
12	304,80	0,53	
13	330,20	0,53	
14	355,60	0,53	
15	381,00	0,56	
16	406,40	0,56	
17	431,80	0,56	
18	457,20	0,56	
19	482,60	0,56	
20	508,00	0,61	
21	533,40	0,64	
22	558,80	0,66	
23	584,20	0,69	
24	609,60	0,69	
25	635,00	0,71	
26	660,40	0,71	
27	685,80	0,71	
28	711,20	0,71	
29	736,60	0,71	
30	762,00	0,71	
31	787,40	0,71	
32	812,80	0,71	

Table 6 — Specified rim diameters in inches

Dimensions in inches

Nominal rim diameter (D_r) code	Specified rim diameter		
	D	Tolerances on D	
		Plus	Minus
3	3,000	0,010	zero
4	4,000	0,013	
5	5,000	0,016	
6	6,000	0,020	
7	7,000	0,020	
8	8,000	0,020	
9	9,000	0,020	
10	10,000	0,021	
11	11,000	0,021	
12	12,000	0,021	
13	13,000	0,021	
14	14,000	0,021	
15	15,000	0,022	
16	16,000	0,022	
17	17,000	0,022	
18	18,000	0,022	
19	19,000	0,022	
20	20,000	0,024	
21	21,000	0,025	
22	22,000	0,026	
23	23,000	0,027	
24	24,000	0,027	
25	25,000	0,028	
26	26,000	0,028	
27	27,000	0,028	
28	28,000	0,028	
29	29,000	0,028	
30	30,000	0,028	
31	31,000	0,028	
32	32,000	0,028	

6.3 Valve, fuse plug and over pressure hole locations, V_{min}

6.3.1 For tubeless tyres

a) If valve, fuse plug, or over pressure plug hole infringes into the minimum ledge width, G_{min}, the hole shall be recessed.

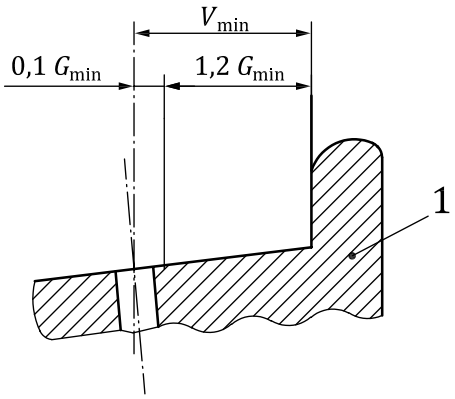
b) Recessed area shall be 7,6 mm (0,3 in) minimum width by 2,5 mm (0,1 in) minimum depth at G_{min}.

c) Recessed area shall extend 12,7 mm (0,5 in) minimum past G_{min} or exit into well area.

d) Recessed area may only extend into G_{min} dimension, 15 % of G_{min} or 12,7 mm (0,5 in) whichever is less.

6.3.2 For tube-type tyres

$V_{min} = 1{,}2 \times G_{min}$ where $0{,}1 \times G_{min}$ shall not be less than 5,1 mm (0,20 in) (see Figure 9).



Key
1 rim

Figure 9 — Valve hole location for tube-type tyre

Annex A
(informative)

Aircraft tyre size designations

A list of tyre size designations are given for information in Tables A.1 to A.4. These are standardized by the following national standards bodies:

— The Tire and Rim Association, Inc (TRA);

— The European Tyre and Rim Technical Organization (ETRTO).

NOTE 1 If the size is listed under more than one standard, there may be minor variations in the data.

NOTE 2 This list is not restrictive. New sizes will be added as they are standardized.

NOTE 3 Numbers in parentheses identify rim diameters per the convention of ETRTO.

Table A.1

Tyre size	TRA	ETRTO	Possible further standards bodies
5.00–4	X		
5.00–4.5	X		
5.00–5	X	X	
6.00–6	X	X	
6.50–8	X	X	
6.50–10	X	X	
7.00–6	X	X	
7.00–8	X		
7.25–6		X	
7.50–10	X	X	
7.50–14	X	X	
8.00–4	X		
8.00–6	X		
8.00–7		X	
8.50–6	X	X	
8.50–10	X	X	
8.90–12.50	X		
9.00–6	X	X	
9.00–10		X	
9.25–12		X	
9.50–16	X	X	
10.50–16		X	
11.00–12	X	X	
12.50–16	X	X	

Table A.1

Tyre size	TRA	ETRTO	Possible further standards bodies
15.00–12	X		
15.00–16		X	
15.50–20	X	X	
17.00–16	X		
17.00–20	X		
20.00–20	X	X	
16 × 4.4 (–8)	X	X	
18 × 4.4 (–10)	X	X	
20 × 4.4 (–12)	X	X	
20 × 5.5	X		

Table A.2

Tyre size	TRA	ETRTO	Possible further standards bodies
18 × 5.5 (–8)	X	X	
22 × 5.5 (–12)	X	X	
24 × 5.5 (–14)	X	X	
18 × 5.7 (–8)		X	
24 × 6.6 (–12)	X	X	
26 × 6.6 (–14)	X	X	
25 × 6.75 (–14)	X	X	
24 × 7.7 (–10)	X	X	
28 × 7.7	X		
29 × 7.7 (–15)	X	X	
30 × 7.7 (–16)	X	X	
24.5 × 8.5 (–10)	X	X	
30 × 8.8 (–15)	X	X	
32 × 8.8 (–16)	X	X	
34 × 11 (–14)	X	X	
36 × 11 (–16)	X	X	
38 × 11 (–18)	X	X	
40 × 12 (–18)	X	X	
39 × 13 (–16)	X	X	
40 × 14 (–16)	X	X	
42 × 15 (–16)	X	X	
44 × 16 (–18)	X	X	
46 × 16 (–20)	X	X	
49 × 17 (–20)	X	X	
56 × 16	X		

Table A.2

Tyre size	TRA	ETRTO	Possible further standards bodies
18 × 4.25 – 10	X	X	
19 × 4.5 – 11.5	X		
13 × 5.0 – 4	X		
20 × 5.25 –11		X	
14.5 × 5.5 – 6	X	X	
18 × 5.7 – 8	X	X	
17.5 × 5.75 – 8	X	X	
18 × 5.75 – 8	X		
22 × 5.75 –12	X	X	
13.5 × 6.0 – 4	X		
15 × 6.0 –6	X	X	
17.5 × 6.25 – 6	X	X	
17.5 × 6.25–11	X		
29 × 6.25 – 16	X		
21 × 6.5 – 10	X		
22 × 6.5 – 10	X	X	
18 × 6.5 – 8	X	X	
24 × 6.5 – 14	X		
27 × 6.5 – 15	X		
22 × 6.6 – 10	X		
19.5 × 6.75 – 8	X	X	
H19.5 × 6.75 – 10	X		
20.5 × 6.75 – 10	X	X	
22 × 6.75 – 10	X	X	
25 × 6.75 – 14	X		
25.75 × 6.75 – 14	X	X	
26 × 6.75 – 14	X		
21.5 × 7.0 – 10	X		
23 × 7.0 – 12	X	X	
21 × 7.25 – 10	X	X	
24 × 7.25 – 10		X	
24 × 7.25 –12	X	X	
25 × 7.5 – 16	X		
27.5x7.5–16	X		
22 × 7.75 – 9	X		
22 × 7.75 – 10	X		
H22 × 7.75 –10	X		
25 × 7.75 – 10	X		
H22 × 7.75 – 10	X		

Table A.2

Tyre size	TRA	ETRTO	Possible further standards bodies
26 × 7.75 – 13	X	X	
27 × 7.75 – 15	X	X	
22 × 8.0 – 8	X		
22 × 8.0 – 10	X		

Table A.3

Tyre size	TRA	ETRTO	Possible further standards bodies
24 × 8.0 – 13	X	X	
25.5 × 8.0–14	X	X	
26 × 8.0–14	X	X	
H26.5 × 8.0 – 14	X		
29 × 8.00 – 15		X	
H22 × 8.25 - 10	X	X	
22 × 8.5 – 11	X	X	
H29 × 9.0 - 15	X	X	
30 × 9.0 - 15		X	
35 × 9.00 – 17		X	
34 × 9.25 – 16	X		
H34 × 9.25 –18	X		
B24 × 9.5 – 10.5	X		
30 × 9.5 - 14	X	X	
H30 × 9.5 - 16	X	X	
31 × 9.75 – 14		X	
H31 × 9.75 – 13	X	X	
32 × 9.75 – 18	X		
34.5 × 9.75 – 18	X		
26 × 10.0 – 11	X		
35 × 10 – 17	X	X	
36 × 10 – 18		X	
31 × 10.75 – 14		X	
32 × 10.75 – 14		X	
33.5 × 10.75- 15		X	
34 × 10.75- 16	X	X	
29 × 11.0 – 10	X		
H35 × 11.0 - 18	X	X	
36 × 11.0 – 18	X		
30 × 11.5 – 14.5	X	X	
31 × 11.50 – 16		X	
32 × 11.5 – 15	X	X	

Table A.3

Tyre size	TRA	ETRTO	Possible further standards bodies
35 × 11.5 –16	X		
34 × 11.75 –14		X	
37 × 11.75–16	X	X	
H34.5 x12 –14		X	
H36 × 12.0 - 18	X	X	
H38 × 12.0 - 19	X	X	
H31 × 13.0 – 12	X	X	
36 × 13.00 – 12		X	
37 × 13.0 – 16	X	X	
H38 × 13.0–18	X	X	
37 × 14.0 –14	X	X	
H37 × 14.0 – 15	X	X	
H40 × 14.0 –19	X	X	
H40 × 14.5 – 19	X	X	
41 × 15.0 – 18	X	X	
H41 × 15.0–19	X		
40 × 15.5 –16	X	X	
40.5 × 15.5 – 16	X	X	
40 × 16.0 - 14	X		
H41 × 16.0–20	X		
H42 × 16.0 - 19	X	X	
43 × 16.0 - 20	X		
H43.5 × 16.0 – 21	X	X	
44.5 × 16.0 – 21	X		
B46 × 16.0 - 23.5	X		
44.5 × 16.5 - 18	X	X	
H44.5 × 16.5 - 20	X	X	
H44.5 × 16.5 - 21	X	X	
H46.25x16.8–21.5	X		
H45 × 17.0 –20	X	X	

Table A.4

Tyre size	TRA	ETRTO	Possible further standards bodies
H46 × 18.0 - 20	X	X	
47 × 18.0 – 18	X		
49 × 18.0 - 22	X		
50 × 18 (–20)		X	
49 × 19.0 – 20	X	X	

Table A.4

Tyre size	TRA	ETRTO	Possible further standards bodies
H49 × 19.0 - 22	X	X	
50 × 20.0 – 20	X	X	
56 × 20.0 – 20	X	X	
52 × 20.5 – 20	X	X	
52 × 20.5 – 23	X	X	
50 × 21.0 – 20	X	X	
54 × 21.0 – 23	X		
H54 × 21.0 – 24	X	X	
175 × 254 × 545		X	
355 × 120 – 5		X	
360 × 135 – 6		X	
380 × 150 – 4	X	X	
380 × 150 – 5		X	
420 × 150 (–6 1/2)		X	
450 × 190–5	X	X	
550 × 250 – 6		X	
605 × 155 – 13		X	
615 × 225 – 10		X	
640 × 170 – 14		X	
670 × 210 – 12		X	
750 × 230 – 15		X	
960 × 354 – 18		X	
16 × 4.4R8	X	X	
20 × 4.4R12	X	X	
18 × 5.5R8	X	X	
16 × 6.0R6	X		
26 × 6.6R14	X	X	
17.9 × 6.7R8	X		
25.75 × 6.75R14	X		
24 × 7.7R10	X	X	
29 × 7.7R15	X		
22 × 7.75R9	X		
26 × 7.75R13	X	X	
27 × 7.75R15	X	X	
23.5 × 8.0R12	X	X	
25.5 × 8.0R14	X		
27.75 × 8.75R14.5	X		
30 × 8.8R15	X	X	

Table A.4

Tyre size	TRA	ETRTO	Possible further standards bodies
32 × 8.8R16	X	X	
H34 × 10.0R16	X	X	
H32 × 10.5R16.5	X		
36 × 11.0R18	X		
30 × 11.5R14.5	X		
40 × 14.0R16	X	X	
40 × 16.0R16	X		
H41 × 16.0R20	X	X	
45 × 16.0R20	X		
42 × 17.0R18	X	X	
46 × 17.0R20	X	X	
49 × 17.0R20	X		
43 × 17.5R17	X		
45 × 18.0R17	X		
50 × 20.0R22	X	X	
52 × 21.0R22	X	X	
1050 × 395R16	X	X	
1270 × 455R22	X	X	
1400 × 530R23	X	X	

Bibliography

[1] ISO 31 (all parts), *Quantities and units*

[2] ISO 690, *Information and documentation — Guidelines for bibliographic references and citations to information resources*

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

[4] ISO/IEC TR 10000-1, *Information technology — Framework and taxonomy of International Standardized Profiles — Part 1: General principles and documentation framework*

[5] ISO 10241, *International terminology standards — Preparation and layout*

[6] IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

[7] European Tyre and Rim Technical Organisation (ETRTO) Aircraft Data Book

[8] The Tire and Rim Association, Inc. (TRA) Aircraft Year Book

ICS 83.160.20
Price based on 30 pages

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

bsi.

...making excellence a habit.™