

HANKOOK TRUCK AND BUS TYRE

TECHNICAL MANUAL

Regrooving Guide • Rim and Accessories • Maintenance and Care



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PREFACE

This manual provides information about truck and bus tyres that can help Hankook Tire customers achieve safe and economical use of our products and maximise tyre life.

The purchase of truck and bus tyres should be looked at as an investment to be protected by thorough maintenance and care in order to produce the best return on your investment and fleet operating efficiency.

Information covered in this manual includes how to achieve the best efficiency through a programme of regular tyre inspection, servicing, repairing and so on. Specific safety related information regarding mounting and demounting tyres are also included.

Careful attention on a regular basis can provide you with added safety and economy. We hope the information is helpful to all tyre service technicians and fleet operators.

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INTRODUCTION

About Hankook Tire

Load Index and Speed Symbol

Truck Tyre Markings

EU Tyre Labeling System

Hankook TBR Technology

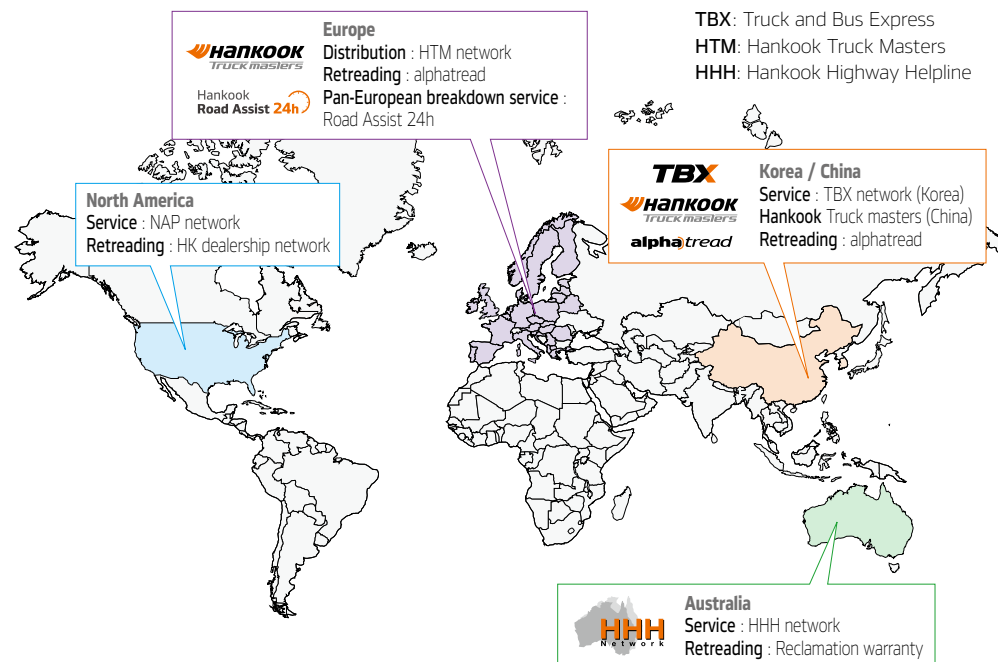
Hankook Tire - A Leading Global Tyre Company

HANKOOK TIRE & TECHNOLOGY OVERVIEW

Hankook Tire is a global corporation that has consistently met the challenges of the future, always a step ahead of changes in the world economy. We have anticipated and prepared for what lies ahead, taking the lead in fostering new growth when important opportunities arise.

Our sales network spans across China, Europe, the Americas, Asia Pacific, and the Middle East & Africa as well as Korea where our headquarters is located in order to ensure that our products satisfy local customer needs.

 CEO Jong-seon Ahn Sang-hoon Lee	 Products Tyres for passenger vehicles, SUVs, Trucks and Buses	 Global Ranking in Tyre Sales 7 th	 Global Sales Revenue (2024) USD 6.9 Billion
 Production Capacity 100,000,000 Units	 Global Corporate Organisation 7 Regional Headquarters 5 R&D Centres 8 Manufacturing Plants 39 Local Subsidiaries	 Number of Selling Countries Approximately 160 countries	 Number of Employees Approximately 20,000



HISTORY OF HANKOOK

1941	Founded Company	2013	Launched 'e-cube MAX', the second generation of our environmentally friendly tyre	2022	Hankook opens Technoring in aean, South Korea - Asia's largest proving ground Hankook and Vaculug partner up for Hankook's retreading business in UK and Ireland	2024	Supplied OE to Porsche Taycan with first 'ISCC PLUS' certified iON evo Supplied OE to the Mercedes-AMG GT Coupe. Received the FIA's '3-Star Environmental Certification'
1979	Built Daejeon (Korea) plant	2014	Supply to Mercedes-Benz Trucks OE	2023	Exclusive supplier of electric vehicle racing tyres for season 9 of the ABB FIA Formula E World Championship		Supplied OE to BMW's high-performance sedan, the M5 Supplied OE to High-performance electric SUV Cupra 'Tavascan'
1982	Established the main R&D Centre	2015	Supply to MAN OE		Partnership to exclusively supply racing tyres for the Lamborghini Super Trofeo Series	2025	Commenced as the official and exclusive tyre supplier to the FIA World Rally Championship(WRC), one of the three major motorsport competitions organised by the Fédération Internationale de l'Automobile (FIA).
1997	Built Geumsan (Korea) plant	2016	Launching of 'e-cube Blue' Supply to Scania OE		Hankook Tire's Hungary plant acquired eco-friendly international certification 'ISCC PLUS'		
1999	Built Jiangsu (China) and Jiaxing (China) plant	2018	Completed the construction of the global R&D centre "Hankook Techno-dome"				
2005	Built G'Trac (proving ground) in Geumsan	2021	Supply to MB Bus Opening of Nürburgring Workshop, Deutschland				
2006	Ranked seventh largest tyre manufacturer in the world		Ranked 7th in global tyre sales				
2008	Begun production at Hungary plant Expanded Geumsan plant						
2009	Launched 'e-cube', the environmentally friendly tyre						

Load Index and Speed Symbol

SIZE MARKINGS

Markings	315/70R 22.5 156/150L
315	Tyre section width (mm)
70	Aspect ratio [(section height / section width) x 100]
R	Radial structure
22.5	Rim diameter (inch)
156	Max. load index when mounting single wheels (3,550kg)
150	Max. load index when mounting dual wheels (3,075kg)
L	Tyre max driving speed symbol (120km/h)

SPEED SYMBOLS [km/h and mph]

Symbol	G	J	K	L	M
km/h	90	100	110	120	130
mph	56	62	68	75	81

VARIATION IN LOAD CARRYING CAPACITY

Speed (km/h)	Variation in load carrying capacity						Inflation pressure compensation (%)*
	Speed symbol						
	F	G	J	K	L	M	
Static	+150.0	+150.0	+150.0	+150.0	+150.0	+150.0	+40
5	+110.0	+110.0	+110.0	+110.0	+110.0	+110.0	+40
10	+80.0	+80.0	+80.0	+80.0	+80.0	+80.0	+30
15	+65.0	+65.0	+65.0	+65.0	+65.0	+65.0	+25
20	+50.0	+50.0	+50.0	+50.0	+50.0	+50.0	+21
25	+35.0	+35.0	+35.0	+35.0	+35.0	+35.0	+17
30	+25.0	+25.0	+25.0	+25.0	+25.0	+25.0	+13
35	+19.0	+19.0	+19.0	+19.0	+19.0	+19.0	+11
40	+15.0	+15.0	+15.0	+15.0	+15.0	+15.0	+10
45	+13.0	+13.0	+13.0	+13.0	+13.0	+13.0	+9
50	+12.0	+12.0	+12.0	+12.0	+12.0	+12.0	+8
55	+11.0	+11.0	+11.0	+11.0	+11.0	+11.0	+7
60	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+6
65	+7.5	+8.5	+8.5	+8.5	+8.5	+8.5	+4
70	+5.0	+7.0	+7.0	+7.0	+7.0	+7.0	+2
75	+2.5	+5.5	+5.5	+5.5	+5.5	+5.5	+1
80	0	+4.0	+4.0	+4.0	+4.0	+4.0	0
85		+2.0	+3.0	+3.0	+3.0	+3.0	0
90		0	+2.0	+2.0	+2.0	+2.0	0
95			+1.0	+1.0	+1.0	+1.0	0
100			0	0	0	0	0
110				0	0	0	0
120					0	0	0
130						0	0

* Increments to be applied in the absence of any specific agreement with the tyre manufacturer

CONVERSION OF LOAD INDEX (LI) INTO LOAD CAPACITIES PER TYRE

LI	kg	lbs	LI	kg	lbs
110	1060	2335	141	2575	675
111	1090	2405	142	2650	5840
112	1120	2470	143	2725	6010
113	1150	2535	144	2800	6175
114	1180	2600	145	2900	6395
115	1215	2680	146	3000	6615
116	1250	2755	147	3075	6780
117	1285	2835	148	3150	6945
118	1320	2910	149	3250	7165
119	1360	3000	150	3350	7385
120	1400	3085	151	3450	7605
121	1450	3195	152	3550	7825
122	1500	3305	153	3650	8045
123	1550	3415	154	3750	8265
124	1600	3525	155	3875	8545
125	1650	3640	156	4000	8820
126	1700	3750	157	4125	9095
127	1750	3860	158	4250	9370
128	1800	3970	159	4375	9645
129	1850	4080	160	4500	9920
130	1900	4190	161	4625	10195
131	1950	4300	162	4750	10470
132	2000	4410	163	4875	10745
133	2060	4540	164	5000	11025
134	2120	4675	165	5150	11355
135	2180	4805	166	5300	11685
136	2240	4940	167	5450	12015
137	2300	5070	168	5600	12345
138	2360	5205	169	5800	12785
139	2430	5355	170	6000	13230
140	2500	5510			

Truck Tyre Markings

TYRE SIZE MARKINGS

All truck tyres are marked to represent their structure, construction type, dimensions and manufacturer / brand. In addition they should carry the Department of Transport code and/or ISO symbols. Below is a typical Hankook tyre that illustrates ISO markings.

- 1 **Brand Name:** Manufacturer name of the tyre.
- 2 **E-mark and Number:** It means the tyre is certified in Europe. In addition, KS, UTQG, CCC, NORM, etc. are carved to signify the certification of each country.
- 3 **Regroovable:** It denotes the tyre is available to use 25% more tread by cutting main groove deeper. It is definitely done by an expert.
- 4 **Tubeless:** This tyre is tubeless structure. (Tyres composed of a tube have "Tubetype" marking)
- 5 **Extra Load Index (LI):** This indicates additional load/speed markings.
- 6 **Radial Tyre:** Indicates the construction: R (for radial), D (for bias [diagonal]) or B (for belted, an extinct kind of construction).
- 7 **Pattern Name:** Pattern name of the tyre.
- 8 **Tyre Size:** Tyre size which shows tyre section width (in mm), aspect ratio, rim inch.
- 9 **Load & Inflation Pressure:** Tyre maximum load and inflation pressure as to standard. It varies from size to size.
- 10 **TWI Mark:** Tread Wear Indicator or TWI shows the minimum status of tread wear which must be conformed.
- 11 **DOT Code:** This is a code required by the Department of Transport (DOT) which certifies the tyre manufacturer's compliance with DOT tyre safety standards. The last four digits indicates the date of manufacture of the tyre. For example, a tyre of DOT ending with 0126 was produced in the 1st week of 2026.
- 12 **Safety Warning:** Critical information customers should know for safety.

Safety Warning

Serious injury may result from: Tyre failure due to under inflation or overloading - follow the tyre placard instructions on the vehicle and check inflation pressures frequently.

Only specially trained people should mount tyres. Follow all safety procedures and inflate using a safety cage and a remote clip-on extension hose.



EU Tyre Labelling System

What is the EU tyre labelling regulation?

What is the aim of the tyre labelling regulations?

- Reduce CO₂ emissions
- Reduce external vehicle noise
- Improve safety
- Improve customer awareness

It supports customers to make better informed choices taking into consideration their type of driving, the climate and road conditions they are likely to encounter.

When was the labelling system introduced?

The original label was introduced on the 1st November 2012. From the 1st of May 2021, the 2nd version of label has been implemented.

What are the changes on the new label?

It is now also mandatory to use the label for commercial tyres. In addition to information about the rolling resistance, wet grip and tyre noise, the 3PMSF marking are added. The noise system is changed from a -classification to an A/B/C system.

A QR code is added to provide easy access to additional tyre info.

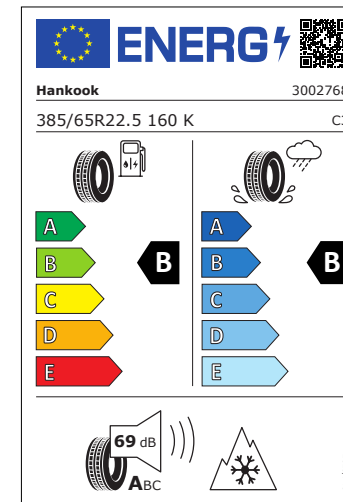
Are all tyres included in the scope of the new tyre labelling?

The rules apply to passenger car tyres (C1), light truck tyres (C2) and heavy-duty vehicle tyres (C3).

The following categories are excluded from the scope:

- Retreaded tyres
- Professional Off-Road tyres
- Racing tyres
- Studded tyres (studdable tyres if supplied without studs are covered)
- Temporary use spare tyres

Who has to give the label information?



Tyre manufacturer: All tyres within the scope must provide the information in technical promotional literature and on the manufacturer's website.

Tyre retailers: Must ensure tyres which are visible to consumers at the point of sale carry a sticker or have a label in their close proximity which is shown to the end user before the sale. They also must give the information during the purchase process when the tyres are offered for sale and are not visible to the end user.

EU Tyre Labelling System

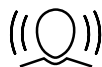
The EU Tyre Labelling System - Overview

Reduce CO₂ emissions

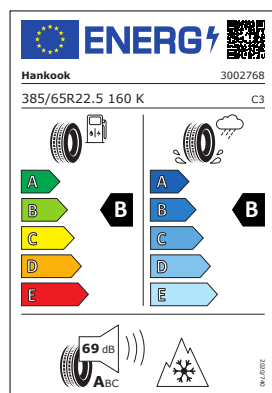
Reduce external noise



Improve safety



Increase customer awareness



Fuel efficiency

Tyres account for 20-30% of the fuel consumption of vehicles.

A reduction of the rolling resistance of tyres may therefore contribute significantly to the energy efficiency of road transport and thus to the reduction of emissions.

A

Low fuel consumption

B

C

D

E

High fuel consumption

Difference between A and E label grades can lead to savings of up to €20K/year in fuel*

* Based on a Tractor unit and trailer at 44T weight covering 130k km per year at 27,5l/100km and fuel cost of 1,25€ per litre.



Wet grip

Wet grip indicates the braking performance of tyres on wet road surfaces and is related to the safety performance of vehicles.

A

Short braking distance

B

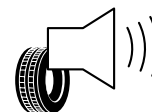
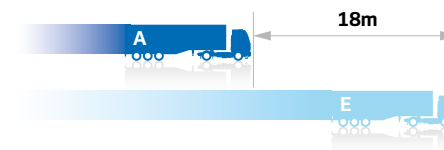
C

D

E

Long braking distance

An A-labelled and an E-labelled tyre can make a braking distance difference of up to 18m, severely impacting the driving safety.



Tyre Noise

The exterior noise levels are measured in decibels (dB) and are indicated in three categories

A Low tyre noise

B Average tyre noise

C Higher tyre noise

Hankook TBR Technology

SMARTEC

HANKOOK TBR TECHNOLOGY

From research to development throughout production, all Hankook commercial tyres are based on the SmartTec technology system and aim to provide all partners with the best and safest driving experiences.



Safety
Robust structure



Mileage
Cover more distance



Anti chip & cut
Sturdy compound



Retreadability
Saving costs



Traction
Enhanced safety





PRODUCT INFORMATION

Truck and Bus Tyre Range

Introduction of Segments

European Winter Tyre Regulations

Technical Table Legend

Technical Data of All Tyres

Truck And Bus Tyre Range

No matter how far you drive, Hankook has the solution.

This chart will help you choose the most appropriate tyre for your driving conditions and region. If you have any questions, please contact your nearest Hankook representative.

EU : Europe

Driving conditions / Axle	All-Position	Drive	Trailer
Long distance transport (above 500km)	AL50	DL50	TL50
Coach	AL22	DL22	
Long & regional haul (Hybrid)	Smart FLeX AL51	Smart FLeX DL51	
National and regional transport (below 500km)	AH51 / AH31 / AH35	DH51 / DH31 / DH35	TH51 / TH31
Mixed service (Below 10% Off-road)	AM09(+)/ AM15(+)/ AM11(+)	DM09 / DM11	TM15 / TM11
Off-road		DM04	
Urban, multi-stop, transport (in the city)	AU04(+)/ AU06	DU02	
Snowy and icy roads	AW53/ AW02(+)	DW53 / DW07 / DW06	TW01

Note : The tyres for front axle can be used for all position. However, if you want to use them on drive or trailer axle, please contact your nearest Hankook representative.

Tyre Labelling:

  : Mud and snow

 : 3PMSF (Three Peak Mountain Snowflake)

This data can be changed by manufacturer without prior notice.



The Tyre Labelling Regulation introduces :

- Fuel efficiency / wet grip / external rolling noise of tyres.

Its aim is to :

- Improve safety.
- Improve environmental and economic efficiency of road transport by promoting fuel efficient and safe tyres.
- Lower noise levels.

Actual fuel saving and road safety depends heavily on the behaviour of drivers, and in particular the following :

- Eco-driving can significantly reduce fuel consumption.
- Tyre pressure should be regularly checked to optimise wet grip and fuel efficiency performance.
- Stopping distances should always be strictly respected.

No matter how far you drive, Hankook has the solution.



Segment **L LONG HAUL**

The long haul tyre is ideally suited for long distance driving on express motorways and good road conditions. It not only saves fuel but also provides excellent riding comfort and handling performance.



SMART Line AL50

Excellent fuel efficiency with optimised grip performance for long haul use

Groove wall step features prevent block deformation and gives reinforcement between tread blocks. The wide tread block enhances the rigidity and improves grip, mileage and reduces the tyre's rolling resistance.



SMART Line DL50

Excellent fuel efficiency with optimised grip performance for long haul use

The centre zigzag grooves create a binding effect on each tread block contributing to better rolling resistance and traction. As the tyre wears, sipes and grooves are revealed to give improved traction and grip performance.



SMART Line TL50

Premium long haul trailer tyre for ultimate fuel efficiency

Ultra-low rolling resistance delivers ultimate fuel efficiency, significantly reducing operating costs and lowering the price per kilometre. Exceptional durability ensures reliable safety while supporting reduced CO₂ emissions for a more environmentally friendly operation.



Segment **L COACH**

The coach tyres are suitable for long distance bus and coach driving. They have been designed for passenger comfort with excellent braking.



SMART Touring AL22

Long distance coach tyre for excellent handling performance and a high driving comfort on motorways

A combination of zigzag and straight grooves provides excellent traction on motorways whilst the centre rib ensures high mileage and supreme handling performance.



SMART Touring DL22

Long distance coach drive axle tyre for excellent handling performance and a high driving comfort on motorways

- Main 4 zigzag grooves improve block stiffness and traction
- Square and interlocking centre blocks enable longer mileage, and improve riding and handling
- Centre V-shaped 3D sipes and lateral groove detail improve winter performance



Segment **LONG & REGIONAL HAUL**

The long & regional haul tyres are designed to provide outstanding mileage performance without compromising fuel efficiency.



SMART Flex AL51

Steer axle tyre for all driving condition from new to fully worn delivering

- Outstanding mileage in long haul condition
- Excellent fuel efficiency in long & regional applications



SMART Flex DL51

Drive axle tyre with outstanding mileage performance without compromising fuel efficiency for long & regional haul use and provides

- Maximum tyre life
- Excellent grip
- Minimum fuel consumption



Segment **H REGIONAL HAUL**

The regional haul tyres are ideal for national and regional roads (below 500km). They are optimised to provide long tread life and durability in all-weather conditions during the whole tyre life.



SMART Flex AH51

Steer axle delivering premium performance in all conditions during the whole tyre life

Hidden grooves appear as the tyre wears. This creates new water channels and gripping surfaces, giving better wet grip traction. Small step-shaped blocks provide even wearing and prevents stone trapping, resulting in a long tyre life while wide tread blocks improve the mileage and a low rolling resistance.



SMART Flex DH51

Drive axle delivering premium performance in all conditions during the whole tyre life

Hidden grooves appear as the tyre wears. This creates new water channels and gripping surfaces, giving better wet grip traction. Self-regenerating sipes prevent cracks, provide enhanced wet grip and keep up the maximum performance even at the later stages of wear.



SMART Flex TH51

Premium Regional-Haul Trailer Tyre for Fleet Efficiency

Designed to deliver excellent mileage and fuel efficiency throughout the tyre's lifespan, helping fleets reduce operating costs and lower CO₂ emissions. Its advanced tread design with hidden grooves, zigzag grooves and optimised water evacuation channels, maintains strong wet-grip performance throughout the tyre's life for enhanced safety and control.





SMART Flex AH31

All-season steer axle tyre for variable road conditions

Wide tread and wide shoulders for a long mileage and an excellent handling performance.

The SmartFlex AH31 has been named as "Winner" in the Product Design category at the IF Design Award 2015.



SMART Flex DH31

All-season drive axle tyre for variable road conditions

Self Regenerating sipes(S.R. sipes) control the tearing and wearing with the help of hidden grooves whilst maintaining traction even at the end of the groove wear.



SMART Flex TH31

All-season trailer axle tyre for variable road conditions

Provides excellent traction and water drainage under various road conditions.



SMART Flex AH35

All-season steer axle tyre for variable road conditions

The special tread pattern design with a combination of 4 wavy and straight grooves provide outstanding traction and drainage performance on long and regional haul multi-applications. Wide tread width offers high pattern volume resulting in a high mileage performance.

The SmartFlex AH35 has been named "Winner" in the Product Design category at the Reddot Design Award 2016.



SMART Flex DH35

All-season drive axle tyre for variable road conditions

Rib type tread pattern design and multi 3 dimensional sipes ensure low rolling resistance and excellent driving performance. Wide tread with 4 zigzag grooves enables high mileage and excellent driving performance in variable conditions.

The SmartFlex AH35 has been named "Winner" in the Product Design category at the Reddot Design Award 2016.



Segment **M ON** and **OFF-ROAD**

The on and off-road tyre has exceptional traction on a dirt track road with excellent performance and is cut and chip resistant. They are designed for tough terrains and to maintain traction with high loads on challenging road surfaces.



SMART Work AM11

All-position tyre for mild on and off-road conditions

Improves traction and braking performance by expanding the point of intersection through 3 zigzag grooves and an optimised unique sipe design without chipping or cutting.



SMART Work AM11⁺

Specialist for waste trucks: reinforced for resilience, built for endurance

Zigzag traction grooves and optimised multi-angular sipes deliver excellent traction and braking while preventing chipping and cutting. Tapered blocks and step-edge grooves maximise edge effect for outstanding braking and enhanced handling.



SMART Work DM11

Drive axle tyre for mild on and off-road conditions

The directional pattern is adopted for excellent handling meaning better traction performance is provided even in wet and muddy conditions.



Segment **M ON and OFF-ROAD**



SMART Work TM11

Trailer axle tyre for mild on and off-road conditions

Improves traction and braking performance by expanding the point of intersection through 3 zigzag grooves and an optimised unique sipe design without chipping or cutting.



SMART Work AM15(+)

Wide based single tyre for mixed operation with high mileage

All-wheel-position wide base tyre designed to deliver high mileage and traction in mixed operations. The tyre has outstanding casing durability and retreadability due to its low heating tread compound application. Thick shoulders help to provide added sidewall protection and minimise casing damage from impacts. Square shoulder shape and ideal contact pressure / contact shape also help prevent irregular wear:

- Realisation of improved durability through the open shouldered structure and increased inner volume of tyres
- Improved tyre durability by applying a compounding technology for tread rubber
- Optimum hydroplaning and traction performance supported under various road conditions



SMART Work AM09

All-position tyre for mixed usage and enhanced on/off-road performance

- Polygonal blocks and zigzag grooves for excellent traction and braking performance
- Wide shoulder design for improved handling performance
- Stone ejector for reduced stone drilling
- Closed shoulder design with lugs for driving stability and an even wear



SMART Work DM09

Designed for mixed usage and enhanced on/off performance

The directional pattern is adopted for excellent handling. The best traction performance is provided even in wet and muddy conditions:

- The first directional type tyre for on and off-road application
- Improved performance for on and off-road
- Increased resistance to cuts and chips on the tread and sidewalls
- Adopted new technology of less stone retention
- Best durability realised through an optimised casing design



SMART Work TM15

Trailer tyre for on and off-road usage

Trailer tyre designed for demanding on and off-road conditions

- Remarkable groove width for enhanced traction performance
- Stone ejector rib in the middle of the grooves prevents stone drilling
- Adoption of linear grooves for maximum stability and performance with excellent water dispersal



DM04

Drive axle tyre for off-road conditions with excellent traction and durability

- Drive axle tyre designed for strong driving power in the mud and on construction sites
- Aggressive lug tread pattern with open shoulders enhances powerful grip



Segment **W** WINTER

The winter tyre has excellent grip and traction on snowy and icy roads providing secure control and unbeatable braking performance. It delivers precise handling and prevents skidding on slippery roads.



SMART Control AW53

Steer axle winter tyre for severe winter conditions

- Advanced winter traction technology with zigzag grooves and 3D sipes for enhanced grip on snow and ice.
- Tie-bar technology enhances tread block stability and handling performance in demanding winter conditions.
- Hidden groove technology helps maintain winter performance throughout the tyre's life.
- Stone ejectors reduce stone retention, supporting durability and longer tread life.



SMART Control AW02(+)

All-position winter tyre for severe weather conditions

- Zigzag 5 groove design supports excellent water abrasion
- 3D sipes provide even wear and a high mileage as well as superb traction on snowy and icy roads
- Tie bars ensure a high block stiffness and a reliable handling performance
- Unique semi-open shoulder design

The SmartControl AW02 has been named "Winner" in the Product Design category at the Reddot Design Award 2015.



SMART Control DW53

Drive axle winter tyre for maximum traction in snow and ice

- Advanced tread pattern with 3D sipes and zigzag grooves deliver outstanding grip and traction on winter roads.
- Enhanced snow acceleration, braking and handling performance in severe winter conditions.
- Tie-bar technology supports tread block stiffness for stable traction and control.
- Hidden groove technology sustains grip and traction as the tyre wears, extending winter performance throughout its life.



SMART Control DW07

Drive tyre for maximum grip on snowy and icy conditions

- Drive axle tyre for severe winter conditions
- Large amount of multi 3D sipes with jaggy edge design for excellent grip and traction on snow
- Pentagon block design and special new tread compound for high mileage



DW06

Winter tyre for maximising grip in ice and snow

Advanced zigzag grooves, multi-sipes, and 3D technology for reliable winter grip, stability, and long-lasting performance in icy and snowy conditions.



SMART Control TW01

Winter tyre for severe snow conditions

4 groove zigzag design provides excellent traction on snow and ice. Wide shoulder rib provides excellent wet grip performance and high mileage.



Segment **E** ELECTRIC BUSES

The urban tyre is primarily used for driving on city roads. The excellent resistance to wear gives the urban tyre a long life and is designed to deliver great braking and driving performance.



e-SMART City AU56

First exclusive tyre for electric buses

Designed exclusively for electric buses, this tyre delivers long-lasting wet grip through hidden groove technology and reduced noise levels with integrated Baffle Technology.

The eSmart City AU56 has been named "Winner" in the Product Design category at the Red Dot Design Award 2024.



Segment **U** URBAN BUS

The urban tyre is primarily used for driving on city roads. The excellent resistance to wear gives the urban tyre a long life and is designed to deliver great braking and driving performance.



SMART City AU06

All-position tyre for ICE city buses

Improved performance for ICE city buses

- Excellent wear performance and fuel efficiency
- Improved grip performance reduced road noise
- Aerodynamic sidewall structure specialised for ICE city buses



SMART City AU04(+)

All-position tyre for urban transport

Optimised design technology for urban operations involving frequent stop and go driving.

- Special pattern design for economic benefit of reduced downtime and easy fitting performance



SMART City DU02

Built for urban buses - optimised for reliability and safety in challenging urban conditions

Noise-reducing shoulder lugs with horn-shaped self-generating sipes ensure a quieter ride, while solid centre blocks and wide shoulder ribs deliver longer mileage and low rolling resistance. Main zigzag grooves provide excellent traction and tread stiffness for demanding urban routes.



European Winter Tyre Regulations

County		Tyre regulations
Albania		No general winter tyre regulation
Austria		Winter tyre obligation from 1st November - 15th April. Vehicles >3.5 t GVW must be equipped on at least one drive axle with M+S tyres and/or the Alpine symbol (3PMSF) with 6 mm skid depth and 5mm skid depth in general. For buses (M2 and M3) the winter tyre obligation from 1st November- 15th March.
Belarus		No general winter tyre regulation
Belgium		No general winter tyre regulation. Symmetrical usage of M+S / winter tyres per axle required
Bosnia and Herzegovina		From 15th November to 15th April two options obligatory for vehicles with more than 8 seats and for vehicles > 3.5 t GVW. Option 1: tyres with a winter tread at least 4 mm skid depth on the drive axle. Option 2: tyres with a standard tread and at least 4mm skid depth and at wintery conditions (snow and freezy rain) snow chains to be equipped on the drive axle.
Bulgaria		From 15th November to 1st March summer or winter tyres with a skid depth of 4mm are required.
Croatia		Winter tyre obligation from 15th November until 15th April. For vehicles > 3.5 t GVW M+S tyre are obligatory on the drive axle.
Cyprus		No general winter tyre regulations for trucks are known
Czech Republic		Between 1st November and 31st March situative winter tyre obligation during wintery conditions or if indicated by signposting. Vehicles heavier > 3.5 t GVW must be equipped with M+S at least on the the drive axle; at least 6mm skid depth.
Denmark		No general winter tyre regulations
Estonia		Winter tyres are obligatory for vehicles < 3.5 t GVW (radial tyres with 3 mm minimum skid depth) from 1st December until 1st March (also from October until April, depending on weather conditions). Heavier vehicles don't require winter tyres but min. skid depth of 3mm.
Finland		From 1st November until 31st March there's a winter tyre obligation at wintery conditions on non-steering drive axles with 3PMSF, POR or stud tyres. The minimum tread depth is at least 5 mm on the drive axle and on all other axles at least 3 mm.
France		Winter equipment is obligatory on roads with the signage B26 and/or B58. The following changes apply from 2021: From 1st November until 31st March vehicles heavier than 3.5 t GVW must be equipped with 3PMSF tyres (at least two 3PMSF tyres on a steer axle and at least two 3PMSF tyres on a drive axle) or snow chains on the drive axle. Until 1st November 2024 tyres with either 3PMSF or M+S are accepted as winter equipment.

Snow chain regulations	Stud tyres	Remarks
Obligation to carry and use snow chains on the drive axle if signposting or weather condition require it		
Obligation to carry along from 1st November until 15th April for at least two driven wheels. Exceptions exist for public buses. Usage on snow and ice covered roads.		Stud tyres are forbidden for vehicles heavier than 3.5 t GVW.
Snow chains are only allowed on snow and ice covered roads		
Snow chains are allowed on snow and ice covered roads		Symmetrical usage required.
Obligation to carry snow chains between 15th November and 15th April		A snow shovel & a bag of sand (25 to 50 kg) must be carried.
Obligation to carry along from 1st November until 31st March. On mountain roads signpostings might display a snow chain obligation.		Stud tyres forbidden. Without appropriate winter equipment the entry can be denied or a driving ban declared.
Under certain circumstances snow chains are required (when the vehicle is equipped with summer tyres. Snow chain obligation in some regions (Lika / Gorski Kotar)		Stud tyres forbidden. Commercially used vehicles must carry along a snow shovel.
No general winter tyre regulations for trucks are known		
If signpostings say so, triaxial and multiaxial vehicles must be equipped with snow chains on at least two tyres on the drive axles		Stud tyres forbidden.
Snow chains allowed from 1st November to 15th April		Stud tyres are allowed between 1st November and 15th April. In this case studs must be mounted on all tyres.
Snow chain obligation if sign postings require so on at least two drive wheels if vehicles have three or more axles.		Stud tyres are allowed from 15th October until 31st March.
Snow chains are allowed on snow and ice covered roads		Stud tyres are legal from 1st November until 31st March during wintery weather conditions.
Snow chain usage when signposting displays		Stud tyres for vehicles lighter than 3.5 t GVW allowed from the 1st November until 31st March. The speed limit is 90 km/h. Vehicles with stud tyres must be marked with a sticker.

County		Tyre regulations
Germany		At winterly conditions vehicles heavier than 3.5 t GVW must be equipped with tyres with the Alpine symbol (3PMSF tyres) on the permanently driven axles and the front steer axles.
Greece		No general winter tyre regulations for trucks are known
Hungary		No general winter tyre regulation
Iceland		There is no winter tyre regulation yet but is expected soon.
Ireland		No general winter tyre regulation
Italy		No general winter tyre regulation. Exceptions are displayed by signpostings.
Kosovo		No general winter tyre regulation
Latvia		Winter tyres (M+S) obligatory for vehicles lighter than 3.5 t GVW from 1st December until 1st March. Minimum skid depth 4mm. Heavier vehicles don't require winter tyres but a minimum skid depth of 3mm is obligatory.
Liechtenstein		No general winter tyre regulation. The vehicles have to be equipped according to weather conditions, liability can be applied.
Lithuania		Winter tyres are obligatory for vehicles lighter than 3.5 t GVW from 1st November until 1st April. Heavier vehicles don't require winter tyres, a minimum tread depth of 1.6 mm is obligatory.
Luxembourg		At winterly conditions trucks and buses must be equipped with winter tyres (M+S mark sufficient) on the drive axles
Malta		No general winter tyre regulations for trucks are known
Montenegro		Between November and April on specific roads (announced by the police ministry) vehicles must be equipped with winter tyres or tyres with M+S marking (at least 4 mm tread depth)

Snow chain regulations	Stud tyres	Remarks
Snow chains allowed in case of signposting.		Stud tyres forbidden. Exception: Kleines Deutsches Eck (a small territory near the Austrian border) 60 Euro fee for using inappropriate tyres. 80 Euro fee for an traffic interference due to inappropriate tyres. 100 Euro fee for an endangerment due to inappropriate tyres. 120 Euro fee for an accident due to inappropriate tyres. Each violation is connected with a penalty point on the driving licence.
No general winter tyre regulations for trucks are known		
Snow chains are only allowed on snow and ice covered roads. The usage can be obligatory (maximum speed 50 km/h). At winterly conditions the entry without snow chains can be denied.		Stud tyres forbidden.
		No general winter tyre regulations for trucks are known.
Snow chains are only allowed on snow and ice covered roads		
Obligation to carry snow chains		
Snow chains must be carried for drive axles. Usage if ordered by signposting and depending on weather conditions		Buses and trucks must carry a snow shovel
Snow chains are only allowed on snow and ice covered roads		Stud tyres are allowed from 1st October to 30th April for vehicles lighter than 3.5 GVW.
Carrying along snow chains is recommended. The usage on mountain roads can be ordered by signposting.		For vehicles lighter than 7.5 t GVW stud tyres are allowed from 1st November until 30th April, with the exception of highways. Speed limit 80 km/h. All tyres must be equipped with studs and the vehicles be marked with a sticker.
Snow chains are only allowed on snow and ice covered roads		Stud tyres allowed between 1st November and 1st April.
Snow chains are only allowed on snow and ice covered roads		
No general winter tyre regulations for trucks are known		
Snow chains must be carried for drive axles. Usage if ordered by signposting and depending on weather conditions		Buses and trucks must carry a snow shovel

County		Tyre regulations
Netherlands		No general winter tyre regulation
North Macedonia		No general winter tyre regulation
Norway		3PMSF mandatory on steer and drive axles, M+S on others. Minimum tread depth is 5 mm. Mandatory during winter period from 15 November to 31 March.
Poland		No general winter tyre regulation
Portugal		No general winter tyre regulation
Romania		At winterly conditions all vehicles heavier than 3.5 t GVW and buses with more than 9 seats must be equipped with M+S tyres or winter tyres on the drive axle
Russia		In the winter months (December, January and February) trucks and buses must be equipped on all drive axles with M+S tyres or 3PMSF tyres and have a skid depth of at least 4mm.
Serbia		Between November and April vehicles must be equipped with winter tyres or tyres with M+S marking. At least 4mm skid depth. Usage if ordered by signposting and depending on weather conditions
Slovakia		Winter tyre obligation (M+S tyres) on drive axles for vehicles heavier than 3.5 t GVW between 15th November and 31st March (at least 3 mm tread depth)
Slovenia		From 15th November until 15th April vehicles heavier than 3.5 t GVW two options are obligatory. Option 1: winter tyres at least on the drive axle with at least 3 mm skid depth. Option 2: Standard tyres but snow chains must be carried along in the vehicle that must be equipped on the drive axle tyres during winterly conditions.
Spain		High altitude mountain roads in level red (15/TV-87): Buses must be equipped with 3PMSF marked tyres on all axles with at least 4mm skid depth. Vehicles with a GVW between 3.5 t and 7.5 t with applications waste disposal, groceries and flux transportation and accident assistance can drive on these roads with winter tyres on all axle positions and at least 4mm skid depth. Other commercial vehicles are not allowed.

Snow chain regulations	Stud tyres	Remarks
Snow chains are only not allowed on public roads		
Obligation to carry along snow chains from 15th October until 15th March if the vehicle is only equipped with standard tyres.		Buses and trucks must carry a snow shovel
Obligation for vehicles heavier than 3.5 t GVW to carry along snow chains for the period when the usage of stud tyres is allowed. A truck with a trailer must carry along seven snow chains.	 Studs with an average protrusion of 1.7 mm are allowed from 1st November until the 1st Monday after Easter. In Nordland, Troms and Finnmark from 16th October until 30th April.	Tractors and trailers: Studs on all tyres of an axle, in case of a dual mounting one tyre is enough. In Trondheim and Oslo there's a fee for being allowed to use stud tyres: Day tickets (3.90 Euro) are available on vending machines along main roads or by telephone or SMS (with Norwegian, Swedish or Danish phone numbers). Month (52 Euro) and year (155 Euro) tickets for Trondheim available at Trondheim City Office. Double prices for vehicles heavier than 3.5 t GVW. Non-compliance is punished with a fee of 97 Euro.
Snow chains are only allowed on snow and ice covered roads. Roads on which snow chains are obligatory are displayed by signposting.		
Snow chain usage when signposting displays (only in high altitudes).		
Obligation for vehicles heavier than 3.5 t GVW to carry along snow chains if ordered by signposting		In vehicles heavier > 3.5 t GVW snow chains and sand must be carried along.
It's recommended to carry snow chains but not mandatory		Stud tyres are forbidden in the summer months (June, July and August)
Snow chains must be carried for drive axles. Usage if ordered by signposting and depending on weather conditions		Buses and trucks must carry a snow shovel
Obligation to carry along and to use if ordered by signposting and depending on weather conditions		
Obligation to carry along for vehicles heavier than 3.5 t GVW if the vehicle is not equipped with winter tyres		
High altitude mountain roads in level red (15/TV-87): Snow chains on vehicles with a GVW between 3.5 t and 7.5 t if winter tyres are not mounted.		Usage of stud tyres with a protrusion of up to 2 mm are allowed on snowy roads.

County		Tyre regulations
Sweden		Minimum tread depth 5 mm for all axles on motor vehicle, 1.6 mm on trailer/semi-trailer. 3PMSF mandatory on steer and drive axles, M+S on others. Permitted from 1 October to 15 April.
Switzerland		No generally valid winter tyre regulations. Regional regulations are possible under wintery road conditions (e.g. on Alps mountain roads). The vehicle must be equipped properly according to the weather conditions. Consider that in case of an accident summer tyres are held liable during wintery conditions.
Turkey		From 1st December until 1st April there is a winter tyre obligation for buses and trucks on regional roads. Within provincial borders the local authorities decide if the winter tyre regulations are applied and announce them according to local temperatures. Mounting winter tyres is obligatory for drive axles of trucks, tractors, tankers and buses. Also on all axles of light trucks, delivery vehicles, taxis, minibuses, vans and commercial vehicles. Every tyre that is exchanged on the road must be replaced with a winter tyre. Within the obligatory period winter tyres should have the M+S symbol, the 3PMSF symbol or both on the sidewall. The tread depth and the tread of a retread should correspond to a winter tyre even if they have the M+S symbol on the sidewall. Winter tyres should have a tread depth of at least 4 mm for trucks, tractors and buses and 1.6 mm for light trucks, delivery vehicles and passenger cars.
United Kingdom (Great Britain)		No general winter tyre regulation
Ukraine		No general winter tyre regulation

Snow chain regulations	Stud tyres	Remarks
It's recommended to carry snow chains.	 Stud tyres are allowed from 1st October until 15th April but this period can be extended depending on the weather conditions.	Maximum 50 studs per tyre if the tyre is produced after 1st July 2013. For certain roads bans must be considered.
Snow chain usage when signposting displays so and wintery conditions require it. Vehicles with four-wheel-drive can be excluded.	 vehicles > 7.5 t GVW from 1st November until 30th April on snow covered roads with a max speed of 80 km/h.	Stud tyres must have a sticker with the marking 80 km/h.
Carrying or using snow chains is allowed but doesn't liberate drivers from the winter tyre obligation	 Only stud tyres that can be used on ice covered roads can substitute winter tyres.	The tread depth should be measured from the centre of the tread.
Snow chains are only allowed on snow and ice covered roads.		Stud tyres are allowed but only on snowy and iced roads and only when the tyre surface is not damaged by them. Otherwise a recourse is possible.
Snow chains are only allowed on snow and ice covered roads		

GVW = gross vehicle weight

Despite careful research, we cannot guarantee that the information is correct and complete.

Technical Table Legend

VALUE AND QUALITY TO CUSTOMERS

(S) SECTION WIDTH (mm)

The linear distance between the outsides of the sidewalls of an inflated tyre excluding elevations due to labeling (marking), decorations, protective bands or ribs.

(H) SECTION HEIGHT (mm)

Half the difference between the overall diameter and the nominal rim diameter.

(OD) OVERALL DIAMETER (mm)

The diameter of an inflated tyre at the outermost surface of the tread.

(RST) STATIC LOADED RADIUS (mm)

The distance between the wheel centre and road surface referring to a tyre inflated and loaded at the values shown in the table under static conditions.

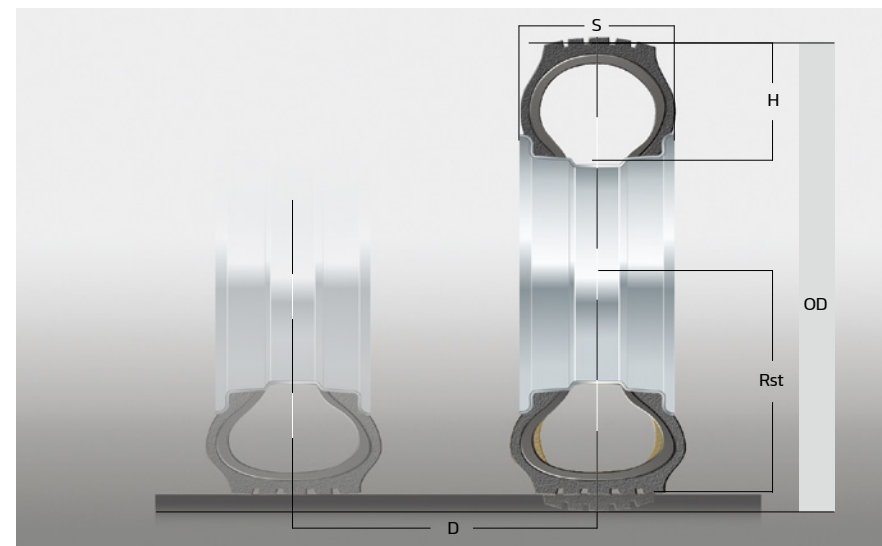
(RC) ROLLING CIRCUMFERENCE (mm)

The distance covered in one complete revolution of the tyre under load and pressure conditions indicated in the tables.

(D) MINIMUM DUAL SPACING FOR TWIN FITMENTS (mm)

Dual spacing is the distance between the centre lines of the twin tyres.

The "D min" values refer to tyres without chains and may also be applied in the case of the fitment of chains for twin tyres. If chains are fitted on one tyre only, the "D min" values must be increased so that the sidewalls of the tyre under load do not trap the chain and become damaged.



The values in the tables are approximate and may vary in practice, including a possible growth in service. They do not, however, exceed the following limits :

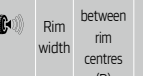
CONVERSION FACTORS		
TO CONVERT FROM	INTO	MULTIPLY BY
mm	inch	0.03937
inch	mm	25.4
kg	lbs.	2.2046
lbs.	kg	0.4536
bar	kg/cm ²	1.01972
kg/cm ²	bar	0.98066
bar	lbs./sq. inch (psi)	14.5033
lbs./sq. inch (psi)	bar	0.06895
bar	kPa	100
lbs./sq. inch (psi)	kPa	6.895
km/h	m.p.h	0.62137
m.p.h	km/h	1.60935

Technical Data of All Tyres

TUBE TYPE

Tyre Size	Tread Pattern	Load Index & Speed Symbol	Extra Load Index	TT/TL	Label Values				Rim		Tyre Dimensions					Load Index (LI)	Load capacity (kg) per axle at tyre pressure (bar/psi)										Speed symbol (km/h)					
					   				Rim width	Distance between rim centres (D)	Max. Standard Value in service	Width (S)	Outer diameter (OD)	Actual Value																		
														Width (S)			Overall Diameter (OD)	Static Radius (Rst)	Rolling circumference (Rc)													
																				RR	Wet	db	Noise	+1%	+1%	+1.5%				+2%	kg	
8R17.5	AH35	117/116L		TL	D	C	71	A	6.00	234	216	797	200	784	369	2395	117	S	2,040	2,220	2,395	2,570							✓	✓		
	DH35	117/116L		TL	D	C	73	A									116	D	3,970	4,320	4,660	5,000							✓	✓		
8.5R17.5	AH35	121/120L		TL	D	C	67	A	6.00	242	224	817	210	802	374	2450	121	S	2,160	2,350	2,535	2,720	2,900						L=120	✓	✓	
	DH35	121/120L		TL	D	C	73	A									120	D	4,170	4,535	4,895	5,250	5,600							✓	✓	
9.5R17.5	AH35	129/127L		TL	D	C	67	A	6.75	270	250	857	235	842	390	2570	129	S	2,455	2,675	2,885	3,095	3,290	3,500	3,700					✓	✓	
	DH35	129/127L		TL	D	C	73	A									127	D	4,650	5,060	5,460	5,855	6,240	6,620	7,000					L=120	✓	✓
	TH31	143/141J		TL	C	B	69	A									143	S		3,490	3,760	4,040	4,300	4,560	4,820	5,080	5,205	5,450	J=100	✓	✓	
																	141	D		6,590	7,110	7,620	8,130	8,620	9,110	9,590	9,835	10,300			✓	✓
10R22.5	AM09	144/142L		TL	D	B	67	A	7.50	286	264	1038	258	1020	480	3090	144	S	3,530	3,840	4,145	4,445	4,740	5,030	5,315	5,600	6,400	6,700		✓	✓	
																	142	D	6,685	7,275	7,850	8,420	8,975	9,525	10,065	10,600	12,035	12,600			✓	✓
11R22.5	AM09	148/145K		TL	D	B	67	A	8.25	314	290	1070	282	1053	493	3225	148	S	3,785	4,120	4,445	4,765	5,080	5,390	5,695	6,000	6,300		K=110	✓	✓	
	DM04	148/145K		TL										1046	493	3105	145	D	6,970	7,585	8,185	8,775	9,355	9,930	10,490	11,050	11,600		L=120	✓	✓	
	DM09	148/145K		TL	E	C	70	A						1063	493	3220														✓	✓	
	AH31	148/145L		TL	D	B	72	A																						✓	✓	
	AU04	148/145J		TL	D	B	70	A																						✓	✓	
12R22.5	AH31	152/149L		TL	C	B	71	A	9.00	338	312	1104	298	1085	504	3307	152	S	4,265	4,640	5,010	5,370	5,725	6,075	6,420	6,760	7,100			✓	✓	
	AM09	152/149K		TL	D	B	69	A									149	D	7,815	8,500	9,180	9,840	10,490	11,130	11,760	12,385	13,000			✓	✓	
	DM09	152/149K		TL	E	C	70	A																						✓	✓	
13R22.5	AM09	156/150K	156/150G	TL	D	C	68	A	9.75	360	326	1146	320	1085	520	3405	156	S	4,590	4,995	5,390	5,780	6,165	6,540	6,910	7,280	7,640	8,000	K=110	✓	✓	
	AM11	156/150K		TL	C	B	71	A									154	S	4,505	4,905	5,290	5,675	6,050	6,420	6,785	7,140	7,500			✓	✓	
	DM04	154/150K		TL													150	D	8,055	8,760	9,455	10,140	10,810	11,470	12,120	12,765	13,400			✓	✓	
	DM09	156/150K		TL	D	C	75	B																						✓	✓	
	DM11	156/150K		TL	C	B	73	A																						✓	✓	
205/65R17.5	TH31	132/130J		TL	C	B	70	A									132	S		2,495	2,695	2,890	3,080	32,770	3,455	3,640	3,820	4,000	F=80	✓	✓	
																	130	D		4,750	5,125	5,495	5,860	6,215	6,570	6,915	7,260	7,600			✓	✓
205/75R17.5	AH35	124/122M		TL	D	C	65	A	6.00	231	213	765	203	761	359	2325	124	S	2,125	2,310	2,495	2,675	2,850	3,015	3,200				M=130	✓	✓	
	DH35	124/122M		TL	D	C	66	A									122	D	3,985	4,335	4,680	5,015	5,350	5,675	6,000					✓	✓	
215/75R17.5	AH35	128/126M	135/133J	TL	D	C	65	A	6.00	239	220	779	214	774.2	360	2363	126	S	2,385	2,595	2,800	3,005	3,200	3,400					M=130	✓	✓	
	DH35	126/124M		TL	D	C	66	A									128	S	2,390	2,600	2,805	3,010	3,210	3,405	3,600				K=110	✓	✓	

TUBELESS CONVENTIONAL

Tyre Size	Tread Pattern	Load Index & Speed Symbol	Extra Load Index	TT/TL	Label Values				Rim		Tyre Dimensions						Load Index (LI)	Load capacity (kg) per axle at tyre pressure (bar/psi)										Speed symbol (km/h)									
									Rim width	Distance between rim centres (D)	Max. Standard Value in service		Actual Value					Tyre fitment (S,D)	Load capacity (kg) per axle at tyre pressure (bar/psi)																		
																			Width (S)	Outer diameter (OD)	Width (S)	Overall Diameter (OD)	Static Radius (Rst)	Rolling circumference (Rc)	4.5	5	5.5				6	6.5	7	7.5	8	8.5	9
																									(65)	(73)	-80				(87)	(94)	(102)	(109)	(116)	(123)	(131)
																	kg										km/h										
215/75R17.5	TH31	135/133J		TL	C	B	69	A										135	S		2,850	3,075	3,295	3,515	3,730	3,940	4,150	4,360	J=100	✓	✓						
225/75R17.5	AH35	129/127M		TL	C	C	67	A	6.75	254	235	797	228	790	371	2420		129	S	2,455	2,675	2,885	3,095	3,295	3,500	3,700		M=130	✓	✓							
	DH35	129/127M		TL	D	C	73	A										127	D	4,650	5,060	5,460	5,855	6,240	6,620	7,000					✓	✓					
235/75R17.5	AH35	132/130M		TL	C	C	67	A	6.75	262	242	811	238	806	373	2445		132	S	2,520	2,745	2,960	3,175	3,385	3,590	3,795	4,000	5,205 5,450	M=130 K=110	✓	✓						
	DH35	132/130M		TL	D	C	73	A										143	S	3,405	3,675	3,940	4,200	4,455	4,710	4,955	✓					✓					
	TH31	143/141K		TL	C	B	70	A										130	D	4,795	5,215	5,630	6,035	6,435	6,825	7,215							7,600	✓	✓		
																			141	D	6,435	6,945	7,445	7,935	8,420	8,900	9,370					9,835 10,300					
245/70R17.5	AH35	136/134M	146/146F	TL	C	C	67	A	7.50	279	258	803	250	796	369	2461		136	S	2,690	2,930	3,160	3,390	3,610	3,835	4,050	4,265	4,480	M=130 K=110	✓	✓						
	DH35	136/134M		TL	D	C	73	A										143	S	3,405	3,675	3,940	4,200	4,455	4,710	4,955	5,205 5,450	✓				✓					
	TH31	143/141K		TL	C	B	70	A										134	D	5,095	5,545	5,985	6,415	6,840	7,260	7,670	8,075						8,480	✓	✓		
																			141	D	6,435	6,945	7,445	7,935	8,420	8,900	9,370	9,835 10,300									
255/60R19.5	TH31	143/141J		TL	C	C	69	A	8.25		527	801	267	813	378	2436		143	S	3,130	3,405	3,675	3,940	4,200	4,455	4,710	4,960	5,205 5,450	J=100	✓	✓						
																		141	D	5,915	6,435	6,940	7,445	7,940	8,420	8,900	9,370	9,840 10,300									
245/70R19.5	AH35	136/134M	136/135J	TL	C	C	67	A	7.50	279	258	853	244	844	391	2580		136	S	2,690	2,930	3,160	3,390	3,610	3,835	4,050	4,265	4,480	M=130 J=100	✓	✓						
	AH35	136/134M		TL	C	C	67	A											141	S	3,095	3,365	3,635	3,895	4,155	4,405	4,655	4,905				5,150	✓	✓			
																			143	S	3,405	3,675	3,940	4,200	4,455	4,710	4,955	5,205 5,450				✓			✓		
	DH35	136/134M		TL	D	C	73	A											134	D	5,095	5,545	5,985	6,415	6,840	7,260	7,670	8,075					8,480	✓		✓	
	TH31	141/140J		TL	C	C	69	A											141	D	6,190	6,735	7,270	7,795	8,310	8,820	9,320	9,810				10,300	✓		✓		
	AU06	143/141K		TL	D	C	71	A											140	D	6,010	6,540	7,055	7,565	8,065	8,560	9,045	9,525				10,000				✓	✓
255/60R19.5	TH31	143/141J		TL	C	C	69	A					249	849	395	2626		143	S	3,130	3,405	3,675	3,940	4,200	4,455	4,710	4,960	5,205 5,450	✓	✓							
																		141	D	5,915	6,435	6,940	7,445	7,940	8,420	8,900	9,370	9,840 10,300									
265/70R17.5	DH35	140/138M		TL	D	C	73	A										136	D		6,152	6,640	7,120	7,590	8,050	8,510	8,960	M=130	✓	✓							
	AH35	140/138M		TL	C	C	67	A	7.50	295	272	881	260	870	400	2675		140	S	3,155	3,430	3,700	3,970	4,230	4,490	4,745	5,000				✓	✓					
	DH35	140/138M		TL	D	C	73	A											143	S	3,560	3,845	4,120	4,395	4,665	4,930	5,190						5,450				
265/70R19.5	AH35	140/138M			C	C	67	A																						✓	✓						
	DH35	140/138M			D	C	73	A																						✓	✓						
	TH31	143/141J			C	C	69	A																						✓	✓						
	AM15	143/141J			D	B	73	A																						✓	✓						
	AU06	143/141K																												✓	✓						
275/70R22.5	AH31	148/145M		TL	C	C	73	A	8.25	311	287	974	279	962	447	2959		148	S	3,615	3,935	4,245	4,550	4,855	5,150	5,440	5,730	6,015 6,300	M=130 K=110 J=100 F=80 E=70	✓	✓						
	AH51	148/145M		TL	C	C	72	A											150	S	3,845	4,185	4,515	4,840	5,160	5,475	5,790	6,095				6,400 6,700	✓	✓			
	DH31	148/145M		TL	D	C	73	A											152	S	4,075	4,435	4,785	5,130	5,470	5,805	6,135	6,460				6,780 7,100			✓	✓	
	DH51	148/145M		TL	D	B	76	B											145	D	6,660	7,245	7,820	8,385	8,940	9,485	10,025	10,555				11,080 11,600	✓	✓			
	TH31	152/148J		TL	C	C	69	A											148	D	7,235	7,870	8,495	9,105	9,710	10,305	10,885	11,465				12,035 123,600			✓	✓	

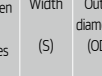
TUBELESS LOW SECTION

Tyre Size	Tread Pattern	Load Index & Speed Symbol	Extra Load Index	TT/TL	Label Values				Rim		Tyre Dimensions					Load Index (LI)	Load capacity (kg) per axle at tyre pressure (bar/psi)										Speed symbol (km/h)							
									Rim width	Distance between rim centres (D)	Max. Standard Value in service Width (S) Outer diameter (OD)		Actual Value																					
													Width (S)	Overall Diameter (OD)			Static Radius (Rst)	Rolling circumference (Rc)																
																			+1%	±1%	±1.5%	±2%												
																kg										km/h								
275/70R22.5	AM15	148/145K		TL	D	B	73	A						277	962	440	2954		149	D	7,465	8,120	8,765	9,400	10,020	10,630	11,235	11,830	12,420	13,000		✓	✓	
	AU04+	152/149J		TL	D	B	67	A																							✓	✓		
	AU56	152/149J		TL	C	C	71	A																							✓	✓		
	AW02	150/145J	152/148F	TL	D	B	70	A																							✓	✓		
	AW02	152/149J		TL	D	B	70	A																							✓	✓		
	DW07	150/145J	152/148F	TL	D	C	72	A																								✓	✓	
275/80R22.5	AU04	149/146J		TL	D	C	71	A	8.25			287	1029	283	1025	476	2991		149	S	3,905	4,250	4,585	4,915	5,240	5,560	5,880	6,190	6,500		✓	✓		
	AH31	149/146L	151/148J	TL	C	C	70	A	8.25			287	1029	283	1022	479	3010		146	D	7,210	7,845	8,470	9,080	9,680	10,270	10,855	11,430	12,000		✓	✓		
285/70R19.5	AH35	146/144M		TL	C	C	67	A	8.25	318		294	911	280	895	415	2745		146	S		3,750	4,050	4,340	4,630	4,910	5,190	5,470	5,740	6,000	M=130	✓	✓	
	DH35	146/144M		TL	D	C	73	A										150	S		4,185	4,515	4,840	5,160	5,475	5,790	6,095	6,400	6,700	J=100	✓	✓		
	TH31	150/148K		TL	C	B	70	A										144	D		7,000	7,560	8,100	8,640	9,170	9,680	10,200	10,700	11,200		✓	✓		
	AU56	146/144L																148	D		7,870	8,495	9,105	9,710	10,305	10,885	11,465	12,035	12,600					
295/55R22.5	DH51	147/145K		TL	C	B	76	B										145	D	6,660	7,245	7,820	8,385	8,940	9,485	10,020	10,555	11,080	11,600		✓	✓		
295/60R22.5	DH31	150/147K	149/146L	TL	D	C	73	A	9.00	351		318	1106	320	1079	500	3299		150	S	3,845	4,185	4,515	4,840	5,160	5,475	5,790	6,095	6,400	6,700	L=120	✓	✓	
	DH51	150/147K	149/146L	TL	C	B	76	B										147	D	7,060	7,685	8,290	8,890	9,480	10,055	10,630	11,190	11,750	12,300	K=110	✓	✓		
	TH31	150/147K	152J	TL	C	C	70	A																						J=100	✓	✓		
	AL50	150/147L		TL	B	B	70	A	9.00	329		304	940	288	919	425	2820														✓	✓		
	DL50	150/147L		TL	B	C	72	A																							✓	✓		
295/80R22.5	AH31	154/149M		TL	C	B	73	A	9.00	335		310	1062	305	1051	490	3226		154	S	4,505	4,905	5,290	5,675	6,050	6,420	6,785	7,140	7,500		M=130	✓	✓	
	AH51	154/149M		TL	C	B	72	A										152	S	4,265	4,640	5,010	5,370	5,725	6,075	6,420	6,760	7,100		L=120	✓	✓		
	AL51	154/149M		TL	B	C	70	A										148	D	7,575	8,240	8,890	9,535	10,165	10,785	11,395	12,000	12,600		K=110	✓	✓		
	AL22	154/149M		TL	C	B	69	A										149	D	7,815	8,500	9,175	9,835	10,485	11,125	11,760	12,380	13,000		J=100	✓	✓		
	DH31	152/148M		TL	D	B	73	A										150	D	8,055	8,765	9,460	10,140	10,810	11,470	12,125	12,765	13,400			✓	✓		
	DH51	152/148M		TL	D	B	76	B																							✓	✓		
	DL51	154/149M		TL	C	C	73	A																							✓	✓		
	DL22	154/149M		TL	C	B	72	A																							✓	✓		
	AU04	154/149M		TL	D	B	67	A																							✓	✓		
	AM09	152/148K	154/150J	TL	D	B	67	A																							✓	✓		
	DM09	152/148K		TL	E	C	70	A																							✓	✓		
	AW02	154/149M		TL	D	C	70	A																							✓	✓		
	DW07	152/148L		TL	D	C	72	A																							✓	✓		
	305/70R19.5	AH35	148/145M		TL	C	C	71	A	9.00	343		317	941	304	920	423	2820		148	S	3,785	4,120	4,445	4,765	5,080	5,390	5,695	6,000	6,300		M=130	✓	✓
		DH35	148/145M		TL	D	C	73	A										145	D	6,970	7,585	8,185	8,775	9,355	9,930	10,490	11,050	11,600			✓	✓	
TH31		148/145M		TL	C	C	69	A																							✓	✓		

TUBELESS LOW SECTION

Tyre Size	Tread Pattern	Load Index & Speed Symbol	Extra Load Index	TT/ TL	Label Values				Rim		Tyre Dimensions						Load Index (LI)	Tyre fitment (S,D)	Load capacity (kg) per axle at tyre pressure (bar/psi)										Speed symbol (km/h)	M+S		
					   				Rim width	Distance between rim centres (D)	Max. Standard Value in service		Actual Value						4.5	5	5.5	6	6.5	7	7.5	8	8.5	9				
											Width (S)	Outer diameter (OD)	Width (S)	Overall Diameter (OD)	Static Radius (Rst)	Rolling circumference (Rc)			(65)	(73)	-80	(87)	(94)	(102)	(109)	(116)	(123)	(131)				
																																+1%
305/70R22.5	AU04	153/150K		TL	C	B	67	A	9,00	343	317	1018	304	1000	465	3030		153	S	4,200	4,580	4,940	5,280	5,640	5,980	6,320	6,660	6,980	7,300	M=130	✓	✓
315/45R22.5	DH51	147/145L		TL	IV.	IV.	IV.	IV.	9.75	345	307	856	319	868		2648		147	S	3,530		4,145	4,445	4,740	5,030	5,315	5,595	5,875	6,150	L=120	✓	✓
315/60R22.5	AH31	154/148L		TL	C	B	71	A	9.75	352	326	966	320	952	442	2940		154	S	4,305	4,685	5,055	5,420	5,780	6,130	6,480	6,825	7,160	7,500	L=120	✓	✓
	AH51	154/148L		TL	C	B	72	A									152	S	4,075	4,435	4,785	5,130	5,470	5,805	6,135	6,460	6,780	7,100	J=100	✓	✓	
	DH31	152/148L		TL	D	C	73	A									148	D	7,235	7,870	8,495	9,105	9,710	10,305	10,885	11,465	12,035	12,600	F=80	✓	✓	
	DH51	152/148L		TL	C	B	76	B																							✓	✓
	AL50	154/148L		TL	B	B	70	A																							✓	✓
	DL50	152/148L		TL	B	C	72	A																							✓	✓
315/70R22.5	AH51	156/150L		TL	C	B	72	A	9,00	351	318	1032	314	1005	463	3095		156	S	4,590	4,995	5,390	5,780	6,165	6,540	6,910	7,280	7,640	8,000	M=130	✓	✓
	DH51	154/150L		TL	D	B	76	B									150	D	7,695	8,370	9,035	9,685	10,325	10,955	11,580	12,195	12,800	13,400		✓	✓	
	DH31	154/150L		TL	D	C	73	A																							✓	✓
	AL50	156/150L		TL	A	B	71	A																							✓	✓
	DL50	154/150L		TL	IV.	IV.	IV.	IV.																							✓	✓
	AL51	156/150L		TL	B	B	72	A																							✓	✓
	DL51	154/150L		TL	C	B	73	A																							✓	✓
	DM11	154/150L		TL	D	B	73	A																							✓	✓
	DW06	154/150L		TL	D	C	76	B																							✓	✓
	AW02	156/150L		TL	D	C	70	A																							✓	✓
	DW07	154/150L		TL	D	C	72	A																							✓	✓
315/80R22.5	AH51	156/150L	154/150M	TL	C	B	72	A	9,00	351	318	1106	320	1075	500	3320		154	S	4,505	4,905	5,290	5,675	6,050	6,420	6,785	7,140	7,500		M=130	✓	✓
	AH31	156/150L	154/150M	TL	C	B	73	A									156	S	4,805	5,230	5,645	6,050	6,450	6,845	7,235	7,620	8,000		K=110	✓	✓	
	DH51	156/150L	154/150M	TL	D	B	76	B									157	S	4,960	5,395	5,825	6,245	6,655	7,065	7,465	7,860	8,250		K=110	✓	✓	
	DH31	156/150L	154/150M	TL	D	C	73	A									150	D	8,055	8,760	9,455	10,140	10,810	11,470	12,120	12,765	13,400			✓	✓	
	AL50	156/150L	154/150M	TL	B	B	70	A									154	D	9,020	9,810	10,590	11,350	12,100	12,840	13,570	14,290	15,000			✓	✓	
	DL50	156/150L	154/150M	TL	B	C	72	A																							✓	✓
	DL51	156/150L	154/150M	TL	C	B	73	A																						✓	✓	
	AM09	156/150K		TL	D	B	67	A																							✓	✓
	AM11	156/150K		TL	C	B	73	B																							✓	✓
	AM11+	158/150J		TL	D	B	73	B																							✓	✓
	DM09	156/150K		TL	D	C	70	A																							✓	✓
	DM11	156/150K		TL	C	B	74	B																							✓	✓
	AL22	156/150L	157/154K	TL	C	B	69	A																							✓	✓
	AW02	156/150L		TL	D	C	70	A																							✓	✓
	DW53	156/150L		TL	D	C	73	A	9,00	351	318	1106	320	1075	500	3299		150	D	8080	8800	9480	10160	10840	11480	12160	12800	13400		L=120	✓	✓
	DW06	156/150L		TL	D	C	76	B																							✓	✓
	DW07	156/150L		TL	D	C	72	A																							✓	✓

TUBELESS LOW SECTION

Tyre Size	Tread Pattern	Load Index & Speed Symbol	Extra Load Index	TT/TL	Label Values				Rim		Tyre Dimensions					Load Index (LI)	Load capacity (kg) per axle at tyre pressure (bar/psi)											Speed symbol (km/h)			
									Rim width	Distance between rim centres (D)	Max. Standard Value in service Width (S) Outer diameter (OD)		Actual Value																		
													Width (S)	Overall Diameter (OD)			Static Radius (Rst)	Rolling circumference (Rc)													
																			+1%	±1%	±1.5%	±2%									
																	kg											km/h			
355/50R22.5	AH31	156K		TL	C	B	69	A	11.75	-	396	1012	379	996	458	3066	156	S	4,590	4,995	5,390	5,780	6,165	6,540	6,910	7,280	7,640	8,000	L=120 K=110	✓	✓
	AH51	156K		TL	B	B	70	A																					✓	✓	
	AL50	156L		TL	A	B	72	A	11.75	-	375	942	355	935	432	2887													✓	✓	
385/55R19.5	TH31	156J		TL	B	B	70	A	12.25		401	935	380	924	424	2850	156	S	4,590	4,995	5,390	5,780	6,165	6,540	6,910	7,280	7,640	8,000	J=100	✓	✓
385/55R22.5	AL50	160K	158L		A	B	70	A																							
	TL20	160K	158L		A	C	66	A																							
	TL50	160K	158L																												
	AH51	160K	158L		B	B	70	A																							
	TH31	160K	158L		B	B	70	A																							
	AW02	160K	158L		C	C	70	A																							
385/65R22.5	AH51	160K	158L	TL	B	B	70	A	11.75	-	405	1092	382	1082	502	3330	158	S	5,110	5,555	6,000	6,430	6,855	7,275	7,690	8,095	8,500		L=120	✓	✓
	TH51	164K	158L	TL	B	C	70	A	11.75	-	405	1092	382	1082	502	3330	164	S	5,760	6,260	6,760	7,240	7,720	8,180	8,660	9,120	9,560	10,000	K=110	✓	✓
	AH31	160K	158L	TL	C	B	69	A									160	S	5,165	5,620	6,065	6,505	6,935	7,360	7,775	8,190	8,595	9,000	K=110	✓	✓
	AH51	164K		TL	B	B	70	A									164	S	5,740	6,245	6,740	7,225	7,705	8,175	8,640	9,100	9,550	10,000		✓	✓
	AH31	164K		TL	C	B	69	A																						✓	✓
	TH31	164K	158L	TL	B	B	69	A																						✓	✓
	TH31+	164K	158L	TL	B	B	69	A																						✓	✓
	AL51	160K	158L	TL	B	B	70	A																						✓	✓
	TL50	164K	158L	TL	A	C	71	A																						✓	✓
	AM15+	164K		TL	C	B	73	A																						✓	✓
	TM11	160K	158L	TL	C	B	73	B																						✓	✓
	TM15	160K	158L	TL	D	B	69	A																						✓	✓
	AW53	164K	158L	TL	C	B	73	A	11.75	-	405	1092	382	1082	502	3330	164	S	5,760	6,260	6,760	7,240	7,720	8,180	8,660	9,120	9,560	10,000	K=110	✓	✓
	AW02+	164K	158L	TL	C	C	70	A																						✓	✓
425/65R22.5	AM15	165K		TL	C	B	75	B	12.25	-	439	1146	412	1131	520	3400	165	S	6,190	6,735	7,270	7,795	8,310	8,815	9,315	9,810	10,300		K=110	✓	✓
	TH31	165K		TL	C	B	69	A																					✓	✓	
435/50R19.5	TL50	160J		TL	A	C	71	A									160	S	5,165	5,620	6,065	6,505	6,935	7,360	7,775	8,190	8,595	9,000	J=100	✓	✓
	TH31	164J		TL	B	B	69	A																					✓	✓	
445/65R22.5	AM15	169K		TL	C	B	75	B	13.00	-	472	1174	454	1162	535	3485	169	S	6,660	7,245	7,820	8,385	8,940	9,485	10,025	10,555	11,080	11,600	K=110	✓	✓
	TH31	169K		TL	B	B	69	A																					✓	✓	
445/45R19.5	TH31	164J		TL	B	B	69	A																					✓	✓	
	TL50	160K		TL	A	C	71	A																					✓	✓	
	TW01	160J		TL	C	C	75	B																					✓	✓	
455/45R22.5	TH31	160J		TL	C	B	69	A	15.00		471	998	458	984	461	2981	160	S	5,170	5,620	6,070	6,505	6,935	7,360	7,775	8,190	8,595	9,000	J=100	✓	✓
	DU02	166J		TL	C	B	72	A	15.00		471	998	462	987	453	3103	166	S	6,085	6,620	7,145	7,660	8,170	8,670	9,160	9,645	10,125	10,600	J=100	✓	✓
																	146	D	6,900	7,500	8,100	8,680	9,240	9,820	10,380	10,920	11,460	12,000			
455/40R22.5	TH31	160J		B	B	70	A																								



REGROOVING GUIDE

Hankook SmartLife Solutions

Regrooving Introduction

Regrooving Technical Data

Hankook SmartLife Solutions

Built-In Value: Regrooving and Retreading with Hankook

Cost competitiveness, safety and respect for the environment are all major issues faced by European Transport professionals.

The Hankook SmartLife Solutions helps:

- Save fleets money
- Reduce emissions
- Improve safety

Up to 250% Mileage Life from 1 new tyre

1st Life		2nd Life	3rd Life		4th Life
New tyre		Regrooved tyre	Retreaded tyre		Regrooved tyre
100% 0%		25%	100% 0%		25%

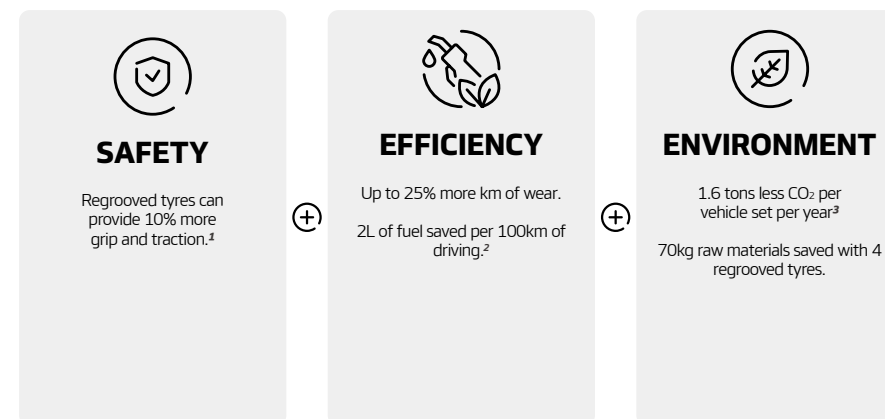
1 tyre = 1 casing = 250% tyre life

Delivering “built-in” value to dealer & fleet partners

- All Hankook TBR tyres are designed and built to be regrooved and retreaded.
- We add 5-8mm more tread rubber under the tread pattern for regrooving.
- We build tyre casings to withstand multiple retreads.

Take advantage of the value Hankook built into its premium TBR tyres through regrooving and retreading

Regrooving - Be SMART and regroove your premium Hankook tyres

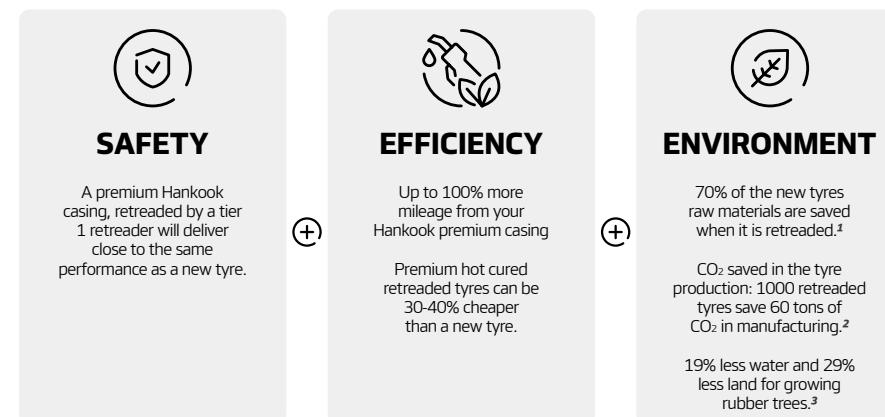


¹ When compared to a Hankook tyre at legal minimum tread depth

² Tyres improve fuel efficiency as they wear. When a tyre is regrooved you extend the tyre life when it is at its most fuel efficient state

³ Vehicle with 4 regrooved tyres covering 120k km per year

Retreading - A SMART solution for your business and the environment



¹ Hot cure retreading requires only 10-20kg of raw materials to manufacture saving 50-55kg raw materials

² 50 tons of raw materials is saved/recycled in the process, saving the CO₂ needed in new tyre manufacturing

³ Ernest & Young: The socio-economic impact of truck tyre retreading in Europe

Regrooving Introduction

INTRODUCTION

A regrooved tyre means a tyre, either new or retreaded, on which a tread pattern has been produced by cutting into the tread in accordance with the tyre manufacturer's recut tread pattern. Recut tread patterns for Hankook tyres are contained in this manual.

Regrooving of truck tyres requires fully trained operators:

- Use only regrooving tools with electrically heated blades
- Determine the blade setting depth for each individual tyre by referring to the following tables
- Set the blade in the cutter head to the specified depth
- While regrooving, hold the cutter so that the underside of the cutting head is flat against the tread surface. Heating of the blade starts automatically as the blade penetrates the rubber

A minimum depth of remaining undertread rubber is required to avoid:

- Damage of the top steel belt
- Rib tearing caused by groove cracking
- Stone damage

After regrooving, the tyre should be free of any defects (cracks, separations exposed ply or cord) visible on either the mounted or demounted tyre.

TECHNICAL REQUIREMENTS

The tyre must be demounted from the rim before regrooving.

Inspection :

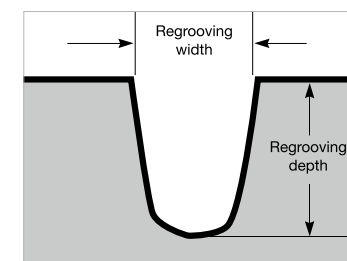
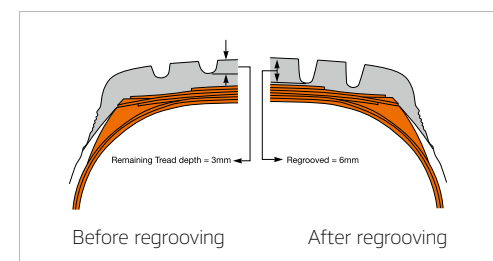
- Before regrooving check there is no damage on any part of the tyre
- Remove stones and any other foreign objects such as nails from the tread which may have embedded into the grooves. Repair if necessary
- Particular care should be exercised in selecting a tyre for regrooving where the tread area is damaged in anyway (eg: chipping, tearing and cutting due to abnormal operating conditions)
- Where a tyre has worn abnormally it may be possible to regroove that part of the worn tyre, provided that a sufficient amount of the original groove is visible before regrooving

It is recommended that the minimum remaining tread depth be between 2mm and 3mm before regrooving. The tread depth should be measured around the circumference at 4 places to find the minimum remaining depth. Set the cutter blade for the recommendations as shown in this publication.

Please make sure that you regroove Hankook tyres steel radials to the patterns, depths and widths recommended in this manual to ensure good service from your tyres.

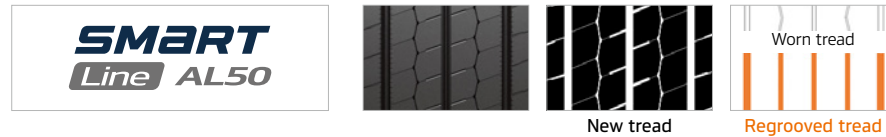
After regrooving, your tyre should be free from defects. It is most important to ensure that the belts under the tread have not been exposed.

REGROOVING RECOMMENDATIONS



Regrooving Technical Data

LONG HAUL



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

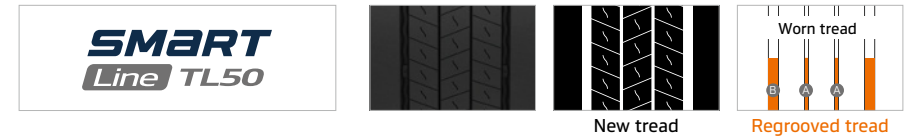
80	315/80R22.5	156/150L	13.0	3	7~9
70	315/70R22.5	156/150L	11.6	3	7~9
60	295/60R22.5	150/147L	11.0	3	6~8
	315/60R22.5	154/148L	10.5	3	6~8
55	385/55R22.5	160K	11.6	3	6~9
50	355/50R22.5		10.6	3	7~9



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

80	315/80R22.5	156/150L	15.0	3	5~7
70	315/70R22.5	154/150L	13.3	3	5~7
60	315/60R22.5	152/148L	13.4	3	6~8
	295/60R22.5	150/147L	13.0	3	6~8

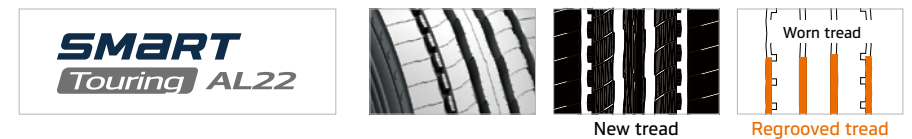


SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

55	385/55R22.5	160K	11.4	3	A : 6~8, B : 12~14
65	385/65R22.5	164K	12.2	3	A : 5~7, B : 9~11
50	435/50R19.5	160J	10.2	3	A : 4~6, B : 8~10
45	445/45R19.5	160K	10.2	3	A : 4~6, B : 8~10

COACH



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

80	315/80R22.5	156/150L	14.6	3	8~10
	295/80R22.5	154/149M	14.1	3	8~10

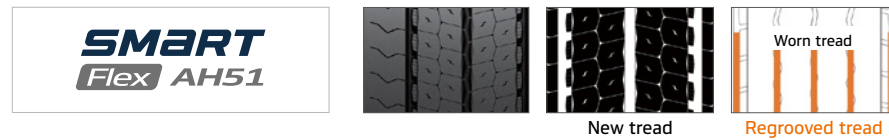


SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

80	295/80R22.5	154/149M	17.9	3	6~8
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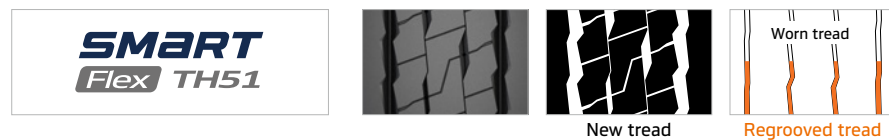
REGIONAL HAUL



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	315/80R22.5	156/150L	16.5	3	6~8
	295/80R22.5	154/149M	15	3	7~9
70	315/70R22.5	156/150L	15	3	7~9
	275/70R22.5	148/145M	14.6	3	6~8
65	385/65R22.5	160K	14.1	3	9~11
	385/65R22.5	164K	14.1		
60	315/60R22.5	154/148L	12	3	8~10
55	385/55R22.5	160K	14.1	3	9~11
50	355/50R22.5		13.1	3	9~11



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	315/80R22.5	156/150L	19.9	3	5~7
	295/80R22.5	152/148M	18.4	3	5~7
70	315/70R22.5	154/150L	17.8	3	5~7
	275/70R22.5	148/145M	16.5	3	5~7
60	315/60R22.5	152/148L	17	3	5~7
	295/60R22.5	150/147K	17	3	5~7
55	295/55R22.5	147/145K	15.4	3	7~9
45	315/45R22.5	147/145L	14.5	3	7~9



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
65	385/65R22.5	164K(158L)	15.8	3	6~8



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	12R22.5	152/149L	16	3	9~11
	11R22.5	148/145L	16	3	7~9
	315/80R22.5	156/150L	17.5	3	9~11
	295/80R22.5	154/149M	16.5	3	9~11
70	275/80R22.5	149/146L	16	3	6~8
	315/70R22.5	156/150L	15.5	3	9~11
	275/70R22.5	148/145M	15	3	7~11
65	385/65R22.5	164K	15.5	3	9~11
60	315/60R22.5	154/148L	12.6	3	8~10
	385/55R22.5	160K	15	3	6~8
50	355/50R22.5	156K	13.6	3	6~8
	355/50R22.5	156K	13.6	3	6~8



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	275/70R22.5	148/145M	18	3	6~8
60	315/60R22.5	152/148L	19.4	3	5~7



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	295/80R22.5	152/148M	21.3	3	7~8

REGIONAL HAUL



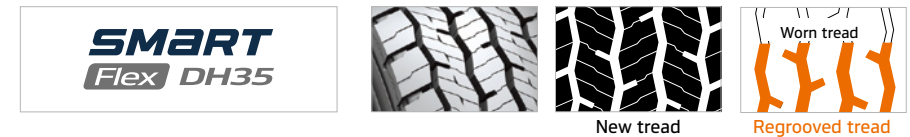
SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
75	9.5R17.5	143/141J	13.6	3	5~7
	235/75R17.5	143/141K	12.6	3	6~8
	215/75R17.5	135/133K	12.1	3	6~8
	215/75R17.5	135/133J	12.1	3	6~8
70	275/70R22.5	152/148J	12.6	3	6
	305/70R19.5	148/145M	14.6	3	7~9
	285/70R19.5	150/148K	14.1	3	6~8
	265/70R19.5	143/141J	13.6	3	7~9
	245/70R19.5	141/140J	13.6	3	6~8
	245/70R17.5	143/141K	12.6	3	6~8
	65	445/65R22.5	169K		3
425/65R22.5		165K	15.5	3	6~8
385/65R22.5		164K	16	3	7.66
205/65R17.5		129/127J	11.6	3	6~8
60	295/60R22.5	150/147K	13.6	3	10
	255/60R19.5	143/141J	13.6	3	7~9
55	385/55R22.5	160K	14.6	3	6~8
	385/55R19.5	156J	14.6	3	10
50	435/50R19.5	160J	12.5	3	6~8
45	455/45R22.5	160J	13.1	3	8~10
	445/45R19.5	160J	13.1	3	9
40	455/40R22.5	160J	13.6	3	10

TH31+

TUBELESS					
65	385/65R22.5	164K	16	3	6~8



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
	9.5R17.5	129/127L	13.6	3	4~6
	8.5R17.5	121/120L	12.1	3	4~6
	8R17.5	117/116L		3	
75	235/75R17.5	132/130M	12.1	3	7~9
	225/75R17.5	129/127M	12.1	3	6~8
	215/75R17.5	128/126M	12.6	3	5~7
	205/75R17.5	124/122M	12.1	3	5~7
70	305/70R19.5	148/145M	14.6	3	6~8
	285/70R19.5	146/144M	13.1	3	5~7
	265/70R19.5	140/138M	13.1	3	7~9
	265/70R17.5	140/138M	12.6	3	7~9
	245/70R19.5	133/132M		3	
	245/70R19.5	136/134M	13.6	3	7~9
	245/70R17.5	136/134M	12.1	3	7~9



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
75	9.5R17.5	129/127L	14.6	3	5~7
	8.5R17.5	121/120L	13.6	3	5~7
	8R17.5	117/116L		3	
	235/75R17.5	132/130M	12.6	3	6~8
	225/75R17.5	129/127M	12.6	3	6~8
	215/75R17.5	126/124M	13.1	3	6~8
70	205/75R17.5	124/122M	13.1	3	5~7
	305/70R19.5	148/145M	15.5	3	6~8
	285/70R19.5	146/144M	14.1	3	6~8
	265/70R19.5	140/138M	13.1	3	5~7
	265/70R17.5	140/138M	15	3	5~7
	245/70R19.5	136/134M	13.1	3	5~7
	245/70R17.5	136/134M	12.6	3	6~8

LONG & REGIONAL HAUL (HYBRID)



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	295/80R22.5	154/149M	13.6	3	7~9
70	315/70R22.5	156/150L	14.1	3	7~9
65	385/65R22.5	160K	13.1	3	8~10



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	315/80R22.5	154/149M	17	3	6~8
	295/80R22.5	156/150L	16.5	3	6~8
70	315/70R22.5	154/150L	15	3	5~7

MIXED SERVICE (ON AND OFF-ROAD)



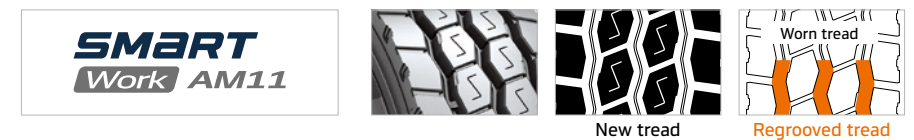
SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
70	275/70R22.5	148/145K	18.0	3	8~10
	265/70R19.5	143/141J	16.0	3	8~10
65	445/65R22.5	169K	18.9	3	10~12
	425/65R22.5	165K	18.5	3	10~12

AM15+

TUBELESS					
65	385/65R22.5	164K	18.0	3	12~14



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
65	385/65R22.5	160K	17.5	3	7~9



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	13R22.5	156/150K	17.0	3	11~13
	315/80R22.5	156/150K	16.5	3	10~12

MIXED SERVICE (ON AND OFF-ROAD)



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	315/80R22.5	158/150J	16.3	3	10~12



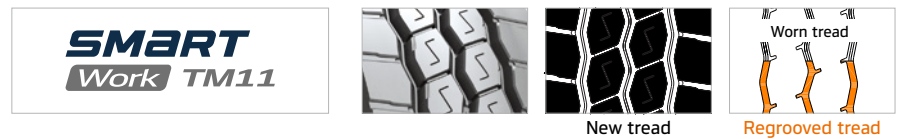
SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	10R22.5	144/142L	14.6	3	9~11
	11R22.5	148/145K	18.9	3	12~14
	12R22.5	152/149K	18.9	3	8~10
	13R22.5	156/150K	18.0	3	13~15
	315/80R22.5	156/150K	17.0	3	12~14
	295/80R22.5	152/148K	17.0	3	11~13



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	11R22.5	148/145K	23.5	3	6.5~12
	12R22.5	152/149K	22.3	3	11
	13R22.5	156/150K	23.0	3	7~12
	315/80R22.5	156/150K	21.8	3	6~12
	295/80R22.5	152/148K	23.8	3	5~10



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	315/80R22.5	156/150L	20.5	3	5~7
	295/80R22.5	152/148L	20.5	3	5~7
70	315/70R22.5	154/150L	17.5	3	6~8
	275/70R22.5	150/145J	18.5	3	3~5



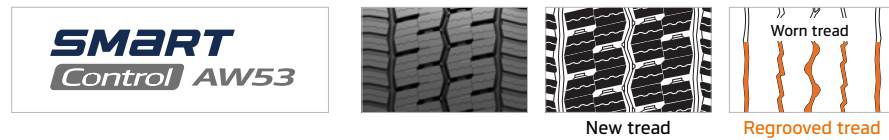
SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
65	385/65R22.5	160K	16.5	3	10~12

OFF-ROAD



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
	11R22.5	148/145K	25.0	4	14~16
	13R22.5	154/150K	24.0	4	14~16
TUBE TYPE					
	1200R24	156/153G	20.9	4	14~16

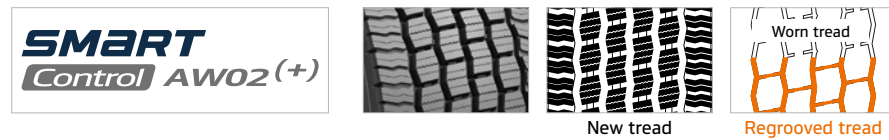
WINTER



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

65	385/65R22.5	164K(158L)	16	3	5~7
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SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

80	315/80R22.5	156/150L	17	3	8~10
	295/80R22.5	152/149J	16.5	3	9~11
	295/80R22.5	154/149M	16.5	3	9~11
70	315/70R22.5	156/150L	16	3	8~10
	275/70R22.5	150/145J	18	3	5~6
55	385/55R22.5	160K	15	3	8~10

AW02+

65	385/65R22.5	160K	15.5	3	8~10
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SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

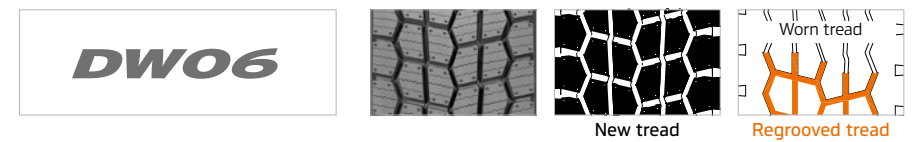
80	315/80R22.5	156/150L	20.4	3	5~7
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SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

80	315/80R22.5	156/150L	20.4	3	5~7
	295/80R22.5	152/148L	20.4	3	5~7
70	315/70R22.5	154/150L	17.5	3	6~8
	275/70R22.5	150/145J	18.4	3	3~5



SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

80	315/80R22.5	156/150L	21.3	3	10~12
70	315/70R22.5	154/150L	21.3	3	10~12

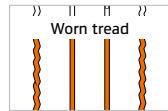


SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width

TUBELESS

45	445/45R19.5	160J	13.6	3	9.0
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ELECTRIC

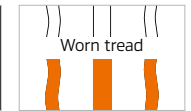
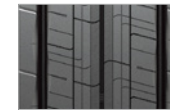


New tread

Regrooved tread

SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
70	285/70R19.5	146/144M	13	3	7~9
	275/70R22.5	152/149J	17.5	3	6~8

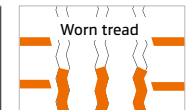
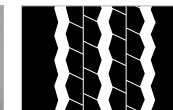
URBAN



New tread

Regrooved tread

SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
70	265/70R19.5	143/141K	15.0	2	8~10
	245/70R19.5	143/141K	15.6	2	7~9



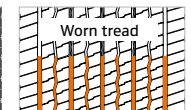
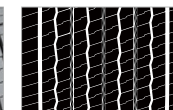
New tread

Regrooved tread

SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
80	11R22.5	148/145J	20.4	3	9~11
	295/80R22.5	152/148J	16.5	3	9~11
	275/80R22.5	149/146J	17	3	9~10
70	305/70R22.5	153/150K	17.5	3	7~9

AU04+**TUBELESS**

70	275/70R22.5	152/149J	18.9	3	7~8
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New tread

Regrooved tread

SRS	Size	LI/SS	Tread depth	Regrooving	
			m/m	Depth	Width
TUBELESS					
45	455/45R22.5	166J	16.5	3	4~6



RIM AND ACCESSORIES

Technical Data of Rims

Demounting and Mounting

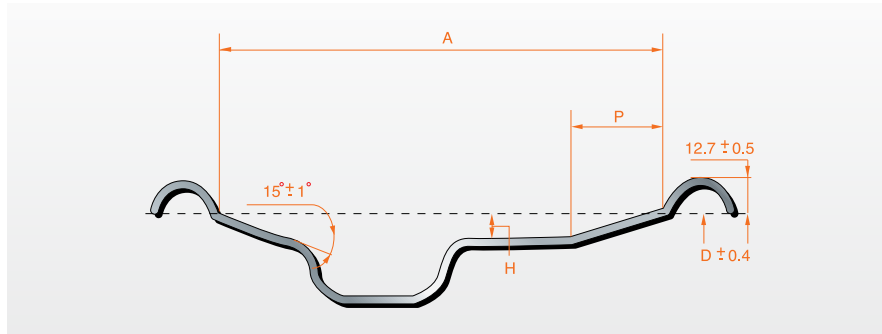
Tubeless Tyre Demounting / Mounting

Tubeless Rim Valve Mounting

About Dual Spacing

Technical Data of Rims

Drop-centre rims with 15° tapered bead seats



DIMENSIONS(MM)	
Rim	A ± 3.2
5.25	133.4
6.00	152.4
6.75	171.5
7.50	190.5
8.25	209.6
9.00	228.6
9.75	247.6

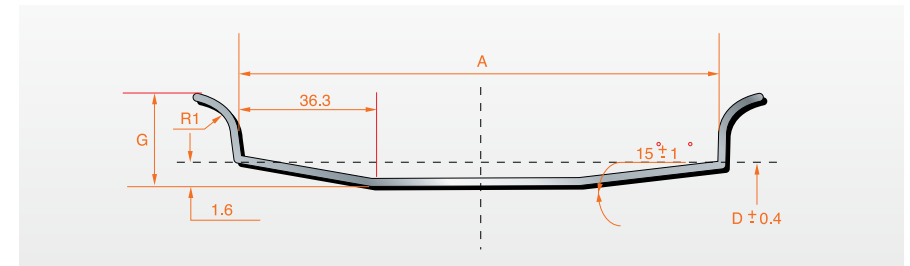
DIMENSIONS(MM)	
Rim	A ± 3.2
10.50	266.7
11.75	298.5
12.25	311.0
13.00	330.2
14.00	355.6

DIAMETERS				
Nominal diameter code	17.5	19.5	22.5	24.5
Diameter D (mm)	444.5	495.3	571.5	622.3

The rim is part of the wheel which supports the tyre.

Multi-piece rims with 5° tapered bead seats

Rims with detachable lateral rings are equipped with flange and bead seats which are removable on one side of the rim.

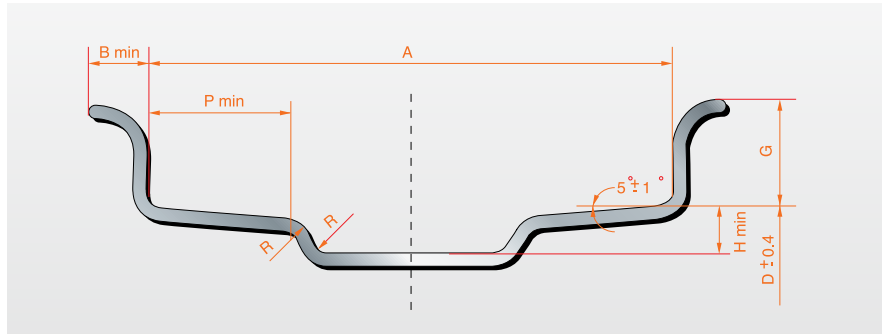


DIMENSIONS(mm)		BASIC		OPTIONAL	
Rim	A ± 3.2	G ± 1.2	R1 ± 2.5	G ± 1.2	R1 ± 2.5
5.0	127.0 ± 3.2	27.9	14.0		
5.5	139.7 ± 3.2	30.5	15.2	33.0	16.5
6.0	152.4 ± 3.2	33.0	16.5		
6.5	165.1 ± 3.2	35.6	17.8	36.8	18.4
7.0	177.8 ± 3.2	38.1	19.0	36.8	18.4
7.5	190.5 ± 3.2	40.6	20.3	42.0	21.0
8.0	203.2 ± 3.2	43.2	21.6	42.0	21.0
8.0 V 5°	203.2 ± 3.2	44.4	27.0	42.0	21.0
8.5	215.9 ± 3.6	45.7	22.9	43.2	21.6
9.0	228.6 ± 3.6	48.3	24.1	45.7	22.8
9.5	247.7 ± 3.6	38.1	19.0	8.25	8.25
10.0	254.0 ± 4.7	50.8	25.4	9.00	9.00
14.0 V 5°	355.6 ± 4.7	44.4	27.0		

DIAMETERS				
Nominal diameter code	15	20	22	24
Diameter D (mm)	384.4	514.4	565.2	616.0

Technical Data of Rims

Drop-centre rims with 5° tapered bead seats



DIMENSIONS (mm)			
Rim	A ±1.5	G $\begin{smallmatrix} + 3.2 \\ - 0.4 \end{smallmatrix}$	H min
4.00B	101.6	14.0	15.0
4.50B	114.3	14.0	15.0
5.00B	127.0	14.0	15.0
5.50B	139.7	14.0	15.0
6.00B	152.4	14.0	15.0
4.00C	101.6	15.9	16.8
4.50C	114.3	15.9	16.8
4J	101.6	17.3	17.3
4½J	114.3	17.3	17.3
5J	127.0	17.3	17.3
5½J	139.7	17.3	17.3
6J	152.4	17.3	17.3
6½J	165.1	17.3	17.3
7J	177.8	17.3	17.3
7½J	190.5	17.3	17.3
6L	152.4	21.6	28.5
6½L	165.1	21.6	28.5

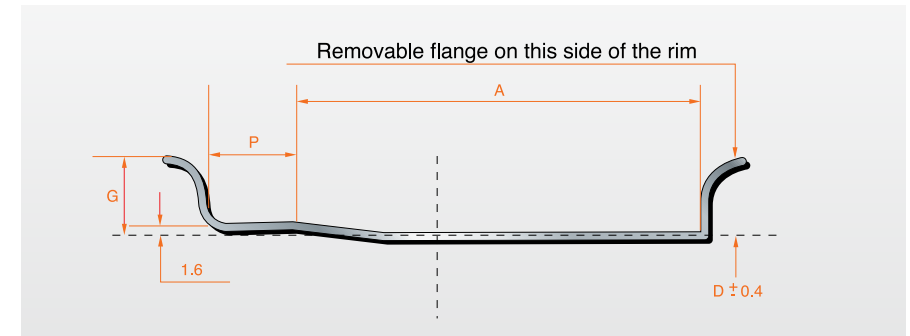
DIMENSIONS (mm)			
Rim	A 3.2	G ±1.2	P min
4.50E	114.3	19.8	22.2
5.00E	127.0	19.8	22.2
5.50E	139.7	22.2	23.9
6.00G	152.4	27.9	31.8
6.50H	165.1	33.7	36.3

DIMENSIONS (mm)				
Rim	A	H min	G $\begin{smallmatrix} + 1.2 \\ - 0.4 \end{smallmatrix}$	P min
11	279.4 ± 5.0	10.0	25.4	50.0
12	304.8 ± 5.0	10.0	25.4	50.0

DIAMETERS						
Nominal diameter code	12	13	14	15	16	20
Diameter D (mm)	304.0	329.4	354.8	380.2	405.6	512.8

The rim is part of the wheel which supports the tyre.

Flat base rims



DIMENSIONS (mm)			
Rim	A ±3.2	G ±2.5	R max
5.00 S	127.0 ± 3.2	33.3	20.0
6.00 T	152.4 ± 3.2	38.1	
7.33 V	186.2 ± 3.2	44.0	
9.00 V	228.6 ± 3.6	44.0	
10.00 V	254.0 ± 4.7	44.0	

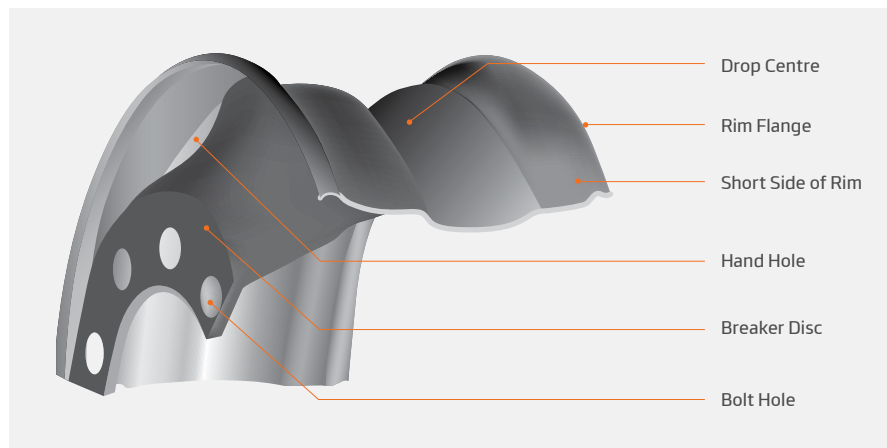
DIAMETERS	
Nominal diameter code	
Diameter D (mm)	

Wheel Structure and Characteristics

You must check the wheel size matches the size of tyre before tyre/wheel mounting. If the tyre is not fitted onto the correct or a compatible wheel size, the bead may be subjected to abnormal pressure during inflation and break or burst. This could result in a serious personal injury or even death.

Wheels have different characteristics based on the material they are made of. The choice of wheel is according to user preference.

Wheel Structure



Wheel Characteristics



Item	Steel Wheel	Aluminum Wheel
Price	Low	High
Strength	High	Low
Corrosion	Weak	Strong

Wheel Inspection

Mounting tyres on wheels with a high degree of deformity and wear on flanges can reduce tyre life and create performance complaints such as vibration or noise.

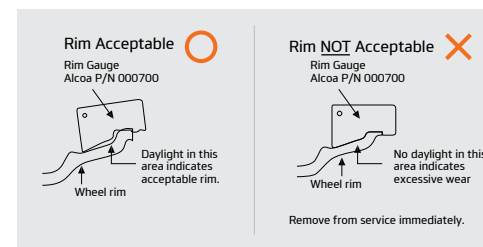
To prevent this issue checking the wheel is essential before tyre mounting.

Check rim flange wear

Use the "Rim Flange Gauge" to check the wear of the flange on the wheel circumference to determine if the wheel is acceptable to use.



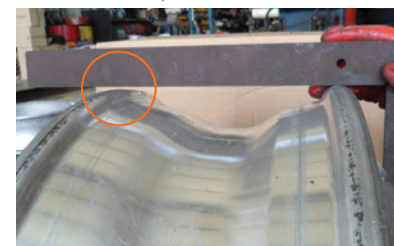
<Rim Flange Gauge>



Rim flange is continuously worn by friction with tyre bead (Below)



Use "Square Tool" to check the step of the flange along the wheel circumference to determine wheel availability.



<Check deviation status>



* Measuring Tool [Square Tool]

Wheel visual inspection

Visually inspect the wheel to determine acceptability.

- Check crack, deformation, distortion, corrosion etc.
- Check wear and damage of rim flange
- Check crack, wear and corrosion of wheel Bolt Holes

Wheel damage



Wheel Cleaning

Clean rust, foreign substance etc. on wheel surface using dedicated tools before mounting work.



<Contamination on aluminum wheel>

<Rust on steel wheel>

<Clean the rust by Wire Brush>

<Apply anti-corrosion solution to keep clean>

Warning

1. Need to separate the tyre and wheel

If the tyre or rim is damaged or the tyre has less than 80% of the recommended tyre pressure, remove the wheel tyre assembly in the vehicle. Before removal the valve core must be removed to get rid of the air. **Deflate the tyre completely** before separating the tyre from the rim. Thoroughly inspect both the tyre and the rim before re-assembling.

2. Precautions before you work

If you do not know how to use the tools, STOP working.

Tyre and rim work is very dangerous and must be carried out by trained personnel who are familiar with the relevant procedures and using the tools. If you do not read and follow all of these guidelines it can put you, or others, in danger of serious injury or death.

3. Precautions when using tyre lubricant

Never use any of the following substances for tyre lubricant.

- 1) Starter fluid 2) Ether substance 3) Gasoline 4) Other flammable material

These materials are explosive causing the tyre and wheel to suddenly separate whilst mounting or driving, which could lead to serious injury or death.

4. Precautions during tyre inflation

- 1) It is dangerous if tyre and rim diameters are not accurately matched. A mismatched assembly can separate, resulting in serious injury or death. Never assemble tyre and rim, unless the diameter of the tyre and rim is clearly identified and matched.
- 2) Never stay, lean on or reach over the assembly in the Safety Cage during tyre inflation. Even if the tyre is in the Safety Cage, inflating beyond maximum pressure is very dangerous. This can break a tyre bead or the assembly with explosive force and result in critical injury or death.
- 3) All inflated tyres mounted on the wheel contain explosive energy. The use of damaged or mismatched or improperly assembled assembly can trigger separation with explosive force. If you get struck by the exploding tyre, wheel or air blast, you or someone else can be seriously injured or dead.

※ Assembly : Complexity of tyre and wheel

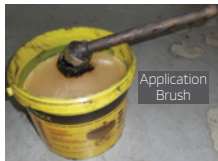
Essential Equipment and Tool

The following equipment is required to install or remove the tyre from the wheel.
Be sure to use the tools recommended by the wheel and tyre manufacturer.

WARNING Do wear safety equipment such as gloves, safety glasses, shoes, safety clothes etc, during mounting works.

Equipment and tools

Tyre lubricant and tools for cleaning



Tyre lubricant



Compresses spray (lubrication)



Wire brush



Corrosion remover

Mounting equipment



Manual mounting tools



Automatic machine

Tools for inflating a tyre



Valve stem



Valve core



Valve cap



Clip-on air chuck



Air hose and pressure controller



Safety cage

* Additional equipment may be required due to difference between vendor and mounting method.

Tyre Lubricant Instruction

Applying tyre lubricant is a must-process and it has following effects.

- Easier fitting is available by applying to the contact surface of tyre and wheel.
- Minimize possible damage caused by mounting machine in tyre bead area.
- Help tyre smoothly and uniformly to settle down on the wheel when inflating the tyre.

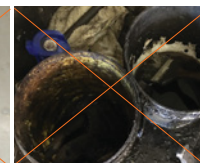
Tyre lubricant



Tyre lubricant



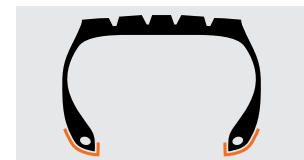
Waste-Oil



Do not use excessive amount of tyre lubricant

- ※ WARNING 1) **Do not use petroleum-based oil or waste-oil** causing the properties of the tyre to change.
- ※ WARNING 2) Keep the tyre lubricant clean and prevent contamination from foreign substances.
- ※ WARNING 3) Applying excessive amounts of tyre lubricant may cause air leakage. Apply moderate amount.

Range of tyre lubricant applications



Application area on tyre



- Sufficiently apply to the entire circumference of the tyre



Application area on wheel



- Sufficiently apply to the circumference of the wheel on the outside drop centre and the flange.



Demounting and Mounting

Most tyre dealers and fleets use machines for demounting and mounting. But some fleets are still working on it by hand.

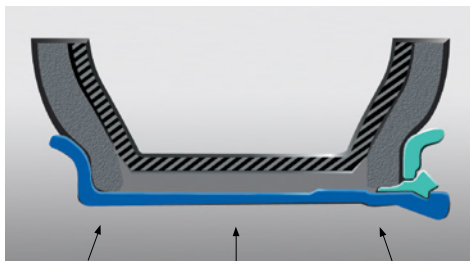
SAFETY INSTRUCTIONS

Do not demount or mount tyres without proper training. Wall charts containing demounting and mounting instructions for all on-highway rims should be available through your normal rim supplier.

Remove all cracked wheels from service



LUBRICATED areas shown by arrows



Use of A GG ring indicates correct mounting

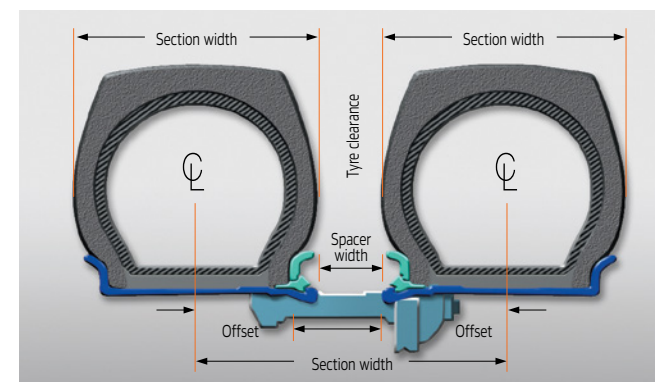


Proper sequence for tightening stud nuts on an 8 stud system



NOTE :
Always use a securely held safety cage and extension hose with a clip on air chuck for airing the tyre. Rapid air loss can propel the assembly.

Cross section through typical dual installation



Proper Matching of Rim Parts

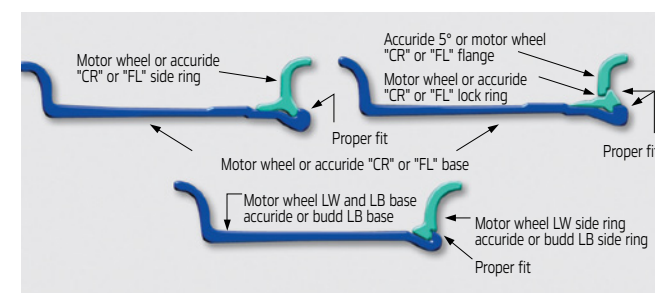


Figure 3.12
Correct and incorrect matching of rim parts

Tubeless Tyre Demounting / Mounting

The tyre should be completely deflated before demounting, which is done by loosening and removing the valve stem core.



1 Completely remove the air in the tyre.



2 Fix the assembly to the automatic machine; using the machine arm locate the bead breaker disc on the drop centre.



3 Create some space between the tyre and wheel by the bead breaker disc and apply tyre lubricant to the rim flange and tyre bead to prevent tyre damage.



4 Push the hook into the end of the tyre bead and lower it down so that the top of the hook does not come into contact with the wheel.



5 Operate the tool arm to pull the hook in the direction of the operator.



6 The gap between the wheel flange and the hook needs to be just smaller than a finger to fit between. If the gap is too wide or too narrow there is a risk of damage to the wheel flange or tyre bead.

Be careful there is no foreign matter left in the valve and that the valve stem is not cracked or damaged. Do not stand near the valve stem during the deflating process.



7 Put the lever between the wheel flange and the tyre bead and rotate clockwise.



8 Separate the entire bead (outside or operator side) from the wheel.



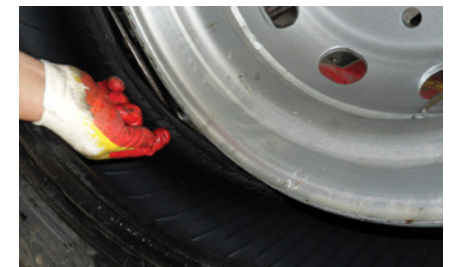
9 Move the tool arm to the opposite side of the bead (not the demounted side) and manipulate the bead disc breaker to further separate the tyre from the wheel.



10 Position the bead breaker disc to sit between the rim flange and the tyre bead. The disc should not touch the wheel.



11 Rotate clockwise and to completely separate the tyre from the wheel.
* Be careful as the tyre will fall in the direction of the operator.



INSPECTION Do a visual inspection to check for bead damage that could have been caused by demounting with excessive pressure or sharply worn rim flange etc.

Tubeless Tyre Mounting

RIM PREPARATION

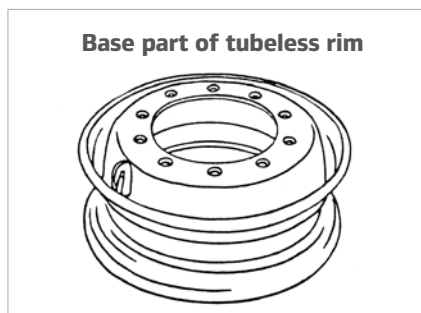
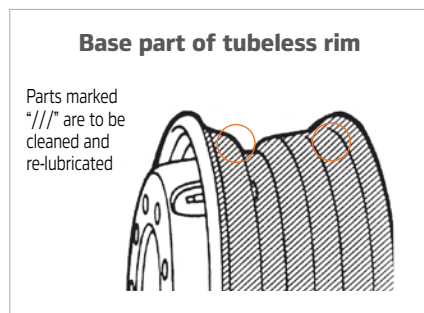
Rims must not be broken or damaged.

Remove the rubber bushing from the valve stem hole and inspect the valve stem for any signs of damage or wear.

Remove rust, dirt and any foreign materials from the rim. Clean and sand smooth the area marked “///” in the picture below. If rusted, clean and repaint the rim surface to protect it from rusting.

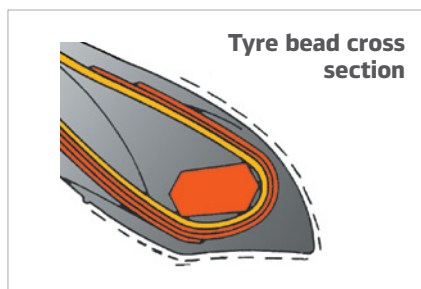
If required, replace any worn or damaged valve stem.

Lubricate the inner parts of the rim surface where the tyre mounts (marked “///”).



TYRE PREPARATION

In the case of new tyres, wipe the bead clean with a dry cloth, checking at the same time that there are no damage, kinks or breakages. Apply the recommended lubricant to the tyre bead as per the illustration to the right.



TUBELESS TYRE INFLATION

For safety reasons, it is essential to use a correct tyre inflation guage with a remote air control lever/button feature for inflation/deflation.

Always use a secured, safety, tyre inflation cage to place the tyre in during tyre inflation and stand a safe distance for your protection.

When fitting the tyre to the wheel rim, both beads of the tyre should be lubricated and inflated to approximately 10psi to check for sealing. Do not stand or have persons nearby during the tyre inflation process. If the beads fail to seat correctly against the rim, rotate tyre on rim by a few degrees and try inflation again. If tyre beads do not seat on the rim with a comfortable fit, DO NOT attempt to inflate any further. Repeat the tyre assembly process again applying more tyre lubricant to the tyre beads and rim flanges and repeat the tyre inflation process. Check that the beads and rim flange are firmly in place and are even fitting all around the tyre/rim. In the safety cage inflate the tyre in slow pressure increments to the recommended inflation pressure required for the axle loading. Let the tyre and wheel assembly stand for a momentary period to satisfy tyre has fitted and inflated safely, then check that the tyre and valve are not leaking before fitting and tightening of the valve cap.

Machine Mounting



- 1 - Check for any damage, corrosion and deformation in the wheel.
- Check the wheel size is correct match for the tyre to be fitted and valve is correct type.



- 2 Attach the wheel onto the mounting machine, using the control module



- 3 Apply tyre lubricant all around the inside and outside of the tyre beads. Also apply lubricant to the wheel rim flanges and the drop centre area.



- 4 Fit the inside bead over the rim flange to position it in the drop centre of the wheel rim.



- 5 Use the machine arm to rotate the wheel clockwise pressing the bead breaker disc so that the bead inside is fully seated on the wheel. Use the machine arm to locate the bead outside in the drop centre crossing the lower flange.



- 6 Locate the bead breaker disc to upper area of the drop centre (do not touch) and fix the lever or clamp on the flange so that the tyre is not separated from the wheel.



- 7 Rotate the wheel clockwise using the control module, so that the bead outside is completely situated on the wheel.



* **Mounting clamp**

Check Uniformity status of Rim Fitting

Uniformity of the tyre and wheel assembly (when inflated to correct tyre pressure) is important to ensure that the tyre and wheel assembly performs correctly in its service use when fitted to the vehicle.

Non-uniformity of the fitting may cause the following tyre issues:

- Vibration and noise
- Shortened tyre life by causing irregular tread wear and wear erosion
- Cracking and separations between components as a result of excessive stressing to specific areas

Check the uniformity of the tyre and rim fitting

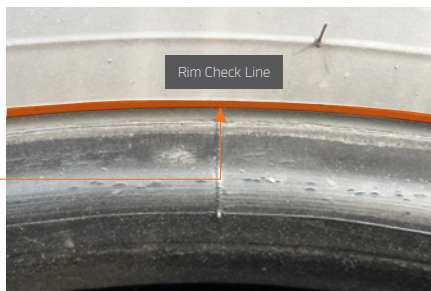
Measure the distance between the rim flange and the bottom of the rim check line of the tyre in all 4 areas of the tyre and wheel assembly as indicated on the photos



<Outside>



<Inside>



※ CAUTION

If the rim is dented against the check line, check for deformity and look for any excessive differences between the rim and the tyre check line. It may be necessary due to rim deformity to replace with the new wheel rim.

Inflation Guide

1. Read and follow the work standard before inflating the tyre and wheel assembly.
2. Do not apply pressure over 10 psi/bar before placing the assembly in the Safety Cage. (Tyre Safety Cage should follow OSHA and/or CE standard.)
3. After removing the valve core, inflate the tyre using air chuck, inline valve and inflation controller. Inflate up to 2 psi/bar and inspect tyre flexion or deformation in the safety cage. Make sure the air hose length is long enough.
4. Visually check the uniformity status in safe position. Make sure you keep away from the safety cage during inflation of the tyre.
5. Inflate the tyre until the bead is seated on the wheel and check if the bead are evenly seated. Do not exceed 40 psi/bar to settle the tyre bead on the wheel. If the bead fails to seat until 40 psi/bar, try refitting, re-checking the wheels, re-applying tyre lubricant and inflate the tyre again after taking away the assembly from the Safety Cage with the air completely removed.
6. If the tyre bead is completely fitted on the wheel, continue to inflate until recommended pressure.
7. Always inspect the fitting status of the assembly before removing it in the Safety Cage.
8. Remove the assembly in the safety cage and implement final inspection. Check for any leakages and attach the valve cap.



* Zipper rupture : A type of separation appearing on tyre sidewall area.

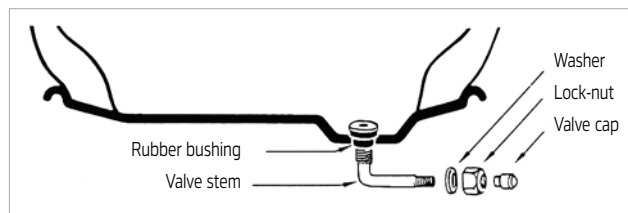
※ Reference material : OSHA(Occupational Safety and Health Administration) Standards
U.S Department of Labor Web-site : www.osha.gov

Tubeless Rim Valve Mounting

A-TYPE RIM VALVE

The valve hole in the rim must be clean, smooth and not damaged. Apply a recommended lubricant to the rubber brushing off the valve and insert the valve stem through the rim hole which will assemble the washing and lock-nut on the inside. Tighten the lock-nut with a wrench so that the valve stem is secured into the rim.

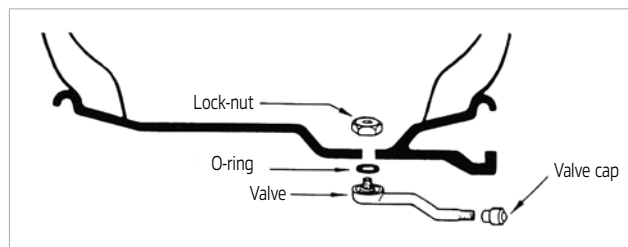
A-type rim valve



B-TYPE RIM VALVE

The valve hole in the rim must be clean, smooth and not damaged, as per the illustration below. Place a lubricated O-ring on the valve stem and insert the stem into the valve stem hole so that the valve faces perpendicular to the rim. The valve stem hole can be found in the rim. Tighten the lock nut with a wrench from the opposite side of the rim until the valve stem is secure.

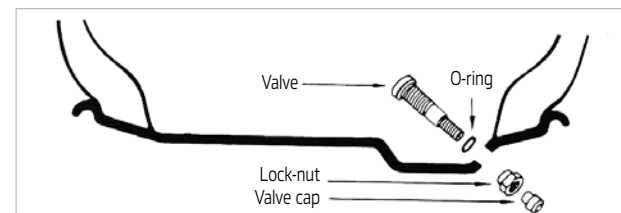
B-type rim valve



C-TYPE RIM VALVE

The valve hole in the rim must be clean, smooth and not damaged, as per the illustration below. Lubricate the O-ring and insert a new valve stem going through the O-ring. This should go through the valve stem hole in the rim from the inside. From the other side securely hand tighten the lock-nut.

C-type rim valve



About Dual Spacing

Mismatched duals have the same effect on the life of tyres as low inflation or overload. An underinflated tyre on a dual assembly shifts its share of the load to the adjacent tyre, which then becomes overloaded and frequently fails prematurely.

When mounting duals on a truck, there will generally be some difference in the diameter of the 2 tyres (within the limits described below).

Mount the small tyre on the inside, the outside tyre wears faster than the inside tyre. As it wears its diameter will approach that of the inside tyre. Additionally, any crown on the road will favour the placement of the smaller diameter tyre on the inside.

The difference in dimensions of the tyres on a dual assembly should never exceed the figures shown in the table below. The measurement and pairing of duals is very important when mounting a new set of radial recaps.

All caps are on the same tyre type and all have the same overall diameter.

The service they were subjected to prior to capping may have an effect on the size of the retreaded tyre.

DUAL MATCHING TOLERANCE			
Tyre size	Diameter (in.)	Circumference (in.)	Radius (in.)
8.25R20 and under	0 to 1/4	0 to 3/4	0 to 1/8
9.00R20 and up	0 to 1/2	0 to 1-1/2	0 to 1/4
Twin screw (all sizes)	0 to 1/4	0 to 3/4	0 to 1/8

Rim width and tyre spacing

RADIAL AND BIAS PLY TYRES			
Tyre size	Alternate rim (wide) is this correct? (narrow)	Tyre section width	Minimum dual spacing without chains
7.50	6.5	8.65	9.9
	6.0*	8.45	9.7
	5.5	8.25	9.5
8.25	7.0	9.50	10.8
	6.5*	9.30	10.6
	6.0	9.10	10.4
9.00	7.50	10.40	11.9
	7.0*	10.20	11.7
	6.5	10.00	11.5
10.00	8.0	11.15	12.7
	7.5*	10.95	12.5
	7.0	10.75	12.3
11.00	8.5	11.75	13.2
	8.0*	11.55	13.0
	7.5	11.35	12.8

TUBELESS (HIGHWAY SERVICE)			
Tyre size	Alternate rim (wide) is this correct? (narrow)	Tyre section width	Minimum dual spacing without chains
9	7.50	9.30	10.6
	6.75*	9.00	10.3
	6.00	8.70	10.0
10	7.50*	10.00	11.4
	6.75	9.70	11.1
11	8.25*	11.00	12.6
	7.50	10.70	12.3
12	9.00*	11.80	13.5
	8.25	11.50	13.2

LOW PROFILE TUBELESS			
Tyre size	Alternate rim (wide) is this correct? (narrow)	Tyre section width	Minimum dual spacing without chains
225/70	6.00	8.60	9.70
	6.75*	8.90	10.00
244/70	6.75*	9.46	10.68
245/75	7.50*	9.76	10.98
255/70	7.50*	10.04	11.30
265/70	7.50*	10.31	11.61
265/75	8.25	10.61	11.91
275/70	8.25	10.86	12.24
285/70	7.50*	10.84	12.22
285/75	8.25*	11.14	12.52
296/75	8.25	11.43	12.89
9.00*	11.73	13.19	



MAINTENANCE AND CARE

About Tyre Inflation

Truck Alignment and Tyre Wear

Abnormal Tread Wear

Tyre Damage

About Tyre Inflation

ONE OF THE MOST IMPORTANT ASPECTS OF TYRE MAINTENANCE IS CORRECT INFLATION.

Correct inflation is needed to carry the load and avoid damage. Driving with improper inflation (particularly grossly under inflated or over inflated tyres) is dangerous and can cause critical damage or sudden failure of the tyre(s).

PROPER INFLATION SHOULD BE MAINTAINED AND CHECKED AT LEAST ONCE A WEEK AS WELL AS BEFORE A LONG DISTANCE DRIVE.

It is also advisable to take into account the axle load and driving conditions when setting inflation pressures. Compensation for heavier loads can be made by increasing inflation pressures. Make sure to not exceed the maximum inflation rates for the tyre or maximum load axle.

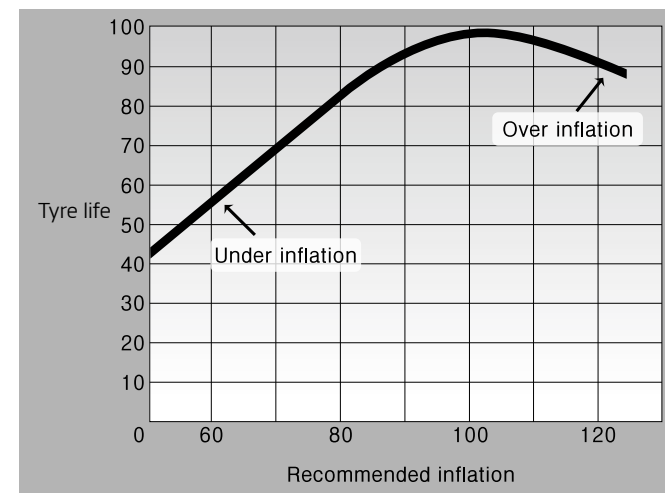
IN THE SPACE OF JUST ONE MONTH A TYRE CAN LOSE 10 POUNDS OF AIR PRESSURE.

It is important to check your air pressure regularly to make sure your tyres are neither under nor over inflated.

To keep running suitable inflation pressure:

- Check inflation pressure at frequent interval.
- Follow the recommended pressure guide in the vehicle, rather than setting the pressure at your discretion.
- Visually inspect tyres for any damages and consult a tyre specialist.
- Do not inflate with cold pressures beyond the recommended pressure.

INFLATION AND TYRE LIFE



UNDER INFLATION

The worst enemy your tyre can have. It causes increased treadwear on the outside edges (or shoulders) of the tyre and generates excessive heat, reducing tyre durability. Soft tyres make your vehicle work harder, meaning that fuel efficiency is reduced as there is an increased rolling resistance.

OVER INFLATION

Is detrimental to the tyre as too much air pressure causes the centre of the tread to bear the majority of the truck's weight. This leads to faster deterioration and uneven wear. Any kind of uneven wear will also shorten the life span of your tyres.

LOADING

In terms of loading in your vehicle, overloading is very dangerous. It causes excessive tyre heat buildup and internal structural damage. This can lead to critical situation such as sudden separation of tyre, property damage and serious injury to persons.

Points to be aware of when loading into a vehicle:

- Check maximum load capacity at maximum inflation pressure marked on sidewall.
- Check inflation pressure which has a possibility to change by fatigue from continuous loading status during pre-trip vehicle inspections.
- Never exceed the Gross Vehicle Weight(GVW) of the vehicle.

Inspection

Tyre maintenance is very important for tyre performance, wear and safety. Inspecting tyres for punctures or other visible signs of damage before driving could prevent a serious accident. Check the tyres overall appearance and inflation pressure; including the spare tyre. Typical types of fatal external tyre damage include zipper rupture, penetration, crack and chip cuts (the tread surface is torn off) bulges and irregular wear.



Zipper rupture



Penetration



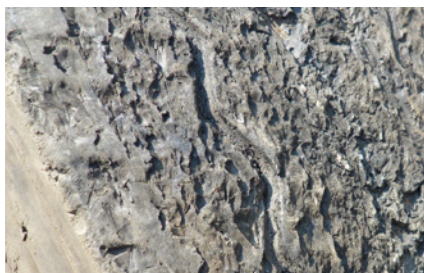
Crack type 1



Crack type 2



Chip-cut type 1



Chip-cut type 2

Storage

Tyres should be stored inside and stacked vertically; never store tyres outside even with a protective covering. It is recommended for tyres to be kept cool, dry, moderately ventilated and out of the sun. Poorly stored tyres become distorted though excessive pressure and are subject to much greater damage from solvent, ozone or oxidative attacks compared to tyres well stored.

There are some recommendations you should know.

- Keep tyres away from direct sunlight.
- Keep tyres away from electric motors or generators producing ozone.
- Keep tyres away from moisture permeating inside and causing severe deterioration of the steel cords.
- Limit vertical stacking to a maximum of 5 feet (around 1.5m) in height.

Cleaning

Tyres are supposed to be black, however, there may be brown discolouration on the side wall. This is called Blooming.



Blooming

This is a general phenomenon triggered by the antioxidant added to rubber to protect tyres from premature deterioration, such as drying, peeling and cracking, through exposure to fluctuating environmental factors. Over time the antioxidant residue on the surface of the tyre shows as brown or white. This discolouration has no impact on the performance of the tyre.

How to remove the blooming

Follow these five steps to clean the tyre

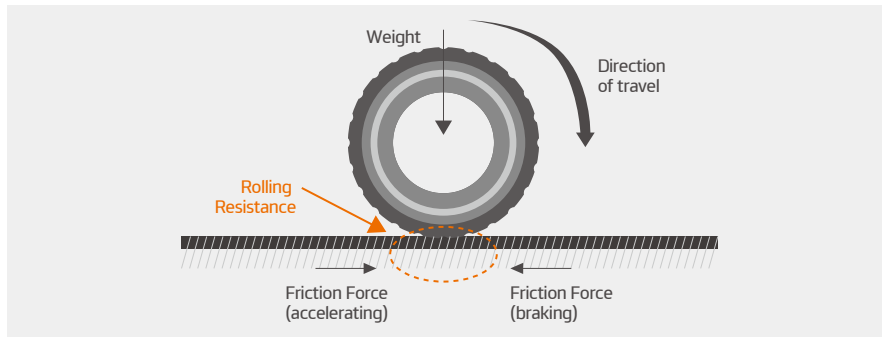
- Step 1** Wet the discoloured area with clean water.
- Step 2** Use a tyre soap and sponge pad to remove the blooming
- Step 3** Rinse with clean water using a hose
- Step 4** Wipe the tyre dry with a clean cloth.
- Step 5** If the tyres are completely dry apply the tyre dressing

Fuel Economy

Fuel economy is a major focus for the automotive industry.

There are over 2 million vehicle components and tyres play a crucial role on vehicle fuel economy; incorrect use of tyres can have a negative impact on fuel efficiency. There are many factors that can impact fuel economy ranging from Rolling Resistance (RR), vehicle load, speed, road conditions, vehicle design, axle alignment etc. Rolling Resistance (RR) is directly related to the tyre and explained in more detail below.

Tyre RR is the terminology used to describe the force resisting the rolling movement of the tyre on a surface - the greater the RR the poorer the fuel efficiency. Thereby the RR value of a tyre gives an indication of the fuel efficiency of the tyre.



What influences the Rolling Resistance (RR) of a tyre?

Technically there are several factors that can impact RR and fuel economy with two main factors being in the control of the vehicle user. Understanding what these are and what can be done will improve results in terms of fuel economy.

1. Tyre pressure

Low tyre pressure increases the tyre surface area in contact with the road which in turn increases the friction between the tyre and the road. Driving with under inflated tyres is an issue of safety as well as fuel efficiency. Properly inflated tyres in accordance with the vehicle manufacturer's recommendations will reduce RR and increase fuel economy.

2. Wheel alignment

For optimum fuel efficiency and to prevent accidents the tyres should be uniformly worn. Incorrect axle alignment causes irregular wear resulting in fuel economy losses due to increased wear volume and RR.

In both instances it is important to regularly check the tyre pressure and wheel alignment of a vehicle in order to achieve maximum fuel economy.



Truck Alignment and Tyre Wear

The two major things that affect tyre wear are :

- Inflation pressure
- Wheel alignment

COMPONENTS OF ALIGNMENT

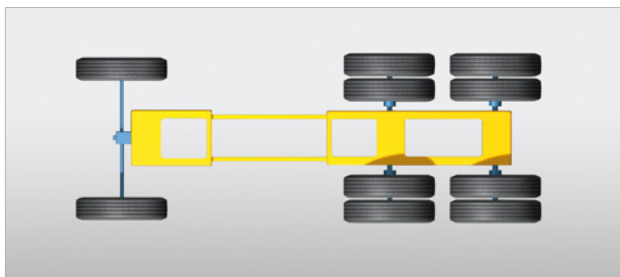
- Toe
- Camber
- Caster
- Ackermann
- Axle parallelism
 - Thrust angle
 - Scrub angle

TOTAL WHEEL ALIGNMENT

Definition :

- The process whereby the vehicle and all the tyres are travelling in the same direction
- Steering axle alignment alone is not sufficient

ALIGNMENT AND WEAR

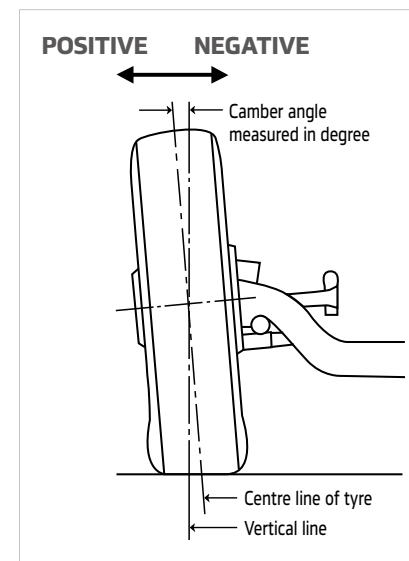


CAMBER

- Camber is the inward or outward tilt of the steering axle tyres when viewed from the front
- Positive camber is the top of the tyre tilted out
- Camber becomes more negative as the load increases

The angle that a centre line of the wheel is inclined from, the vertical centre line perpendicular to a flat road, is called camber angle. If the top of the wheel leans out from the perpendicular then it is positive camber. If the top of the wheel leans in from the perpendicular then it is negative camber.

Camber is meant to compensate for the downward forces of added loads. Correct camber settings help the tyre maintain a firm and even tread contact with the road while the vehicle is travelling under loaded conditions. Often wear at the outside or inside edge of the tyre may indicate incorrect camber setting.



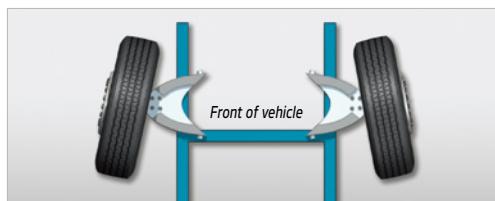
Positive camber



Negative camber

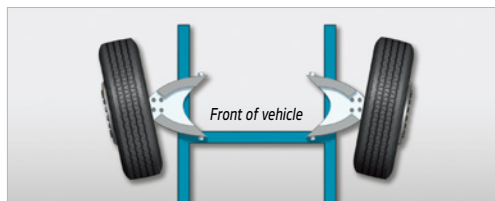
TOE

- Toe is the inward or outward pointing of the wheels when viewed from the top of the vehicle
- The goal is to have zero toe when the vehicle is loaded to its normal operating condition



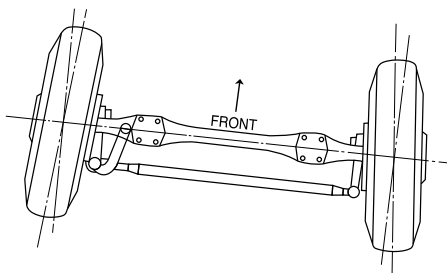
Toe-in refers to the inclination of the wheels of a vehicle so that the pair of front wheels (viewing from the front as per the illustration to the left), are closer together at the front than at the rear of the wheels.

The purpose of toe-in is to relieve or counteract some of the force which pulls wheels outwards as they roll along the road. Correct toe-in will ensure the rotation direction and direction of travel are as similar as possible at driving speed. Insufficient toe-in settings will result in steering instability.



The opposite is considered toe-out, see diagram as per the illustration to the left.

If toe-in or toe-out is insufficient or excessive the tyre wear will be effected and appear as feathering at the edges of the tread.



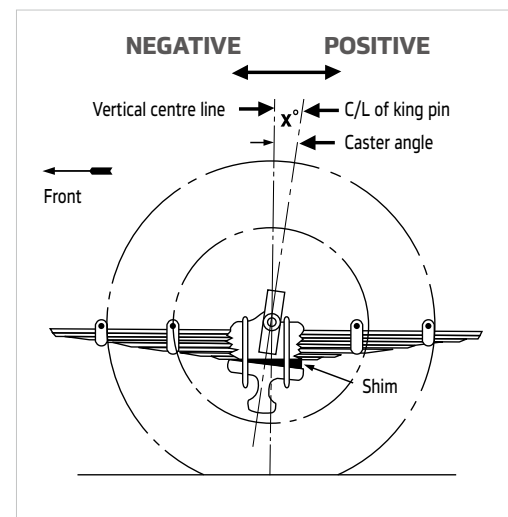
CASTER

- Caster is the forward or rearward tilt of the king pin of the steering axle when viewed from the side
- Caster is generally not considered to have a great effect on the tyre wear

Caster is the condition where the king pin is inclined with the top of the pin angled rearward similar to the front forks of a bicycle. Caster angle is meant to compensate for the resistance which the tyre(s) encounter(s) as a result of drag forces against the road. Caster angle should be the same for both wheels on a given axle or the result will be vibration and abnormal tyre wear.

Too much caster will more than compensate for the amount of drag but it will also create additional difficulty in steering.

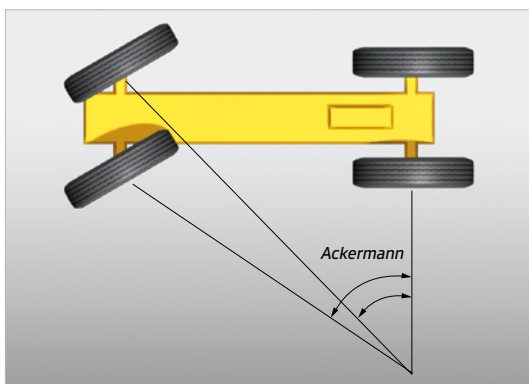
Too little caster makes steering become lighter but also unstable and can cause it to wonder. The caster angle should be checked as it can be distorted by impacts on the tyre or by driving in rough conditions.



Abnormal Tread Wear

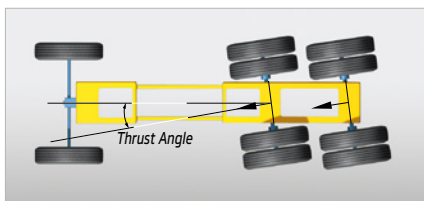
ACKERMANN

- The Ackermann Principle shows that in any turn the inside tyre needs a sharper turn angle than the outside tyre
- The difference in turn angles between the tyres is determined by the actual turn angle and the vehicle wheel base
- Improper Ackermann causes side force, excessive scuffing and fast or irregular wear



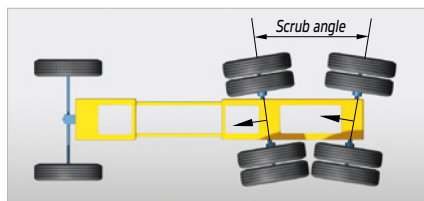
THRUST ANGLE

- Thrust angle is the difference between the line perpendicular to the axle and vehicle centre line
- Each drive axle has its own thrust angle
- The target is to have zero thrust angle



TANDEM SCRUB

- Tandem scrub is the difference in the thrust angles of the drive axles
- The target is zero
- Tandem scrub errors cause constant side force on the steer tyres. This leads to irregular wear



Under inflation and over inflation of the tyre is the prime cause of tread wear. However there are other conditions that influence tread wear and produce irregular wear patterns.

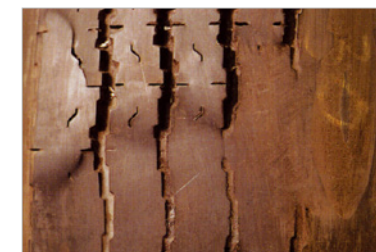
COMPONENTS OF ALIGNMENT

- Imbalance of the tyre or tyre and wheel assembly
- Improper wheel alignment
- Braking system problems that may cause the wheel to lock up or flat spotting
- Bent or round rims
- Worn or damaged bearings
- Broken or worn shock absorbers, springs or steering components

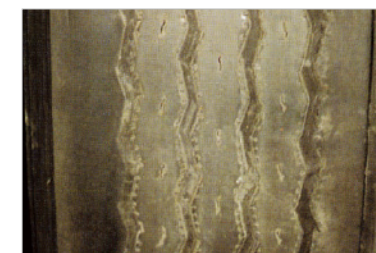
ABNORMAL WEAR



DIAGONAL WEAR



SHOULDER WEAR CAUSED BY WRONG CAMBER OR MISALIGNMENT



Tyre Damage

Considerable loss of air can cause a rapid heat build up which can damage the tyre. This may result in tyre failure or separations between the tread and carcass plies.

Care should be taken to avoid road debris, dirt or moisture penetrating any puncture or getting trapped inside the tyre, or between the wheel rim and tyre.

Damaged tyres should always be repaired or replaced at the earliest possible opportunity to avoid further tyre damage, possible tyre failure, vehicle or personal injury.

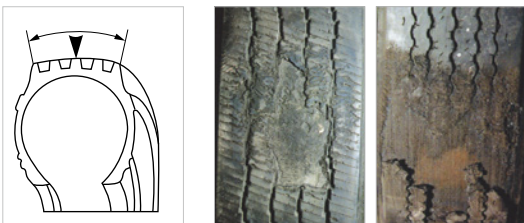
Check for and correct any of the following conditions:

DAMAGE DUE TO CONTACT WITH THE VEHICLE



- Improper tyre inflation
- Overloading
- Improper vehicle maintenance
- Brake system abnormalities
- Differences of tyres sizes or circumferences on the same axle
- Improper mounting of tyre or wheel
- Improper, worn or damaged valve
- Improper use of tube or flap

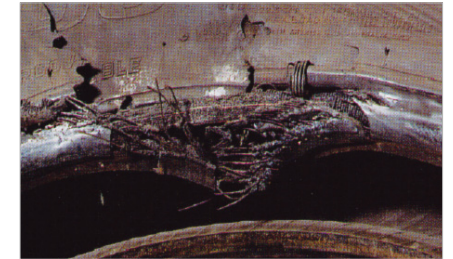
FLAT SPOTTING DUE TO LOCKED BRAKES



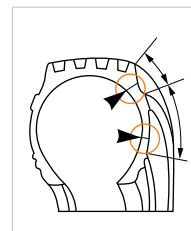
BEAD DAMAGE FROM CURBING



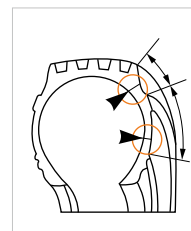
BURNT BEADS



RIPPED SIDEWALL



SIDEWALL DAMAGE DUE TO RUN FLAT OR SEVERE UNDER INFLATION



Tyre Damage due to Mounting Procedures

1. Bead hardening and multiple small cracks caused by incorrect tyre lubricant

Appearance



Multiple small cracks on the bead

Main Cause

Application of incorrect tyre lubricant (waste/petroleum-based oil) during mounting.
 ► When it reacts with high heat, the bead rubber becomes hardened
 → It leads to bead crack and separation.



Application of incorrect tyre lubricant



Bead hardening

Apply moderate amount of certified tyre lubricant to the tyre bead and wheel.

Prevention



Apply certified tyre lubricant

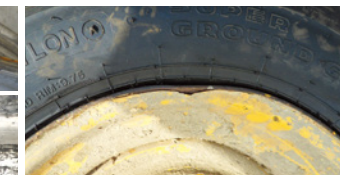


2. Tyre dislocation on the wheel by rim flange wear/deformation

Appearance



Deformed rim



Tyre dislocation by deformed rim

Main Cause

As the inside rim diameter is reduced due to rim deformation the tyre is dislocated from the wheel.

→ Normal fitting result with normal wheel (right picture) compared to abnormal fitting result with deformed wheel (left picture).



Deformed wheel used



Normal wheel used

Before mounting:

Check rim flange deformation by using "Rim Flange Gauge".

Check rim flange step of inside/outside by using "Square Tool".

Prevention



Rim Flange Gauge



Square Tool

3. Tyre damages by rim flange wear/deformation

Appearance



Torn tyre bead

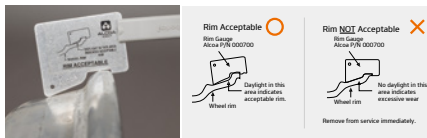
Aluminium wheel used for a long period or overloaded can become sharply worn/deformed due to abnormal friction. As a result the wheel diameter (inside/outside) is reduced.
→ With a deformed wheel the tyre becomes displaced/unstable and if used like this the bead will crack or tear.

Main Cause



Sharply worn/deformed rim flange

Check the strain of the wheel



► Check the deformation status on the entire rim flange by using the 'Rim Flange Gauge' tool and judge the suitability.

Prevention



* Measuring Tool [Square Tool]

► Check the entire deviation of the upper and lower rim flange by using the 'Square Tool' and judge the suitability.

Check the uniformity of the tyre fitting



► Measure the distance of the rim flange / rim check line - 4 points (inside/outside)

4. Bead Separation by non-uniform rim fitting

Appearance



Trace of non-uniform rim fitting (white line)

The bead was not evenly positioned on the wheel as the tyre lubricant has not been correctly applied or due to the deformed wheel. Heel line (below right) is wavy. This means the mounting was not even.

→ If used like this the unevenly fitted tyre can cause stress to be unevenly concentrated at certain points leading to bead separation.

Main Cause



Deformed wheel used

- Apply the tyre lubricant correctly. (Amount, applied position)
- Check the deformation status of the wheel and judge the suitability.



Correctly applied tyre lubricant

Deformed wheel

Prevention

5. Tyre contamination by corrosion from steel wheel

Appearance



Contaminated bead by corrosion from the steel wheel

Corroded steel wheel was used without cleaning ► Bad contamination

Main Cause



Corroded steel wheel

Before using the steel wheel, eliminate corrosion on the wheel using a brush and apply corrosion inhibitor on corroded area



Eliminate corrosion

Apply corrosion inhibitor

Prevention

6. Tyre Separation by damages in mounting procedures

Appearance



Damage occurred in mounting procedures

Main Cause

Due to the misuse of mounting tools (or non certified tools) or incorrect mounting method, damage to the bead is caused such as tearing and cuts.
→ As a result of this damage the inside cord could be exposed or cut, so that moisture and air could penetrate around the steel cords and cause rust. It may also cause a crack which would lead to tyre separation.



Torn outside bead

Cut bead

Torn inside bead

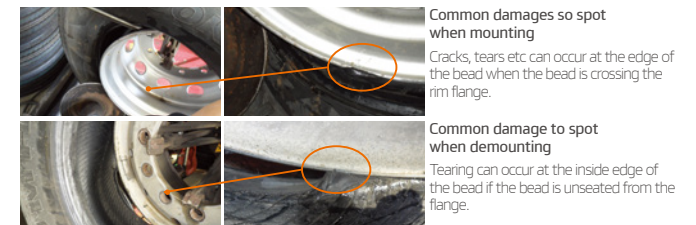
- 1) Precautions for manual mounting:
 - Do not use sharp tools, only use correct (certified) tools
 - Do not hit the tyre/wheel with a hammer - this is the primary cause of damage



Rubber/Plastic hammer

Prevention

- 2) Precautions for automatic mounting:
 - Work with great care to minimise tyre bead damage



Common damages so spot when mounting

Cracks, tears etc can occur at the edge of the bead when the bead is crossing the rim flange.

Common damage to spot when demounting

Tearing can occur at the inside edge of the bead if the bead is unseated from the flange.

7. Bead deformation due to excessive pressure from the automatic machine

Appearance



Bead deformation by excessive pressure of automatic machine

Main Cause



Due to inexperience work or carelessness, the tyre bead can become deformed due to warping or buckling as a result of excessive pressure.

Prevention

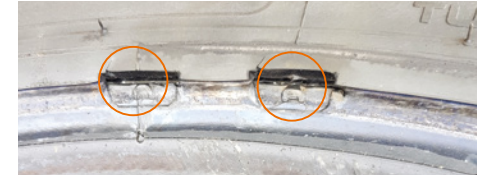


Lever work

- Correctly operate the machine and do not apply excessive pressure on the tyre
- Minimise the tyre deformation by using a lever as much as possible
(The more the lever is used the less pressure there is on the tyre)

8. Bead damages by balancing Lead Clip

Appearance



Tyre bead damages by balancing Lead Clip

Main Cause



Tyre bead is torn out due to issues with the Lead Clip such as
→ Lead Clip not attached properly, low inflation pressure, overloading etc.

Prevention



Tyre barcode attached on the bead

- Attach balancing Lead Clip carefully and correctly
- Do not overlap the Lead Clip on the tyre barcode

Tyre damage due to the vehicle

Incorrect wheel alignment settings can cause irregular/uneven tyre tread wear reducing tyre life (premature removal from service) and risking illegality of the tyre and even tyre failure which could lead to a fatal accident. The following images show examples of tyre damage from vehicle influences (misalignment, worn/damaged component, other mechanical issues), detailing the likely causes and the corrective action to take.

1. One-side Wear



Possible Cause

Steer & Trailer axle	• Improper Toe, Camber • Drive or trailer axle misaligned • Steer or Suspension system is damaged • Excessive axial load • Frequent runout and pulling cases - High centre of gravity of vehicle/loadings - Spacing of trailer to tractor unit coupling - Loadings that are not secured or unevenly loaded - Bent or damaged trailer couplings or towing bar
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Corrective Action

Tyre	• Reposition tyres according to the pattern of wear
Vehicle	• Adjust the wheel alignment and align the axle • Inspect and repair the suspension system • Check the cause of runout, pulling and take action

2. One-side Shoulder Wear



Possible Cause

Steer & Trailer axle	• Improper Toe, Camber • Drive or trailer axle misaligned • Steer or Suspension system is damaged • Excessive axial load • Frequent runout and pulling cases - High centre of gravity of vehicle/loadings - Spacing of trailer to tractor unit coupling - Loadings that are not secured or unevenly loaded - Bent or damaged trailer couplings or towing bar
----------------------	--

Corrective Action

Tyre	• Reposition tyres according to the pattern of wear
Vehicle	• Adjust the wheel alignment and align the axle • Inspect and repair the suspension system • Check the cause of runout, pulling and take action

3. Shoulder Wear



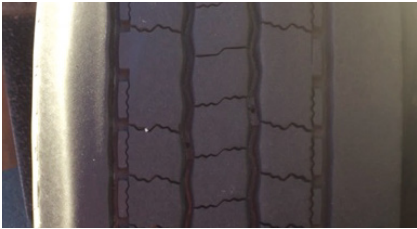
Possible Cause	
Steer & Trailer axle	• Under inflation, overloading • Frequent runout and pulling - High centre of gravity of vehicle/loadings - Spacing of trailer to tractor unit coupling - Loadings that are not secured or unevenly loaded - Bent or damaged trailer couplings or towing bar
Corrective Action	
Tyre	• Inflate tyres to correct air pressure for the axle loads imposed
Vehicle	• Check causes for tyre assemble run out and take corrective action

4. Heel and Toe Wear

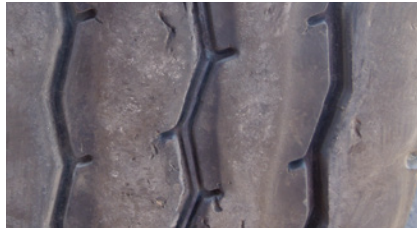


Possible Cause	
Steer axle	• Slipping of tyre during rotation by improper toe out
Drive & Trailer axle	• Slipping of tyre during service from - High torque forces - Changes of load dynamics • For dual tyre fitments - Mismatching of tyres from differing rolling circumferences, tyre pattern or differing of tyre pressures
Corrective Action	
Tyre	• Reposition of tyres by running in opposed direction of travel of initial fitment • Correct matching of tyres in dual fitment in pattern, wear and correct air pressure match
Vehicle	• Adjust the wheel alignment • Check steer, suspension system and repair

5. Shoulder Edge Chamfer Wear



6. River Wear



Possible Cause

Steer & Trailer axle	- Type of wearing characteristics in steer tyres and trailer tyres that are free rolling - Vibration in low tread wearing service on continuous straight roads under light loaded conditions - Steering and suspension worn or broken components - Tyre and wheel assembly imbalance
----------------------	---

Corrective Action

Tyre	- Reposition the tyres according to the pattern of wear - Adjust the inflation pressure considering the load status
Vehicle	- Check the steer, suspension system and repair - Check the rotation of hub and balance of the tyre and wheel assembly

7. Rib Depression / Punch Wear



Possible Cause

Steer & Trailer axle	- Under inflation, overloading - Steer, suspension system worn or damaged - Unbalance of tyre and wheel assembly / Frequent straight line driving under light road conditions - For dual tyre fitments - Mismatching of tyres from differing rolling circumferences, tyre pattern or differing of tyre pressures - Two tyres have different inflation pressure (Smaller pressure tyre is slipped on)
----------------------	---

Corrective Action

Tyre	- Reposition the tyres according to the pattern of wear - Adjust the inflation pressure considering the load status
Vehicle	- Check the steer, suspension system and repair - Check the rotation of hub and balance of the tyre and wheel assembly

8. Cupping Wear



Possible Cause

Steer & Trailer & Drive axle	• Improper tyre pressures used and/or imbalance of the tyre and wheel assembly Steer and suspension worn or damaged • For dual tyre fitments - Mismatching of tyres from differing rolling circumferences, tyre pattern or differing of tyre pressures
------------------------------------	--

Corrective Action

Tyre	• Reposition the tyres according to the pattern of wear • In dual tyre fitment - Correct matching of tyres in fitment in tread depth - Correct and equal tyre pressures
Vehicle	• Check the balance of rotating equipment of tyre and wheel assembly • Adjust the wheel alignment • Check the steer, suspension system and repair

9. Shoulder Wavy Wear



10. Diagonal Wear



Possible Cause

Steer & Trailer & Drive axle	• Forces applied to the tyre to cause diagonal type tread wear - Mechanical irregularities from damaged or worn steering and suspension components - Imbalance of tyre and wheel assembly • For tyres in dual fitment, - Tyres that are mismatched in tread wear - Tyres that have differing tyre pressures
------------------------------------	--

Corrective Action

Tyre	• Replace tyres
Vehicle	• Check the steering and axle alignment • Check and repair the suspension components • Check and balance of the wheel assembly

11. Hot Spot Wear



Possible Cause	
Steer & Trailer & Drive axle	• Rapid braking • Locked braking system • Unbalanced braking
Corrective Action	
Tyre	• For dual fitment, reposition and match according to pattern of tread wear and depth • If wear is severe replace the tyre.
Vehicle	• Check braking system and repair

12.Shoulder Scrubbing / Scuffing Wear



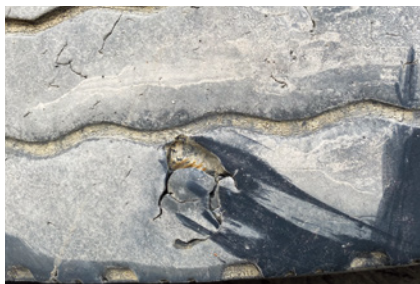
Possible Cause	
Trailer axle	• Scrubbing of shoulder area or tearing on the tread edge from severe lateral drag with possible contribution from improper tyre pressure used
Corrective Action	
Tyre	• Reposition the tyres according to the pattern of wear • Set appropriate inflation pressure considering the load status
Vehicle	• Check vehicle wheel alignment

Tyre Damage due to External Impact

Bad driving habits and poor road conditions can result in tyre damage and lead to an accident. External risks on poor roads could be potholes, rocks, metal parts, shards, nails etc, all capable of causing tyre damage. It is important that a damaged tyre be replaced immediately to prevent an accident that could even be fatal.

The following show examples of damaged tyre patterns and the possible causes.

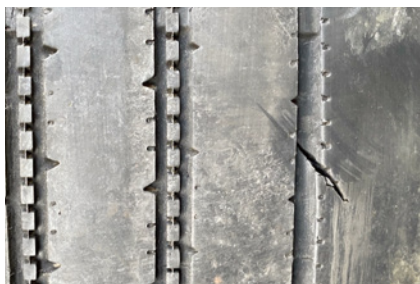
- Appearance: Damage by external impact
- Possible cause: Poor road conditions (Sharp debris, potholes etc.)



External damage type 1



External damage type 2



External damage type 3



External damage type 4

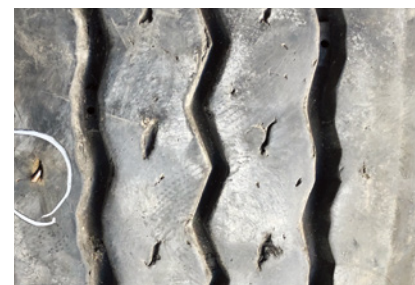


External damage type 5



External damage type 6

- Appearance: Penetration
- Possible cause: Penetration of a nail



Penetration



Inner tyre material is rusty

- Appearance: Chip-cut
- Possible cause: Wrong tyre application, poor road conditions.



Chip-cut type 1



Chip-cut type 2

- Appearance: Torn bead
- Possible cause: Bead damaged by rim flange or mounting tools



Torn Bead type 1



Torn Bead type 2

-
- Appearance: Cracks in grooves
 - Possible cause: Small stone embedded in the groove caused the crack due to continuous force



Groove Crack type 1



Groove Crack type 2

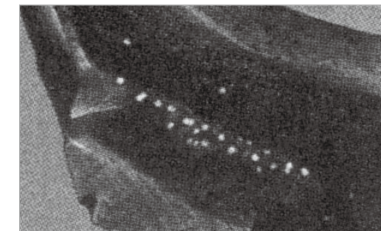
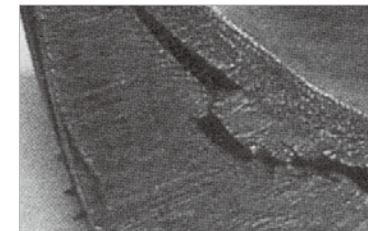
HEAT CAN DAMAGE TYRES

Under inflation, overloading or excessive speed can cause damage because of heat build up. Tyre parts such as cord, the bonding between carcasses, belts and treads can be easily damaged by excessive heat. Most tyre cords lose strength at temperatures above 120°C making the tyre more vulnerable to a failure.

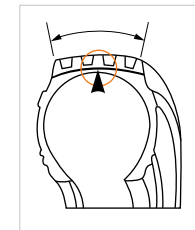
Excessive heat can either weaken or damage cords and rubber compounds or even cause separation between the plies.

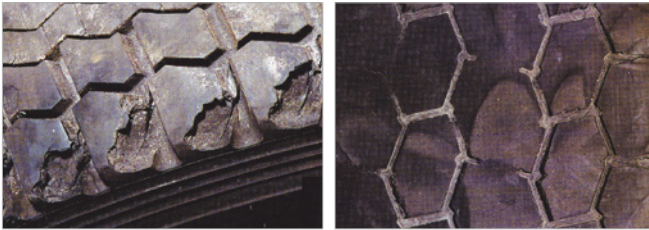
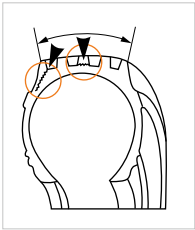
The following pictures show some of the possible damage conditions.

SHOULDER SECTION DAMAGE OR SEPARATION DUE TO HEAT



TREAD DAMAGE DUE TO EXCESSIVE HEAT



TREAD SEPARATION CAUSED BY EXCESSIVE HEAT**Notes:****MOISTURE DAMAGE**

Moisture inside the tyre or penetrating through to the steel belts of a radial tyre can cause rust damage to the steel cord or rim.

Therefore always:

- ❶ Store tyres indoors in a dry place.
- ❷ Ensure all wheels, flaps, tubes, valves and the inner tyre surface are clean and dry before and during mounting.
- ❸ Use the recommended mounting lubricant on the rim and tyre bead during the mounting process.
- ❹ Maintain inflation and keep the valve stem capped or protected so as not to allow moisture to enter the tyre.