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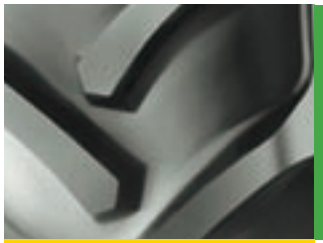

Barum

Technical Databook 2003/2004

Agricultural Tyres

Barum -
a brand of
Continental AG

Technical Databook

Barum

In the year 1998
Barum Continental,Ltd.
received the certificate
TÜV CERT according
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QS 9000

Barum Continental, Ltd.
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from TÜV Rheinland
a certificate, which ratifies
that environmental politics,
platform and management
system accords with
postulates of EU 1836/93
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EG-SYSTEM FÜR DAS UMWELT-MANAGEMENT UND DIE UMWELTBETRIEBS-PRÜFUNG

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1836/93

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Agricultural Tyres

Technical Databook 2003/2004

Introduction

This booklet is a comprehensive guide to Barum agricultural tyres. The technical data and other information relating to tyres and accessories has been compiled with great care to reflect the current state of technology. All specifications comply with ETRTO[1)] and DIN standards.

The information given in this guide is based on the average operating conditions normally found in Central Europe. For different operating conditions, e.g. for applications outside Central Europe, please contact our Customer Service department.

This guide is designed for information purposes only. All liability, whether for compensation or any other legal ground, is excluded. The tyre sizes given in the data tables are not always identical to the ones available in the current size range.

The data and instructions given in this booklet must be adhered to under all circumstances to ensure the safety of the vehicle and, as far as tyre fitting goes, the safety of the fitter. This applies particularly to tyre pressure information. Should the instructions given not be adhered to, there is a risk that the tyre may be damaged as a result or it may burst during use.

1) ETRTO – The European Tyre and Rim Technical Organisation, Brussels

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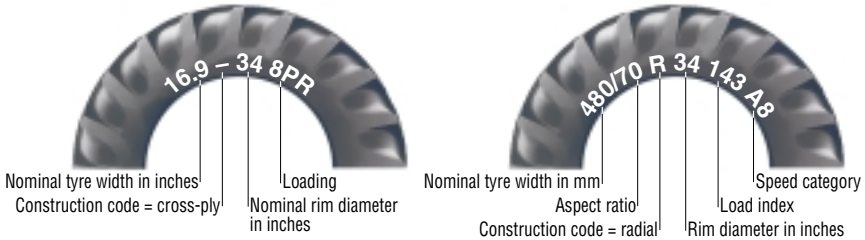
Tyre Designations



Examples of Sidewall Lettering

Nominal tyre width (inches × mm)	H : B[1] (%)	Code of tyre construction[2]	Nominal rim width (inches)	Code of tread pattern	Tyre loading PR[3]	Tyre loading LI[4]	Speed category SS
6.00		–	18	TP 7	6 PR		
18.4		–	34	TZ 19	12 PR		
480	70	R	34	AR 70		143	A8
16.9		R	30			137	A8
17.5 L[5]		–	24	TG 1			
11.5	80	–	15.3	ZSN 4	10 PR		

[1] Aspect ratio (height H is 70 % of width B of tyre profile)
[2] "R" radial carcass; "–" crossply carcass
[3] PR = PLY RATING (Symbol of carcass support)
[4] LI = LOAD INDEX
[5] L = Code of low pattern

Number PR is not identic with real number of layers as before, because in past this symbol has been issued from number of cotton cord layers. Nowadays are used cords of rayon, nylon or steel with higher firmness. PR is used to differ load capacity among tyres with identic size.

Tyre Width – Old and New Lettering

Old	Transient	New	Millimetre range
7	7.2/7	7.2	
8	8.3/8	8.3	
9	9.5/9	9.5	300
10	11.2/10	11.2	320
11	12.4/11	12.4	360
12	13.6/12	13.6	380
13	14.9/13	14.9	420
14	16.9/14	16.9	480
15	18.4/15	18.4	520
18	23.1/18	23.1	
Example of complete lettering			
12-38	13.6/12-38	13.6-38	520/70 R 38

Load Index

This number gives the maximum tyre loading at the speed given by the speed category under specified conditions.

LI	kg	LI	kg	LI	kg	LI	kg	LI	kg
90	600	110	1 060	130	1 900	150	3 350	170	6 000
91	615	111	1 090	131	1 950	151	3 450	171	6 150
92	630	112	1 120	132	2 000	152	3 550	172	6 300
93	650	113	1 150	133	2 060	153	3 650	173	6 500
94	670	114	1 180	134	2 120	154	3 750	174	6 700
95	690	115	1 215	135	2 180	155	3 875	175	6 900
96	710	116	1 250	136	2 240	156	4 000	176	7 100
97	730	117	1 285	137	2 300	157	4 125	177	7 300
98	750	118	1 320	138	2 360	158	4 250	178	7 500
99	775	119	1 360	139	2 430	159	4 375	179	7 750
100	800	120	1 400	140	2 500	160	4 500	180	8 000
101	825	121	1 415	141	2 575	161	4 625	181	8 250
102	850	122	1 500	142	2 650	162	4 750	182	8 500
103	875	123	1 550	143	2 725	163	4 875	183	8 750
104	900	124	1 600	144	2 800	164	5 000	184	9 000
105	925	125	1 650	145	2 900	165	5 150	185	9 250
106	950	126	1 700	146	3 000	166	5 300	186	9 500
107	975	127	1 750	147	3 075	167	5 450	187	9 750
108	1 000	128	1 800	148	3 150	168	5 600	188	10 000
109	1 030	129	1 850	149	3 250	169	5 800	189	10 300

Speed Symbol

This is the maximum speed at which the tyre can bear the load given by the load index under specified conditions.

Symbol	A1	A2	A3	A4	A5	A6	A7	A8	B
Speed *(km/h)*	5	10	15	20	25	30	35	40	50

The diagonal agricultural tyres Barum are produced in Speed category A6 (30 km/h).

Units of Measurement and Definitions of the main Technical Parameters

- **The tyre width** is given in inches or millimetres.

- **The standard dimensions** are the theoretical values which apply to a new tyre. The width refers to the smooth sidewall, the outer diameter to the centre of the tread (the dimensions given in the following tables on pages 35–51 of this booklet are standard values in accordance with ETRTO regulations).

- **The maximum dimensions** are the actual values of the inflated, unladen tyre without dynamic deformation.

- **The nominal cross-sectional width (SW)** is a design dimension, indicating the tyre width with smooth sidewall.

- **The max. operating width (LSW)** is the maximum permitted width of the tyre, including deformation under load.

- **The outer diameter (OD)** refers to the diameter of the unladen tyre. This can be calculated as follows using the circumference (lo):

$$D = lo/\pi \quad (mm)$$

- **The cross-sectional height (SH)** is equal to the outer diameter minus the rim diameter divided by two.

- **The static radius (SLR)** is the distance between the axle and the contact patch of a stationary tyre under the prescribed load and the respective inflation pressure.

- **The tyre aspect ratio** is the ratio of the height to the width of the tyre cross-section expressed in %:

$$100 \ \frac{H}{B}$$

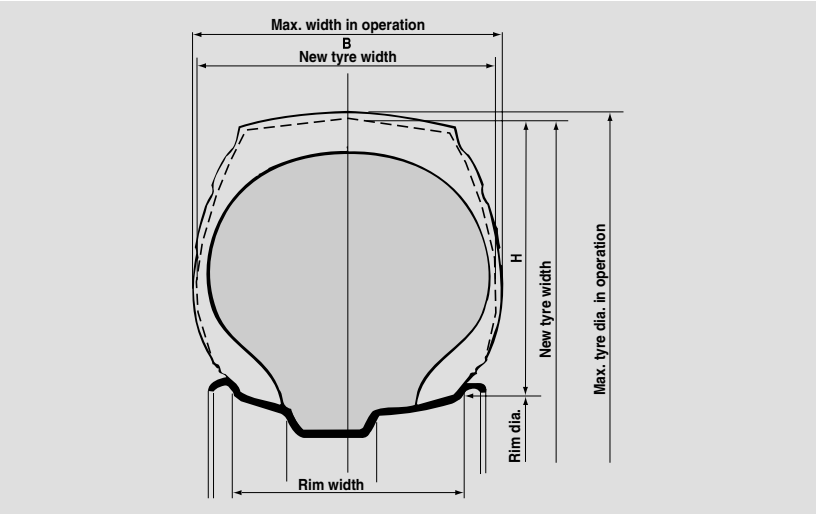
- **The rolling circumference (lo)** is the distance covered by the tyre in one wheel revolution on a firm surface.

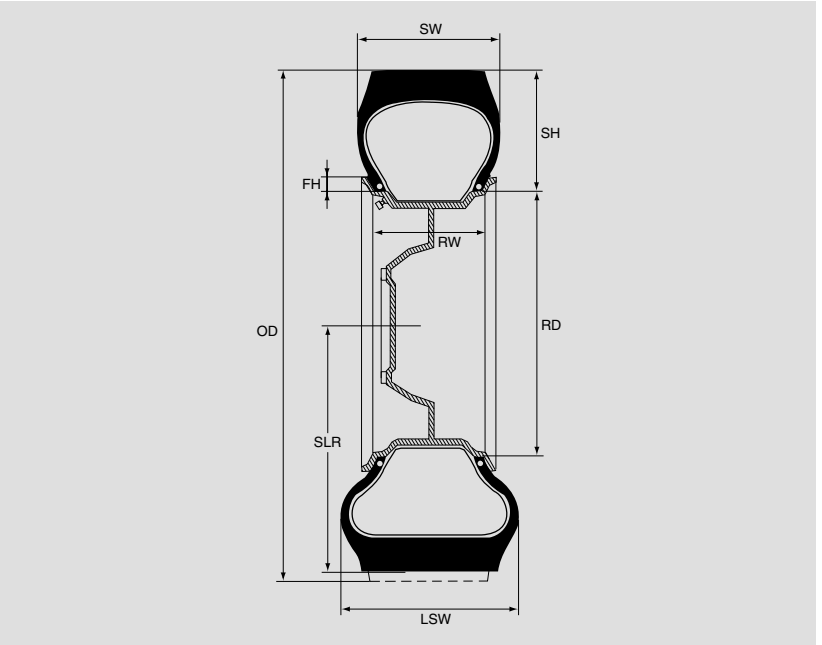
- **The rim width (RW)** is the distance between the two opposing rim edges, expressed in inches.

- **The rim diameter (RD)** is the diameter of the rim around the bead heel, expressed in inches.

- **The rim flange height (RH)** is the distance between the bead heel and the upper edge of the rim flange.

Tyre Dimensions





Overview of Radial Drive Wheel Tyres

Rim diameter in inches	Size	AR 70◆
24"		
	320/70 R 24	LI 116
	380/70 R 24	LI 125
	420/70 R 24	LI 130
26"		
28"		
	380/70 R 28	LI 127
30"		
	480/70 R 30	LI 141
32"		
34"	**480/70 R 34**	LI 143
36"		
38"		
	480/70 R 38	LI 145
	520/70 R 38	LI 150
	580/70 R 38	LI 155
42"		

Rim diameter in inches	Size	TZR 2◆	TZR 3◆
24"	**8.3 R 24**		
	9.5 R 24		
	11.2 R 24	LI 114	
	12.4 R 24	LI 119	
	13.6 R 24	LI 121	
	14.9 R 24	LI 126	
	16.9 R 24		LI 134
	17.5L R 24		
26"	**18.4 R 26**		
28"	**11.2 R 28**		LI 116
	12.4 R 28		LI 121
	13.6 R 28		LI 123
	14.9 R 28	LI 128	
	16.9 R 28	LI 136	
30"	**14.9 R 30**		LI 129
	16.9 R 30	LI 137	
	18.4 R 30		LI 142
32"	**9.5 R 32**		
	12.4 R 32		
34"	**16.9 R 34**	LI 139	
	18.4 R 34	LI 144	
36"	**12.4 R 36**		
	13.6 R 36	LI 127	
38"	**12.4 R 38**		
	13.6 R 38		LI 128
	16.9 R 38	LI 141	
	18.4 R 38	LI 146	
	20.8 R 38	LI 153	
42"	**20.8 R 42**		LI 156

◆ In speed category A8 (40 km/h); all other tyres in speed category A6 (30 km/h)

AR 70 TRACTION

- A representative of radial low-profile tyres with aspect ratio 70% which presents a higher state of development compare to usual radial tyres
- Low profile tyres by the same outer diameter provides lower contact pressure on soil, higher carrying capacity and offers very good grip and traction

320/70	R 24	116	A8	TL
380/70	R 24	125	A8	TL
420/70	R 24	130	A8	TL
380/70	R 28	127	A8	TL
480/70	R 30	141	A8	TL
480/70	R 34	143	A8	TL
480/70	R 38	145	A8	TL
520/70	R 38	150	A8	TL
580/70	R 38	155	A8	TL

TZR 2

- A standard radial tractor tyre
- Increased contact area, uniform pressure on ground and excellent grip
- The decreased rolling resistance reduces fuel consumption and ensures higher ride comfort
- Especially suitable for use on flat and gently sloping terrains

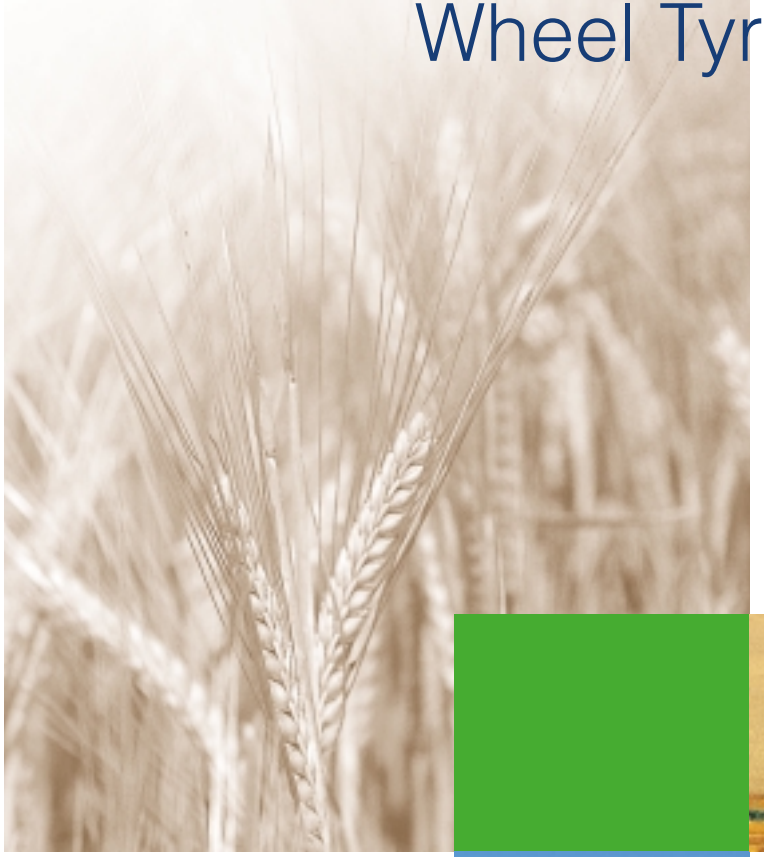
11.2	R 24	114	A8	TL
12.4	R 24	119	A8	TL
13.6	R 24	121	A8	TL
14.9	R 24	126	A8	TL
14.9	R 28	128	A8	TL
16.9	R 28	136	A8	TL
16.9	R 30	137	A8	TL
16.9	R 34	139	A8	TL
18.4	R 34	144	A8	TL
13.6	R 36	127	A8	TL
16.9	R 38	141	A8	TL
18.4	R 38	146	A8	TL
20.8	R 38	153	A8	TL

Overview of Crossply Drive Wheel Tyres

TZR 3

- Standard profile tubeless radial tyre
- High curved tread lugs ensure high efficient traction forces
- A sophisticated shoulder rib protects the flexible sidewall
- Smooth interlug surfaces for effective selfcleaning
- Excellent driving comfort and minimal wear

16.9 R 24 134 A8 (131 B) TL
11.2 R 28 116 A8 (113 B) TL
12.4 R 28 121 A8 (118 B) TL
13.6 R 28 123 A8 (120 B) TL
14.9 R 30 129 A8 (126 B) TL
18.4 R 30 142 A8 (139 B) TL
13.6 R 38 128 A8 (125 B) TL
20.8 R 42 156 A8 (153 B) TL



Rim diameter in inches	Size	TZ 13	TZ 17	TZ 19	TL 1	TG 1
16"	6.00-16	6 PR				
	6.50-16					
	7.50-16	6 PR				
	9.00-16					
18"	6.00-18					
20"	6.50-20					
	7.50-20	6 PR				
	8.3-20	6 PR				
24"	8.3-24	6 PR				
	9.5-24	8 PR		8 PR		
	11.2-24			8 PR		
	12.4-24			8 PR		
	13.6-24					
	14.9-24					
	16.9-24	8 PR				10, 12 PR
26"	18.4-26			10, 12 PR		
28"	11.2-28			8 PR		
	12.4-28			6, 10 PR		
	13.6-28			6 PR		
	14.9-28			8 PR		
	16.9-28	8, 10 PR				8, 12 PR
30"	16.9-30	8, 10 PR	8, 10 PR		12 PR	
	18.4-30	8, 10, 12 PR				
32"	9.5-32	6 PR				
	12.4-32	6 PR				
34"	16.9-34		8 PR			
	18.4-34	8 PR		8, 12 PR		
36"	12.4-36	6 PR				
	13.6-36	6 PR				
38"	12.4-38		8 PR			
	13.6-38	6 PR				
	16.9-38	8 PR				
	18.4-38			8 PR		
	20.8-38					

TZ 13

- A well-tested and proven tread design for tractors
- Features good self-cleaning ability and resistance to damage
- Ideal for applications on sloping terrains
- Suited for both front and driving axle use

6.00-16	6 PR TT
7.50-16	6 PR TT
7.50-20	6 PR TT
8.3 -20	6 PR TT
8.3 -24	6 PR TT
9.5 -24	8 PR TT
16.9 -24	8 PR TT
16.9 -28	8, 10 PR TT
16.9 -30	8, 10 PR TT
18.4 -30	8, 10, 12 PR TT
9.5 -32	6 PR TT
12.4 -32	6 PR TT
18.4 -34	8 PR TT
12.4 -36	6 PR TT
13.6 -36	6 PR TT
13.6 -38	6 PR TT
16.9 -38	8 PR TT

TZ 17

- A significant increase in the depth of the tread lugs offers outstanding road-grip characteristics
- The optimal shape of the tread lug root improves resistance to mechanical damage
- The bead is well protected against penetration by foreign matter and contaminants

16.9-30	8, 10 PR TT
16.9-34	8 PR TT
12.4-38	8 PR TT

TZ 19

- The increased rib height (compared to TZ 13) offers improved road-grip characteristics
- The increased central rib surface improves roll on compacted surface
- Developed for use on steering-grip and rear axles of tractors

9.5-24	8 PR TT
11.2-24	8 PR TT
12.4-24	8 PR TT
14.9-24	8 PR TT
18.4-26	10, 12 PR TT, TL
11.2-28	8 PR TT
12.4-28	6, 10 PR TT
13.6-28	6 PR TT
14.9-28	8 PR TT
18.4-34	8, 12 PR TT
18.4-38	8 PR TT

TG 1

- Developed for tractor graders and use in the building and construction industry, as well as in agricultural
- The shape and dimensions of the tread lugs avoids irregular wear
- Offers excellent resistance to mechanical damage during earth work

16.9-24	10, 12 PR TL
16.9-28	8, 12 PR TL

TL 1

- Developed for forest tractor operation
- Use of steel-cord breaker makes this tyre highly resistant to mechanical damage
- Configuration of tread lugs allows the use of protective chains
- Tyre bead is protected against penetration by foreign objects

16.9-30 12 PR TT

Overview of Crossply Front Tyres

Rim diameter in inches	Size	TP 7	TP 8	TP 9
16"	6.00-16		6 PR*	6 PR
	6.50-16		6 PR	6, 8 PR
	7.50-16		6 PR	6 PR
	9.00-16			6 PR
18"	6.00-18	6 PR		
20"	6.50-20	6 PR	6 PR	6 PR
	7.50-20		6 PR	6 PR

* Tread pattern TP 8P

TP 7

- Tyre for steering axles of two wheel drive tractors
- High stability in track due to strong relief of design
- Deep ribs in shoulder area increase possibility of track changes
- Good stearing charactericstics, especially on sloping terrains and in wet conditions

6.00-18 6 PR TT
6.50-20 6 PR TT

TP 8

- Designed for front non-driven wheels of tractors
- Very good straight-line steering characteristics
- Improved performance in on-the-road service

6.50-16 6 PR TT
7.50-16 6 PR TT
6.50-20 6 PR TT
7.50-20 6 PR TT

TP 8P

- Tyre for 2WD steering axle fitment
- Very good straight-line characteristics especially on soft terrain
- Offers long service life

6.00-16 6 PR TT

Overview of Radial Implement Tyres

TP 9

- A variation of the proven TP 7 tread pattern
- Offers increased resistance to irregular wear
- The greater reliefing of the tread pattern improves safety of operation on roads

6.00-16	6 PR TT
6.50-16	6, 8 PR TT
7.50-16	6 PR TT
9.00-16	6 PR TT
6.50-20	6 PR TT
7.50-20	6 PR TT

Rim diameter in inches	Size	NR 40 A	NR 27
22.5"	445/65 R 22.5	169 F	
	18 R 22.5		168 J

NR 40 A

- An arrow-like design of the tread pattern with high grip especially designed for agricultural use
- Suitable for use on both front and rear axles up to 80 km/h
- Excellent grip characteristics in terrain and good self-cleaning properties

445/65 R 22.5 169 F TL

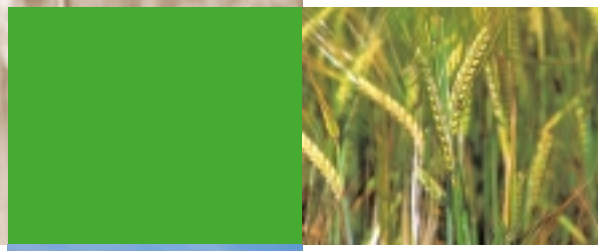
NR 27

- A pattern for universal use, also with very good off-road grip
- Suitable for both front and rear driven axles as well as for trailer axles up to 100 km/h

18 R 22.5 168 J TL

Overview of Crossply Implement Tyres

Rim diameter in inches	Size	ZSN 4	UKN 4	DTN 4
12"	10.0/80-12	12 PR		
15.3"	11.5/80-15.3	10 PR		
	10.0/75-15.3			10 PR
	10.0/75-15.3		8 PR	
	10.0/75-15.3		14 PR	
16"	7.50-16	8 PR		
18"	13.0/65-18	14 PR		



ZSN 4

- The tread pattern, derived from proved tread pattern UKN 4
- A significant increase of adhesion due to deeper grooves between the tread pattern blocks
- The tyre is above all suited for agricultural use

10.0/80-12	12 PR TT
11.5/80-15.3	10 PR TT
7.50-16	8 PR TT
13.0/65-18	14 PR TT

UKN 4

- Typical steering tread pattern for all kinds of trailers
- The wavy central longitudinal ribs and short and robust lateral lugs on the edge of the tread pattern ensure good steering characteristics and makes driving out of the furrow easier

10.0/75-15.3 8 PR TL
10.0/75-15.3 14 PR TT

DTN 4

- Tyre particulary suitable for works on loaders at building sites and for agricultural use
- The robust lugs ensure good grip and due to their crossing in centre of pattern provide comfortable ride especially on though road surface

10.0/75-15.3 10 PR TT

Technical Data

Radial Drive Wheel Tyres AR 70 TRACTION

Size	LI	Dimensions				Static radius	Rolling circum-ference	Approved rim
		Barum		Standardised				
		Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	± 2 % (mm)	± 2.5 % (mm)	
320/70 R 24	116	310	1 106	335	1 076	508	3 333	W10 (W9; W11)
380/70 R 24	125	377	1 180	399	1 164	534	3 531	W12(W11; W13)
420/70 R 24	130	411	1 259	439	1 222	572	3 774	W13 (W12; W14L)
380/70 R 28	127	370	1 282	399	1 265	591	3 870	W12 (W11; W13)
480/70 R 30	141	491	1 484	503	1 460	669	4 433	W15L (W14L; W16L)
480/70 R 34	143	480	1 580	503	1 562	715	4 731	W15L (W14L; W16L)
480/70 R 38	145	483	1 678	503	1 663	762	5 030	W15L (W14L; W16L)
520/70 R 38	150	529	1 737	542	1 723	787	5 200	W16L (W15L; W18L)
580/70 R 38	155	577	1 854	606	1 809	834	5 532	W18L

[1] In on-the-road traffic: all tyres inflation 190 kPa

Tyre load capacity in kg at inflation pressure in kPa (for speed category 40 km/h)[1]								
80	90	100	110	120	130	140	150	160
800	865	925	985	1 040	1 095	1 150	1 200	1 250
1 060	1 140	1 220	1 300	1 375	1 445	1 515	1 585	1 650
1 220	1 315	1 405	1 495	1 580	1 665	1 745	1 825	1 900
1 125	1 210	1 295	1 375	1 455	1 530	1 605	1 680	1 750
1 650	1 780	1 905	2 025	2 140	2 255	2 365	2 470	2 575
1 750	1 885	2 015	2 145	2 265	2 385	2 500	2 615	2 725
1 860	2 005	2 145	2 280	2 410	2 540	2 660	2 785	2 900
2 150	2 320	2 480	2 635	2 785	2 935	3 075	3 215	3 350
2 860	3 000	3 145	3 280	3 410	3 535	3 660	3 770	3 875

Conversion Table

70% Tyre	Standard tyre
320/70 R 24	11.2 R 24
380/70 R 24	13.6 R 24
420/70 R 24	14.9 R 24
380/70 R 28	13.6 R 28
480/70 R 30	16.9 R 30
480/70 R 34	16.9 R 34
480/70 R 38	16.9 R 38
520/70 R 38	18.4 R 38
580/70 R 38	20.8 R 38

Static radius and rolling circumference are identical for both standard and corresponding 70% tyre.
Benefits: higher carrying capacity, lower pressure on ground and possibility of mounting on existing rim.

Radial Drive Wheel Tyres TZR 2

Size	LI	Dimensions				Static radius	Rolling circum-ference	Approved rim
		Barum		Standardised				
		Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	± 2 % (mm)	± 2.5 % (mm)	
11.2 R 24	114	282	1 080	307	1 115	502	3 272	W10 (W9)
12.4 R 24	119	292	1 127	340	1 170	515	3 388	W11 (W9, 10)
13.6 R 24	121	353	1 179	373	1 215	540	3 548	W12 (11)
14.9 R 24	126	371	1 227	408	1 275	559	3 684	W13 (W11, 12)
14.9 R 28	128	370	1 349	408	1 380	623	4 076	W13 (W11, 12)
16.9 R 28	136	390	1 419	463	1 450	643	4 249	W15L (W14L)
16.9 R 30	137	425	1 471	463	1 505	674	4 428	W15L (W14L)
16.9 R 34	139	430	1 570	463	1 605	721	4 731	W15L (W14L)
18.4 R 34	144	468	1 643	504	1 680	750	4 937	W16L (W15L)
13.6 R 36	127	335	1 488	373	1 525	692	4 511	W12 (W11)
16.9 R 38	141	432	1 673	463	1 705	770	5 047	W15L (W14L)
18.4 R 38	146	474	1 750	504	1 780	800	5 262	W16L (W15L)
20.8 R 38	153	545	1 823	570	1 870	830	5 471	W18L (W16L)

Tube	Tyre load capacity in kg at inflation pressure in kPa (for speed category 40 km/h)								
	80	90	100	110	120	130	140	150	160
11.2-24	755	815	875	930	980	1 035	1 085	1 130	1 180
12.4-24	875	940	1 005	1 070	1 130	1 190	1 250	1 305	1 360
13.6-24	930	1 005	1 075	1 140	1 205	1 270	1 330	1 390	1 450
14.9-24	1 090	1 175	1 260	1 340	1 415	1 490	1 560	1 630	1 700
14.9-28	1 155	1 245	1 330	1 415	1 495	1 575	1 655	1 725	1 800
16.9-28	1 435	1 550	1 660	1 760	1 865	1 960	2 055	2 150	2 240
16.9-30	1 475	1 590	1 705	1 810	1 915	2 015	2 110	2 205	2 300
16.9-34; 18.4-34	1 560	1 680	1 800	1 910	2 020	2 130	2 230	2 330	2 430
16.9-34; 18.4-34	1 795	1 935	2 075	2 205	2 330	2 450	2 570	2 685	2 800
12.4-36/13.6-36	1 125	1 210	1 295	1 375	1 455	1 530	1 605	1 680	1 750
16.9-38	1 650	1 780	1 905	2 025	2 140	2 255	2 365	2 470	2 575
18.4-38	1 925	2 075	2 220	2 360	2 495	2 625	2 755	2 880	3 000
20.8-38	2 340	2 525	2 700	2 870	3 035	3 195	3 350	3 500	3 650

Radial Drive Wheel Tyres TZR 3

Size	LI	Dimensions				Static radius	Rolling circum-ference	Approved rim
		Barum		Standardised				
		Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	± 2 % (mm)	± 2.5 % (mm)	
16.9 R 24	134	453	1 328	463	1 350	596	3 968	W15L (W14L)
11.2 R 28	116	295	1 170	307	1 220	539	3 530	W10 (W9)
12.4 R 28	121	311	1 246	340	1 275	569	3 724	W11 (W10, 9)
13.6 R 28	123	343	1 293	373	1 320	598	3 902	W12 (W11)
14.9 R 30	129	388	1 398	408	1 430	631	4 180	W13 (W12, 11)
18.4 R 30	142	467	1 529	504	1 575	682	4 560	W16L (W15L)
13.6 R 38	128	356	1 562	373	1 575	726	4 675	W12 (W11)
20.8 R 42	156	549	1 945	570	1 970	892	5 826	DW18

Tube	Tyre load capacity in kg at inflation pressure in kPa (for speed category 40 km/h)										
	80	90	100	110	120	130	140	150	160	180	240
TL	1 350	1 445	1 540	1 635	1 730	1 830	1 930	2 020	2 120		
TL	800	865	925	985	1 040	1 095	1 150	1 200	1 250		
TL	930	1 005	1 075	1 140	1 205	1 270	1 330	1 390	1 450		
TL	995	1 075	1 145	1 220	1 290	1 355	1 425	1 485	1 550		
TL	1 185	1 280	1 370	1 455	1 540	1 620	1 700	1 775	1 850		
TL	1 700	1 835	1 960	2 085	2 205	2 320	2 435	2 545	2 650		
TL	1 155	1 245	1 330	1 415	1 495	1 575	1 655	1 725	1 800		
TL	2 500		2 900		3 250		3 575		3 875		

Crossply Drive Wheel Tyres

Size	Tread pattern	PR	Dimensions				Static radius	Rolling circum-ference	Approved rim	Tube[1)2)]
			Standard		Maxim. operational					
			Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	± 2 % (mm)	± 2.5 % (mm)		
6.00-16	TZ 13	6	165	735	180	751	340		4.50E (4.00E; 5K; 5.00F)	6.00/6.50-16
7.50-16	TZ 13	6	205	805	223	825	370		5.50F (5.00F; 5K; 6.00F)	7.50-16
7.50-20	TZ 13	6	205	915	223	935	420		5.50F (5.00F)	7.20/8.0-20
8.3-20	TZ 13	6	211	895	230	914	416		W7 (W6)	8.3-20
8.3-24	TZ 13	6	211	995	228	1 015	470	2 872	W7 (W6)	8.3-24/9.5-24
9.5-24	TZ 13, TZ 19	8	241	1 050	260	1 075	495	3 070	W8 (W7)	8.3-24/9.5-24
11.2-24	TZ 19	8	284	1 205	307	1 235	520	3 300	W10 (W9)	11.2-24
12.4-24	TZ 19	8	315	1 160	340	1 195	539	3 473	W11 (W9, W10)	12.4-24
14.9-24	TZ 19	8	378	1 265	408	1 305	581	3 795	W13 (W11, W12)	14.9-24
16.9-24	TZ 13	8	429	1 335	463	1 380	594	3 823	W15L (W14L)	16.9-24
	TG 1	10	429	1 310	463	1 355	579	3 798	W15L (W14L)	TL+, 16.9-24
	TG 1	12								
18.4-26	TZ 19	10	467	1 450	501	1 500	663	4 285	W16L (W15L)	18.4-26
	TZ 19	12								
11.2-28	TZ 19	8	284	1 205	307	1 235	567	3 529	W10 (W9)	11.2-28
12.4-28	TZ 19	6	315	1 260	340	1 295	598	3 750	W11 (W9, W10)	12.4-28
	TZ 19	10								
13.6-28	TZ 19	6	345	1 310	373	1 350	612	3 853	W12 (W11)	13.6-28
14.9-28	TZ 19	8	378	1 365	408	1 405	627	4 113	W13 (W11, W12)	14.9-28
16.9-28	TZ 13	8	429	1 435	463	1 480	651	4 190	W15L (W14L)	16.9-28
	TZ 13	10	429	1 435	463	1 480	651	4 190		16.9-28
	TG 1	8	429	1 410	463	1 455	640	4 190		TL+, 16.9-28
	TG 1	12								

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Continuation from page 40

Size	Tread pattern	PR	Dimensions				Static radius	Rolling circum-ference	Approved rim	Tube[1)2)]
			Standard		Maxim. operational					
			Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	± 2 % (mm)	± 2.5 % (mm)		
16.9-30	TZ 13, TZ 17	8	429	1 485	463	1 530	685	4 390	W15L (W14L)	16.9-30
	TZ 13, TZ 17	10								
	TL 1	12								
18.4-30	TZ 13	8	467	1 550	504	1 575	714	4 540	W16L (W15L)	16.9-30
	TZ 13	10								
	TZ 13	12								
9.5-32	TZ 13	6	241	1 050	260	1 075	597	3 695	W8 (W7)	9.5-32
12.4-32	TZ 13	6	315	1 360	340	1 395	633	3 975	W11 (W9, W10)	12.4-32
16.9-34	TZ 17	8	429	1 585	463	1 625	724	4 680	W15L (W14L)	16.9-34
18.4-34	TZ 13, TZ 19	8	467	1 610	504	1 660	750	5 003	W16L (W15L)	16.9-34/18.4-34
	TZ 19	12								
12.4-36	TZ 13	6	315	1 465	340	1 500	685	4 330	W11 (W9, W10)	12.4-36/13.6-36
13.6-36	TZ 13	6	345	1 515	373	1 550	698	4 447	W12 (W11)	12.4-36/13.6-36
12.4-38	TZ 17	8	345	1 515	373	1 550	719	4 514	W11 (W9, W10)	12.4-38
13.6-38	TZ 13	6	345	1 565	373	1 600	740	4 670	W12 (W11)	13.6-38
16.9-38	TZ 13	8	429	1 685	463	1 730	795	5 091	W15L (W14L)	16.9-38
18.4-38	TZ 19	8	467	1 750	504	1 795	814	5 216	W16L(W15L)	18.4-38

[1)] Valve 38G 16 (TR 15) for tyre tubes 6.00-16; 7.50-16; 7.50-20
[2)] Valve 47GW (TR218A) for tyre tubes from 8.3-20 to 18.4-38
TL = Tubeless tyre

Crossply Drive Wheel Tyres

Size	Tread pattern	PR	Tyre load capacity in kg at inflation in kPa (for speed category 30 km/h)[1]									
			80	90	100	110	120	130	140	150	160	170
6.00-16	TZ 13	6	250	260	275	285	295	310	320	335	345	360
7.50-16	TZ 13	6	345	365	385	405	425	445	465	485	505	525
7.50-20	TZ 13	6	400	425	450	470	495	520	540	565	590	615
8.3-20	TZ 13	6	410	435	460	485	510	535	560	585	610	635
8.3-24	TZ 13	6	420	440	465	490	515	540	565	590	615	635
9.5-24	TZ 13, TZ 19	8	525	550	580	610	640	670	700	725	755	785
11.2-24	TZ 19	8	650	685	720	755	790	825	865	900	935	970
12.4-24	TZ 19	8	795	840	885	930	975	1 020	1 065	1 110	1 155	1 200
14.9-24	TZ 19	8	1 120	1 180	1 245	1 310	1 375	1 440	1 500	1 565	1 630	1 695
16.9-24	TZ 13	8	1 330	1 410	1 485	1 565	1 645	1 725	1 800	1 880	1 960	2 040
	TG 1	10										
	TG 1	12										
18.4-26	TZ 19	10	1 720	1 810	1 900	1 990	2 080	2 170	2 265	2 355	2 445	2 535
	TZ 19	12	1 905	2 040	2 170	2 305	2 435	2 570	2 700	2 835	2 965	3 100
11.2-28	TZ 19	8	785	820	850	885	920	950	985	1 020	1 050	1 085
12.4-28	TZ 19	6	850	895	940	990	1 035	1 085	1 130	1 180	1 225	1 275
	TZ 19	10	850	895	940	990	1 035	1 085	1 130	1 180	1 225	1 275
13.6-28	TZ 19	6	990	1 045	1 100	1 155	1 210	1 265	1 320	1 375	1 430	
14.9-28	TZ 19	8	1 195	1 260	1 330	1 400	1 465	1 535	1 605	1 670	1 740	1 810
16.9-28	TZ 13	8	1 415	1 495	1 580	1 665	1 750	1 835	1 920	2 005	2 090	2 175
	TZ 13	10	1 415	1 495	1 580	1 665	1 750	1 835	1 920	2 005	2 090	2 175
	TG 1	8										2 610
	TG 1	12	1 605	1 725	1 840	1 960	2 075	2 195	2 310	2 430	2 545	2 665
16.9-30	TZ 13, TZ 17	8	1 520	1 595	1 670	1 745	1 820	1 900	1 975	2 050	2 125	2 200
	TZ 13, TZ 17	10	1 520	1 595	1 670	1 745	1 820	1 900	1 975	2 050	2 125	2 200
	TL 1	12	1 520	1 595	1 670	1 745	1 820	1 900	1 975	2 050	2 125	2 200

Tyre load capacity in kg at inflation in kPa (for speed category 30 km/h)[1]																
180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330
370	385	395	410	420	435	445	460	470	485	495	510				
545	565	585	605	625	645	665	685	705	725	745					
635	660	685	705	730	755	780	800	825	850	875					
660	685	710													
660	685	710	735	760	785	810									
815	845	875	905	930	960	990	1 020	1 050	1 080	1 110					
1 005	1 045	1 080	1 115	1 150	1 185	1 225									
1 245	1 290	1 335	1 380	1 425											
1 760															
		2 730	2 800	2 870											
					2 970	3 070	3 160	3 250							
2 625															
3 230	3 365	3 495	3 630	3 760	3 895	4 025	4 160								
1 120	1 150	1 185	1 220	1 250	1 285	1 320									
1 320	1365	1 415	1 460	1 510	1 555	1 605	1 650	1 700	1 745	1 790					
1 880															
2 255	2 340	2 425													
2 720	2 830														
					3 195	3 285	3 375	3 465							
2 275	2 350	2 425													
2 275	2 350	2 425	2 500	2 575	2 650	2 730									

[1] For on-the-road use inflation should be increased: 6PR 0.3 bar, 8PR and more 0.4 bar.

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Continuation from page 43

Size	Tread pattern	PR	Tyre load capacity in kg at inflation in kPa (for speed category 30 km/h)[1]									
			80	90	100	110	120	130	140	150	160	170
18.4-30	TZ 13	8	1 820	1 915	2 015	2 115	2 215	2 315	2 415			
	TZ 13	10	1 820	1 915	2 015	2 115	2 215	2 315	2 415	2 515	2 615	2 715
	TZ 13	12	2 020	2 175	2 330	2 475	2 620	2 755	2 890	3 020	3 150	3 270
9.5-32	TZ 13	6	600	635	670	705	740	775	810	850	885	920
12.4-32	TZ 13	6	920	965	1 015	1 065	1 110	1 160	1 210	1 255	1 305	1 355
16.9-34	TZ 17	8	1 545	1 635	1 730	1 820	1 915	2 005	2 100	2 190	2 285	2 380
18.4-34	TZ 13, TZ 19	8				2 250	2 355	2 460	2 565			
	TZ 19	12				2 640	2 765	2 890	3 015	3 140	3 265	3 390
12.4-36	TZ 13	6	980	1 030	1 080	1 130	1 180	1 235	1 285	1 335	1 385	1 440
13.6-36	TZ 13	6	1 100	1 160	1 225	1 290	1 355	1 420	1 485	1 550	1 615	
12.4-38	TZ 17	8	1 075	1 120	1 165	1 210	1 255	1300	1 345	1 390	1 435	1 480
13.6-38	TZ 13	6	1 145	1 205	1 270	1 335	1 400	1 465	1 530	1 595	1 660	
16.9-38	TZ 13	8	1 685	1 785	1 880	1 980	2 080	2 180	2 275	2 375	2 475	2 575
18.4-38	TZ 19	8	2 020	2 135	2 250	2 365	2 480	2 595	2 715			

Tyre load capacity in kg at inflation in kPa (for speed category 30 km/h)[1]															
180	190	200	210	220	230	240	250	260	270	280	290	300	310	320	330
											520	535	545	560	
2 815															
3 395	3 515	3 630	3 745	3 860	3 970	4 080	4 190								
955	990	1 025	1 065												
3 515	3 640	3 765	3 890	4 015	4 140	4 265	4 390								
1 525	1 570	1 615	1 660	1 705	1 750										

[1] For on-the-road use inflation should be increased: 6PR 0.3 bar, 8PR and more 0.4 bar.

Crossply Front Tyres

Size	PR	Tread pattern	Dimensions				Static radius	Approved rim
			Standard		Maxim. operational			
			Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	±2 % (mm)	
6.00-16	6	TP 9, TZ 13, TP8P	165	735	180	751	340	4.50E (4.00E; 5K; 5.00F)
6.50-16	6	TP 8, TP 9	175	760	191	778	350	4.50E (4.00E; 5K; 5.00F; 5.50F)
7.50-16	6	TP 8, TP 9	205	805	223	825	370	5.50F (5.00F; 5K; 6.00F)
9.00-16	6	TP 9	234	855	255	891	395	W8 (W7; W8L; 6.00F)
6.00-18	6	TP 7	160	790	175	867	365	4.50E (4.00E; 5K; 5.00F)
6.50-20	6	TP 7, TP 8, TP 9	175	865	191	883	408	5.00F (4.00E; 5.50F)
7.50-20	6	TP 8, TP 9	205	915	223	935	420	5.50F (5.00F)

Tube[1)]	PR	Tyre load capacity in kg at inflation pressure in kPa for speed category 30 km/h												
		100	120	140	160	180	200	220	240	260	280	300	320	340
6.00/6.50-16	6	275	295	320	345	370	395	420	445	470	495	520	545	570
6.00/6.50-16	6	315	340	370	400	425	455	485	515	540	570	600	625	
7.50-16	6	385	425	465	505	545	585	625	665	705	745			
9.00/10.00-16	6	555	610	665	720	775	830	885						
6.00-18	6	270	310	350	390	430	470	510	550	590	630	670	710	
6.50/7.00-20	6	360	390	425	460	495	530	565	600	635	670	705	740	
4.50/8.00-20	6	450	495	540	590	635	685	730	780	825	875			

[1)] Ventil 38G16 (TR15)

Radial Implement Tyres

Size	LI/SS	Tread pattern	Type	Valve	Dimensions of New Tyres		Static radius	Rolling circum-ference	Approved rim
					Profile width (mm)	Outer diameter (mm)	± 2 % (mm)	± 2.5 % (mm)	
445/65 R 22.5	169F	NR 40A	TL	V 528	454	1 150	524	3 508	14.00
18 R 22.5	168J	NR 27	TL	V 528	457	1 158	528	3 509	14.00

Axle load capacity in kg at inflation in kPa								
450	500	550	600	650	700	750	800	850
3 490	3 790	4 090	4 400	4 650	4 750	5 150	5 500	5 800
3 370	3 660	3 950	4 250	4 500	4 700	5 000	5 300	5 600

Crossply Implement Tyres

Size	PR	Tread pattern	Type	Dimensions				Static radius	Approved rim
				Standard		Maxim. operational			
				Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	±2 % (mm)	
7.50-16	8	ZSN4	TT	209	787	219	802	362	5.50F × 16
10.0/80-12	12	ZSN4	TT	264	710	277	730	313	9.00 × 12
11.5/80-15.3	10	ZSN4	TT	290	845	305	868	372	9.00 × 15.3
13.0/65-18	14	ZSN4	TT	336	890	353	912	398	11 × 18
10.0/75-15.3	10	DTN4	TT	264	760	277	800	360	9.00 × 15.3
10.0/75-15.3	8	UKN4	TL	264	760	277	800	360	9.00 × 15.3
10.0/75-15.3	14	UKN4	TT	264	760	277	800	360	9.00 × 15.3

Tube	PR	Tyre load capacity in kg at inflation in kPa												
		100	150	170	175	190	200	225	230	250	275	280	300	310
7.00/8.00-16T	8	550	700		765		825	890		945	995	1 260	1 050	1 330
10.0/80-12T	12	650	825	890		965			1 060	1 125		1 675		1 760
11.5/80-15.3T	10	930	1 170	1 290		1 410			1 500	1 590		1 940		2 070
13.0/65-18T	14		125	1 390		1 530			1 670	1 810		1 260		1 330
10/75-15	10	705	880	960		1 040			1 120	1 190		1 260		1 330
10/75-15	8	705	880	960		1 040			1 120	1 190		1 260		1 330
10/75-15	14					1 040			1 120	1 190		1 260		1 330

Size	PR	Tread pattern	Type	Dimensions				Static radius	Approved rim
				Standard		Maxim. operational			
				Profile width (mm)	Outer diameter (mm)	Profile width (mm)	Outer diameter (mm)	±2 % (mm)	
7.50-16	8	ZSN4	TT	209	787	219	802	362	5.50F × 16
10.0/80-12	12	ZSN4	TT	264	710	277	730	313	9.00 × 12
11.5/80-15.3	10	ZSN4	TT	290	845	305	868	372	9.00 × 15.3
13.0/65-18	14	ZSN4	TT	336	890	353	912	398	11 × 18
10.0/75-15.3	10	DTN4	TT	264	760	277	800	360	9.00 × 15.3
10.0/75-15.3	8	UKN4	TL	264	760	277	800	360	9.00 × 15.3
10.0/75-15.3	14	UKN4	TT	264	760	277	800	360	9.00 × 15.3

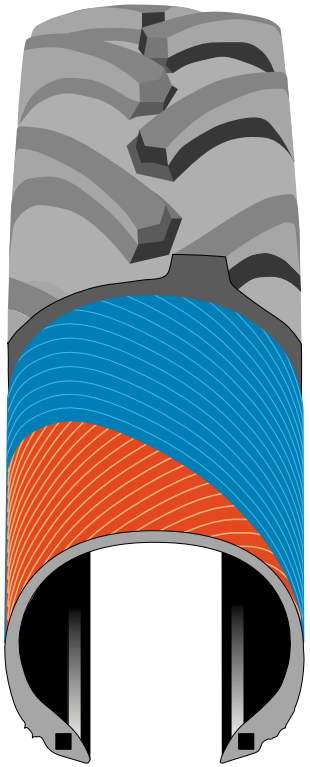
Tube	PR	Tyre load capacity in kg at inflation in kPa												
		325	330	340	390	420	430	450	470	550				
7.00/8.00-16T	8	1 120												
10.0/80-12T	12		1 315	1 375	1 440	1 510		1 580	1 650					
11.5/80-15.3T	10		1 845	1 950										
13.0/65-18T	14		2 190	2 280	2 495		2 575							
10/75-15	10		1 395	1 460	1 550									
10/75-15	8													
10/75-15	14		1 395	1 460	1 550	1 640		1 730	1 805	1 900				

All tubes: valve 38G 11.5 (TR 13) or 38G 16 (TR 15)

For all tyres: A6 = 30 km/h

Design of Agricultural Tyres and Recommendations for Use

Construction of Crossply Tyres



The casing of crossply tyres consists of rubberised fabric plies, whose threads run criss-cross under the tread. The fabric plies cross each other at an angle of 30–40 °.

The number of fabric plies on crossply tyres is greater than on similar size radial tyres.

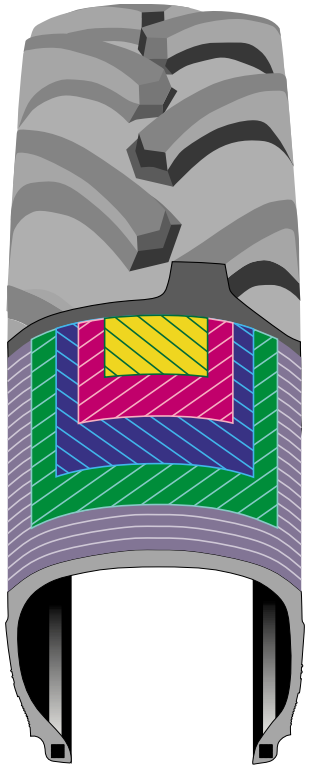
Benefits:

- The sturdy sidewall means increased resistance to mechanical damage (in forestry work, on stony ground)

Drawbacks:

- Speed is restricted to 30 km/h (18 mph)
- Low vibration absorption

Construction of Radial Tyre



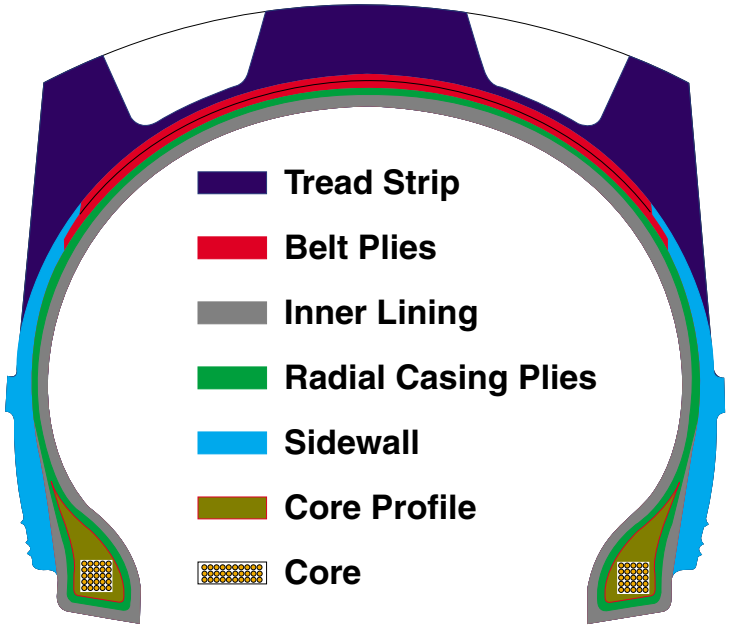
The Carcass of the Radial Tyre

The casing of radial tyres consists of rubberised fabric plies, whose fabric threads run parallel from bead to bead at an angle of 90 ° to the centre line. To achieve circumferential stability, an additional belt consisting of fabric layers running criss--cross is placed on the original casing plies. Together the belt and the tread form the solid contact patch of the tyre; the flexible sidewall permits deflection, thereby providing suspension. Radial tyres have a substantially larger ground contact patch than crossply tyres and offer more even ground pressure distribution.

Benefits:

- Greater ground contact patch
- Greater tractive force
- Low ground pressure
- The belt ensures increased tread lug stability on ground contact and lower rolling resistance
- Suitable for higher speeds

Tyre Construction



Casing
The tyre substructure is referred to as the casing and it is this which gives the tyre its characteristics. The casing determines the load capacity and the traction performance of the tyre. It consists of several fabric plies, which run from bead to bead under the core and wrap around this.

Belt
The belt, which is only used on radial tyres, consists of several fabric plies, whose threads run diagonally under the tread, crossing each other. The belt ensures the stability of the substructure in a circumferential direction and it provides a firm base for the tread strip.

Tread Pattern
The tyre tread strip is made of solid rubber and the design on the tread is referred to as the tread pattern. The tread ribs and lugs are arranged at an angle to the tyre centre. The number of pairs of tread lugs and the tread pattern design vary according to the type of tyre and tyre size. The spaces between the tread lugs are designed to provide optimum self-cleaning of the tyre.

Sidewall
The sidewall is also made of solid rubber and protects the casing from mechanical damage.

Core/Bead
The core consists of rubberised, coiled wire and is surrounded by the core profile. The core and core profile together form the bead, which gives the tyre a firm grip on the rim. An additional protective rib safeguards the area around the core from damage during fitting. The bead diameter must match the rim diameter to ensure the tyre fits firmly, is airtight and does not turn on the rim.

Recommendations for Use

Tyre pressure

The volume of air in the tyre determines its load capacity, which increases with the volume of air. However, increased tyre pressure and the corresponding load also means an increase in ground pressure. High ground pressure destroys the structure of the ground, retarding plant growth. It is therefore imperative that the tyre pressure and the required load capacity are set correctly to match the application (arable land, grassland, road etc.), as this means:

- long tyre service life
- high transmission of forces with low slip
- low ground pressure
- low rolling resistance

The load capacity values at different tyre pressures and ambient temperatures are specified by the manufacturer. The optimum tyre pressure depends on:

- the tyre size (volume of air)
- the tyre load (use of machinery)
- the maximum speed
- the size of the contact patch (radial/crossply)

The tractor or machine manufacturer determines the correct tyre for a specific type of vehicle. For a particular tyre size the required tyre pressure depends on:

- the maximum load
- the maximum speed

The tables on pages 36–51 give the tyre pressure for every tyre size, according to the corresponding load. All tyre pressures apply to the 'cold' tyre, i.e. when the tyre has been stationary for several hours out of direct sunlight.
The tyre pressure given for the required load capacities is calculated to avoid excessive tyre flexing and to ensure that the operating conditions achieve optimum traction and tyre service life. The tyre pressures given are minimum values. For applications on hard surfaces or for road travel, tyre pressure should be increased by 0.3 bar, thereby reducing slip and in turn wear.

Low Tyre Pressure

If tyres are used with insufficient inflation, the following consequences must be anticipated:

- Irregular tyre wear (convex curving of the tread, i. e. wear predominantly in the side sections)
- Reduced rolling circumference, with reduced speed as a result
- Less sidewall resistance to mechanical damage and therefore risk of casing breakage in damaged areas
- Travelling of the tyre on the rim, with the valve possibly tearing off

High tyre pressure

Where the tyre is used with excessive inflation pressure, the tread bulges outwards so that wear is concentrated mainly on the centre of the tread. As a result, the tractive force is transmitted to a smaller contact patch and thereby reduced. At the same time, slip and wear increase.
On soft ground, a tyre with excessive inflation pressure penetrates deeper, increasing the rolling resistance and in turn the fuel consumption.
Particularly when the tyres are filled with water, the tyre pressure should be checked more frequently.
If higher tractive force is required, we recommend reducing the tyre pressure.

Increasing the tractive force on a tractor

For ploughing, in particular, a tractor needs a high tractive force. The objective is to transmit the existing force of the tractor via the tyres with minimum slip. Transmission of forces is affected by the following factors:

- Size of the contact patch, tyre pressure, tyre size and construction, load on the drive axle, width and height of the tread lugs, type of ground etc.

A higher tractive force can be achieved by reducing the tyre pressure, thereby increasing the ground contact patch, so that more pairs of tread lugs can grip the ground.
Clearly there are limits to how much the tyre pressure can be reduced, particularly when ploughing, because the transmission of high tractive forces places great strain on the casing sidewall. When selecting the minimum tyre pressure, care must therefore be taken to ensure that excessive deformation of the tyre is avoided.

Load capacity

The biggest problem when setting the tyre pressure is the constantly changing load on the tyre in use (e.g. empty/full hopper). Tyre pressure regulators are the ideal solution here, as they allow the tyre pressure to be adapted quickly and easily to the specific application conditions.
In practice, tyre pressure regulators are still not widely used. For safety reasons, it is therefore recommended that the tyre pressure is set to handle the highest load capacity required. If equipment is used for the same work over a longer period, the tyre pressure for that task should be adjusted to the ideal setting.

Load capacity and speed

When determining the required minimum load capacity of the tyres for a vehicle axle, this should always be based on the permitted axle load and the maximum design speed of the vehicle, as specified by the manufacturer.

On twin tyres fitted to drive axles, the load capacity of the single tyre fitment must be multiplied by a factor of 1.76

Speed (km/h)	Change of load capacity in % Front tyres	Crossply tyres	Radial tyres
10	+ 50 [1]	+ 40 [1]	+ 50 [1]
20	+ 35	+ 20	+ 23
30	0	0	+ 7
35	– 10	– 10	+ 3
40	– 20	– 20	0
45	–		– 4
50	–		– 9

[1] For 6 PR and higher: increase the tyre pressure by 25 %

Load capacity increases in %

Type of tyre	Speed (km/h) 10	20	30	35	40	45	50
Radial	150 [1]	123	107	103	100	96	91
Crossply drive wheel tyre	140 [1]	120	100	90	80		
Crossply front tyre	150 [1]	135	100	90	80		
Implement tyre	125 [1]	110	100	95	90	85	80

[1] For 6 PR and higher: increase the tyre pressure by 25 %

Fitting advice

Important note

Fitting tyres involves risks and should only be carried out by trained staff with the necessary experience and equipment. The following advice should be followed:

1. Check that the dimensions of the rim and tyre match. Only use rims in excellent condition, i. e. rims which show no signs of mechanical damage, rust, cracks, random welding seams, etc.

2. Ensure all the specified safety precautions have been taken before commencing and work on a solid floor.

3. Make sure that all the parts to be fitted are clean (free from grease and solvents) and in good condition. Check that no stones etc. have become lodged in the tyre or between the bead and rim. Only fit tyres of the same size, design and tread pattern on each individual axle. When fitting new tyres, always also replace all other components (inner tube, valve, etc).

4. Dust the inner tube with talcum and place in the tyre (with the valve pointing upwards and on the level of the valve opening). Inflate slightly. Unscrew the safety nut. When fitting and removing the tyre, make sure that the tyre, inner tube and other tyre parts are not damaged.

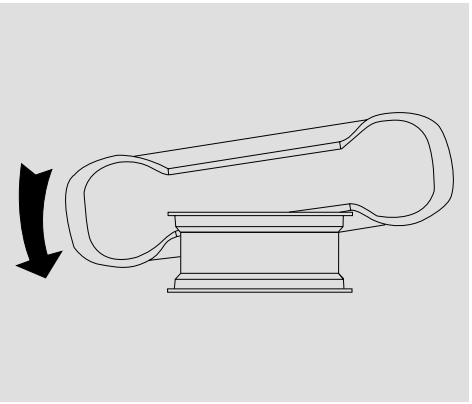
5. Coat the beads and rim bead seat with a suitable fitting paste (do not use petroleum- or silicon-based agents).

6. Insert the lower bead into the rim well level with the valve and using the flat of your hand, pull the tyre over the rim flange to about 1/3 of the tyre circumference to the right and left of the valve.

7. Pull the valve through the valve opening and secure using the safety nut.

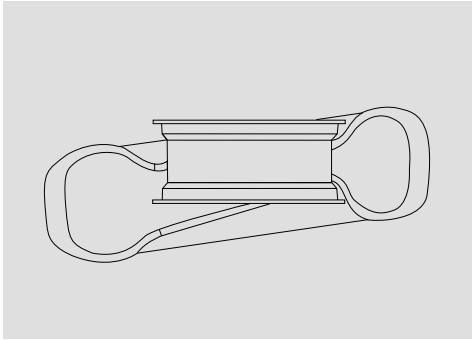
8. Use fitting tools to pull the lower bead over the rim flange in 10 cm intervals.

9. Using the palms of your hands, press the upper bead on the side opposite the valve until up to 1/3 of the tyre circumference is over the rim.



10. Use fitting tools to press the bead into the rim well in 10 cm intervals, until the tyre sits firmly on the rim.

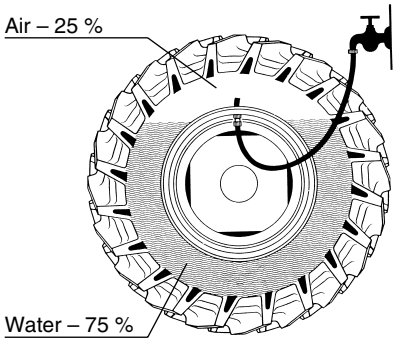
11. Check that the tyre is centred on the rim. To do this, use the visible reference lines above the rim flange on the tyre sidewall.

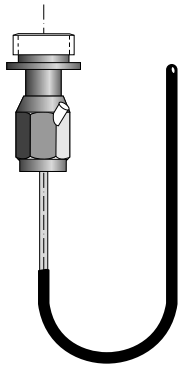


Make sure that both bead heels sit properly on the rim bead seats and start inflating the tyre. Check the tyre constantly during inflation. The wheel should be in a safety cage or fixed to the floor. If the tyre is not in a safety cage, it must not be inflated to more than 1.0 bar. If the bead heels do not sit well after fitting, this can be corrected by inflating the tyre to a fitting pressure of 2.5 bar. If they still do not fit well, the tyre must be deflated and the beads re-centred (cf. WdK-Guideline 104).
Always observe the safety regulations. On agricultural tyres the fitting pressure must not exceed 150 % of the maximum standard tyre pressure; under no circumstances must it exceed 2.5 bar.

Filling with Water

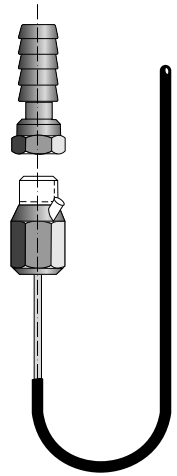
Additional weight on the drive axle helps to increase the tractor's traction power. The simplest way of achieving this additional weight is by filling the drive wheel tyres with water, thereby increasing the load without augmenting the axle load as the weight is applied below the axles. Moreover, the tractor's centre of gravity is then shifted downwards, which makes it easier to work on slopes. To retain approximately the same flexibility as that of a tyre filled with air, only 75 % of its volume should be filled with water. This level is achieved by placing the valve in its uppermost position.
Filling the tyre with water requires the use of so-called water filling valves for tubes and tubeless tyres.
In regions where there is a risk of frost, it is advisable to fill the tyre with antifreeze. The higher specific weight of the antifreeze also increases the filling weight. Calcium chloride ($CaCl_2$) or magnesium chloride ($MgCl_2$) should be added to the water in the ratio indicated in the tables (for each size and for 75 % of the respective tyre volume).
Calcium chloride or magnesium chloride should be added to the water in small quantities only – and in this order, never the other way round.
As a result of greater environmental awareness, nowadays there is an increasing tendency to use ethylene glycol-based radiator antifreeze, which also provides rust protection for the rims:





„Waterboy" combined device for filling and emptying water

Manufacturer:
Alligator-Ventilfabrik
D-89526 Giengen/Brenz
Germany



„Hanauer Maus" combined device for filling and emptying water

Manufacturer:
EHA-Ventilfabrik
D-63152 Mülheim/Main
Germany

Increasing the Weight by Filling the Crossply Drive Wheel Tyre with Water

75 % filling of the tyre volume; frost protection down to approx. –30 °C

Tyre size	Filling 75 %	Proportion of water and additional weight through use of Calcium chloride			Magnesium chloride		
	Addit. load – plain water litres (kg)	$CaCl_2$ (kg)	Water (l)	Addit. load (kg)	$MgCl_2$ (kg)	Water (l)	Addit. load (kg)
8.3-24	50	20	34	54	30	26	56
9.5-24	60	26	40	66	36	32	68
11.2-24	75	32	50	82	46	38	84
12.4-24	110	48	72	120	68	56	124
13.6-24	120	52	80	132	74	62	136
14.9-24	170	74	112	186	104	88	192
16.9-24	220	96	146	242	136	114	250
18.4-26	280	122	186	308	174	144	318
11.2-28	90	38	60	98	56	46	102
12.4-28	125	54	82	136	78	64	142
13.6-28	145	62	96	158	90	74	164
14.9-28	190	82	126	208	118	98	216
16.9-28	250	108	166	274	156	128	284
16.9-30	240	104	160	264	148	124	272
18.4-30	330	144	218	362	206	170	376
9.5-32	80	34	54	88	48	42	90
12.4-32	140	60	94	154	86	72	158
16.9-34	250	108	166	274	156	128	284
18.4-34	330	144	218	362	206	170	376
12.4-36	160	70	106	176	100	82	182
13.6-36	180	78	120	198	112	92	204
12.4-38	166	72	110	182	102	86	188
13.6-38	190	82	126	208	118	98	216
16.9-38	290	126	192	318	180	150	330
18.4-38	385	168	254	422	240	198	438
20.8-38	510	224	336	560	318	262	580
20.8 R 42	560	190	370	615	350	288	635

- The above-mentioned amounts are approximate values, rounded up to 5 litres
- 0.4 kg $CaCl_2$ per litre of water = frost protection down to –30 °C; 0.2 kg $CaCl_2$/l = frost protection down to –15 °C; 0.3 kg/l = frost protection down to –20 °C
- 0.55 kg $MgCl_2$ per litre of water = frost protection down to –30 °C
- Valve for tubes: 47GW (DIN), TR218A (TRA), V4-01-1 (ETRTO)
- Valve for tubeless tyres: 50 MSW (DIN), TR618A (TRA), V5-01-1 (ETRTO)

Increasing the Weight by Filling the Radial Drive Wheel Tyre with Water

75 % filling of the tyre volume; frost protection down to approx. –30 °C

Tyre size	Filling 75 %	Proportion of water and additional weight through use of Calcium chloride			Magnesium chloride		
	Addit. load – plain water litres (kg)	$CaCl_2$ (kg)	Water (l)	Addit. load (kg)	$MgCl_2$ (kg)	Water (l)	Addit. load (kg)
320/70 R 24	135	58	90	148	82	70	152
380/70 R 24	145	62	96	158	90	74	164
420/70 R 24	185	80	122	202	114	96	210
380/70 R 28	275	120	182	302	170	142	312
480/70 R 30	280	122	186	308	174	144	318
480/70 R 34	305	132	202	334	190	156	346
480/70 R 38	335	146	222	368	208	172	380
520/70 R 38	390	170	258	428	244	200	444
580/70 R 38	560	190	370	615	350	288	635

- The above-mentioned amounts are approximate values, rounded up to 5 litres
- 0.4 kg $CaCl_2$ per litre of water = frost protection down to –30 °C; 0.2 kg $CaCl_2$/l = frost protection down to –15 °C; 0.3 kg/l = frost protection down to –20 °C
- 0.55 kg $MgCl_2$ per litre of water = frost protection down to –30 °C
- Valve for tubes: 47GW (DIN), TR218A (TRA), V4-01-1 (ETRTO)
- Valve for tubeless tyres: 50 MSW (DIN), TR618A (TRA), V5-01-1 (ETRTO)

- 570 g per litre of water = frost protection down to –20 °C
- 850 g per litre of water = frost protection down to –30 °C

PLEASE NOTE: ANTIFREEZE IS CLASSED AS SPECIAL WASTE AND MUST BE PROPERLY DISPOSED OF.

Filling procedure:

1. Jack up the vehicle.
2. Turn the wheel until the valve is in its highest position.
3. Unscrew the valve insert.
4. Screw the combined water filling and emptying valve on to the valve shaft. The valve has an opening on the side, so that air can escape whilst the water is being filled. When water runs out of this opening, the tyre is then full enough (70–75 %). The pre-mixed antifreeze can be poured into the tyre through the water filling valve via a tube from a container placed above the tyre. If filling the tyre with plain water, the tube of the water filling valve can be connected directly to the water main.
5. After filling the tyre, the original valve insert should be screwed on

again and the tyre inflated to the correct pressure for the application.

Emptying the water

Jack up the vehicle and turn the wheel until the valve is in its lowest position. Once the valve insert has been removed, the water will run out.
When the water pressure is so low that no more water runs out, screw in the water filling insert and inflate the tyre. When no more water runs out, screw in the normal valve insert once again and inflate the tyre to the correct pressure for the application.

Tubeless tyres

When fitting and inflating tubeless tyres, the same rules apply as with tube type tyres.
To protect the environment and prevent corrosion, when filling the tyre with water always use ethylene glycol-based antifreeze.
Tubeless tyres do not need an additional inner tube. If an inner tube is nevertheless used in a tubeless tyre, the airtight inner lining could be damaged through friction against the tube.
No additional inner tube is needed in a repaired tyre either, if the repair has been carried out professionally.

Twin tyres

Single tyres are used for heavy-duty tasks, such as ploughing or for transportation on the road or fields.
Twin tyres are used when the fields are to be fertilised or sprayed for the first time in the year and the ground is pressure sensitive, as is the case particularly in the spring. To reduce the ground pressure, the tyre pressure on twin tyres is lowered according to the reduced load level per tyre. The tyre pressure can be reduced to 0.6 bar.
The load capacity of twin tyres is higher than that of single tyres by a factor of 1.76.
Please note – this low tyre pressure should only be used for cultivation work (e.g. spraying). Under no circumstances should it be used for transmitting higher tractive forces, such as those required in ploughing. If this advice is not followed, tyres with insufficient inflation pressure could suffer damage through flexing and/or the tyre travelling on the rim.

All-wheel-drive tractors

To maximise the benefits of all-wheel-drive tractors and at the same time avoid premature wear, the circumferential speed of the front wheels must be greater than that of the rear wheels. This difference, referred to as advance, is between 1% and 4%, rarely over 5%.

The tyre pressure should remain between the figures given by the tractor manufacturer, so that the advance remains constant. Increasing or reducing the tyre pressure also changes the outer diameter and the rolling circumference of the tyre.[1)]

If the tyre pressure on the front wheels is increased, the advance also increases and vice-versa. The advance on the front wheels can be calculated as follows:

$$\text{Advance in \%} = \frac{(O_F \times R) - O_Z}{O_Z} \times 100$$

O_F = Rolling circumference of the front wheels
O_Z = Rolling circumference of the rear wheels
R = Wheel factor, specified by the manufacturer

When switching tyres, care should be taken to ensure that the rolling circumference ratio of front tyres to rear tyres remains within the tolerances specified by the manufacturer. For the smaller front tyre to cover the same distance as the rear tyre, it has to rotate up to 30% more frequently than the rear tyre. This is also the reason for the more rapid wear and tear on the front tyres compared with the rear.

1) The rolling circumference is measured at max. load (= 100 %) and the corresponding tyre pressure (cf. tables). At 50 % load, the rolling circumference on radial drive wheel tyres increases by 1 %, on crossply drive wheel tyres by 1.8 %.

Tyre Care and Storage

Tyres require particular care, both in use and storage, as they contribute substantially towards road safety. Regular tyre checks should cover tyre pressure, wear and tear and mechanical damage to the tread, sidewall and bead. Tyres with casing damage must be repaired by a tyre specialist.
Check your tyre pressure regularly at least every two weeks, using a pressure gauge where the scale goes from 0 to 4.0 bar.
Tyre pressure should be checked on the cold tyre before use. When driving, the tyres heat up – particularly during the summer months – and the tyre pressure rises. This pressure increase when the tyre is in use is a normal physical occurrence and under no circumstances should the tyre pressure be reduced for this reason. Only the tyre pressure selected while the tyre is cold will provide optimum traction.
Maintaining the specified tyre pressure is at the same time the basic requirement for a long tyre service life.
The tyre pressure must be set to accommodate the tyre load (weight of the equipment) and the use of the tyre under different ground conditions (rolling resistance). The sidewall must not be overstretched in any way during ploughing.
If the tractor or machine is to remain unused for a period of more than 4 weeks, the tyre pressure should be set for road use; alternatively, the nominal tyre pressure for field work should be increased by 25 %. To avoid flat tyre sections caused by the tyre being stationary over a longer period, the machine should be jacked up and the tyre pressure reduced, so that the wheels can turn freely.

Tyres and inner tubes should be stored in dark, dry, cool rooms away from draughts. Tyres which are not fitted on rims should be stored standing up.
Tyres and inner tubes should not come into contact with petroleum-based products (oil, fuel and lubricants), as they will become soft and lose their specific characteristics. Tyres and inner tubes should not be stored outside for longer than one month and they should not be exposed to sunlight and other weather conditions, damp and dirt.

- Tyres and inner tubes can be stored at temperatures between –30 °C and +35 °C at 50–80 % relative humidity.
- Tubeless tyres should be stored standing up
- Tube type tyres can be stored in piles up to 2m high for a maximum of one month
- Tyres must never be stored close to fuels, lubricants or similar aggressive chemicals.

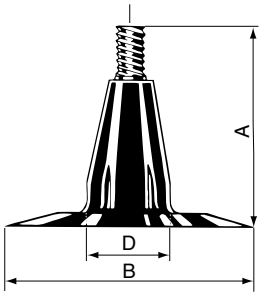
Notes

Valves and Rims for Agricultural Tyres

Valves

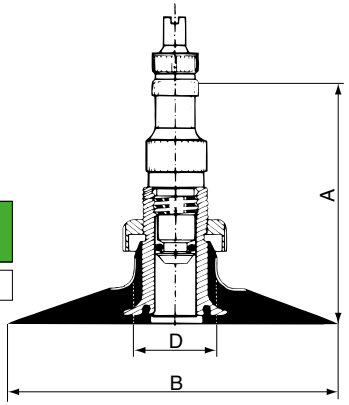
Rubber base valve for tubes

TRA no.	DIN no.	ETRTO no.	Sizes (mm) A	B	D dia.	Valve hole dia.	ESN[1]
TR 15	38 G 16	V2-01-2	38	57	16.5	15.7	V584/16.5



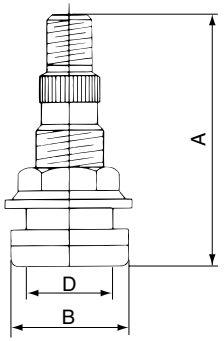
Rubber base valve for tubes (suitable for water filling)

TRA no.	DIN no.	ETRTO[2] no.	Sizes (mm) A	B	D dia.	Valve hole dia.	ESN[1]
TR 218 A	47 GW	V4-01-1	47.5	63.5	16.2	15.7	V54525-G



Valve for tubeless tyres (suitable for water filling)

TRA no.	DIN[3] no.	ETRTO no.	Sizes (mm) A	B	D dia.	Valve hole dia.
TR 618 A	50 MSW	V5-01-1	51	22.5	16	15.7

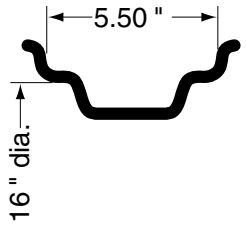


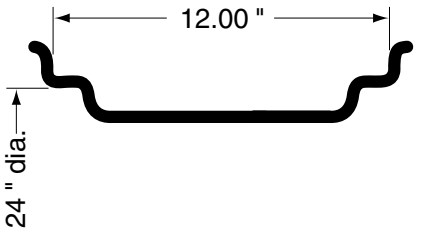
[1] Czech designation – equivalent to DIN 7773
[2] With valve insert for water filling V4-02-1 (ETRTO)
[3] According to DIN 78026

Rims

General definition of terms

Solid wheel – wheel consisting of rim and wheel disc, which form an integral unit
Rim – ring-shaped section of the wheel on which the tyre is fitted
Wheel disc – linking element between the rim and the axle hub
Rim flange – lateral support for the rim bead
Rim bead seat – the base on which the tyre bead is seated
Rim well – inner base of the rim
Well depth – the distance from the hub docking area to the rim centre. Depending on the wheel design, the well depth can be positive, negative or zero.
Rim width – inner distance between the two rim flanges in inches, also referred to as the nominal width
Rim diameter – diameter of the rim in inches, measured at the rim bead seat





Well-base Rim **5.50 F x 16**

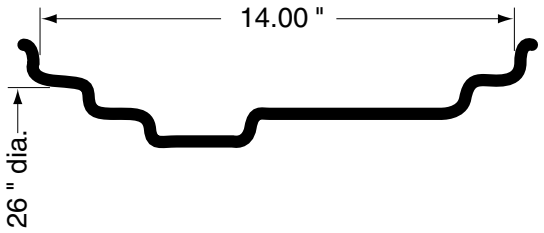
Rim width in inches
Flange design
One-piece rim
Nominal diameter in inches

Wide Rim W **W 12 x 24**

W = Wide
Rim width in inches
One-piece rim
Nominal diameter in inches

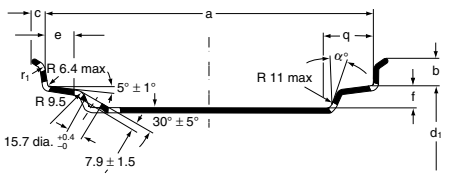
Wide base rim with 2nd well base **DW 14 x 26**

DW = double well
Rim width in inches
One-piece rim
Nominal diameter in inches



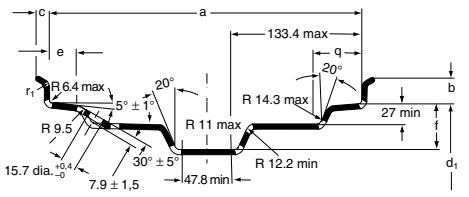
W and DW Wide Rims According to DIN 7823 for Tractors and Agricultural Machinery

W6 to W13
W8L to W18L



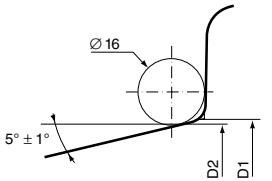
W wide rims

DW10 to DW27A



DW wide rims

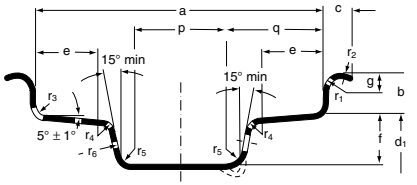
Rim	a		b	c		e	f	q	r1	r2	r3	Gama
	Nom. value	Perm. difference	+ 1.2 − 0.4	min.	max.	min.	min.	max.				min.
W6	152.4											
W7	177.8		22.2	7.9	14.5	23.8		44.5	9.5			6 °
W8	203.2											
W9	228.6											
W10	254.0	± 2.4					20.6	50.8				
W11	279.4		25.4									
W12	304.8							57.2				
W13	330.2					27.0					11.0	
W8L	203.2		21.6					50.8				
W10L	254.0						20.5	57.0		6.4		
W14L	355.6			9.5	16.0							
W15L	381.0											
W16L	406.4	± 4.7				33.0		57.2	11.0			15 °
W17L	431.8											
W18L	457.2						20.6					
DW10	254.0		25.4									
DW11	279.4	± 2.4				27.0						
DW12	304.8							54.0				
DW13	330.2										14.3	
DW14L	355.6						27.0			7.9		
DW15L	381.0	± 4.7		11.1	18.0	36.5	(max	63.5				
DW16L	406.4					50.8	34.3)	95.3				



Rim diameter in inches	20	24	26	28	30	32	34	36	38	
Rim diameter D1	512.8	614.4	665.2	716.0	766.8	817.6	868.4	919.2	970.0	1 071.6
D2 dia. control circle	511.40	613.02	663.82	714.62	765.42	816.22	867.02	917.82	968.62	1 070.22
Circumference of control circle	1 606.7	1 925.9	2 085.2	2 245.1	2 404.6	2 564.2	2 723.8	2 883.4	3 043.0	3 362.2

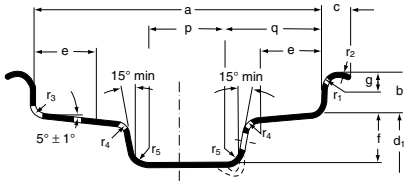
Well-base Rims According to DIN 7818 for Tractors and Agricultural Machinery

3.00D to 5.00F



Symmetrical well-base rim

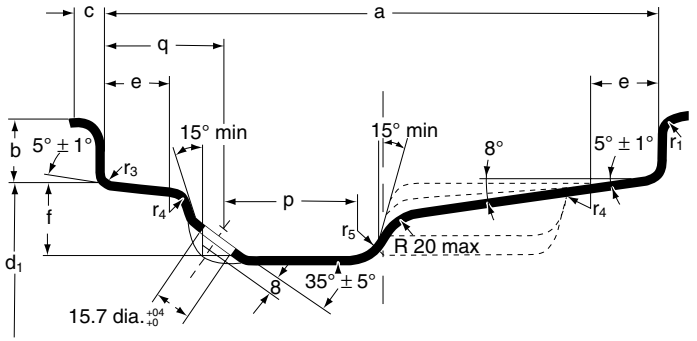
5.50F to 6.00F



Asymmetrical well-base rim

Rim	d1	d2	U ± 1.2	a ± 1.5	b ± 1.2 − 0.4	c		e	f	g	p	q	r1	r2	r3	r4	r5	r6
						Nom. value	Permitted difference		min.		min.	max.			max.	min.	max.	min.
4.00E x 16	405.6	404.27	1 280.0	101.6	19.8	12.4	+ 4.1 0	18.0	19.9	13.6	19.0	35.0	14.2	8.6	6.4	6	10	38
4.50E x 16				114.3					23.4		22.0	39.7						
4.00E x 18	462.0	460.62	1 447.1	101.6					19.0		19.0	35.0						38
5.00F x 16	405.6	404.27	1 270.0	127	22.2	12.9	+ 2.3 0	23.9	27.6	14.5	25.4	54.0	15.6	9.7				
5.00F x 18	462.0	460.62	1 447.1															
5.00F x 20	512.8	511.42	1 606.7															
5.50F x 16	405.6	404.27	1 270.0															
5.50F x 18	462.0	460.62	1 447.1	139.7														
5.50F x 20	512.8	511.42	1 606.7															
6.00F x 16	405.6	404.27	1 270.0	152.4					28.6									

Rims for Implement Tyres



Rim	d1	d2	U ± 2.4	a ± 2.4	b		c		e	f	p	q	r1	r3	r4	r5
					Nom. value	Permitt. difference	Nom. value	Permitt. difference	min.	min.	min.	max.		max.	max.	max.
9.00 x 15.3	388.3	386.98	1 215.7		19	±1		+5.5 0	25	34	50					
9 x 18	462.0	460.82	1 447.1	228.6								60				
9 x 20	512.8	511.42	1 606.7						27		55					
11 x 16	405.6	404.27	1 270.0		25.4	+1.2 –0.4		+4 0					11	6.4		10
11 x 18	462.0	460.82	1 447.1	279.4					31.8		61					
11 x 20	512.8	511.42	1 606.7				12			31					19	
13.00 x 17	436.6	435.22	1 367.3	330.2	19.0	±1.0		+5.5 0	30			65				
16.00 x 17				406.4 ±4.7												
13 x 20	512.8	511.42	1 606.7	330.2	25.4	+1.2 –0.4		+5.5 0	31.8		90		12	8		20
14 x 16				355.6												
17 x 20				431.8 ±4.5												

Notes

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