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1-/2- WAY PASSENGER CAR TIRE REPAIRS PREMIUM with vulcanizing materials and machines

Repair instructions

Introduction

- Before starting any repair, always inspect the tire in a professional way according to appropriate criteria, such as the general state of tire, national repair limits, etc. before deciding if the tire is repairable. Check the whole tire for further hidden damage.
- Information given in these repair instructions only refer to the use of original REMA TIP TOP products.
- A proper repair requires not only the use of high quality repair materials and tools but also an appropriate working environment such as:
 - good illumination of the workplace,
 - periodical cleaning of the workplace and the tools (maintenance),
 - protection of the repair area against draught and direct sunlight during the repair process,
 - storage of all products according to the specifications (on the packs),
 - well serviced machines and tools,
 - well trained staff.
- We reserve the right to change our products and processes in order to carry out technical improvements.
- The solvents and adhesives listed in the instructions can be used both in a highly flammable, CKW- and aromatics-free version, as well as for the countries without restrictions in one version with trichlorethylene as solvent. In the EU the use of trichlorethylene and trichlorethylene containing products in accordance with REACH annex XIV defined expiration date since 2016-04-21 is prohibited without authorization. For details please see our RTT microsite <http://www.rtt-tri-free.eu/en>.
- Always observe the applicable REMA TIP TOP repair charts when selecting the appropriate repair materials.

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In accordance with this manual, the following patches can be applied:

- **RAD 100 PREMIUM**
Repair patches with rayon cord of high quality for durable repairs to all radial tire sizes and for all applications.
- **PN-DIAGONAL PREMIUM**
Repair patches with nylon cord of high quality for durable repairs to all BIAS/PN tire sizes and for all applications.
- **UP PREMIUM**
Universal patches for durable repairs of small injuries to tubes or tubeless radial and cross-ply tires.
- **THERMOPRESS PREMIUM**
Non-vulcanized patches for durable repairs according to the 1-way system.

1. General information

1.1 General safety instructions

Carefully read the operating and application instructions enclosed with the corresponding products/ machines. Always observe the safety instructions.

- Before starting work on large tires, ensure that the tires are secured against turning over, rolling or any other movement. Otherwise, there is a high risk of personal damage with significant injuries.
- When using rotary tools, solvents or any other dangerous tools and substances, always wear safety goggles.
- When working in an environment with a high noise level starting from 85 dB (A) (e.g. near noisy machines or tools), use ear protection according to labour protection regulations. However, an appropriate ear protection is reasonable even at lower figures.
- The use of S1-class safety shoes (toe protection cap, fully closed heel, antistatic and penetration-resistant) is prescribed for the operations described in this manual. These shoes must be equipped with a metal or plastic toe protection cap and a penetration-resistant, antistatic sole.
- When working with sharp-edged tools, aggressive solutions, hot devices or hot materials, always wear suitable safety gloves.
- When skiving out the injury with a rotary tool or during other work with a risk of projection of hot, pointed or sharp-edged drops, chips and sparks, face protection is recommended.

Safety symbols:



Use eye goggles!



Wear ear protection!



Wear safety shoes!



Wear protective gloves!












Face protection recommended!

When using solvents and vulcanizing cements, observe the safety instructions and symbols on the containers and the Safety Data Sheets.

Safety Data Sheets are available at:

<http://www.rema-tiptop.com/products/safety-data-sheets/>

Pictogram	Code	Hazard designation
 Exploding bomb	DANGER GHS01	Unstable explosives, mixtures and products containing explosives, self-reactive substances and mixtures, organic peroxides
 Flame	DANGER / ATTENTION GHS02	flammable, self-heating, self-reactive, pyrophoric, water-reactive, organic peroxides
 Flame over circle	DANGER GHS03	oxidizing hazards
 Gas cylinder	ATTENTION GHS04	gases under pressure, compressed, liquefied, frozen, dissolved gases
 Corrosion	DANGER / ATTENTION GHS05	for corrosive damage to metals, as well as skin, eyes
 Skull and Crossbones	DANGER GHS06	acute toxicity
 Exclamation mark	GHS07	div. health hazards
 Health hazard	DANGER / ATTENTION GHS08	div. health hazards
 Environment	ATTENTION / DANGER GHS09	may cause damage to the aquatic environment

Ensure that the concentration of the pollutant is under the occupational limit values. These are country-specific and specified in the safety data sheet, chapter 9 of each country. Not in every country limits have been defined for every chemical substance.

Especially when working with solutions inside the tire it is important to provide adequate ventilations as limit values might be exceeded quickly in closed areas. Flammable solvents can also lead to an explosive atmosphere. Solvent vapors are usually heavier than air and need to be extracted near the floor.

1. General information

- When using chemicals or solvents, do not eat, drink or smoke.



- Tire repair equipment and tools have to be in good conditions. They must never be left unattended when in use. Damaged or unserviceable safety equipment such as defective safety switches or similar devices expose the staff working near them to high risks.
- Working under bad illumination is dangerous. Good illumination and a clean work place are essential conditions for safe work. Reflective jackets are recommended in areas where vehicles are handled.
- Always keep dangerous tools, solutions, etc. out of the reach of children and unauthorized persons.
- Always observe the specific regulations for prevention of accidents from the employer's liability insurance association and the general safety regulations which apply in the countries concerned. In principle, a risk assessment for all activities in the respective working environment must be carried out before the start and adjusted in case of changes.

1.2 Tire terms

Tread

Plain or grooved rubber composite, which ensures the contact with the road surface. It withstands wear, and also protects the body plies together with the belts from cuts, punctures or any other damage resulting from running conditions. The tread includes the belts (protection plies and working stabilizer belts).

Shoulder

The edge area of the tread into the sidewall where the stepped belt edges are possibly located. The term describes a critical repair area, as this area is subject to increased temperatures and irregular movements. This area tends to be a possible area to develop separations.

Sidewall

Area between the bead and the tire shoulder. It determines the flexing behaviour of a tire. It contains the body ply including the extended ply turn-up.

Bead area (NRZ)

The part of the tire which is in contact with the rim. This part anchors the body ply, and seals the tire against the rim. This part of the tire is described as NRZ (non-repairable zone or area). This term refers to the area between the bead toe and the centring rib.

Body ply

The radial body ply is the reinforcement which enables the tire to resist the tire inflations pressure. At the same time, it transmits the carrying force from the rim to the tread and the working belts.

The specification of the structure is specified according to the US standard for new tires under "sidewall".

The belt plies

The belt plies stabilize the tread and improve the distribution of pressure of the tire footprint. It also fulfills a protective function.

The specification of the structure is specified according to the US standard for new tires under "tread".

Inner liner

An air/ gas-tight rubber layer inside the tire. The inner liner usually consists of butyl rubber.

1. General information

1.3 Terms regarding tire repair

Hot/ warm vulcanization

Method of vulcanizing rubber fillings and repair patches on repair areas by means of heat and pressure.

Self- vulcanization

Method of vulcanizing repair patches on injuries at room temperature at least +18°C/ 65°F.

Puncture channel

Hole made by a foreign body penetrating into the tire casing/ belt.

Skive filling

Uncured rubber compound for filling the puncture channel before hot/warm vulcanization.

Pre-cured rubber insert (e.g. REMASTEM)

Pre-cured rubber plug for filling the puncture channel. It can only be used for punctures to the tread.

Combi repair unit (e.g. MINICOMBI)

One-piece repair unit which serves as a repair patch and fills the puncture channel at the same time. It can only be used for punctures to the tread.

Repair patch

Flat repair unit whose size and strength are adapted to the individual tire and injury sizes.

Reinforcement

Textile or steel cord which forms the plies of tire and is also used in repair patches from a specific size on.

Drying time/ Test with the back of the finger

The minimum drying time and the maximum permissible drying time have to be observed during the application of vulcanizing solutions and cements. The right moment for the application of a repair patch is, when the coat feels a little sticky when touched with the back of the finger but does not adhere to the finger or leave a wet residue on the finger; the coat should be dry, but still tacky. This test is always carried out on the edge of the coated surface area.

LS (Low Speed)

Low speed – low speed rotary tool with 2 500 – 7 500 RPM preferred for machining rubber.

HS (High Speed)

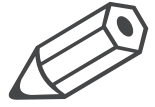
High speed – high speed rotary tool with 16 000 – 30 000 RPM, preferred for machining steel.

RMA = Retreader Manufacturer Association

1.4 General rules for tire inspection and repair

- Before starting any repair, check whether it is technically safe and economically viable to repair the tire. Also check the whole tire for further hidden damage. Always examine the tire taking into account its general state outside the repair area.
- If a small injury is difficult to locate, slowly inflate the tire step by step to the operating pressure, permanently checking the whole tire for any noticeable defects.
- Always demount the tire from the rim in order to check whether repairs are technically safe and economically viable, and to carry out the repair.
- After preparing the injury, select the appropriate repair materials depending on the size and position of the injury.
- The injury area has to be prepared correctly by means of the appropriate tools. Further damage arising from the injury, which may be found during this operation, also has to be included in the evaluation of the tire's reparability.
- Always observe the country-specific regulations on the repair of tires.

Notes



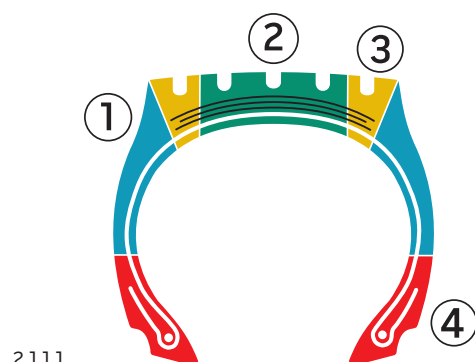
2. Repairs to radial tires

2.1 Preparations

2.1.1 Repair instructions

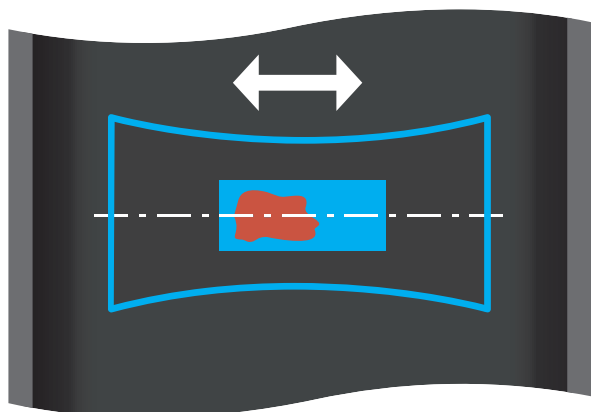
Classification of areas of a tire (fig. 2.1.1.1)

- 1) Sidewall
- 2) Tread
- 3) Shoulder
- 4) Bead (non repairable area)



Patch centre (fig. 2.1.1.2)

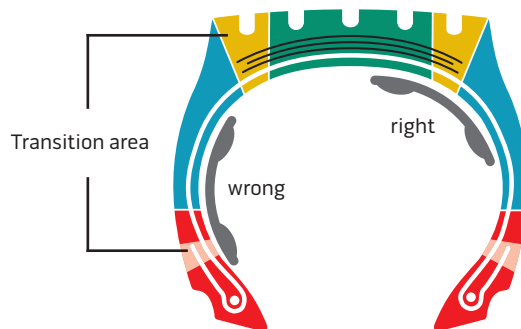
The centre of the patch is identical to the centre of the injury. Do not move the patch in the axial direction. A radial move inside the marked area of the repair patch template is ok.



Flexing area (fig. 2.1.1.3)

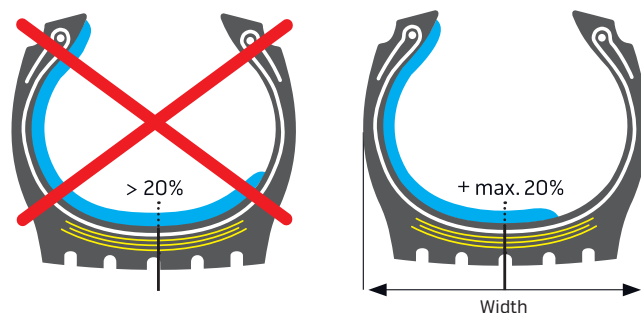
When applying repair patches to radial tires, make sure that the cord ends of the repair patch do not end in the flexing area of the tire due to the risk of fatigue breakage in the repair patch. If the whole injury is still within the recess of the patch template, the repair patch can be shifted out of the flexing area in the radial direction.

The cord ends are under the raised areas at the ends of the repair patches. The punched hole for hang-up of the patch template indicates the position of the cord ends. This marking can be used to move the patch until the cord ends lie outside of the transitional area between the shoulder (broadest ply) and the sidewall.



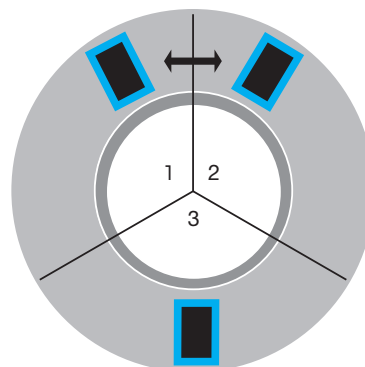
Bridge patch (fig. 2.1.1.4)

A patch may extend from the bead, a maximum of 20% across the middle of the tire width.



Maximum number of injuries (fig. 2.1.1.5)

Only one repair is allowed for each ply cord. In a tire divided into three thirds, only one repair patch in every third is allowed.



Check damage distance

The distance between two injuries must be at least 15 cm/6".

2. Repairs to radial tires

2.1.2 Preparation of the damaged area

- Note and record all tire data.
- Locate and mark the damaged spot on the tire. (fig. 2.1.2.1)
- Demount the tire correctly.
- Remove the foreign body without causing any further damage to the tire. (fig. 2.1.2.2)
Screws should be screwed out of the tire.
- Check the whole tire inside and outside.
- Always check in a professional way according to appropriate criteria, such as the general state of the tire, national repair limits etc. whether the tire can be repaired. Also check the whole tire including existing repairs for further hidden damage.
- Clean the whole injury area inside the tire with LIQUID BUFFER.
- Remove residues of mounting agents after mounting the tire.
- Immediately scrape the area with a liner scraper tool. (fig. 2.1.2.3)
- Remove all debris by vacuum. (fig. 2.1.2.4)

Notes: The above process will remove all traces of silicone, graphite, and other mould lubricants from the liner. Scrape an area a little larger than the area of the expected patch.



2.1.2.1



2.1.2.2



2.1.2.3



2.1.2.4

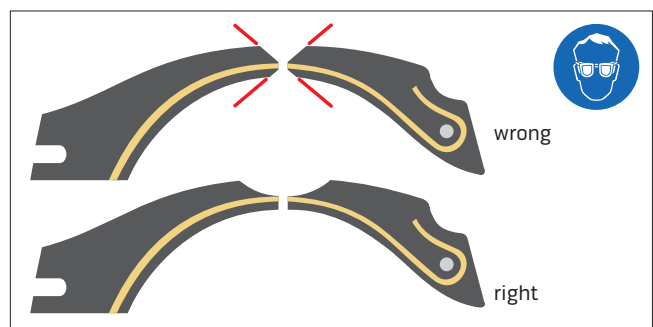
2. Repairs to radial tires

2.1.3 Preparation of the injury

- Remove loose rubber parts with a knife.
- Skive out the injury with a suitable buffing wheel and a high speed air buffer (max. 4500 rpm). Rotary gouges cut much more easily when hot and sharp. (fig. 2.1.3.1)
- Carefully remove loose or damaged cord ends with a carbide cutter or buffing pin.
- Buff the skive with a suitable buffing wheel, giving the skive a concave shape. (fig. 2.1.3.2 and 2.1.3.3)
Make sure to not damage the cord or belt plies.

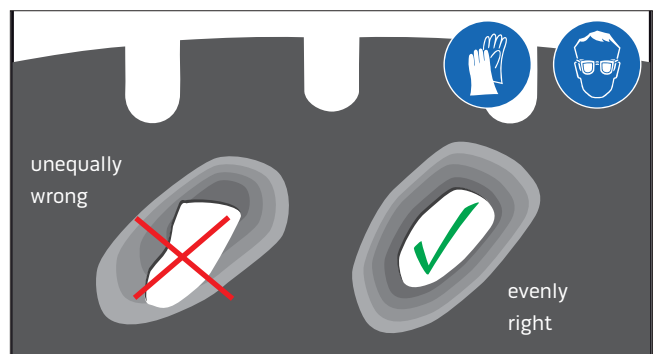


2.1.3.1



2.1.3.2

- Buff the rim of the skive with a buffing brush. (fig 2.1.3.4)
- Brush away the buffing dust with a soft hand brush to make the injury more visible.
- Clean the area with a brass brush and vacuum.



2.1.3.3



2.1.3.4

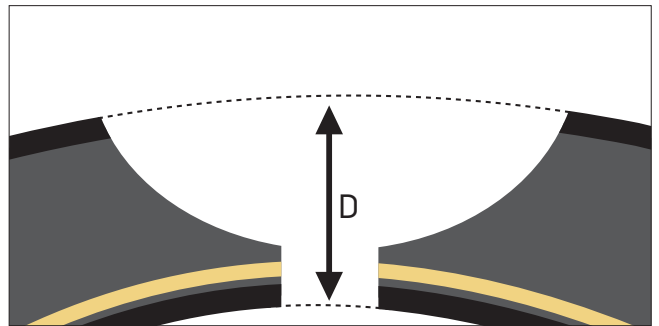
➤ **Notes:** Use the round surface of the rasps in order to help to provide the correct shape. Do not leave sharp edges on the rubber buff. Try to keep the injury as round as possible by constant movement of the buffer in a circular motion.

Make sure that no splits extend from the injury.

2. Repairs to radial tires

2.1.4 Measure injury/select patch unit

- Measure the injury.
- Measure the maximum tire width in the damage's area and note it in order to calculate the curing time.
(fig. 2.1.4.1)



2.1.4.1

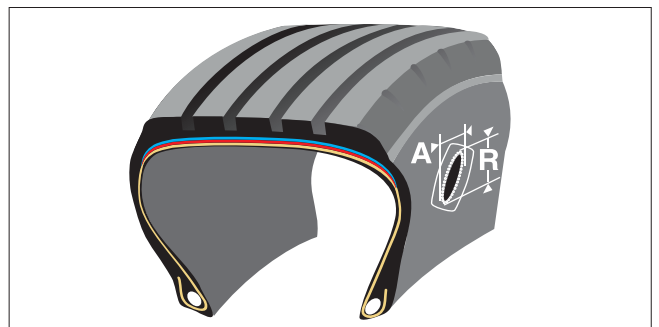
For sidewall injuries:

Measure the maximum damage width.

Value A (axial)

Value R (radial)

(fig. 2.1.4.2)



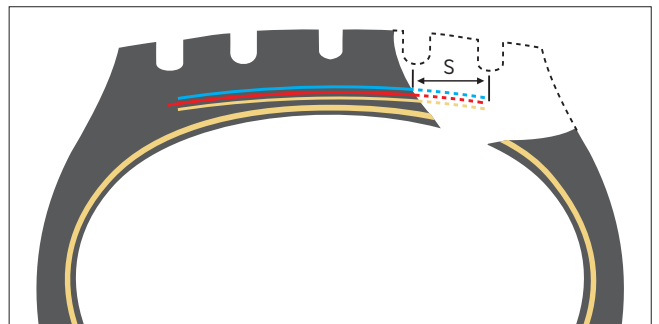
2.1.4.2

For shoulder injuries:

For damages to the shoulder completely embedded in the edge area.

Value S (shoulder)

Measure the value S on the first damaged ply.
Additionally measure the **values A and R** in the carcass.
(fig. 2.1.4.3)



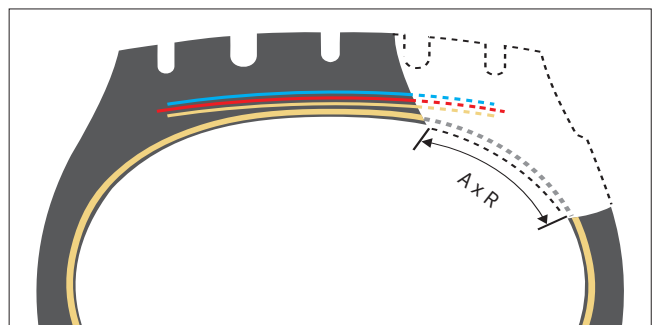
2.1.4.3

If the shoulder injury also covers part of the side wall:

Value A (axial)

Value R (radial)

Additionally measure **A x R**. The **value A** may not be bigger than the corresponding **value S** for shoulder injuries.
Measure the **value R** along the entire damage area.
(fig. 2.1.4.4)



2.1.4.4

2. Repairs to radial tires

For injuries in the tread area:

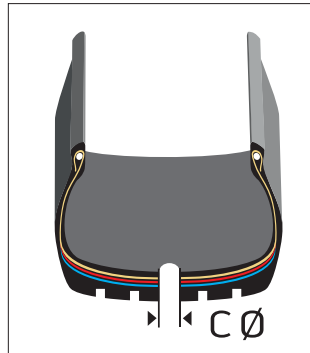
Max. diameter of the damage in the first ply from the top.

Value Ø C (tread damages)

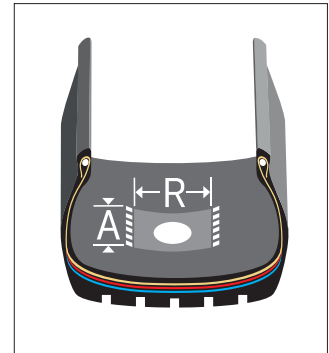
A (axial)

R (radial)

(fig. 2.1.4.5 and 2.1.4.6)



2.1.4.5



2.1.4.6

- Chalk damage sizes on tire.
- Select the corresponding patch based on the latest REMA TIP TOP RADIAL repair chart
- Chalk patch size number on tire. (fig. 2.1.4.7)

➤ **Notes:** Make sure that both blunts are visible in every carcass piece in order to exclude separations.

The repair charts create a relation between tire size, injury size, injury location, and the patch repair unit to be used.



2.1.4.7

2. Repairs to radial tires

2.2 Two-way system

In the two-way system the curing of the rubber fill is carried out prior to the application of the patch unit. The patch repair unit is cured chemically at a minimum room temperature of **(+18°C / 65°F)** for 24 hours.

Instructions for a sidewall repair:

2.2.1 Preparation of the injury

- Buff an approx. **5 mm** - wide area around the injury. (fig. 2.2.1.1)
- Clean the repair area with the brass brush. (fig. 2.2.1.2)
- Remove all debris by vacuum.
- Check the outside skive to make sure it is clean if not, buff it lightly with the polywire brush and the brass brush and then vacuum.
- Apply an even coat of SOLUTION MTR-2 to the tire outside first, then to a smaller inside area. (fig. 2.2.1.3 and 2.2.1.4)
- Turn the tire so that the repair area is in the **3 or 9 o'clock position**.

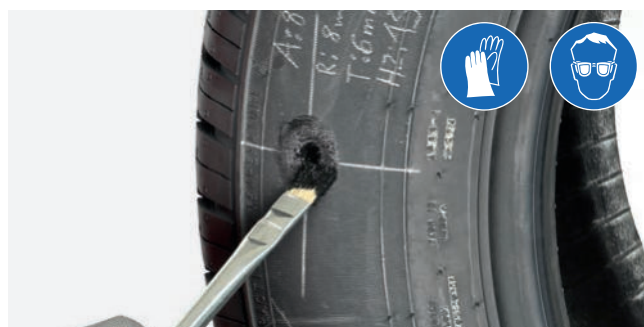
🔪 **Notes:** Avoid waiting times. Coat the repair area immediately after buffing.



2.2.1.1



2.2.1.2



2.2.1.3



2.2.1.4

2. Repairs to radial tires

2.2.2 Filling

- Observe the drying time, before applying RUBBER MTR. **Drying time knuckle test (10 - 45 minutes).**

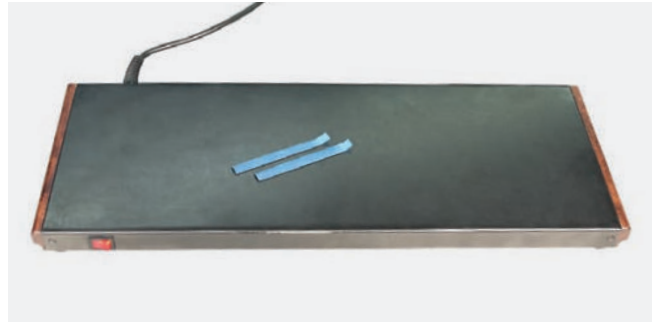
➤ **Note:** Do not speed up the drying of the solution using any artificial means. Make sure that before rotating the tire back into its initial position after the drying process is complete no remaining dust falls into the tire contaminating the dried solution.

- Cut RUBBER MTR-UNI.
- Pre-heat RUBBER MTR-UNI up to 80°C [176°F]. (fig. 2.2.2.1)
- Stitch 2 pieces RUBBER MTR-UNI in the repair area inside the tire. (fig. 2.2.2.2)
- Stitch RUBBER MTR-UNI layer by layer on the tire outside to avoid air traps. (fig. 2.2.2.3)

Alternatively:
Apply RUBBER MTR-EXT with an extruder and stitch at regular intervals in order to avoid air traps.

- Overfill slightly to prevent shrinkage during curing. Overfill by 2 to 3 mm. (fig. 2.2.2.4)

➤ **Note:** Seal open grooves near the filling in the tread area with adequate material in order to avoid running of the rubber.



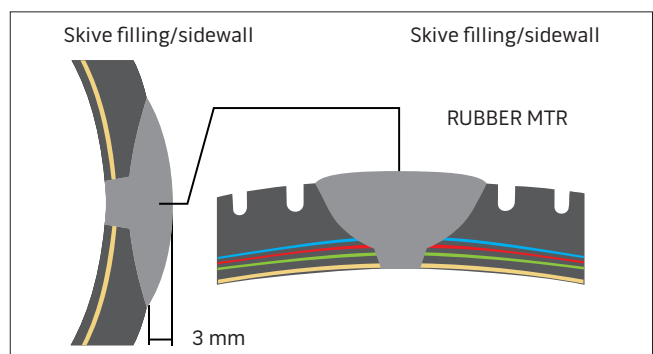
2.2.2.1



2.2.2.2



2.2.2.3



2.2.2.4

2. Repairs to radial tires

2.2.3 Cure the fill rubber

- Apply SOLUTION MTR-2 to both the inside and outside filling. After **2-3 minutes** cover with heating foil to avoid dirt or machine parts sticking to the rubber fill. (fig. 2.2.3.1)



2.2.3.1

- Cure using a vulcanizing press or another system. (fig. 2.2.3.2)
Always follow the manufacturer's instructions for use of the particular curing equipment.
The curing temperature for warm/hot curing starts from +100°C / 212°F)



2.2.3.2

- Use specially shaped plates and bags to maintain the normal tire contours during the cure. (fig. 2.2.3.3)



2.2.3.3

- Check the skive filling immediately after removing the tire from the vulcanizing device. In order to do so, press the tire probe into the skive filling. If it leaves a durable mark (rubber not fully vulcanized), the whole curing process will have to be repeated. If gas bubbles are found upon inspection, the repair has to be repeated. (fig. 2.2.3.4)
- When satisfied with the curing, allow the tire to cool down to ambient room temperature.



2.2.3.4

2. Repairs to radial tires

2.2.4 Mark the contours of the repair patch

➤ **Note:** The arrow on the patch unit of THERMO-PRESS PREMIUM points in the tire's direction of rotation. The arrow on the patch unit of RAD 100 PREMIUM points in the bead direction.

- Draw auxiliary lines which will help to centre the patch unit. These lines must run through the middle of the injury, slightly beyond the edge of the patch placement area.
- Use a tire marking pen (or a piece of chalk) and template to mark the liner area to be buffed. (fig. 2.2.4.1)
- The use of a patch template is a must to locate the patch unit accurately. Patch templates are printed on the packaging of the patches. Just cut them out in the marked areas. (fig. 2.2.4.2)
- If any additional contamination needs to be removed, this should be completed now. Then, mark the contours of the repair patch again (see section "clean the liner").
- Buff the liner with a dome rasp K46, K60 or a rotary brush. (fig. 2.2.4.3 and 2.2.4.4)
- When buffing the liner, all vent lines or vent patterns must be removed. Use only light pressure while buffing and do not allow the tool to remain stationary in one spot.

➤ **Note:** A nice and even buffing texture RMA 3 is recommended for the application of patch units. Avoid waiting times. Coat the repair area immediately after buffing.



2.2.4.1



2.2.4.2



2.2.4.3



2.2.4.4

2. Repairs to radial tires

2.2.5 Cement application

- Clean with a brass bristled brush and remove all dust by vacuum. (fig. 2.2.5.1 and 2.2.5.2)
Never use compressed air to remove buffing dust, always use a vacuum together with a brass cleaning brush.



2.2.5.1



2.2.5.2

- Apply an even coat of CEMENT SC-BL to the buffed liner inside. (fig. 2.2.5.3)
- Turn the tire so that the repair area is in the **3 or 9 o'clock position**.



2.2.5.3

- Observe drying time prior to patch application. **Drying time knuckle test (10 - 45 minutes)**. (fig. 2.2.5.4)

➤ **Note:** Do not speed up the drying of the solution using any artificial means. Make sure that before rotating the tire into its initial position after the drying process, no remaining dust falls into the tire contaminating the dried solution.

When renewing the coat, respect the drying time of at least 60 minutes for the first coat. Apply the patch after the regular **drying time knuckle test (10 - 45 minutes)** after the second coat.



2.2.5.4

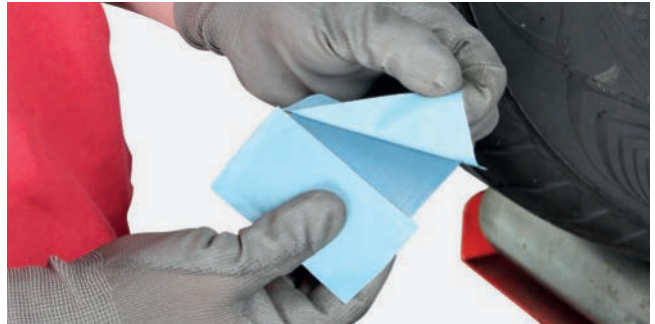
2. Repairs to radial tires

2.2.6 Patch application

- Relax the tire beads before applying the patch (do not spread them). Position the injury at the **6 o'clock position**.
- Draw auxiliary lines which will help to centre the patch unit.
- Test the dryness of the cement (**knuckle test**).
- Loosen the patch backing paper but place it back to protect the bonding layer. (**fig. 2.2.6.1**)
- Align the patch correctly inside the tire with the help of the auxiliary lines. (**fig. 2.2.6.2**)
- Start removing the patch backing paper on the first half of the patch from the centre first and stitch from the centre working outwards.
- Then also remove the patch backing paper on the second half of the patch from the centre first and stitch from the centre working outwards.
- Make sure that the whole patch area is stitched down. (**fig. 2.2.6.3**)
- Finally stitch the patch border area.

- Record any required data on the patch unit using the marking pen. (**fig. 2.2.6.4**)

Vulcanization: The self-vulcanizing process of the applied patch requires an ambient temperature of at least **18°C (65°F)** and a curing time of **24 hours**.



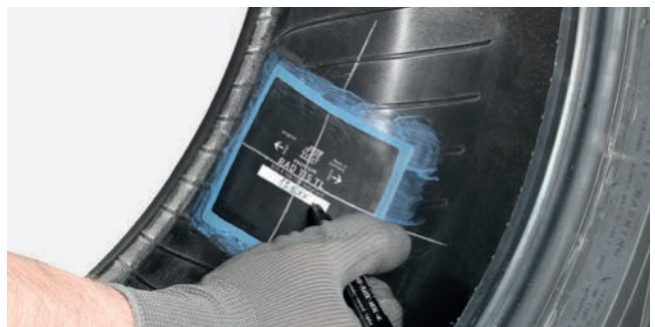
2.2.6.1



2.2.6.2



2.2.6.3



2.2.6.4

2. Repairs to radial tires

2.2.7 Final inspection

- Check whether the patch has been applied correctly with no air or gas entrapment under it. (fig. 2.2.7.1)

➤ **Note:** The patch unit will need to be left for a minimum of 24 hours to allow it to chemically vulcanize at a minimum temperature of 18°C / 65°F.

- Inspect the complete tire, including the inside and the patch repair unit.
- Apply INNERLINER SEALER to the patch border area and any buffed over area. (fig. 2.2.7.2)

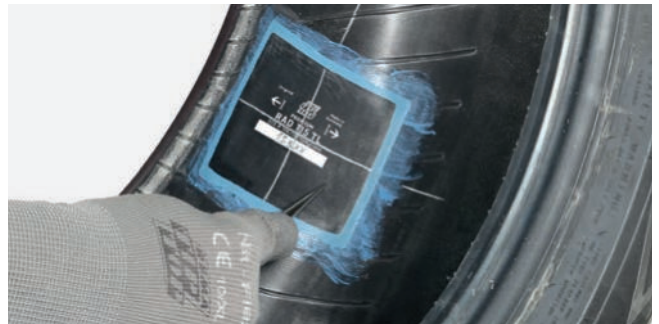
Alternatively:

As an alternative, apply RCF SEALER-PLUS.

- Buff the skive filling with **max. 1 bar** filling pressure when the tire is mounted in order to adapt it to the tire contour. Initially the **65 mm** dome rasp can be used to remove the overfill. However, it is recommended to finally improve the appearance by using a fine grit buffer ES45. (fig. 2.2.7.3)

- Regroove the tread pattern to match the original. (fig. 2.2.7.4)

➤ **Note:** Inspect the complete tire, including the inside and the patch repair unit.



2.2.7.1



2.2.7.2



2.2.7.3



2.2.7.4

2. Repairs to radial tires

2.3 One-way system

In the one-way system, the curing of the rubber fill and patch repair unit is carried out simultaneously.

Instructions for a tread repair using uncured Thermo-press patches:

➤ Note: Apply THERMOPRESS PREMIUM patches using Thermopress vulcanizing equipment.

2.3.1 Mark the contours of the repair patch

➤ Note: The arrow on the patch unit of THERMOPRESS PREMIUM points in the tire's direction of rotation. The arrow on the patch unit of RAD 100 PREMIUM points in the bead direction.

- Draw auxiliary lines which will help to centre the patch unit. These lines must run through the middle of the injury, slightly beyond the edge of the patch placement area. (fig. 2.3.1.1)
- Use a tire marking pen or a piece of chalk and a patch template in order to mark the liner area to be buffed. (fig. 2.3.1.2 and fig. 2.3.1.3)
- The use of a patch template is a must to locate the patch unit accurately. Patch templates are printed on the packaging of the patches. Just cut them out in the marked areas. (fig. 2.3.1.4)
- If any additional contamination needs to be removed, this should be completed now. Then, mark the contours of the repair patch again (see section "clean the liner").



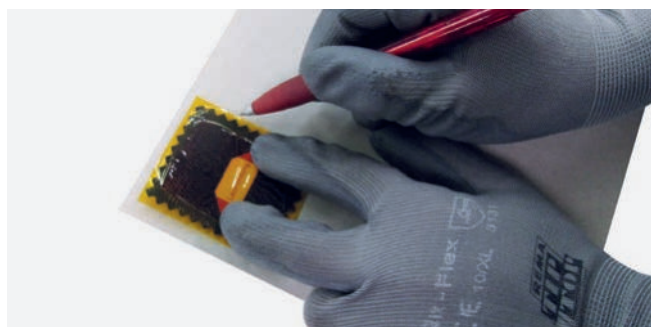
2.3.1.1



2.3.1.2



2.3.1.3



2.3.1.4

2. Repairs to radial tires

2.3.2 Buff the liner and apply cement

- Buff the liner with a dome rasp K46, K60 or a rotary brush. (**fig. 2.3.2.1 and 2.3.2.1**) When buffing the liner, all vent lines or vent patterns must be removed. Use only light pressure while buffing and do not allow the tool to remain stationary in one spot.

➤ **Note:** A nice and even buffing texture RMA 2 is recommended for the application of patch units. Avoid waiting times. Coat the repair area immediately after buffing.

- Clean with a brass bristled brush and remove all dust by vacuum. Never use compressed air to remove buffing dust, always use a vacuum together with a brass cleaning brush.
- Apply an even coat of SOLUTION MTR-2 to both the inside and outside filling. (**fig. 2.3.2.3 and 2.3.2.4**)
- Turn the tire so that the repair area is in the **3 or 9 o'clock position**.
- Observe the drying time prior to patch application.
Drying time knuckle test (10 - 45 Minuten).

When applying RAD patches with the blue connection layer, use CEMENT SC- BL.

Drying time knuckle test (10 - 45 Minuten).

Max. waiting time prior vulcanization: **12 hours**.

When applying RAD patches and if interruptions of the curing process are anticipated, use SOLUTION HR.

Drying time knuckle test (15 - 180 Minuten), provided that the one-way system is used in a hot/warm curing process (**starting from +85°C / 185°F**) and the waiting time before vulcanization is **max. 14 days**.

Shorter drying times can be reached using CEMENT FD-BL.

Drying time knuckle test (5 - 15 Minuten) provided that the one-way system is used in a hot/warm curing process (**starting from +100°C / 212°F**) and the waiting time before vulcanization is **max. 4 hours**.



2.3.2.1



2.3.2.2



2.3.2.3



2.3.2.4

2. Repairs to radial tires

2.3.3 Patch application

- Relax the tire beads before applying the patch (do not spread them). Position the injury at the 6 o'clock position.
- Draw auxiliary lines which will help to centre the patch unit.
- Test the dryness of cement (knuckle test).
- Remove the protective foil from the patch unit. (fig. 2.3.3.1)
- Align the patch correctly inside the tire with the help of the auxiliary lines. (fig. 2.3.3.2)
- Stitch the patch from the centre working outwards (fig. 2.3.3.3 and 2.3.3.4) Make sure that the whole patch area is stitched down. Finally stitch the patch border area.
- Do not remove the protective foil from the surface.

➤ **Note:** Do not speed up the drying of the solution using any artificial means. Make sure that the drying process is complete before rotating the tire back into its initial position and that no remaining dust falls into the tire contaminating the dried solution. Waiting time before vulcanization: **48 hours**.



2.3.3.1



2.3.3.2



2.3.3.3

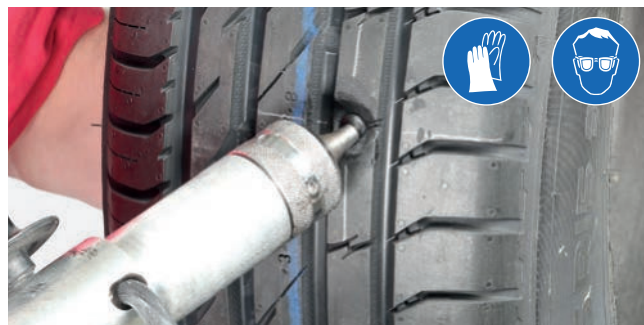


2.3.3.4

2. Repairs to radial tires

2.3.4 Filling

- Apply RUBBER MTR-EXT with an extruder. (fig. 2.3.4.1)



2.3.4.1

- Stitch at regular intervals in order to avoid air traps. (fig. 2.3.4.2)

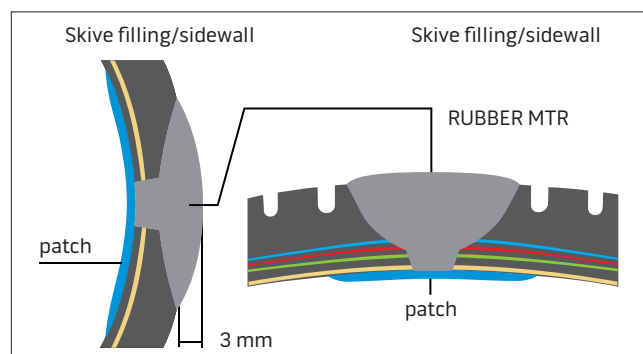
Alternatively:
Cut RUBBER MTR-UNI, pre-heat it up to 80°C [176°F] and stitch layer by layer on the tire outsider.



2.3.4.2

- Overfill slightly to prevent shrinkage during curing. Overfill by 2 to 3 mm. (fig. 2.3.4.3)

Note: Seal open grooves near the filling in the tread area with adequate material in order to avoid running of the rubber.



2.3.4.3

Apply SOLUTION MTR-2 to the fill. After 2-3 minutes cover with heating foil to avoid dirt or machine parts sticking to the rubber fill. (fig. 2.3.4.4)

2.3.5 Curing

- Cure the repair area using the Thermopress curing equipment system. RAD 100 PREMIUM can also be heated with an autoclave or another vulcanizing system according to the one-way system. Always follow the manufacturer's instructions.



2.3.4.4

2. Repairs to radial tires

2.3.6 Final inspection

- Check the skive filling immediately after removing the tire from the vulcanizing machine. In order to do so, press a tire probe into the skive filling. If it leaves a durable mark, the rubber has not fully been vulcanized and the whole curing process needs to be repeated. If gas bubbles are found upon inspection, the repair has to be repeated as well. (fig. 2.3.6.1)
- Check whether the patch has been applied correctly with no air or gas entrapment under it.
- Allow the tire to cool down to ambient temperature.
- Inspect the complete tire including the inside and the patch repair unit.
- Apply INNERLINER SEALER to the patch border area and any buffed over area. (fig. 2.3.6.2)

Alternatively:

As an alternative, apply RCF SEALER-PLUS.

- Buff the skive with max. 1 bar filling pressure when the tire is mounted in order to adapt it to the tire contour. Initially a dome rasp can be used to remove the overfill. However, it is recommended to finally improve the appearance by using a fine grit buffer ES45. (fig. 2.3.6.3)

- Regroove the tread pattern to match the original. (fig. 2.3.6.4)

➤ **Note:** Inspect the complete tire including the inside and the patch repair unit before returning the tire to normal service.



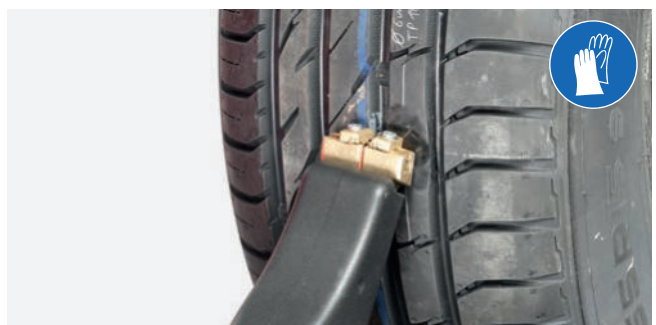
2.3.6.1



2.3.6.2

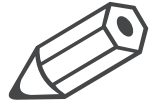


2.3.6.3



2.3.6.4

Notes



3. Repairs to BIAS tires

3.1 Preparations

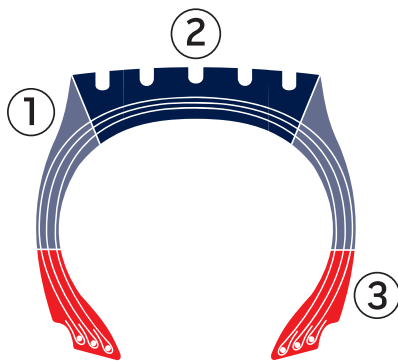
3.1.1 Repair instructions

Classification of areas of a tire (fig. 3.1.1.1)

1) Sidewall

2) Tread

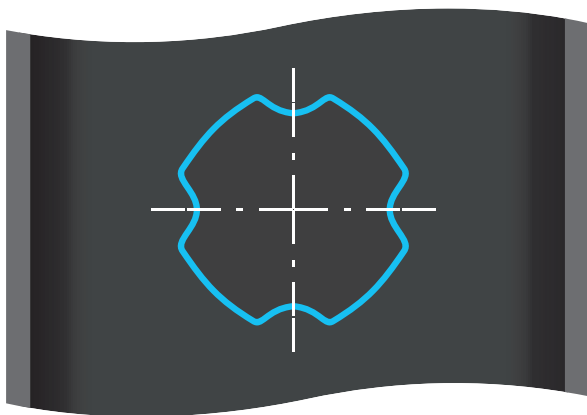
3) Bead (non repairable area)



3.1.1.1

Patch centre (fig. 3.1.1.2)

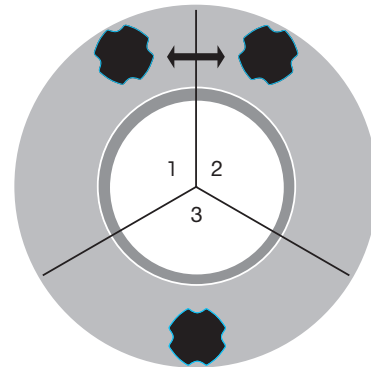
The centre of the patch is identical to the centre of the injury. Patches applied in the shoulder area can be trimmed. (see chapter 3.1.6).



3.1.1.2

Maximum number of injuries (fig. 3.1.1.3)

In a tire divided into three thirds, only one repair patch in every third is allowed.



3.1.1.3

Distance check between the injuries

The distance between two injuries must be at least 15 cm/6".

3. Repairs to BIAS tires

3.1.2 Preparation of the damaged area

- Note and record all tire data.
- Locate and mark the damaged spot on the tire. (fig. 3.1.2.1)
- Demount the tire correctly.
- Remove the foreign body without causing any further damage to the tire. (fig. 3.1.2.2) Screws should be screwed out of the tire.
- Check the whole tire inside and outside.
- Always check in a professional way according to appropriate criteria, such as the general state of the tire, national repair limits etc. whether the tire can be repaired. Also check the whole tire including existing repairs for further hidden damage.
- Clean the whole injury area inside the tire with LIQUID BUFFER.
- Immediately scrape the area with a liner scraper tool. (fig. 3.1.2.3)
- Remove all debris by vacuum. (fig. 3.1.2.4)

➤ **Notes:** The above process will remove all traces of silicone, graphite, and other mould lubricants from the liner. Scrape an area a little larger than the area of the expected patch.



3.1.2.1



3.1.2.2



3.1.2.3



3.1.2.4

3. Repairs to BIAS tires

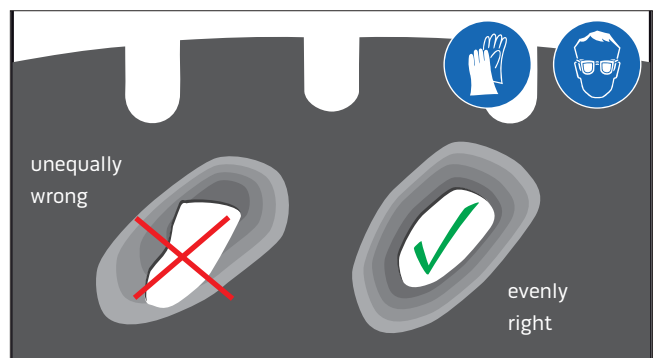
3.1.3 Preparation of the injury

- Skive out the injury with a rotary gouge or ball rasp, giving it a concave shape. (fig. 3.1.3.1)
- Make sure that the skive is both regular in size and shape. If it is not shaped regularly, the tensions arising may cause the repair to fail. (fig. 3.1.3.2)
- Brush away the buffing dust with a soft hand brush to make the injury more visible.
- Inspect the damage in detail.
- Use the tapered knife in order to cut out the major part of the damage.
Angle the skive using the knife with **45° for sidewall injuries and 30° for tread or shoulder injuries.** (fig. 3.1.3.3 and 3.1.3.4)
Remove all rotten or separated cords.

🔧 **Notes:** Use the round surface of the buffing tool to help provide the correct shape. Do not leave sharp edges on the rubber buff.



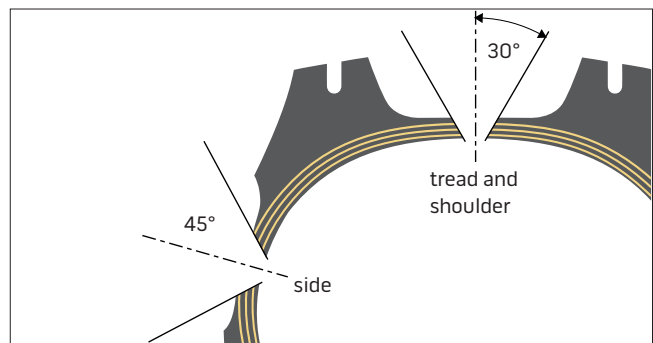
3.1.3.1



3.1.3.2



3.1.3.3



3.1.3.4

3. Repairs to BIAS tires

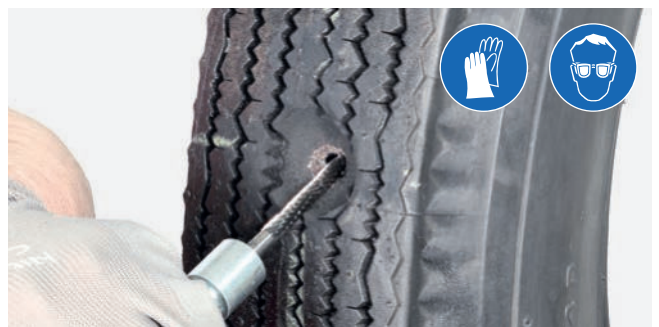
3.1.4 Limitation of damages to the textile

- Use a cone rasp and a pencil rasp in order to round off the injury. Observe the skive angle. Take care to limit tear proliferation (propagation). (fig. 3.1.4.1)



3.1.4.1

- Buff the cord plies using ball rasp or a limestone in order to avoid that the rubber surface will be overlapped by the textile cords. (fig. 3.1.4.2)



3.1.4.2

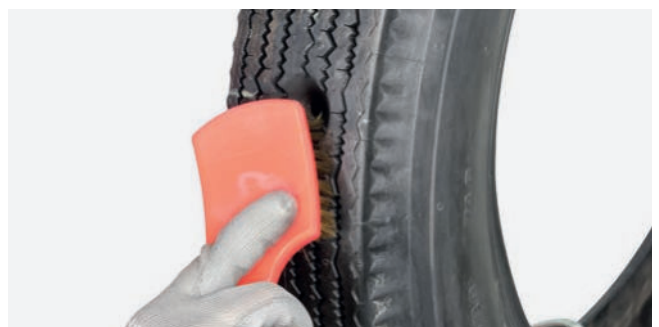
- Check if all textile cords are held tight within the rubber without any separations. (fig. 3.1.4.3)



3.1.4.3

- Clean the area with a brass brush and vacuum. (fig. 3.1.4.4)

➤ **Note:** Make sure that no splits extend from the trimmed cut.



3.1.4.4

3. Repairs to BIAS tires

3.1.5 Measure injury/elect patch unit

- Measure the injury at the largest extent of the textile damage. (fig. 3.1.5.1 and 3.1.5.2)
- Measure the maximum tire width in the damage's area and note it in order to calculate the curing time. (fig. 3.1.5.3)
- Chalk the damage sizes as well as the tire width on the tire.
- Note the PR number of the tire. If not indicated on the tire itself, request information directly from the tire manufacturer of the ETRTO.
- Select the corresponding patch based on the latest REMA TIP TOP BIAS/PN repair chart.

➤ **Note:** the BIAS/PN repair chart features two types of damages

A) continuous injuries

B) injuries with less than 50% damaged cord plies

In order to determine the cord plies, use 2/3 of the given plies.

Example:

6 PR - tire with 6 plies

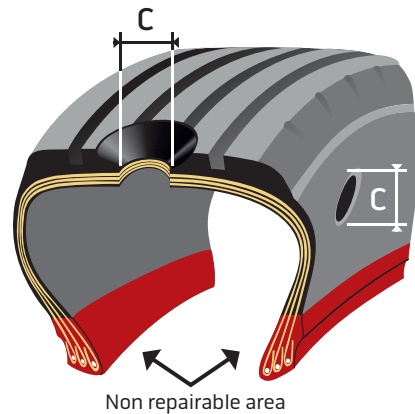
$6/3 * 2 = 4$ installed plies

3 or 4 damaged plies = type A) continuous injuries.

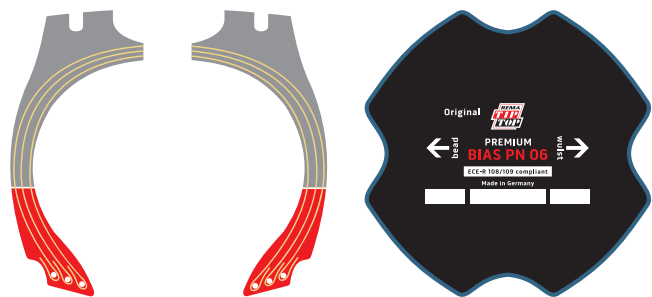
1 or 2 damaged plies = type B) injuries.

- Chalk patch size number on tire. (fig. 3.1.4.4)

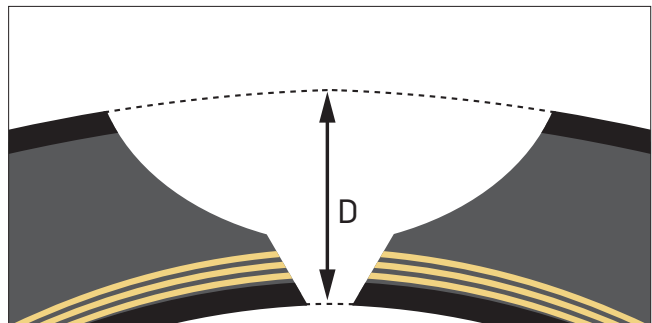
➤ **Note:** The repair charts create a relation between tire size, injury size, injury location, and the patch repair unit to be used. Only constant use of the repair charts will provide the necessary experience to read them correctly.



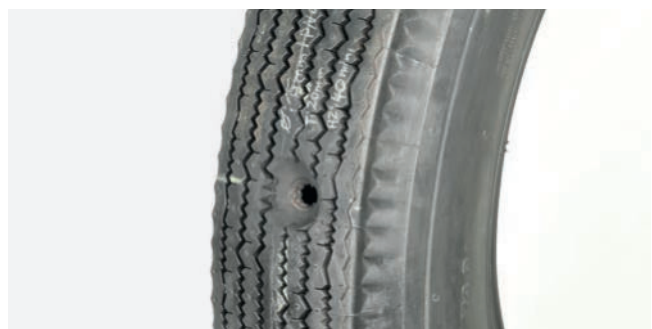
3.1.5.1



3.1.5.2



3.1.5.3

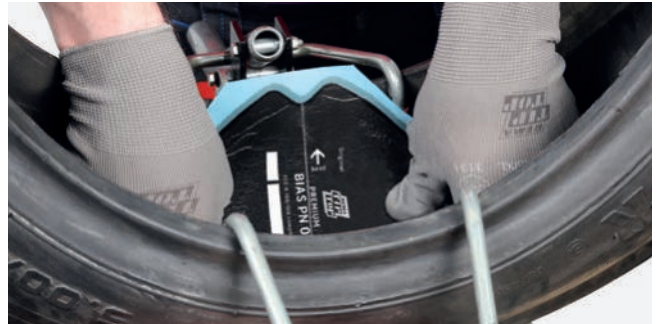


3.1.5.4

3. Repairs to BIAS tires

3.1.6 Measure injury/Select patch unit

- Patches applied in the shoulder area, can be trimmed.
- Align the patch correctly inside the tire with the auxiliary lines. (fig. 3.1.6.1)



3.1.6.1

- Draw an auxiliary line where the bead toe runs. (fig. 3.1.6.2)



3.1.6.2

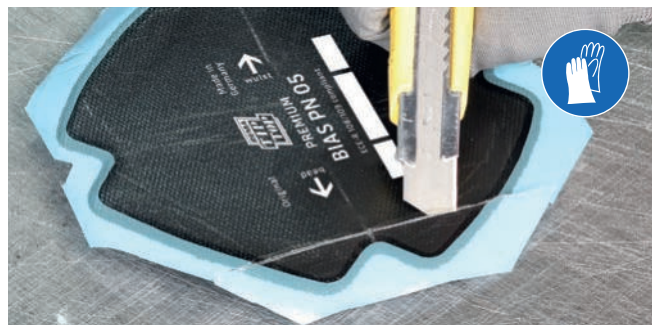
- Draw another auxiliary line 5–10 mm next to this line in the direction towards the centre of the patch unit. (fig. 3.1.6.3)



3.1.6.3

- Cut the patch along the second line with an **angle of 45°** using a knife. Patches may be trimmed up to the point where the first cord plies cross each other. (fig. 3.1.6.4)

🔪 **Note:** Make sure that no splits extend from the trimmed cut. Apply INNERLINER SEALER to the trimmed area in order to avoid penetration of moisture.



3.1.6.4

3. Repairs to BIAS tires

3.2 Two-way system

In the two-way system the curing of the rubber fill is carried out prior to the application of the patch unit. The patch repair unit is cured chemically at a minimum room temperature of **(+18°C / 65°F) for 24 hours**.

Instructions for repairs according to the two-way system can be found in chapter 2.2.

3.3 One-way system

In the one-way system the curing of the rubber fill and patch repair unit is carried out simultaneously.

Instructions for repairs according to the one-way system can be found in the chapter 2.3.



3.2.1



3.2.2



3.2.3



Your local contact



// ONE BRAND // ONE SOURCE // ONE SYSTEM

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