



General Information Body Repairs, General Body Repairs

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Repair GroupRepair Group



Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



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1 Safety instructions

1.1 Removing components

The vehicle should be securely attached to the vehicle lift before the centre of gravity of the vehicle is changed substantially due to it being dismantled.

1.2 Battery, welding work



Note

Make sure the radio code is available before disconnecting the battery. Ensure radio is in an operational condition by inputting radio code before releasing vehicle to customer.

Before welding work, always detach both battery terminal connections and cover the battery terminals.

If work which produces sparks is to be performed in the vicinity of the battery, the vehicle battery must always be removed.



WARNING

Switch ignition on before connecting battery!

There must be nobody in the vehicle when connecting the battery!

1.3 Electronic control units

Connect the earth connection of the electric welding appliance directly to the part to be welded. In doing so, make sure that no electrically insulated parts are between the earth connection and the welding point.

Do not allow the earth connection or the welding electrode to touch the electronic control units and electrical wiring.

1.3.1 Procedure for handling electronic control units after accident repairs

It is only necessary to fit new electronic control units after an accident where at least one of the following conditions is present:

- ◆ The housing is obviously deformed or damaged.
- ◆ The support surface or bracket is deformed; there is no visible external damage to the unit itself.
- ◆ The connector is damaged or corroded.
- ◆ The functional check or the unit self-diagnosis procedure indicates the fault "Control unit defective".

When electronic components, e.g. ABS control unit, have been removed to enable repairs to be carried out, and are then reused, after refitting perform a functional check as described in the existing technical literature, e.g. V.A.G self-diagnosis procedure.



1.4 Paint, glass, upholstery, trim

No other vehicles may be parked unprotected in areas used for body repairs. (Fire hazard due to flying sparks, damage to battery, paintwork and glass).

1.5 Fuel tank or fuel pipes

Use extreme care when performing sanding and welding work near the tank or other components carrying fuel. Where there are doubts, these parts must be removed.

1.6 Air conditioner

No parts of the charged air conditioner system may be welded, brazed or soldered. This also applies to welding and soldering work on the vehicle if there is a risk of parts of the air conditioner heating up. After paint repairs, the vehicle must not be heated up to more than 80° C in the drying booth or preliminary heating zone, because heat causes a pressure increase which can burst the system.



Note

The refrigerant circuit must also be evacuated whenever electrical welding work has to be carried out nearby the refrigerant hoses. During the electrical welding process invisible ultraviolet rays are given off which penetrate the refrigerant hoses and decompose the refrigerant.

1.6.1 Remedy:

Evacuate the refrigerant circuit ⇒ Air conditioner; Rep. Gr. 87 ; Heating and air conditioner

An empty system can only be recharged in a specially equipped V.A.G Service workshop. For this reason the system should only be opened and evacuated if this is required for safety reasons.

If it is necessary to evacuate the refrigerant when carrying out repairs to a vehicle, avoid all contact with liquid refrigerant or refrigerant vapour!

Wear rubber gloves to protect the hands and goggles to protect the eyes! If the refrigerant comes into contact with unprotected parts of the body it will cause frostbite.



WARNING

It is advisable to have a rinsing bottle for the eyes handy at all times. If liquid refrigerant gets into the eyes, they should be rinsed thoroughly with water for about 15 minutes.

Then use eye drops and obtain medical attention immediately even if no pain is felt in the eyes. The doctor should be informed that the frostbite has been caused by R12 or R134a refrigerant.

If the refrigerant comes into contact with other parts of the body despite compliance with safety measures, the part of the body concerned must be rinsed immediately with cold water for at least 15 minutes.

Although refrigerant does not present a fire hazard, smoking is not permitted in rooms containing refrigerant vapours. The high temperature of a burning cigarette causes a chemical breakdown of the refrigerant vapour. The products of this breakdown are poisonous and cause violent coughing and sickness when inhaled.



1.7 Airbag system

Repair instructions ⇒ General body repairs, interior; Rep. Gr. 69 ; Passenger protection; Airbag

The earth strap of the battery must be disconnected whenever work is carried out on the airbag system or straightening work performed during body repairs.



WARNING

Switch ignition on before connecting battery!

There must be nobody in the vehicle when connecting the battery!

Airbag components must not even briefly be subjected to temperatures above 100° C.

Airbag components must not come into contact with grease, cleaning agent, oil or similar.

Mechanically damaged airbag parts must be renewed. ⇒ Chapter disposal information, page ⇒ [page 23](#) .

Wash hands after touching airbag units which have been ignited!

1.8 Checking seat belts



WARNING

After every accident, the seat belt system must be checked systematically! If damage is determined when checking the test points, customer must be informed regarding necessity of renewing belts.

Test points:

- ◆ Checking belt webbing
- ◆ Checking inertia reel (locking effect)
- ◆ Belt lock - visual check
- ◆ Belt lock - functional check
- ◆ Checking belt guides and lock tongues
- ◆ Checking securing parts and anchorage points
- ◆ Check lap belt retractor



Note

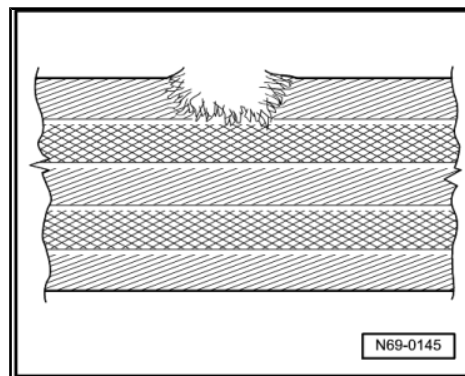
If customer refuses to have damaged belts renewed, appropriate note should be made.

1.8.1 Checking belt webbing

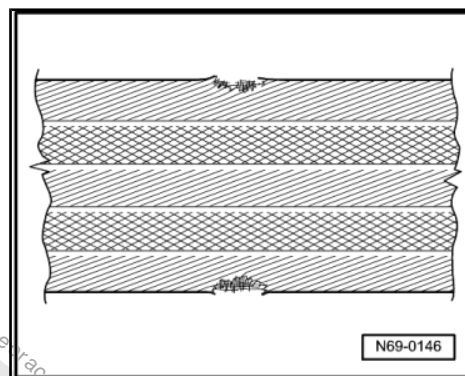
- Pull belt completely out of inertia reel or pull lap belt adjustment tongue fully out.
- Check belt for dirt and, if necessary, wash with mild soap solution ⇒ see Instruction Manual also.



- If either of following illustrated examples of damage (1 and 2) are determined on accident vehicle - renew seat belt and belt lock completely.
- If damage as illustrated under points 1, 2 or 3 is determined on a vehicle which has not been involved in an accident, it is sufficient to renew damaged belt only.

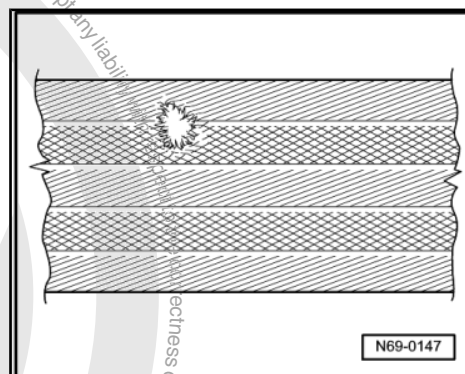


1 - Cut, torn or chafed belt



2 - Webbing loops on belt edge torn

3 - Burn marks from cigarettes or similar



1.8.2 Checking inertia reel (locking effect)

Inertia reel has two locking functions.

- ◆ First locking function is initiated by belt being jerked out of reel (belt extraction acceleration).

Check

- Pull belt out of inertia reel with sudden jerk.
- No locking effect - renew seat belt complete with lock.
- If difficulties are experienced when pulling belt out or reeling belt in, first check whether inertia reel is in the correct position.
- Second locking function is initiated by change in vehicle movement sequence (vehicle-dependent locking function).

Check

- Put seat belt on.
- Accelerate vehicle to 20 km/h and then carry out emergency braking with foot brake.
- If during braking procedure belt is not locked by locking mechanism, seat belt complete with belt lock must be renewed.

**WARNING**

For safety reasons, the road test should be carried out on a traffic-free stretch to ensure no other motorists/pedestrians are endangered.

1.8.3 Belt lock - visual check

- Check belt lock for cracks and fracturing.
- If damage is determined, renew seat belt complete with belt lock.

1.8.4 Belt lock - functional check

Checking locking mechanism:

Push lock tongue into belt lock until it engages audibly. Check whether locking mechanism is properly engaged by giving belt firm pull.

If belt tongue fails only once to engage properly in belt lock during minimum of 5 tests, seat belt must be renewed complete with belt lock.

Checking release mechanism:

- Release seat belt by depressing button on belt lock with finger pressure. The lock tongue must automatically spring out of belt lock if the belt is slack.
- Carry out minimum of 5 tests. If belt tongue fails only once to spring out of lock, seat belt must be renewed complete with belt lock.

**WARNING**

Under no circumstances whatsoever may lubricant be used to eliminate noise or stiffness at belt lock buttons.

1.8.5 Checking belt guides and lock tongues

Plastic-covered guides show very fine parallel scoring, after strain on belt system (when belt has been worn during accident). (Wear which has been brought about by frequent belt use can be recognized by smooth signs of wear which are free of scoring).

- Examine for deformation, fracturing and cracks in plastic.
- If scoring and/or damage is determined, renew seat belt complete with belt lock.

1.8.6 Checking securing parts and anchorage points

- ◆ Lock securing strap/bracket deformed (stretched)
- ◆ Height adjuster not functioning
- ◆ Anchorage point (seat, pillar or vehicle floor) signs of distortion or thread damage
- If damage is determined on such parts, renew seat belt and belt lock complete .
- Renewing anchorage points.



Note

In case of damage which did not result from an accident (e.g. wear), only the part which is actually damaged need be renewed.

1.9 Safety regulations for belt tensioners

- ♦ Testing, removing, installing and repair work may only be performed by qualified personnel.
- ♦ The pyrotechnic charge has no expiry date, i.e. it has an unlimited, maintenance-free life.
- ♦ Belt tensioner components may be neither opened nor repaired; always use new parts.
- ♦ Belt tensioner units which have been dropped on the floor, must not be fitted into a vehicle.
- ♦ Belt tensioner units which are mechanically damaged (dents, cracks) must be renewed.
- ♦ A belt tensioner unit must be installed immediately after removing it from packaging.
- ♦ If the work is interrupted, the belt tensioner unit should again be placed in its packaging.
- ♦ It is not permitted to leave the belt tensioner unit unattended.
- ♦ The belt tensioner unit must not be treated with grease, cleaning or similar substances, nor may it be exposed to temperatures above 100° C, even for short periods.

1.10 Body repairs on vehicles fitted with belt tensioners



WARNING

Before commencing cutting, straightening and/or panel beating work, mechanically ignited belt tensioners without belt in use detection (triggering lock) must be removed. The battery earth strap must be disconnected if the belt tensioners are electrically triggered.



Note

If the seat belt is fully retracted, the belt-in-use detection (triggering lock) prevents the mechanically triggered belt tensioner from being actuated during accidents.



WARNING

If seat belts have belt in use detection, the seat belt must not be pulled out during cutting, straightening and/or panel beating work. If large vibrations are generated during cutting, straightening and/or panel beating work, belt tensioners with belt in use detection must also be removed.



The following vehicles do not have belt in use detection on belt tensioner:

- Golf 1992 ▶
- Golf Convertible 1994 ▶
- Passat 1988 ▶
- Passat 1994 ▶
- Polo 1995 ▶
- Polo Classic 1996 ▶
- Polo Variant 1998 ▶

Removing and installing the seat belt with belt tensioner ⇒ General body repairs, interior; Rep. Gr. 69 ; Passenger protection; Seat belts

1.10.1 The following list of vehicles are equipped with:

	Mechanical belt tensioner with belt in use detection	Electric belt tensioner
Passat 1997 ▶ front and rear	X	
Golf 1998 ▶ front with side airbag		X
Golf 1998 ▶ front without side airbag	X	
New Beetle 1999 ▶ front with side airbag		X
New Beetle 1999 ▶ front with side airbag only USA 1. Model year	X	
New Beetle 1999 ▶ front without side airbag	X	
Lupo 1999 ▶ front	X	
Transporter 1991 ▶ front from MY. 1998	X	
LT 1997 ▶ front		X

1.11 Cutting, straightening and/or panel beating work on vehicles fitted with airbag

The earth strap of the battery must be disconnected whenever work is carried out on the airbag system or straightening work performed during body repairs.



WARNING

Switch ignition on before connecting battery!

There must be nobody in the vehicle when connecting the battery!

Repair instructions ⇒ General body repairs, interior; Rep. Gr. 69 ; Passenger protection; Seat belts



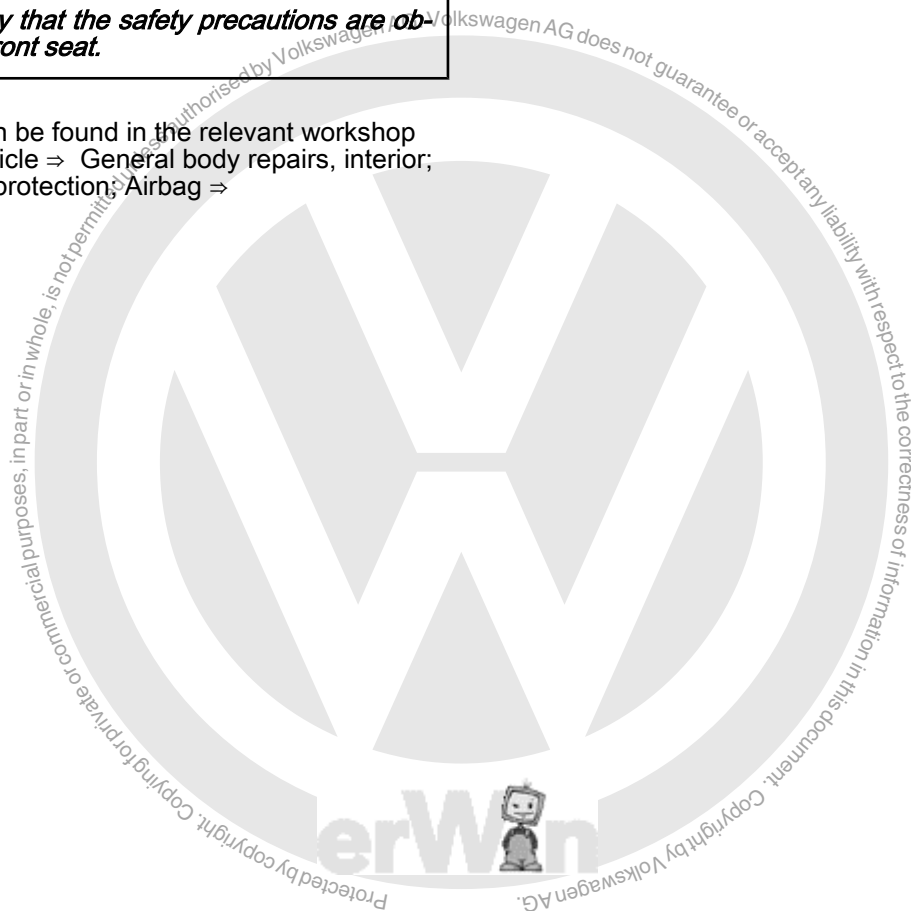
1.12 Removing front seats with side airbag



WARNING

It is absolutely necessary that the safety precautions are observed when removing front seat.

The safety instructions can be found in the relevant workshop manual for the type of vehicle ⇒ General body repairs, interior; Rep. Gr. 69 ; Passenger protection; Airbag ⇒





2 Fundamental instructions

2.1 Diagnosis on accident vehicles

When accident vehicles are being repaired, damage to the running gear and assembly mountings, which could have very serious consequences at a later date, is sometimes not found. Where the accident damage indicates over-stressing of the vehicle, special attention must be paid to the following components, completely independent of the axle geometry check which must be done in all cases:

- ◆ Check to ensure that the steering gear and linkage operate correctly over the complete lock-to lock range. Carry out a visual check for bent or cracked parts.
- ◆ Check the running gear and all running gear components such as wishbones/trailing arms, suspension struts, steering knuckles, anti-roll bars, sub-frames, axle beams and mountings for bending, twisting and fracturing.
- ◆ Examine wheels and tyres for damage, true running and imbalance. Examine tyres for cuts/slits etc. in treads and walls and check the pressures.
- ◆ Examine the engine/gearbox/exhaust system mountings for damage.
- ◆ Finally, a thorough road test after the repairs will give you the assurance that the vehicle is completely roadworthy and can be handed back to the customer without having any doubts about its mechanical state.

2.2 Conditions in which body and/or parts are passed for painting

Before a repaired vehicle or individual part is handed over to the paint shop for painting, the repaired or beaten out, and if necessary, filled surface must be prepared for painting by rubbing it down with abrasive paper with a grade of P 80 - P 100.

This preparatory work is the job of the sheet metal worker and is included in the time allowed for the repair.

2.3 Straightening

Bodies and floor sections are produced mainly from cold formed deep drawn sheet metal. For this reason the reshaping of accident damaged areas should be carried out in the same manner.

If the extent of the damage does not allow anti-clockwise reforming, the damaged part should only be separated after straightening the adjacent surfaces.

2.4 Parting cuts

Separating cuts which affect the rigidity of the body and therefore also the operational safety and road safety of the vehicle must be made in accordance with the information of the respective workshop manual.

2.5 Replacement body sub-parts and part sections

A "subpart" is a section of a complete part (e.g. end section front and rear), which is supplied direct from the Parts Department, already cut to size.



- On the other hand “part sections” are cut to the required size from complete parts, by the workshop doing the repair. In individual cases it will be necessary to work exactly to the method described and illustrated in the Body repairs Workshop Manual.
- Because the use of “sub-parts” and/or “part sections” together with special tools and equipment influence the repair times, special note is made of the tools and equipment in the description of repair.

2.6 Original joint

The term “Original joint” means the welded joint, which was made at the time the vehicle was manufactured.

These welded joints must be restored when carrying out body repairs.

Make sure the standard number of spot welds is not fallen short of in the event of repairs.

Methods and procedures which deviate from the original joint are described in the respective Body Repairs workshop manual.

2.7 Galvanized body parts

Fully galvanized sheets already provide a high level of bodywork anti-corrosion protection during manufacture. To be able to maintain the warranty guarantee against perforation rusting when carrying out repairs, the repair information from page [⇒ page 26](#) must be complied with.



WARNING

Good workplace ventilation and smoke extraction must be ensured by appropriate extraction systems, e. g. -V.A.G 1586- since toxic zinc oxide is produced when welding galvanized steel sheets.

2.8 Removing remaining material.

If the damaged body part has been roughly cut-out in accordance with the separating cuts in the appropriate Workshop Manual, e.g. using a pneumatic sabre saw -V.A.G 1523- , most spot weld joints can be drilled out with the spot weld breaker -V.A.G 1731- .

Beyond this, we recommend the parallel grinder -V.A.G 1529- and an angle grinder to remove the welded joints which cannot be removed with the spot weld breaker.

2.9 New parts

New parts which are not accessible from the inside after a repair, e.g. side members, should, to prevent corrosion, be pre-painted in the colour of the vehicle before being welded in. When doing this it is recommended to mask-off the welding flanges.

2.10 Replacement parts

In order to reduce the number of stock items, many service parts are only supplied as a “basic version”.

Examples:

- Mudguard for Golf 1984 ▶ 1991 without holes for trim strip and aerial.
- Tailgate for Transporter 1991 ▶ without holes for rear wiper or interior trim.



In these cases we recommend the workshop makes "templates" from damaged parts.

Example tailgate for Transporter 1991 ▶ hole for rear wiper:

- Use the body saw -V.A.G 1523- to cut out a section of the rear bonnet, while observing any distinctive contours. For example, deburr part of the recess for the VW sign as well as the edge above the windscreen wiper bore hole cutting edges and protect them with adhesive tape reinforced with fabric.

The strength of the template material must be taken into account when applying the template and marking the bore holes prior to painting the new parts.

Check new spare parts e.g. doors, bonnet/boot lid or wings for transportation damage before passing to paint spraying shop. This prevents having to respray when transportation or other damage is first noted when installing.

2.11 Moulded foam elements

The pre-formed parts are fitted during body shell construction and they increase their volume in the paint shop drying oven at approx. 180 °C, after priming.

Proceed as follows when using moulded foam elements:

- Remove foam material remains on vehicle.
- Restore the paint work structure. If necessary, apply two coats (wet in wet) of glass/paint primer -D 009 200 02- (apply the second coat in the opposite direction) - flash-off time of about 10 minutes.

Prerequisites

- Before continuing with this procedure, ensure that the part for replacement is correctly prepared e.g. cut and adapt to fit, corrosion protection measures.

Renewing moulded foam element

- Wrap moulded foam element with sealing cord -AKD 497 010 04 R10- all around.
- Fix moulded foam element to vehicle.
- Secure new part (e.g. A-pillar) in position. Gently press new part, in vicinity of moulded foam element, until it makes contact and then weld in.
- Do not do perform shielded arc welding (SG) within 15 mm on either side of moulded foam element.
- Carry out cavity protection to repair area after painting vehicle.



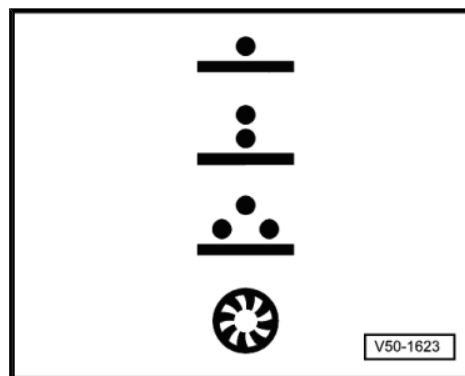
3 Symbols

3.1 Symbols for welding operations

RP Spot welded seam (single row) RP = spot welding

RP Spot welded seam (double row)

RP Spot welded seam (double row offset)



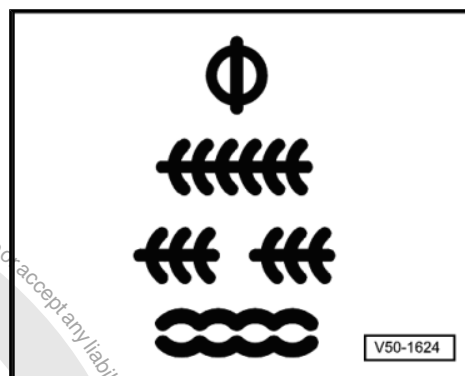
SG Plug weld seam SG = Inert gas arc welding

SG stitched weld seam

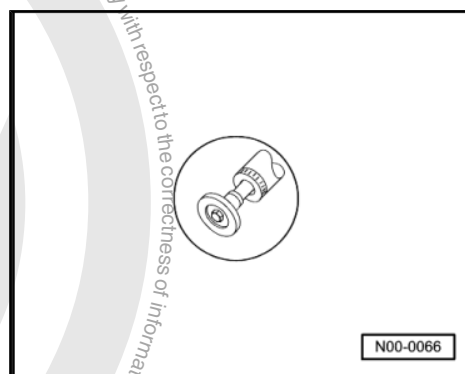
SG Continuous seam

SG Continuous seam (staggered)

Brazing



3.2 Symbols for working procedures



3.2.1 Grind

- In order to remove material from a welded seam using a rod grinder.



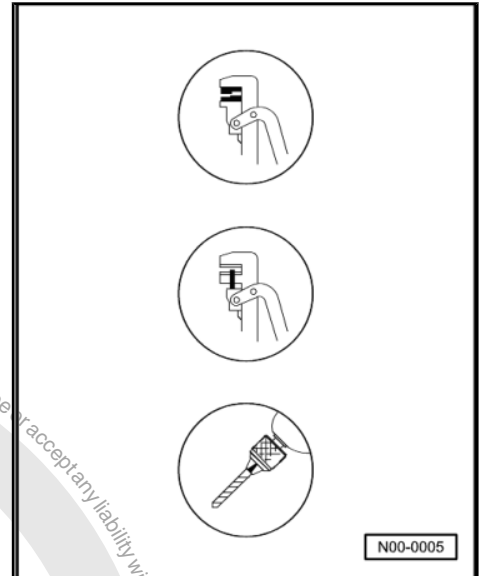
Note

The sheet thickness of the outer panels may be reduced only by a minimum or not at all when grinding the welding seams.



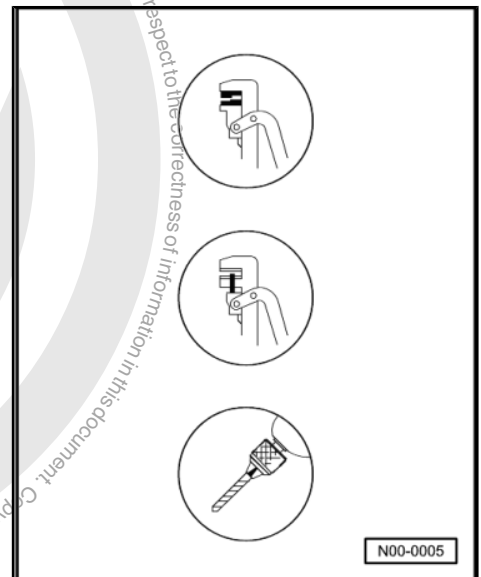
3.2.2 Offset

- for overlap welding.



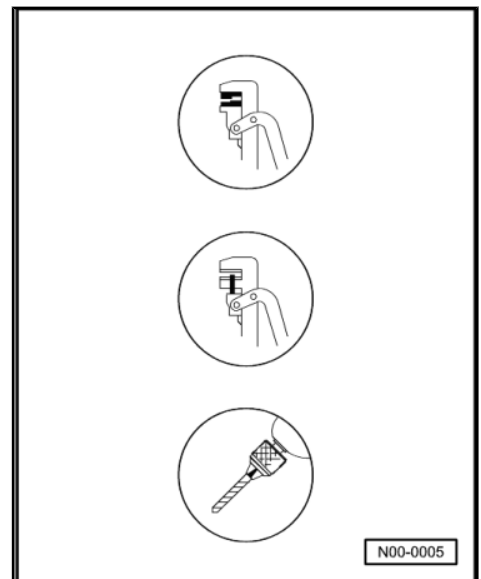
3.2.3 Punch

- for subsequent SG plug welding.



3.2.4 Drill

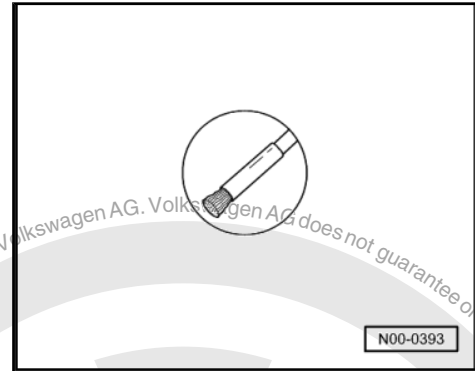
- for subsequent SG plug welding or spot welding (original joint).



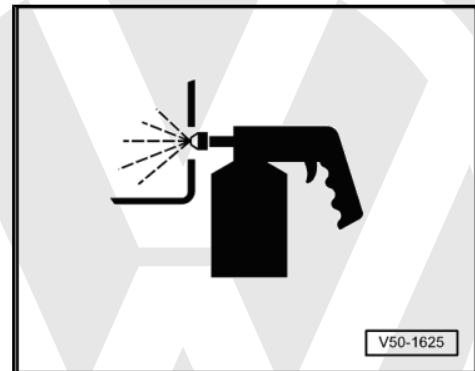


3.2.5 Grind

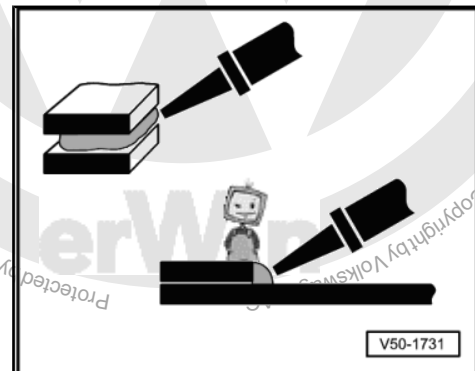
- ◆ Remove paint in inaccessible areas (e.g. inner roof frame) with wire brush -VAS 5182- .



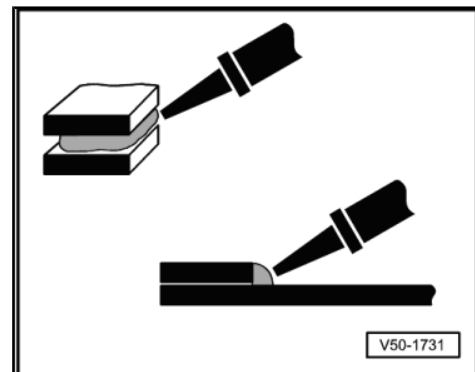
3.2.6 Cavity preservation



3.2.7 Bond



3.2.8 Seal





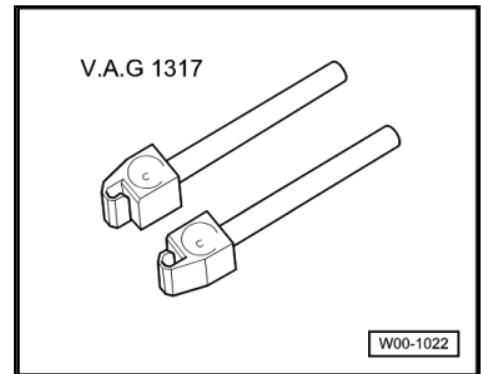
4 Body repair tools



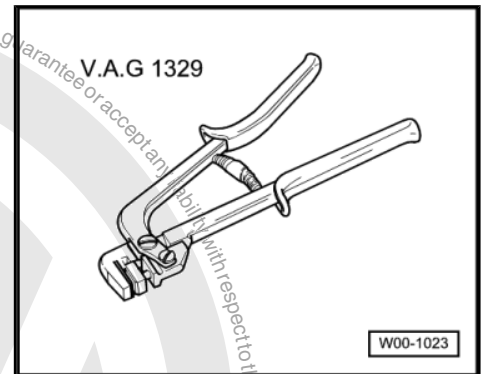
Note

The following tools are listed according to V.A.G / VAS numbers.

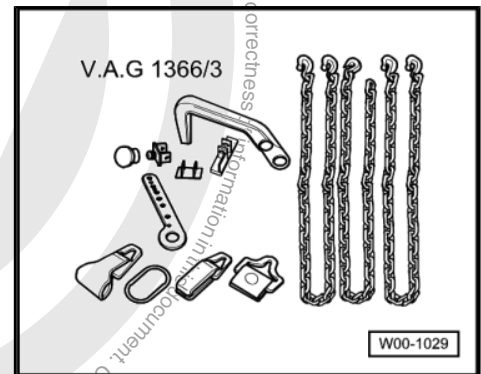
4.1 Flanging tool -V.A.G 1317-



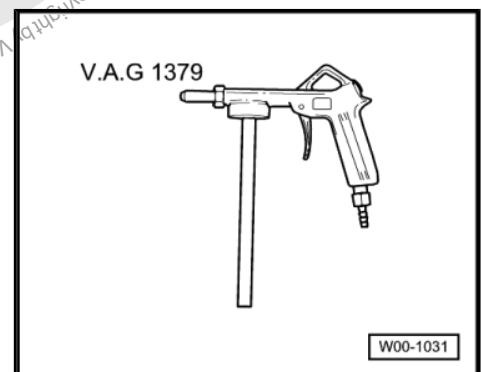
4.2 Hole punch -V.A.G 1329-



4.3 Basic equipment -V.A.G 1366/3-

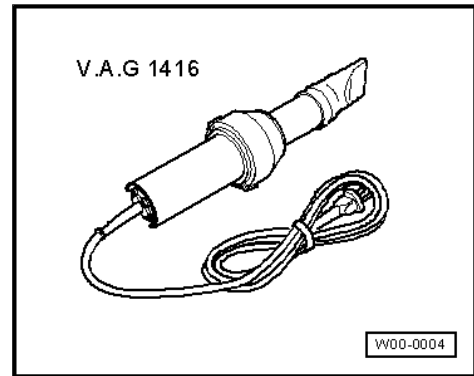


4.4 Underseal spray gun -V.A.G 1379-

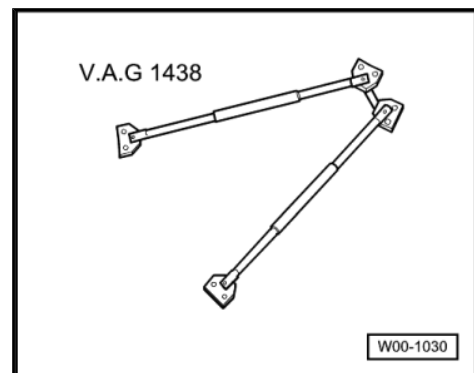




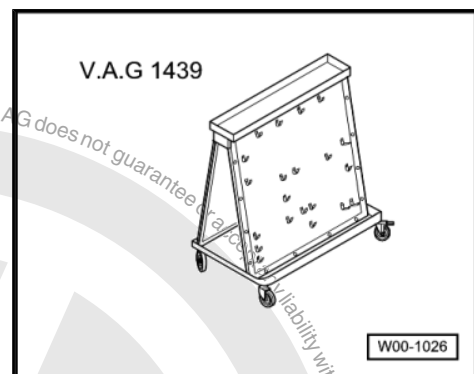
4.5 Hot air blower -V.A.G 1416-



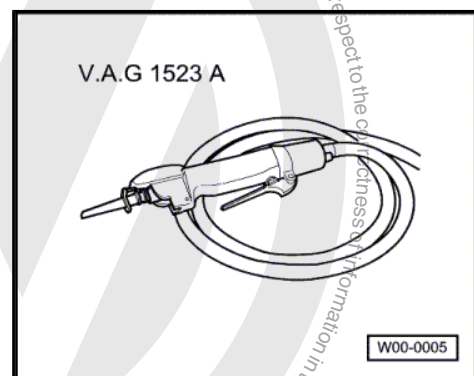
4.6 Mechanical door tensioner -V.A.G 1438-



4.7 Body equipment trolley -V.A.G 1439-

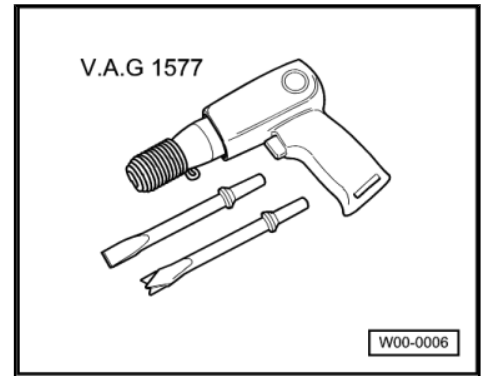


4.8 Pneumatic sabre saw -V.A.G 1523 A-

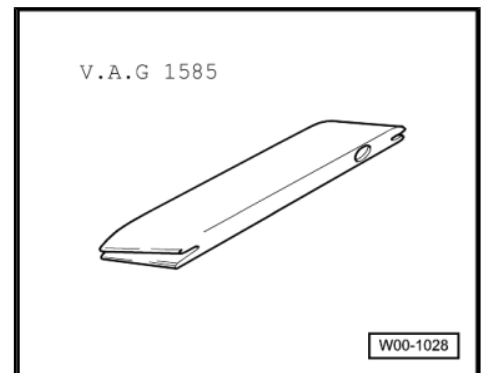




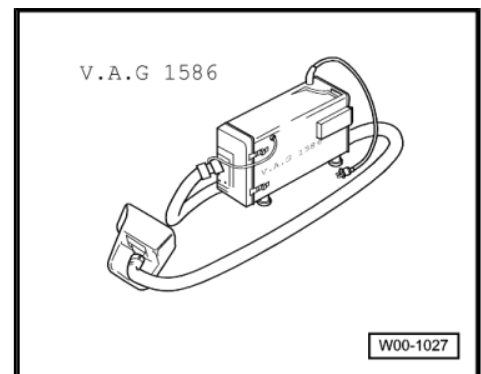
4.9 Pneumatic hammer -V.A.G 1577-



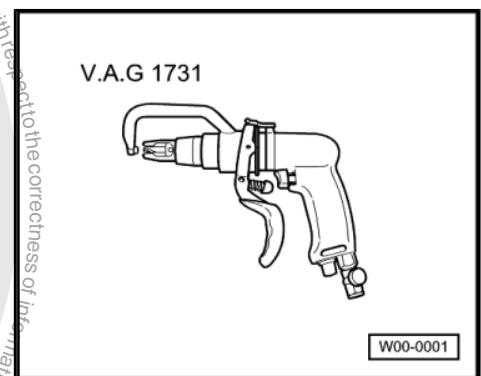
4.10 Fold crimping tool -V.A.G 1585-



4.11 Local exhaust ventilation unit - V.A.G 1586-



4.12 Spot weld breaker -V.A.G 1731-

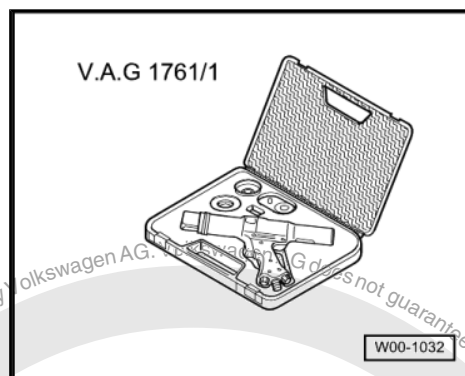




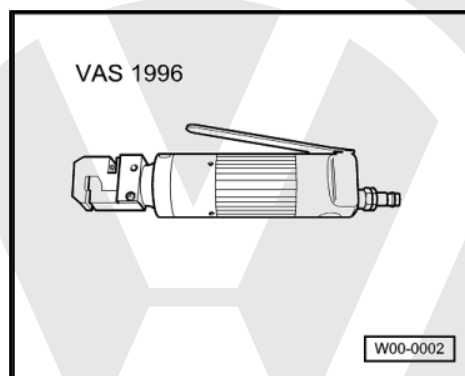
4.13 Pneumatic cartridge gun -V.A.G 1761/1-

Pneumatic cartridge gun to produce sealing and underbody protection to original factory condition.

Over and above this all 310 ml. cartridges can be used in this gun.

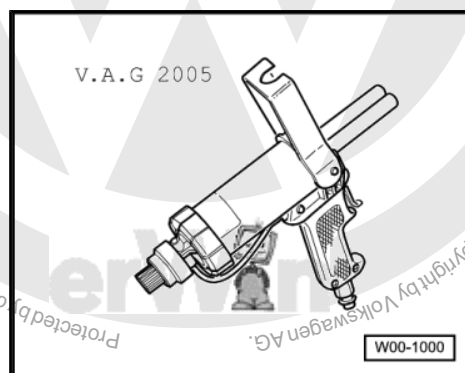


4.14 Pneumatic punch and offset tool -VAS 1996-

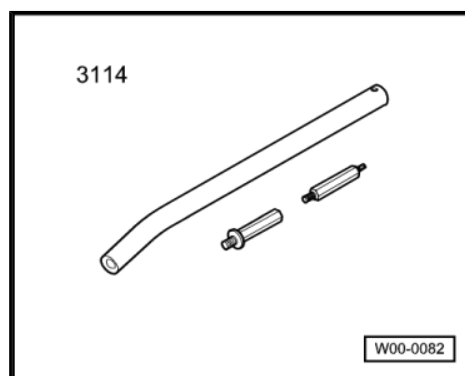


4.15 Pneumatic glue gun -V.A.G 2005-

- ◆ For body adhesive



4.16 Door hinge alignment tool

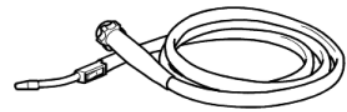




4.17 Hose set 5023

- ◆ Nozzles for hose set 5023/1

VAS 5023

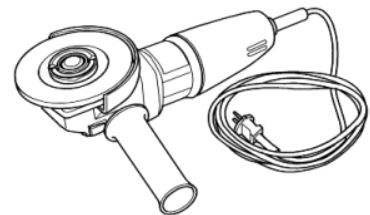


W00-0003

4.18 Angle grinder -VAS 5174-

- ◆ 710 Watt; 115 mm Ø

VAS 5174

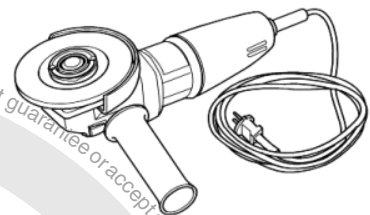


W00-1024

4.19 Angle grinder -VAS 5175-

- ◆ 1500 Watt; 180 mm Ø

VAS 5174

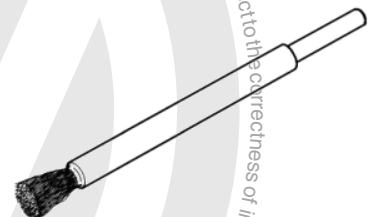


W00-1024

4.20 Wire brush -VAS 5182-

- ◆ For removing paint in inaccessible areas (e.g. inner roof frame).

VAS 5182



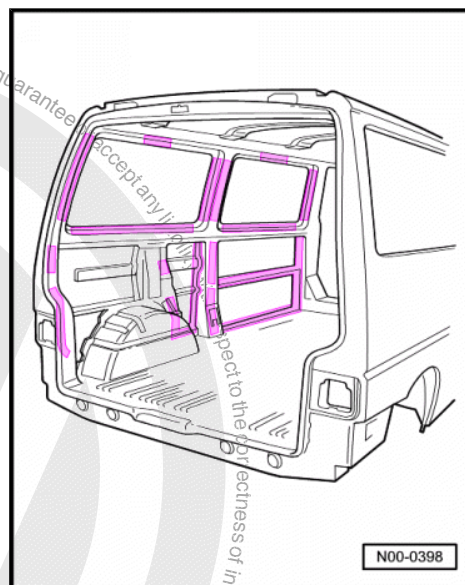
W00-0999



5 Body bonded joints

5.1 Transporter 1991 ▶

The following procedures are employed for repairing bonded joints:



5.1.1 Separating procedure:

- Separate the bonded joint with the oscillating cutting knife.
- Remove adhesive remains with knife and scraper.

5.1.2 Bonding procedure:

- ◆ Material: D 180 KD1 A3
- Measures for preparing the areas to be bonded, and specific information for using the adhesive should be taken from the instructions for use of the repair adhesive.

5.2 Types of bonded joints

Bonded joints, including spot welded bonded joints, are being increasingly produced at the factory to increase the body rigidity and stability. They differ as follows:

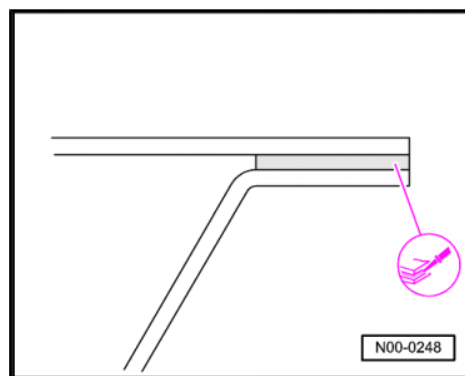
5.2.1 Joints bonded for strength

With these bonded joints the panels are joined only by adhesive.

The distance between the surfaces bonded for strength should not be less than 2 mm and not more than 4 mm. The surfaces to be bonded must be aligned if necessary.

Repair measures

- The bonded joints are re-established using the materials as given in the Workshop manual or replacement parts programme.



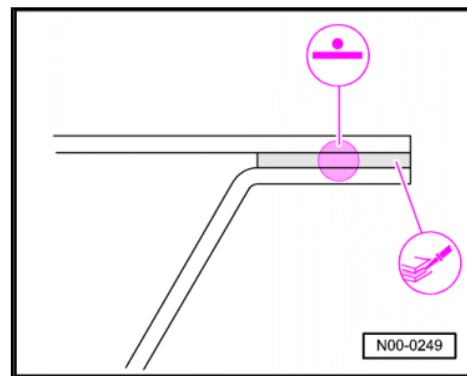


5.2.2 Spot welded bonded joints

For spot welded bonded joints an electrically conductive adhesive is used between the panels, which allows problem free welding.

The distance between the spot weld bonding surfaces should not be more than 1 mm. The surfaces to be bonded must be aligned if necessary.

The welding current must not be increased for spot welded/bonded joints. The pre-press time must be increased due to the adhesive displacement, about 30 - 50 periods. The gases produced must be extracted.



5.3 Repair solutions for part section replacement

Adhesive DA 001 730 A1 in conjunction with pneumatic glue gun -V.A.G 2005- is used as a substitute for the spot weld adhesive.

For simultaneous bonding and welding the procedures are dictated by the type of weld (spot welding, shielded arc welding) as follows:

5.3.1 RP spot welding and bonding

When spot welding and bonding in repair cases, all spot welds and bonded areas are reinstated as for a production vehicle.

For welding problems, i.e. a three-layer panel joint, if only the outer panel is replaced the spot weld points are set over the "old" spot weld points.

5.3.2 SG welding and bonding (when spot welding is not possible)

If it is not possible to reach a bonded joint with a spot weld unit then SG plug welds are used.

In this case, to ensure a good root weld the adhesive is not used. Spacing of SG plug welds is set at 15 mm.

5.3.3 Extraction of welding fumes

When spot welding in conjunction with spot weld adhesive, the normal extraction system for welding galvanized panels is used.

5.3.4 Preparation

The sheet metal parts to be welded in must be adapted to fit prior to applying the adhesive.

The adhesive surfaces in the area of the weld must be free of primer and remains of adhesive as well as dust and grease.

The otherwise normal application of zinc spray is not performed in area of adhesive.

When spot welding the adhesive is dispersed over the bare metal weld flanges, which coats them and therefore provides the corrosion protection.

5.3.5 Supplementary work

- Wipe off excess adhesive.
- Corrosion protection measures ⇒ [page 22](#)
- Paint construction ⇒ Binder Surface treatment / Chemical materials



6 Anti-corrosion measures

6.1 Anti-corrosion protection

The standard anti-corrosion protection must be restored after repairs with materials which have been approved by the vehicle manufacturer.

⇒ See Workshop Manual on painting





7 Disposal instructions

7.1 Disposal

The first step to enable a part of the vehicle to be fed into a recycling circuit after repairs or servicing, is that the Volkswagen and Audi dealers collect materials according to types!

This sorting is to be carried out according to the following material groups:

- Sheet steel or iron material ("steel scrap") → scrap dealer and Schredder operator
- Aluminium → engine reconditioning Kassel; scrap dealer or special engine scrap dealer
- Tyres → in some cases for retreading
- Plastics → PP bumper and presently via VW, Audi collection logistics; further plastic recycling is being prepared
- Batteries → existing recycling circuit via regional disposal
- Old oil → existing method of disposal
- Brake fluid → material circuit being prepared
- Anti-freeze → material circuit being prepared
- Refrigerant → existing method of disposal
- Refrigerant oil for R 12 → as for engine oil refrigerant oil for R 134a → material circuit being prepared
- Dampers, e.g. bumper dampers, filled with oil → Remove the oil and dispose of it in the accustomed way
- Gas filled dampers e.g. gas struts → release gas, collect escaping oil and feed into the existing method of disposal
- Separate differing types of material to make possible type-sorted reuse. For example remove tyres from wheels and feed into disposal system separately.

7.2 Releasing gas from strut

- Clamp gas-filled strut in vice in area x = 50 mm.



WARNING

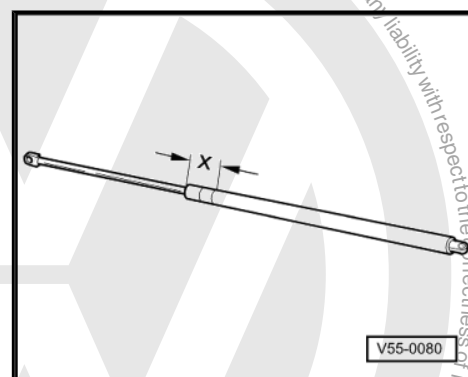
Clamping in vice may only be carried out in this area, otherwise there is danger of accident!

- Saw through cylinder of gas-filled strut within first third of cylinder's overall length using piston rod end of cylinder as reference point.



Note

- ◆ Protective goggles must be worn during sawing process.
- ◆ Cover area of saw cut with a cloth to catch escaping oil.
- ◆ Feed oil and cleaning clothes into existing method of disposal.





7.3 Airbag



WARNING

Scrapping airbag units which have not been ignited is a hazard.

7.3.1 Disposal

Within the framework of material disposal, since 01. 12. 97 Volkswagen in Germany takes back free of charge, all airbags/belt tensioners which have not been ignited. The return take place via the responsible sales centre. Pyrotechnic components which have been ignited in a accident, can be disposed of in the scrap or commercial refuse similar to the normal house refuse.





8 Contact corrosion protection

8.1 Joining aluminium/magnesium and steel



Note

- ◆ *When joining aluminium or magnesium to steel the following corrosion protection measures must be observed. At the threaded connection points between aluminium and steel or magnesium and steel:*
- ◆ *Mudguard*
- ◆ *Bonnet*
- ◆ *Doors*
- ◆ *Rear lid, protective film must be used.*
- ◆ *When bolting aluminium or magnesium to steel only use dacromet coated bolts, which can only be used once. Dacromet is green chemical protective coating, which protects against contact corrosion.*
- ◆ *Non-metallic connection or sealing elements (door seals, rear lid seal) between two different metals must not be electrically conductive.*
- ◆ *Special genuine replacement parts for the Lupo 3L start with the part number 6E.*
- ◆ *Special procedures can be found in the appropriate repair group in Workshop Manual:*
- ◆ *Lupo 1999⇒ General body repairs, interior*
- ◆ *Lupo 1999⇒ General body repairs, exterior*



9 Steel sheet repairs

9.1 Strengthened steel body panels

Strengthened steel body panels are being increasingly used in our vehicles. The areas of use of these parts are shown in the illustration in the Workshop Manual General Body Repairs, Repair Group 00.

What is strengthened steel sheet?

Optically normal sheet metal, but due to the addition of various alloys, it has a higher yield limit than standard body metal. This means, with an equivalent impact, the dent in strengthened sheet metal will not be so deep as that in standard body sheet metal.

What has to be observed when removing dents?

Dents can be removed with the usual tools. More force may have to be applied since there is more bounce due to the greater buckling strength. If creases are removed, the material could fracture.

What has to be observed when straightening with an alignment bank or hydraulic press?

Due its greater bounce, sheet metal of higher rigidity has to be overstretched more than standard sheet metal before it stops in the desired position. However, the greater force applied also affects parts made of standard metal which are welded to the strengthened steel parts. This increases the stress on these parts. Additional anchoring must be provided to prevent the standard sheet metal going way or fracturing.



WARNING

- ◆ *If strengthened steel is significantly overstretched, it will suddenly extend to a length greater than that required!*
- ◆ *For reasons of safety, as for normal body sheet steel it is not permitted to heat up strengthened body steel sheet to reshape it!*

What has to be observed when painting?

Strengthened steel will expand if it is heated too quickly with a drier radiator. If a panel is spot welded or securely bonded to a reinforcement behind it, dents will be formed at these points. These will remain visible after the panel has cooled down. For this reason, drier radiators are only to be brought to full power very gradually. There are no restrictions on drying in a drier booth.

9.2 Galvanized body parts

9.2.1 Preparation

- Only remove underbody protection/sealing materials with a hot air blower (max. 420°C) or with rotating wire brush.
- Remove paint and primer with paint remover (LLE 812 000 A2) or rotating plastic brush.

9.2.2 Parting cuts

- Where possible, avoid hot separation techniques (cutting torch) - course cuts only.



- To prevent damage to the zinc coating in the separating area, mechanical separating procedures are preferred, e.g. spot weld miller, body saw.

9.2.3 Joint techniques

Electric resistance welding (RP) causes only slight burning of the zinc coating at the centre of the spot welds. The protective zinc ring which is simultaneously built-up around the spot weld provides protection against corrosion.

Whenever possible, always use resistance spot welding techniques (RP).

When electric resistance spot welding (RP) note various thicknesses of zinc layers (carry out trial weld).

Only use shielded arc welding (SG) instead of electric resistance spot welding (RP) when nothing else is possible.

Always apply welding primer between joint flanges (zinc spray D 007 500 04).

Apply Vario body filler (ALN 787 200 10) to joints.

9.3 Welding work on galvanized body panels



WARNING

Good workplace ventilation and smoke extraction must be ensured by appropriate extraction systems, e. g. -V.A.G 1586- since toxic zinc oxide is produced when welding galvanized steel sheets.

9.3.1 SG inert gas welding of galvanized panels

The following welding criteria must be observed, in order to achieve high quality inert gas arc welded joints:

- ◆ The current (amperage) must be increased at the welding transformer.
- ◆ At the same time the wire feed must be readjusted since the voltage increase on its own merely results in a greater arc (less penetration, porous seam structure).
- ◆ Use cylindrical instead of conical gas nozzle (spatters on too narrow a gas jet result in pore formation).
- ◆ Guide the torch about 12 mm above the plates being welded at a neutral up to 10° angle.
- ◆ Use the softest wire possible.
- ◆ CO₂ and mixed gases may be used as inert gas.

9.3.2 RP welding of galvanized panels

When resistance spot welding galvanized panels the following points must be observed:

9.3.3 Welding transformer

- ◆ Increase welding current -Ampère- by 10 % up to max. 30 %.

If the welding transformer permits "welding time regulation" a longer welding time is more advantageous.



- Welding time prolongation (reference values) panel thickness:
- 0.6 mm - min. 7 periods
- 0.8 mm - min. 9 periods
- 1.0 mm - min. 11 periods

Welding time is correct if the welding spots can be placed without spattering.

9.3.4 Welding clamp

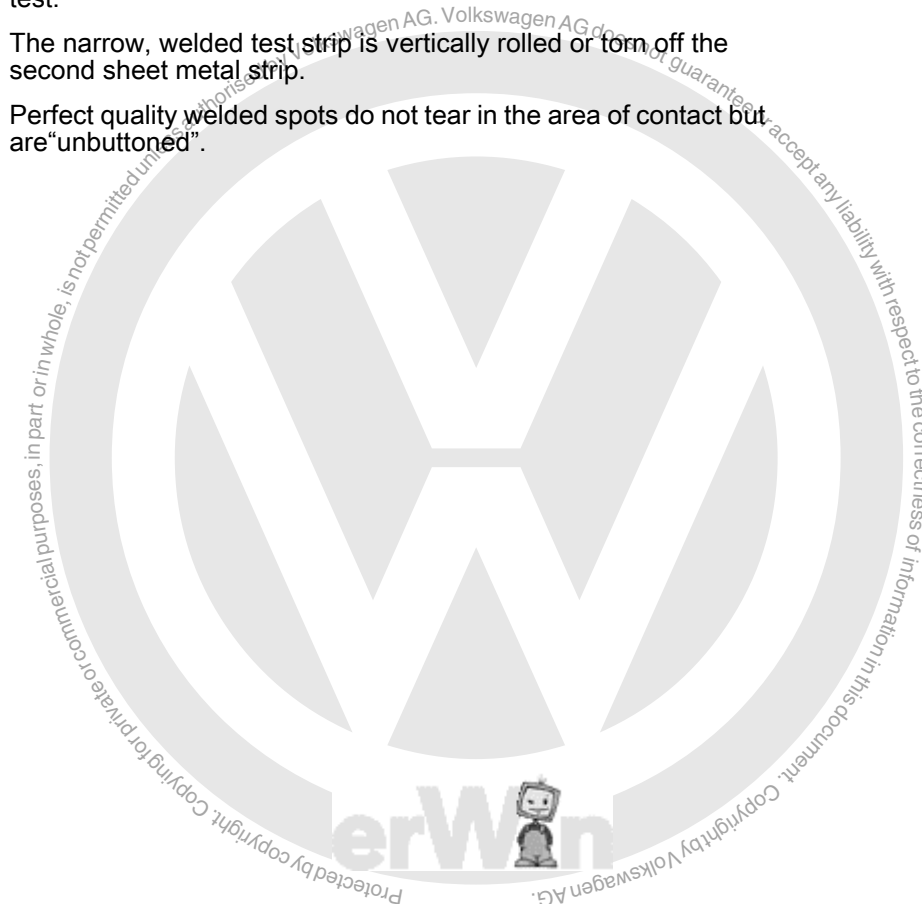
- ◆ Use hard copper electrodes (copper-chrome-zirconium plated) with high temperature resistance ($>400^{\circ}\text{C}$).
- ◆ Frequently clean hard copper electrodes and rework edge of contact surface diameter 4 mm \varnothing .
- ◆ Increase electrode pressure.

9.4 Unbuttoning test

How favourable the welding results are can be determined by welding specimen plates and then carrying out an unbuttoning test.

The narrow, welded test strip is vertically rolled or torn off the second sheet metal strip.

Perfect quality welded spots do not tear in the area of contact but are "unbuttoned".





10 Aluminium repairs



Note

- ◆ *These instructions are valid only for conventional steel vehicles on which aluminium body panels are installed.*
- ◆ *The range of application of these panels is depicted on an illustration in the respective Body repairs Workshop Manual, Repair group 00.*
- ◆ *The workshop manual still applies to repairs to full aluminium vehicles (e.g. Audi A8) ⇒ Body repairs; Audi cars; Aluminium, General instructions*



WARNING

Use tools for either steel or aluminium.

Recommendation: Aluminium tool set in tool trolley - V.A.G 2010/2-

10.1 Paint

The paint system is identical to the steel body.

Only approved materials for aluminium must be used. ⇒ Paint Workshop Manual



WARNING

Do not remove adhesive points on earth wiring until after painting.

10.2 Surface preparation

Use stainless steel wire brushes only.

Rough discs must not be used because of the smear effect.

Use sanding discs of grade P 80 to P 200.

Use sanding discs, drills, millers and cutting discs with cleaning block DA 009 802 only.

Clean surface with Nitro thinners.

Further surface treatment as for steel.



Note

Cover aluminium parts when grinding/sanding and welding steel parts. If metal swarf/dust contacts aluminium, remove immediately otherwise contact corrosion will occur.



WARNING

Use tools for either steel or aluminium.

Recommendation: Aluminium tool set in tool trolley - V.A.G 2010/2-

10.3 Removing dents

With aluminium there is a greater danger of material stretch than with steel.

Sharp edged or hard panel beating tools (e.g. steel hammer) should not be used and should be replaced by a plastic, wooden or aluminium hammer.

Direct panel beating procedures i.e. aluminium panel lies between dolly and panel beating hammer should be reduced to a minimum.

Panel beating aluminium panels begins as opposed to steel in the middle of the dent.

Aluminium panels should more often be pressed rather than beaten.

When finishing hold the dolly lightly. Finishing too hard can result in the material stretching. For this reason a hard wood dolly should be used.

If material stretching still occurs it can be removed by hot air shrinking.



WARNING

Hot air shrinking temperature max. 150° C.

If a crack appears during panel beating, the part must be renewed!

10.4 Temperature regulation when heating

No temper colours can be seen when heating aluminium.

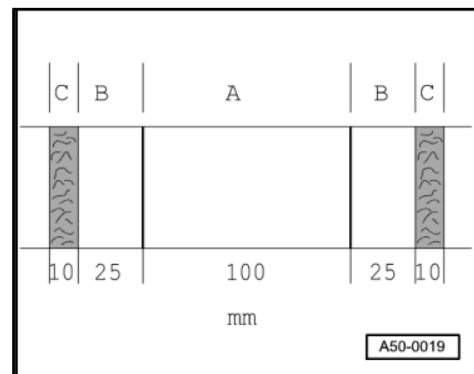
Therefore the temperature must be determined using thermo-pins or thermo-strips.

Thermal pins and thermal strips change colour at a predetermined temperature

A - Heating range

B - Free zone

C - Thermal pin or thermal strips





11 Synthetic material repair procedures

11.1 Materials

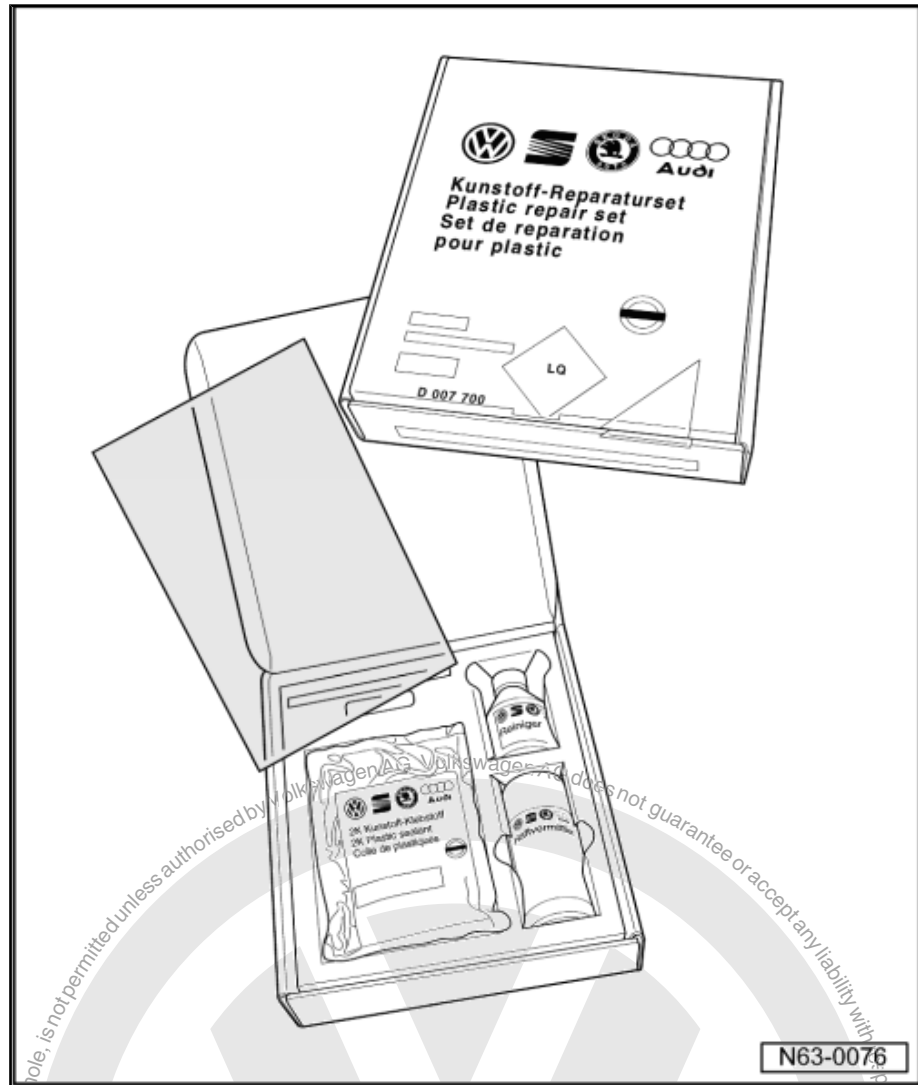


WARNING

Observe the generally valid accident prevention regulations. Safety relevant parts which no longer meet requirements after repairs, e.g. absorbing crash force, must not be repaired.

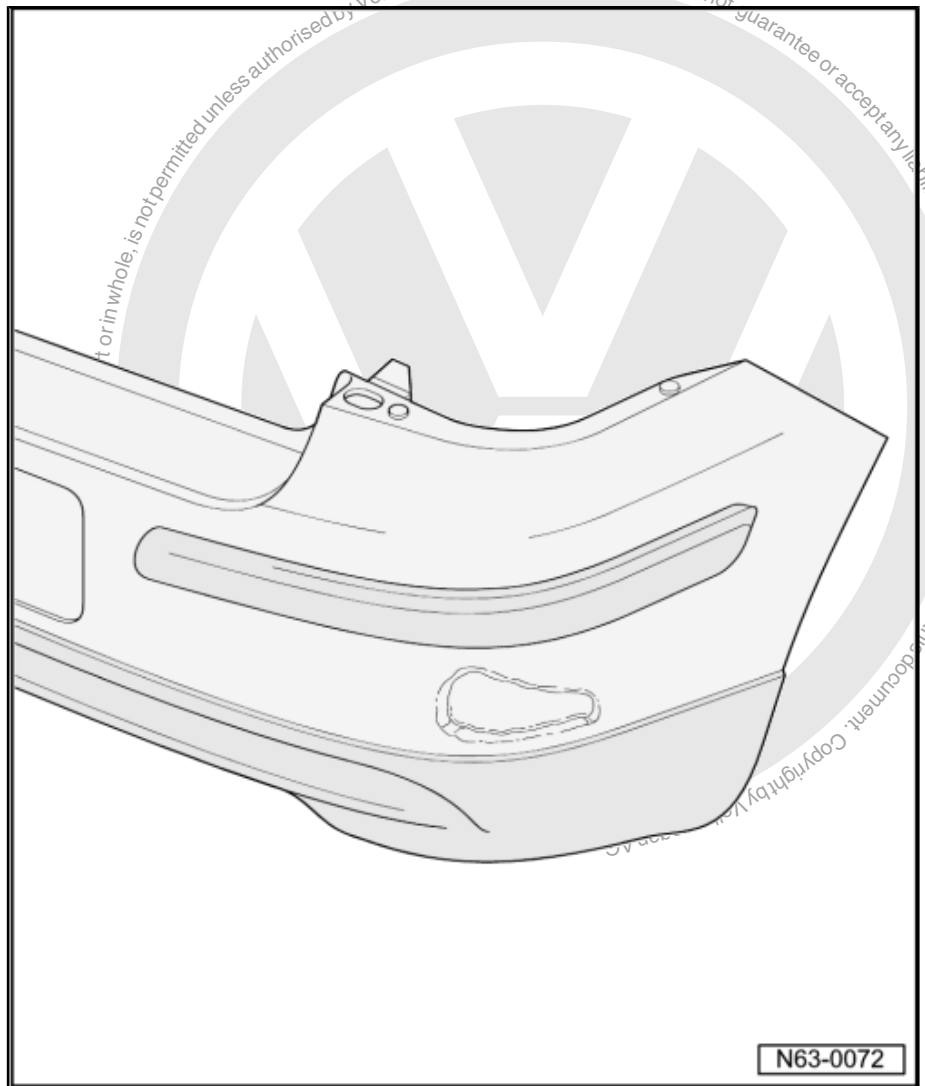
Plastic repairs using plastic repair set D 007 700 covers the repair of painted plastic body parts like e.g. bumper and mirror housing. Before starting repairs check carefully whether a repair is feasible and whether it makes sense commercially (repair/new part).

Plastic parts with a structured surface can also be repaired. However, the surface quality standard of a new part will not be completely attained.

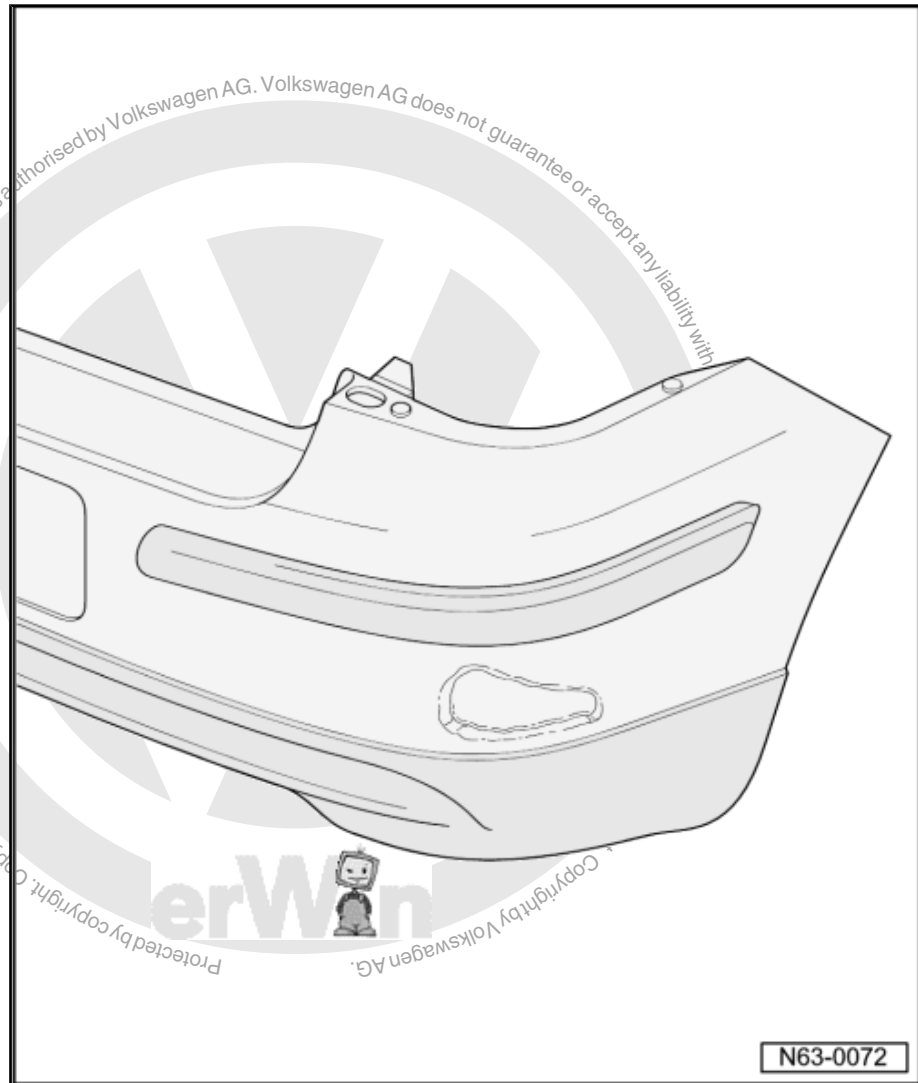




11.2 Repairing dents



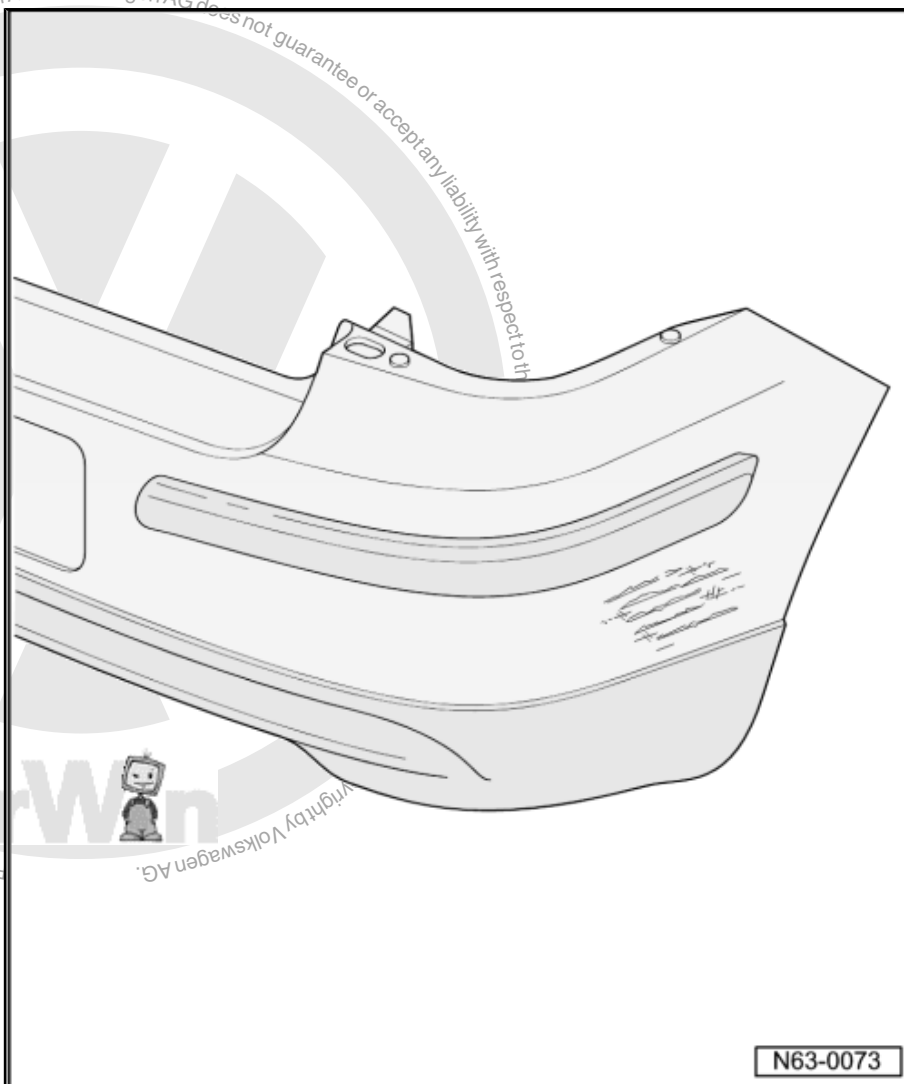
- First clean and dry the part to be repaired.
- Now heat the dent area with a hot air gun until it can be pushed out with an appropriate tool.
- Rub down the area of the dent with sanding paper grade 120.
- Then clean the area under repair with cleaner D 195 850 A1. The flash-off time is 5 minutes.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.



- It is now possible to fill any remaining unevenness with adhesive D 180 KU A1 and smooth with a spatula.
- The hardening process can be accelerated with an infrared lamp. Set it to 15 minutes at 60°-70°C.
- Sand the area under repair smooth with grade 120 sand paper.
- Remove sanding dust.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- Paint in accordance with Painting Workshop Manual.



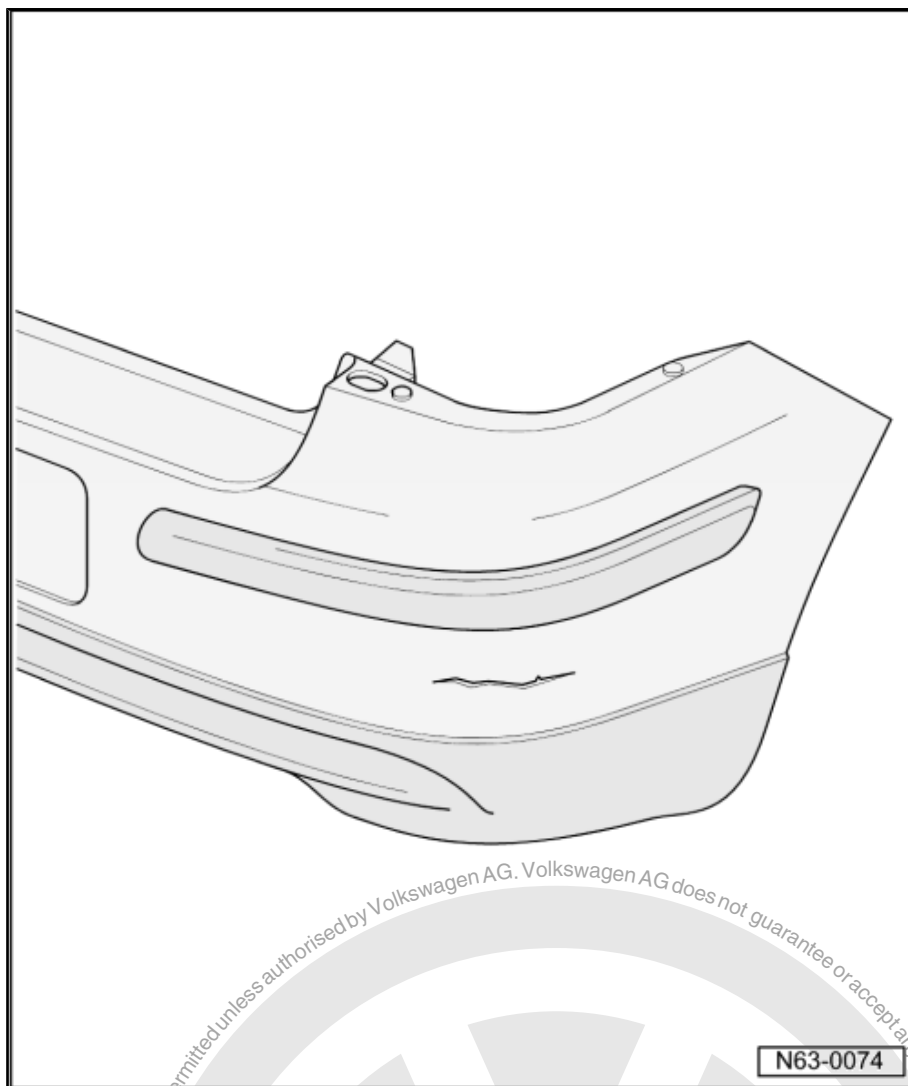
11.3 Repairing scratches



- First clean and dry the part to be repaired.
- Remove proud material with grade 80 sanding paper.
- Then clean the area under repair with cleaner D 195 850 A1. The flash-off time is 5 minutes.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- It is now possible to fill any remaining unevenness with adhesive D 180 KU A1 and smooth with a spatula.
- The hardening process can be accelerated with an infrared lamp. Set it to 15 minutes at 60°-70°C.
- Sand the area under repair smooth with grade 120 sand paper.
- Remove sanding dust.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- Paint in accordance with Painting Workshop Manual.



11.4 Repairing cracks (up to 100 mm in length)

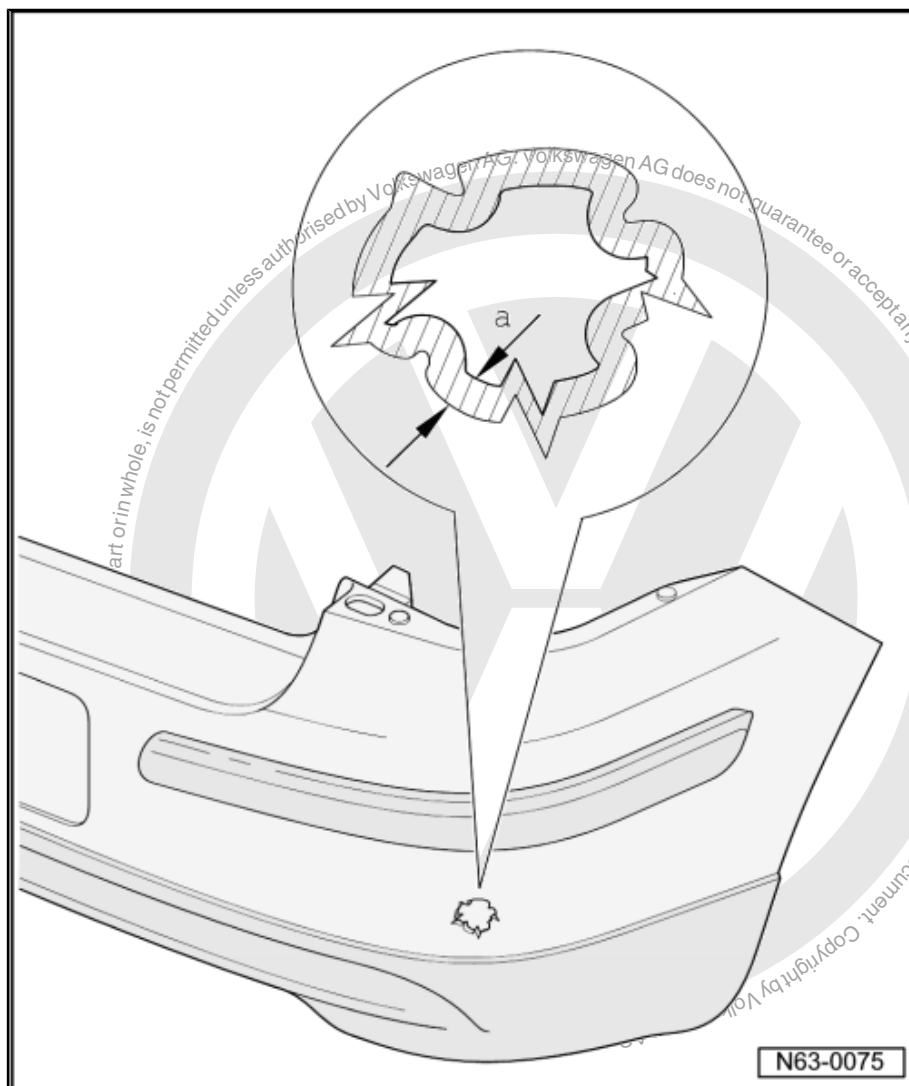


- First clean and dry the part to be repaired.
- You can remove the unevenness caused by the overexpansion by drilling the crack (5 mm) and sanding it out in the shape of a V.
- Then clean the area under repair with cleaner D 195 850 A1. The flash-off time is 5 minutes.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- First bond a D 002 KD A1 reinforcement fleece to the rear of the area being repaired using the adhesive D 180 KU A1 so that it overlaps the area being repaired by at least 20 mm.
- The hardening process can be accelerated with an infrared lamp. Set it to 15 minutes at 60°-70°C.
- Then fill the front sanded out area with adhesive D 180 KU1 A1 and smooth with a spatula.
- The hardening of the front should also be accelerated with infrared lamp as previously mentioned.
- Sand the area under repair smooth with grade 120 sand paper.



- Remove sanding dust.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- Paint in accordance with Painting Workshop Manual.

11.5 Repairing hole (up to 30 mm diameter)

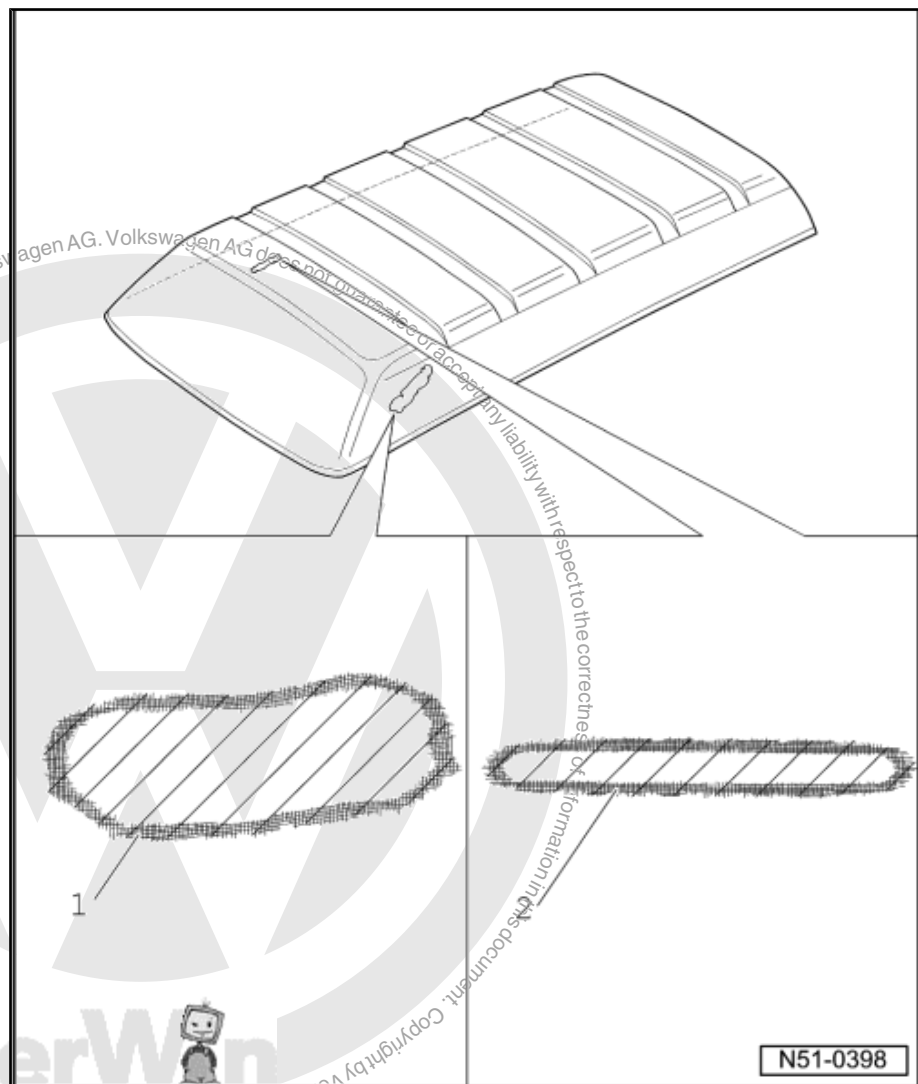


- First clean and dry the part to be repaired.
- Use 120-grade sanding paper to sand the area being repaired in a funnel shape 10-20 mm, dimension a.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- Rough-up the area with grade 120 sanding paper.
- Then clean the area under repair with cleaner D 195 850 A1. The flash-off time is 5 minutes.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- First bond a D 002 KD A1 reinforcement fleece to the rear of the area being repaired using the adhesive D 180 KU A1 so that it overlaps the area being repaired by at least 20 mm.



- The hardening process can be accelerated with an infrared lamp. Set it to 15 minutes at 60°-70°C.
- Then fill the front sanded out area with adhesive D 180 KU1 A1 and smooth with a spatula.
- The hardening of the front should also be accelerated with infrared lamp as previously mentioned.
- Sand the area under repair smooth with grade 120 sand paper.
- Remove sanding dust.
- Now spray thinly with adhesion promoter D 195 150 A1 and observe a 10 minute flash-off time.
- Paint in accordance with Painting Workshop Manual.

11.6 Synthetic material repair (glass fibre materials)



WARNING

Observe the generally valid accident prevention regulations. Safety relevant parts which no longer meet requirements after repairs, e.g. absorbing crash force, must not be repaired.



1- Rupture/hole

- ◆ Glass fibre mat, polyester resin and hardener

2- Surface damage

- ◆ Glass fibre reinforced polyester resin, hardener

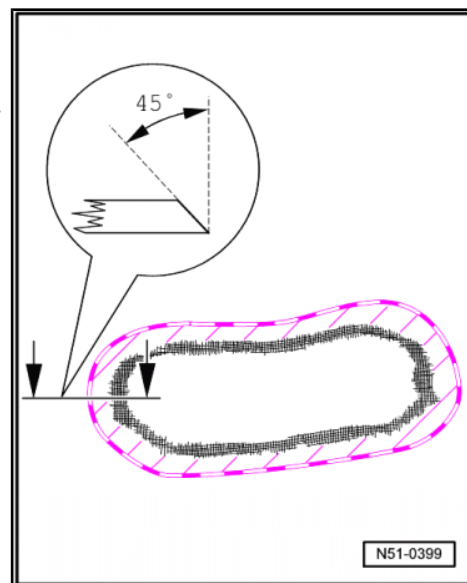


Note

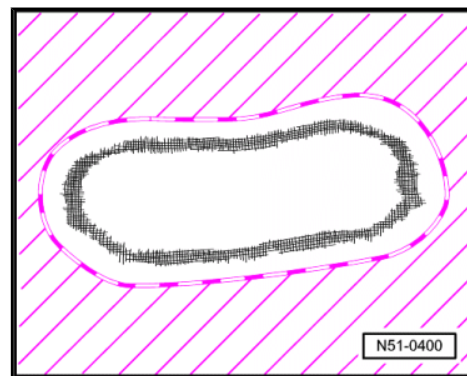
Observe manufacturer's instructions when using materials.

11.7 Repair procedures

11.7.1 Repairing rupture/hole



- Grind peripheral edge of rupture/hole to 45°.

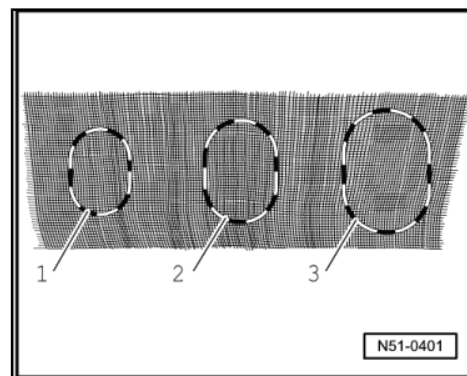


- Sand area approx. 100 mm wide around rupture/hole -hatched area- using 150 grade sanding paper and then clean with silicone remover.
- Cut three glass fibre mats: -1- Overlap rupture/hole approx. 25 mm , -2- Overlap approx. 50 mm,-3- Overlap approx. 75 mm.



Note

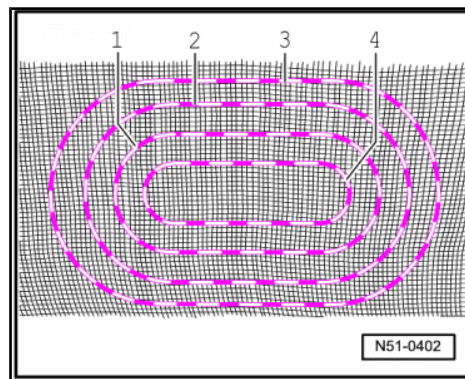
For large ruptures/holes it is recommended to use a polystyrene block as a support. Cover polystyrene with commercially available unprinted PE synthetic foil so that contact with polyester resin is prevented. Then secure the prepared support to the inside of the rupture/hole with adhesive tape.





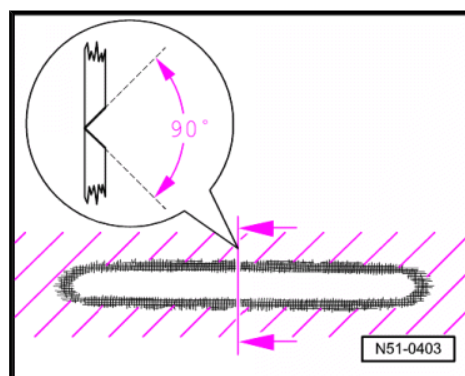
Applying glass fibre mats

- Mix polyester resin (observe manufacturer's instructions).
- Apply thin coat of polyester resin to rupture/hole.
- Soak smallest glass fibre mat -1- in polyester resin and apply to rupture/hole -4-.
- After applying immediately remove air bubbles in polyester resin with a pointed tool.
- After applied material has hardened, sand surface flat using 120 grade sanding paper.
- Clean area being repaired with silicone remover.
- Repeat work sequence for the second -2- and third-3- glass fibre mats.

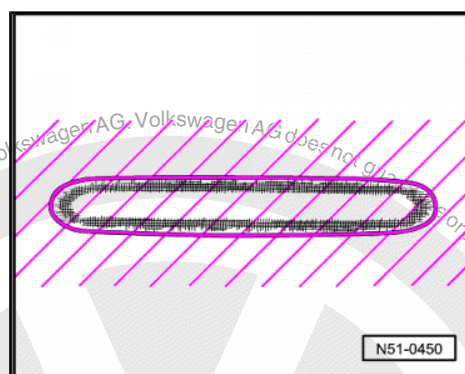


11.7.2 Repairing damaged surfaces

- Sand damaged surface to form a V.
- Sand area approx. 50 mm wide around damaged surface - hatched area- using 150 grade sand paper.



- Clean area being repaired with silicone remover.
- Mix glass fibre reinforced polyester resin (observe manufacturer's instructions) and apply to area being repaired -hatched area-.
- After applied material has hardened, sand down area being repaired flat and clean with silicone remover.





12 Glass repair

12.1 Repairing windscreen

Apart from replacing a windscreen, a cost effective repair is available for windscreens which have been damaged by stone chip-pings, provided the conditions are adhered to.

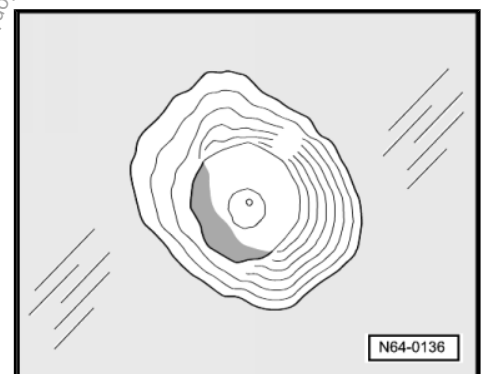
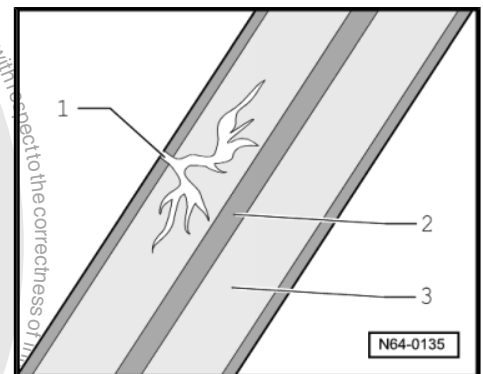
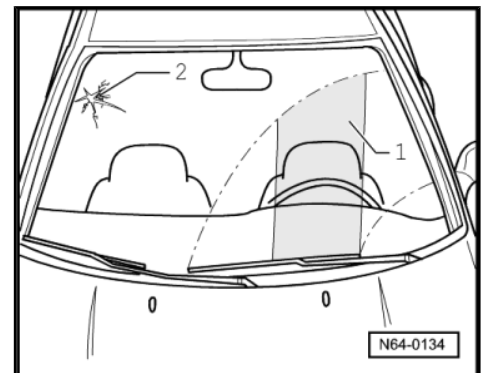
Tinted windows, windows with a coloured sun strip or insulated glass (Audi A8, A6) can also be repaired, as the tinting is provided by the colour of the intermediate foil.

Repairing the windscreen, under the following prerequisites, is to be preferred to replacement.

12.1.1 Prerequisites

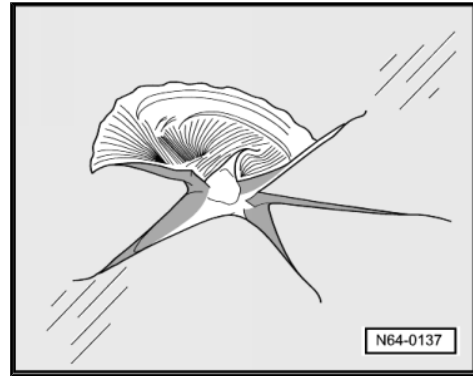
- The damaged area must not be in driver's direct long field of vision -1-. This field corresponds to a 29 cm wide strip (A4 landscape) in centre of driver's direct forward field of vision, limited at top and bottom by windscreen wiper wiped area.
- The cracks radiating from the damaged area -2- must not be longer than 50 mm and/or not run outwards to the edge.
- Diameter of damaged area -1- not larger than 5 mm.
- Intermediate foil -2- or inner glass-3- must not be damaged.
- There must be no dirt or moisture in area of lower cracks.
- Therefore the time elapsed since the damage occurred must not be too long.

Repair of the following damage is permitted provided that it does not lie within the field of vision or window edge area:



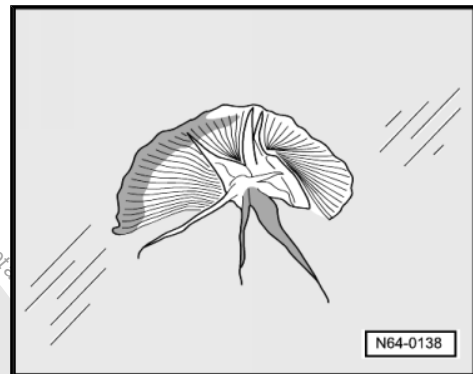


Crater



Combi-break

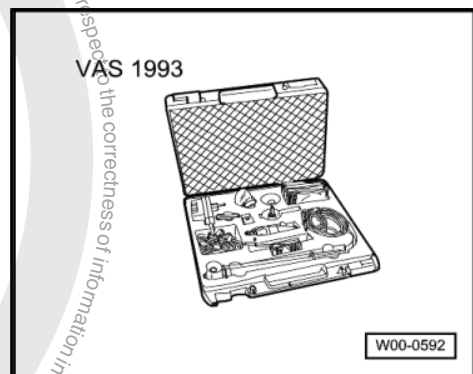
Star and crack



12.1.2 Special tools, workshop equipment, testers, measuring instruments and auxiliary items required

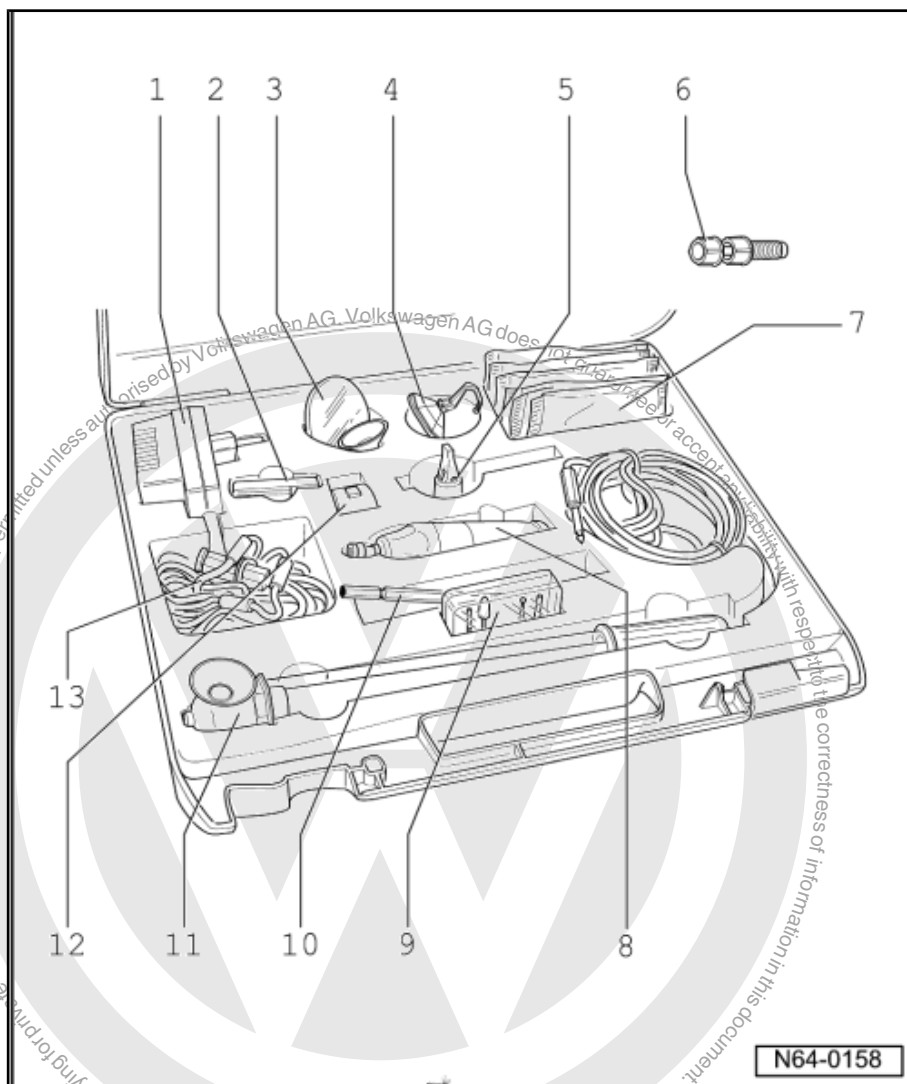
- ◆ VAS 1993- Windscreen repair set

Includes the following tools:



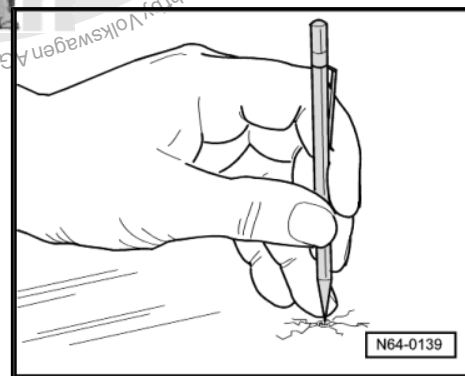


- 1 - Transformer
- 2 - Resin knife (1 set)
- 3 - Mirror
- 4 - Suction hook
 - ☐ Used as a vacuum pump
- 5 - Tool holder
- 6 - Injector
 - ☐ Place in opaque packing after first use
- 7 - Resin, for minimum 15 applications
- 8 - 12V drill
- 9 - Grinding and polishing set
- 10 - Scriber
- 11 - UV lamp
- 12 - Foil
- 13 - Battery connection cable



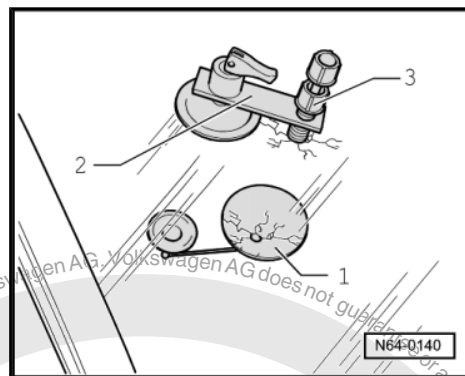
12.1.3 Description of repair

- Repairs undertaken in an area not in direct sunlight.
- The repair area must be about room temperature.
- The work area must be protected from moisture.
- Loosen point of penetration with hard metal scriber but do not increase size or remove pieces of broken glass.

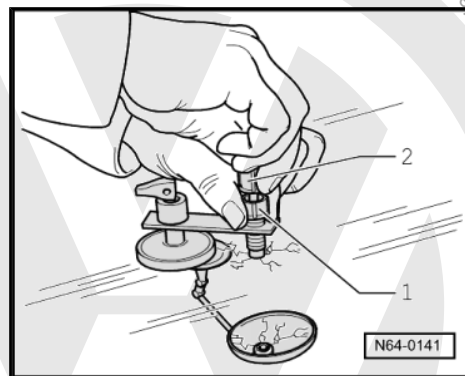




- Remove any moisture with suction hook, assisted by a hot air blower from interior. Terminate repair if moisture cannot be removed.
- Fit the mirror -1- from the inside and align it in such a way that the damaged area can be easily observed.



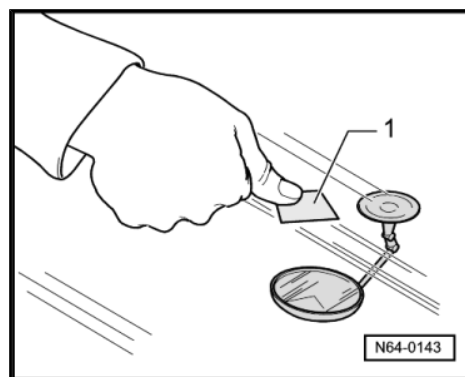
- Fit the tool holder -2- with injector-3- in such a way that the rubber seal of the injector lies exactly over the point of penetration. Check by looking in mirror.
- Remove threaded spindle -2- completely from injector -1-.
- Place 2...3 drops of resin in injector -1- (this quantity of resin is sufficient for every damaged area).
- Place resin bottle immediately in its packaging as resin is UV light sensitive.
- Wait until resin has run to rubber seal.
- Tension injector -1- by turning spindle in -2-. The correct pressure has been attained, when the penetration point goes clear starting in centre.



Note

The ingress of resin in the cracks is very slow and may not be seen immediately.

- Wait 10 minutes, then release injector up to end of threads.
- Hold injector when loosening so that it does not move.
- Repeat sequence (at least 3 times) until all the air has been evacuated from damaged area. You can tell this by the fact that the cracks become increasingly invisible. A pressure of up to 18 bar is produced when tensioning injector.
- Check in mirror when damaged area is full. Then end injection.
- Then swivel holder with injector to side and check that resin has reached all break points.
- Remove any air locks still present by placing suction hook over area being repaired.
- Cut covering foil -1- and keep to hand. Remove injector with tool holder and place covering foil immediately over damaged area (do not press on) to prevent air entering. The foil contains an activator to harden the resin.





- Place the injector immediately in its packaging, because the resin is UV light sensitive and can be used for the next repair. Place tool holder, in released position, in tool box and remove mirror with holder.
- Secure UV lamp -1- over damage area. Allow UV light to act on resin for 10 minutes then remove UV lamp.
- Smooth damaged area with resin knife, polish with 12 volt drill and polishing attachment if necessary.



Note

- ◆ *The vehicle can be used immediately after repairs without waiting a curing period.*
- ◆ *There is a possibility that traces of some breakages will remain with some forms of damage but this will not influence the repair result.*
- ◆ *After the repair work the window can be put under strain as usual due to the pressed-in, hardened resin and any further cracking is impossible. The hardened resin is colourless and has an identical light refracture index as the glass.*

