

Workshop Manual

Citigo 2012 ➤, Citigo-e iV 2020 ➤,
Enyaq 2021 ➤, Enyaq Coupe 2021 ➤,
Fabia 2000 ➤, Fabia II 2007 ➤,
Fabia II 2009 ➤, Fabia II 2011 ➤,
Fabia III 2015 ➤, Fabia IV 2022 ➤,
Kamiq 2019 ➤, Karoq 2018 ➤,
Karoq 2020 ➤, Kodiaq 2017 ➤,
Kodiaq 2019 ➤, Kodiaq 2021 ➤,
Octavia 1997 ➤, Octavia II 2004 ➤,
Octavia II 2010 ➤, Octavia III 2013 ➤,
Octavia III 2014 ➤, Octavia IV 2020 ➤,
Octavia IV 2021 ➤, Rapid 2011 ➤,
Rapid NH 2013 ➤, Rapid NH 2014 ➤,
Roomster 2006 ➤, Scala 2019 ➤,
Slavia 2022 ➤, Superb 2002 ➤,
Superb II 2008 ➤, Superb III 2015 ➤,
Yeti 2010 ➤, Yeti 2011 ➤

Electrical System - general notes

Edition 12.2021

List of Workshop Manual Repair Groups

Repair Group

- 27 - Starter, current supply, CCS
- 92 - Windscreen wash/wipe system
- 94 - Lights, bulbs, switches - exterior
- 96 - Lights, bulbs, switches - interior
- 97 - Wiring



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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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27 – Starter, current supply, CCS

1 Battery

(SRL001921; Edition 12.2021)

⇒ [a1.1 bout batteries", page 1](#)

⇒ [t1.2 ypes", page 1](#)

⇒ [i1.3 nstructions and safety precautions when working on the battery", page 4](#)

⇒ [o1.4 n the airbag system", page 5](#)

⇒ [c1.5 onnections of battery poles", page 6](#)

1.1 Basics about batteries

In order to ensure a long use, the battery must be inspected, serviced and cared for according to the versions in this workshop manual.

In addition to the function as energy supplier for the start operation, the battery has further tasks as buffer and supplier of electrical energy for the complete electrical on-board power supply in the vehicle.

1.2 Battery types

⇒ [w1.2.1 ith a magic eye", page 1](#)

⇒ [b1.2.2 atteries \(AGM batteries\)", page 2](#)

1.2.1 Batteries with a magic eye



WARNING

Danger of injury! Observe the warning instructions and safety precautions when working on the battery ⇒ [i1.3 nstructions and safety precautions when working on the battery", page 4](#).



Caution

When the battery is being replaced, the correct battery type must always be selected.

The correct battery type must be assigned according to vehicle type, engine type and equipment using the ⇒ [Electronic Catalogue of Original Parts "ETKA"](#).

The batteries described in the following are maintenance-free. The labels must not be released and or covers for cell plugs must not be removed or no distilled water must be topped up.

Battery with a magic eye »Standard«

In all vehicle types with the battery in the engine compartment (except vehicles with the start-stop system and vehicles with the auxiliary heating and additional heating), maintenance-free batteries with liquid electrolyte and magic eye are installed.



Battery with a magic eye »Enhanced«

A battery with a magic eye with EFB technology (Enhanced Flooded Battery) is fitted in vehicles with petrol engines with start-stop system and small engine displacement. It is fitted with thicker plates and separators with special polyester scrim. Thereby the cycle durability as well as the loading capacity are considerably increased in order to recover the energy more quickly while driving.



Note

- ◆ *This battery type is visible at the lettering "EFB" on the top of its housing.*
- ◆ *An "EFB" battery must only be replaced with an "EFB" battery or an AGM fleece battery.*

The magic eye on the battery lid gives information via a colour indicator about:

- ◆ The electrolyte level - the battery indicator of the magic eye can show two colours ⇒ [t2.1.1 the two-coloured indicator of the magic eye", page 7](#)
- ◆ The electrolyte level and the charge state of the battery - the battery indicator of the magic eye can show three colours ⇒ [t2.1.2 the three-coloured indicator of the magic eye", page 8](#) (not valid for "EFB" batteries).



Note

The variant with three colour displays of the magical eye is no longer installed- this can arise on old batteries.



WARNING

- ◆ ***Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. No starting aid must be performed!***
- ◆ ***There is a risk of explosion when testing or performing a starting aid.***
- ◆ ***These batteries must be replaced.***

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Note

We recommend to replace batteries which are older than 5 years of age.

1.2.2 Fleece batteries (AGM batteries)

- ◆ Maintenance-free lead acid batteries on which the electrolyte is defined in a micro-glass fibre fleece (AGM). The battery is closed and fitted with valves.
- ◆ The fleece batteries are marked with the abbreviation AGM (Absorbed Glass Matt).
- ◆ Due to defining the electrolyte, these batteries cannot have a magic eye.



Caution

The fleece batteries cannot and may not be opened.

If the vehicle was fitted with a fleece battery (AGM battery) for first equipment, a new fleece battery must absolutely be installed when replacing the fleece battery.

The correct battery type must be assigned according to vehicle type, engine type and equipment using the → Electronic Catalogue of Original Parts "ETKA".

The maintenance-free fleece battery (AGM battery) is installed:

- ◆ in vehicles with the battery in the luggage compartment (Superb II, 3.6 l engine)
- ◆ in some vehicles with the "start/stop" system
- ◆ in some vehicles with the auxiliary heating and additional heating

1.2.3 Lithium Ion Battery

Visual inspection and classification is possible with this type of battery.

Visual inspection and classification of the battery, 48 V -A6-

- Using the vehicle diagnostic tester, ⇒ Vehicle diagnostic tester perform a condition assessment of the battery under 0021 Battery Management 2.

Visual inspection and classification of the additional battery for coasting function -A8-

- Using the vehicle diagnostic tester, ⇒ Vehicle diagnostic tester perform a condition assessment of the additional battery for coasting function under 008 Battery Management 2.



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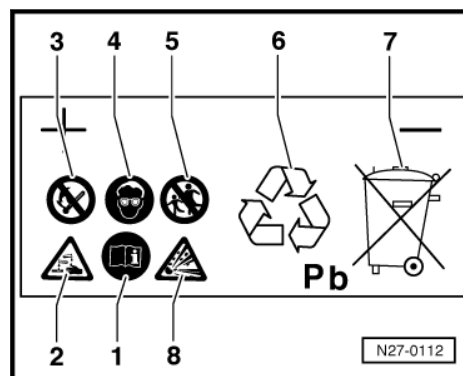
1.3 Warning instructions and safety precautions when working on the battery



WARNING

- ◆ *Persons under supervision e.g. apprentices or trainees must work with vehicle batteries only under the supervision of skilled labourers e.g. mechanics/teachers or electricians/teachers.*
- ◆ *Battery acid is highly caustic. There is a risk that in case of incorrect work on the battery, the personnel can be exposed to the harmful effect of the battery acid. Therefore suitable agents against acid causticization should be made available. A suitable agent is, for example, detergent.*
- ◆ *If battery acid flows out this could lead to causticization of the skin, acid seizure and vehicle corrosion. Under some circumstances, components which are important for the safety of the vehicle could be damaged.*
- ◆ *The detonating gas which results during the charging and also partially when the battery is at rest, is explosive when degassing after the charge. In an extreme case, the battery can explode due to escaping gases as a result of incorrect work on the battery.*
- ◆ *Battery with colourless or bright yellow magic eye must be replaced. It must not be subjected to any test or charge and no starting aid must be performed. There is a risk of explosion when testing, charging or performing a starting aid.*
- ◆ *It is prohibited to create sparks through grinding, welding, cutting work and to use open fire, e.g. smoking in the proximity of the battery. Avoid spark formation through electrostatic discharging. Before touching the battery, it is therefore necessary to touch the vehicle body.*
- ◆ *Work on the batteries must only be carried out in suitable well-ventilated areas.*
- ◆ *Do not expose batteries to direct sunlight.*
- ◆ *Discharged batteries may freeze.*

Warning instructions and safety precautions for lead acid batteries



1 - Observe the instructions on the battery, in the Workshop Manual Electrical System and in the Owner's Manual.

2 - Risk of acid burns:

- ◆ Battery acid is highly caustic, for this reason always wear protective gloves and eye protection.
- ◆ Do not tilt battery as otherwise acid may flow out of the vent openings.

3 - No fire, sparks, naked lights or smoking:

- ◆ Avoid creating sparks when handling cables and electrical equipment.
- ◆ Avoid short circuits.

4 - Wear eye protection.

5 - Keep acid and batteries away from children.

6 - Disposal:

- ◆ Old batteries must be disposed of in compliance with the country specific regulations.

7 - Never dispose of old batteries as domestic waste!

8 - Risk of explosion:

- ◆ A highly explosive gas mixture is produced when charging batteries.

1.4 Working on the airbag system



WARNING

When working on the airbag system (pyrotechnic components of the control unit for airbag -J234-, wiring), the earth strap must be disconnected with the ignition switched on.

Exception: For vehicles with a battery inside the vehicle, the ignition must be switched off.

- ◆ *Then disconnect the negative terminal.*
- ◆ *After disconnecting the battery it is essential to wait 10 seconds.*
- ◆ *The battery must be connected with the ignition switched on.*
- ◆ *Nobody should be inside the vehicle when the battery is being connected.*
- ◆ *If this is the case, make sure that you are not within the effective range of the airbags and belt tensioners.*
- ◆ *Vehicles with the interface for access and start system with keyless start authorisation - the ignition can be switched on with ⇒ Vehicle diagnostic tester outside the vehicle.*
- ◆ *If the ignition is not switched on after reconnecting the battery - the warning lights in the dash panel insert are not illuminated - the ignition (key/button) may only be switched on while sitting in the driver's seat, with it in the rearmost position.*

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**Note**

For vehicles with a high-voltage battery, a voltage test of the 12-volt vehicle electrical system must be carried out after disconnecting the 12-volt battery. When voltage is applied, the high-voltage system must be disconnected.

1.5 Screwed connections of battery poles**WARNING**

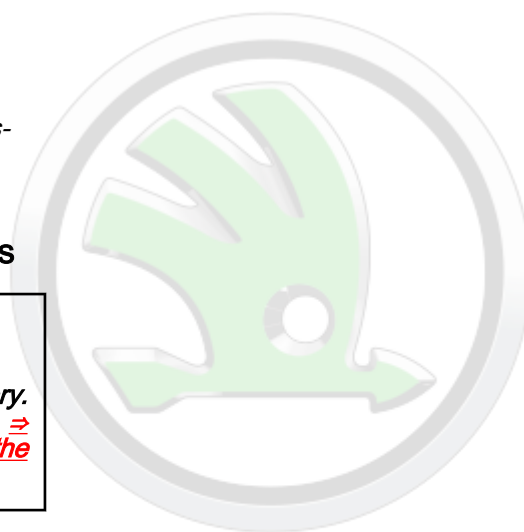
*There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ **i1.3 nstructions and safety precautions when working on the battery", page 4**.*

**Caution**

In order to prevent damage to the battery pole terminals as well as the battery poles, pay attention to the following:

- ◆ *Neither grease nor oil the battery terminals.*
- ◆ *The battery pole terminals must only be fitted by hand without using any force in order to avoid damaging the battery housing.*
- ◆ *Install the battery pole terminals in such a way that the battery pole with the terminal is on the same level or protrudes.*
- ◆ *After tightening the battery pole terminals to the specified tightening torque, the screws must not be tightened again.*
- ◆ *If both terminals are disconnected, only then disconnect the battery positive pole terminal (+).*

If the battery terminals are not correctly connected and tightened, the cable can ignite. This can result in extensive function problems of the electrical system. A safe vehicle operation is no longer guaranteed.



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2 Checking battery

⇒ [C2.1 heck battery with a magic eye”, page 7](#)

⇒ [f2.2 leece battery \(AGM\)”, page 10](#)

⇒ [i2.3 nspction of the battery”, page 10](#)

⇒ [o2.4 n battery replacement and battery degassing”, page 11](#)

⇒ [t2.5 ester with printerVAS 6161”, page 12](#)

⇒ [t2.6 ester with printerVAS 5097 A”, page 17](#)

⇒ [c2.7 urrent drain when charging”, page 18](#)


⇒ [v2.8 oltage measurement - Demonstration vehicles and stock vehicles”, page 19](#)

2.1 Check battery with a magic eye

Test is carried out in the following order:

1. Visual inspection ⇒ [i2.3 nspction of the battery”, page 10](#)
2. Check the colour indicator of the magic eye
⇒ [t2.1.1 he two-coloured indicator of the magic eye”, page 7](#)
⇒ [t2.1.2 he three-coloured indicator of the magic eye”, page 8](#)
3. Check the battery with a load-free battery tester with printer -VAS 6161- ⇒ [t2.5 ester with printerVAS 6161”, page 12](#) or with a load-dependent battery tester with printer -VAS 5097A- ⇒ [t2.6 ester with printerVAS 5097 A”, page 17](#).
4. Depending on the last test result, check the current drain when charging ⇒ [c2.7 urrent drain when charging”, page 18](#).

2.1.1 “Checking the two-coloured” indicator of the magic eye



WARNING

There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery”, page 4](#).

Difference between the batteries with a magic eye, “two-coloured” indicator.

- Batteries with the two-coloured indicator which are factory-installed are marked with a code which always begins with “5K0”. Then the exact identification is for example 5K0 915 105 D
- The replacement batteries with the three-coloured indicator, which have been purchased from the Škoda Original Accessories, are marked with “000 915 105 Dx”, whereby “x” is a variable. Then the exact identification is for example 000 915 105 DB.



Check the colour indicator of the magic eye



Note

When recharging the battery via a charger or during operation, air locks can form under the magic eye, which can distort the indicator regarding the battery state. For this reason before an inspection of the battery, tap lightly and carefully on the magic eye (for example by using the handle of a screwdriver). The air bubbles disperse in this way and the colour indicator becomes more accurate.

The colour indicator of the magic eye no longer gives information about the charge state of the battery, yet only about the electrolyte level. An exact assessment of the charge state of the battery is only possible using a battery tester ⇒ [t2.5 ester with printerVAS 6161](#), page 12 .

The battery indicator can show two different colours:

- ◆ Black - Electrolyte level O.K.
- ◆ Colourless or bright yellow - Electrolyte level too low. Replace battery.



WARNING

- ◆ ***Battery with colourless or bright yellow magic eye must not be subjected to any test or charge under load. No starting aid must be performed!***
- ◆ ***There is a risk of explosion when testing or performing a starting aid.***
- ◆ ***These batteries must be replaced.***



Note

In accordance with the guarantee, the load-dependent battery tester with printer -VAS 5097A- is no longer used for testing these batteries, but has instead been replaced with the stress-free battery tester with printer -VAS 6161-.

2.1.2 "Checking the three-coloured" indicator of the magic eye



WARNING

There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 instructions and safety precautions when working on the battery](#), page 4 .



Note

Not valid for "EFB" batteries.

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Difference between the batteries with a magic eye, “three-coloured” indicator.

- Batteries with the three-coloured indicator which are factory-installed are marked with a code which always begins with “1J0, 7N0 or 3B0”. Then the exact identification is for example 1J0 915 105 AC
- The replacement batteries with the three-coloured indicator, which have been purchased from the Škoda Original Accessories, are marked with “000 915 105 Ax”, whereby “x” is a variable. Then the exact identification is for example 000 915 105 AB.

Check the colour indicator of the magic eye

Note

- ◆ *When recharging the battery via a charger or during operation, air locks can form under the magic eye, which can distort the indicator regarding the battery state. For this reason before an inspection of the battery, tap lightly and carefully on the magic eye (for example by using the handle of a screwdriver). The air bubbles disperse in this way and the colour indicator becomes more accurate.*
- ◆ *The fact that the magic eye is only located in one battery cell means that the reading is only relevant for that one battery cell. An exact assessment of the charge state of the battery is only possible by means of a battery load test ⇒ [t2.5 ester with printer VAS 6161](#), page 12.*

The colour indicator of the magic eye on these batteries gives information about the electrolyte level and the charge state of the battery.

The battery indicator can show three different colours:

- ◆ Green - Battery adequately charged and electrolyte level O.K.
- ◆ Black - Battery discharged or charged inadequately. Charge battery ⇒ [b3.1 attery](#), page 20 .
- ◆ Colourless or bright yellow - Electrolyte level too low. Replace battery.



WARNING

- ◆ *Battery with colourless or bright yellow magic eye must not be subjected to any test or charge under load. No starting aid must be performed!*
- ◆ *There is a risk of explosion when testing or performing a starting aid.*
- ◆ *These batteries must be replaced.*

Note

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In accordance with the guarantee, the load-dependent battery tester with printer -VAS 5097A- is no longer used for testing these batteries, but has instead been replaced with the stress-free battery tester with printer -VAS 6161-.



2.2 Checking fleece battery (AGM)



WARNING

There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .

Check battery in the following sequence:

- 1 - Visual inspection ⇒ [i2.3 nspection of the battery](#), page 10 .
- 2 - Check battery with stress-free battery tester with printer -VAS 6161- or with load-dependent battery tester with printer -VAS 5097A-.
- 3 - Depending on the last test result, check the current drain when charging ⇒ [c2.7 urrent drain when charging](#), page 18 .

2.3 Visual inspection of the battery



WARNING

- ◆ *There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .*

A visual inspection of the outer state of the battery and of the fixed battery connections must be carried out before comprehensive measurements.

During the visual inspection determine:

- ◆ If the battery housing is not damaged. In the event of damage to the battery housing e.g. the excess acid can lead to severe vehicle damage (not valid for fleece batteries). In the event of excess acid, the contaminated components must be immediately treated with neutralizing agent or with a detergent. Paint damage must be repaired by a specialist.
- ◆ If the battery terminals (connections of the battery cable) are not damaged and if the fixed connection of the terminals is not destroyed in the event of damage to the battery terminals.



Caution

When connecting the battery terminals, observe the work procedure in the prescribed workshop manual ⇒ [c1.5 onnections of battery poles](#), page 6 .

- ◆ To see whether the battery is seated properly in the vehicle, see the assembly workflow of the battery in the associated vehicle.

2.4 Notes on battery replacement and battery degassing

- ◆ The side on which the battery is degassed is relevant for safety.
- ◆ In cases where a degassing hose is used, make sure that the degassing hose is in the correct position and that the degassing opening on the opposite side is closed.
- ◆ When replacing the vehicle battery, make sure that there is no open vent hole near the positive terminal. If a vent hole is opened in this area, it must be closed with a sealing plug.
- ◆ For vehicles with an AGM battery that is installed outside the engine compartment, make sure that the battery is replaced with another AGM battery.
- ◆ If there is a protective cap with moulded sealing plug on the positive terminal of the original battery 000.915.105.DX, with the exception of 000.915.105.DN and all Economy batteries with a simple index, it must be placed on the negative or positive terminal side according to the application. The batteries are listed below.

If an original replacement battery is found with the following part numbers, a red sealing plug must be placed on either the positive or negative terminal side (if it is not already present), original part no.: 000.915.506.

List of batteries with protective cap and moulded sealing plug

OES wet

- ◆ "36 Ah" 000.915.105.DA
- ◆ "44 Ah" 000.915.105.DB
- ◆ "51 Ah" 000.915.105.DC
- ◆ "60 Ah" 000.915.105.DD
- ◆ "61 Ah" 000.915.105.DE
- ◆ "72 Ah" 000.915.105.DG
- ◆ "80 Ah" 000.915.105.DH
- ◆ "85 Ah" 000.915.105.DJ
- ◆ "95 Ah" 000.915.105.DK
- ◆ "110 Ah" 000.915.105.DL
- ◆ "36 Ah" 000.915.105.DN

Economy batteries:

- ◆ "61 Ah" JZW.915.105.
- ◆ "72 Ah" JZW.915.105.A
- ◆ "85 Ah" JZW.915.105.B
- ◆ "44 Ah" JZW.915.105.C
- ◆ "36 Ah" JZW.915.105.D
- ◆ "95 Ah" JZW.915.105.E
- ◆ "80 Ah" JZW.915.105.F



2.5 Battery tester with printer -VAS 6161-

⇒ [d2.5.1 escription", page 12](#)

⇒ [b2.5.2 attery test with the battery tester with printerVAS 6161", page 13](#)

⇒ [o2.5.3 f a VW original battery", page 14](#)

⇒ [s2.5.5 hould be taken when storing", page 15](#)

⇒ [o2.5.4 f a non -VW battery:", page 15](#)

⇒ [r2.5.6 egarding the test printout", page 16](#)

⇒ [r2.5.7 esult assessment", page 16](#)

2.5.1 General description



WARNING

- ◆ *There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery", page 4](#) .*
- ◆ *Carefully read through the Owner's Manual and observe during the measurement before using the battery tester.*

When using the battery tester with printer -VAS 6161-, the battery must not be disconnected or removed.

The battery tester with printer -VAS 6161- does not stress the battery. It operates on the principle of dynamic conductivity detection.

All types of batteries are stored in the tester.

The data can be stored on a SD card.

The battery tester with printer -VAS 6161- can be updated via an interface or the SD card.

The integrated temperature sender improves the measurement quality.

Device description battery tester with printer -VAS 6161-




1 - integrated printer

- 2 - Operating lever for the paper tray
- 3 - Paper slot
- 4 - LCD screen with main menu
- 5 - Operating field with On/Off switch
- 6 - Connection for battery test cable
- 7 - Card slot for memory card
- 8 - Infra-red sensor for temperature
- 9 - Data transmitter for PC

2.5.2 Perform battery test with the battery tester with printer -VAS 6161-

Special tools and workshop equipment required

- ◆ Battery tester with printer -VAS 6161-

 **WARNING**

Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. Starting aid must be provided ⇒ [C2.1 heck battery with a magic eye](#), page 7 !

- ◆ *There is a risk of explosion when testing or performing a starting aid.*
- ◆ *These batteries must be replaced.*

Read the Owner's Manual carefully before using the battery tester.

There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .

Note

Before using the Battery tester with printer -VAS 6161-, carry out a visual inspection of the vehicle battery ⇒ [i2.3 nspection of the battery](#), page 10.

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- Switch off the ignition and all electrical components.
- Check the colour display for batteries with inspection window ⇒ [C2.1 heck battery with a magic eye](#), page 7 .
- Switch on device.
- Clamp the red terminal "+" of the tester to the positive terminal.
- Clamp the black terminal "+" of the tester to the negative terminal.

Note

Ensure good contact of the test terminals!

- Select one of the following tests.



- ◆ Test of an original VW battery: All original VW batteries with-in and outside the warranty are tested here. [⇒ o2.5.3 f a VW original battery”, page 14](#)
- ◆ “Non-” VW Battery Test: This tests all batteries of other manufacturers [⇒ o2.5.4 f a non -VW battery:”, page 15](#) .
- ◆ Stockpiling: For batteries included in the care program for exhibited vehicles and storage vehicles [⇒ s2.5.5 hould be taken when storing”, page 15](#) .

**Note**


- ◆ *The test is finished after approx. 10 seconds.*
- ◆ *The test results are outputted via the printer.*
- ◆ *The tester requires no time to cool down and prepare for further measurements.*

2.5.3 Test of a VW original battery**WARNING**

- ◆ ***There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions [⇒ i1.3 nstructions and safety precautions when working on the battery”, page 4](#).***
- ◆ ***Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. No starting aid must be performed!***
- ◆ ***There is a risk of explosion when testing or performing a starting aid.***
- ◆ ***These batteries must be replaced.***

- Select “Test of VW Original battery” in the menu.
- “Select in vehicle” or “outside vehicle”.
- “Select at battery terminal” or “at jump start point”.
- Scan the 2D battery code or select battery type and current manually.
- Determine the temperature. Hold temperature sensor approx. 5 cm over a battery terminal, until the temperature is stable.
- Start test.
- Print test report as needed.

2.5.4 Test of a “non” -VW battery:


 **WARNING**

- ◆ *There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .*
- ◆ *Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. No starting aid must be performed!*
- ◆ *There is a risk of explosion when testing or performing a starting aid.*
- ◆ *These batteries must be replaced.*

- Select “Test of Non-VW battery” in the menu.
- “Select at battery terminal” or “at jump start point”.
- Select the battery type.
- Select the “CCA”, “JIS”, “DIN”, “SAE”, “IEC” or “EN” standard.
- Select the battery value.
- Determine the temperature. Hold temperature sensor approx. 5 cm over a battery terminal, until the temperature is stable.
- Start test.
- Print test report as needed.

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2.5.5 Care should be taken when storing

 **WARNING**

- ◆ *There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .*
- ◆ *Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. No starting aid must be performed!*
- ◆ *There is a risk of explosion when testing or performing a starting aid.*
- ◆ *These batteries must be replaced.*

- Select “Stockpiling” in the menu.
- Connect scanner and scan in the VIN.

 **Note**

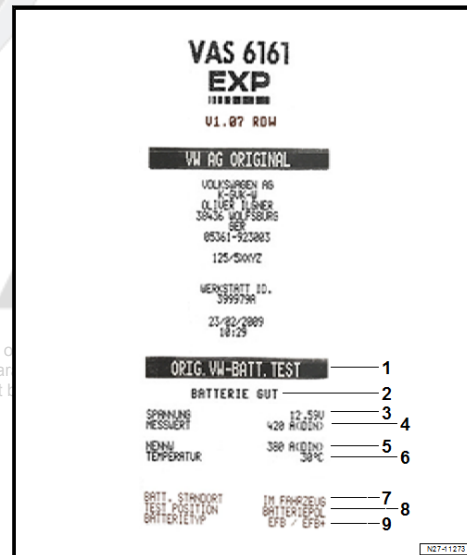
If no scanner is available, manually enter the VIN on the test printout.

- “Select at battery terminal” or “at jump start point”.



- Scan the 2D battery code or select battery type and current manually.
- Determine the temperature. Hold temperature sensor approx. 5 cm over a battery terminal, until the temperature is stable.
- Start test.
- Print test report as needed.

2.5.6 Explanations regarding the test printout



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- 1 - Test type
- 2 - SOC
- 3 - Measured voltage
- 4 - Measured cold start value of the battery
- 5 - Nominal cold start value of the battery adjusted on the tester
- 6 - Measured battery temperature
- 7 - Installation location of the battery
- 8 - Battery terminal position adjusted on the tester
- 9 - Adjusted battery technology

2.5.7 Test result assessment

Evaluation of the test results of a VW battery and a “non-” VW battery:

Battery test result	Measure
Battery OK	No measure on the battery
Battery OK - recharge	Charge battery ⇒ b3 attery ”, page 20 search for discharge reason as needed
Perform power consumption test	Perform power consumption test ⇒ c2.7 urrent drain when charging ”, page 18 , fully charge battery ⇒ b3 attery ”, page 20 and test again

Battery test result	Measure
Replacing battery	Check cable connection and test again. The "Replace battery" result can be caused by poor cable contact.
Battery cell defective - replace	Replacing battery
Check the connection	Connect cable directly to the battery and not the jump start point
Battery worn out	Replacing battery

Evaluation of the battery test result for care during storage


Battery test result	Measure
Battery OK	No measure on the battery
Charge battery immediately	Fully charge battery ⇒ b3 at-tery , page 20
Mark as defective	Mark battery as defective
Check tester connection	The "Check tester connection" result can be caused by poor cable contact.
Check the connection	Connect cable directly to the battery and not the jump start point
Noises	Wait until a measured value appears on the display
Battery worn out	Replacing battery

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2.6 Battery tester with printer -VAS 5097 A-

Special tools and workshop equipment required

- ◆ Battery tester with printer -VAS 5097 A-

 **WARNING**

- ◆ *There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), [page 4](#).*
- ◆ *Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. These batteries must be replaced.*
- ◆ *Carefully read through the Owner's Manual and observe during the measurement before using the battery tester.*

Note

Before using the Battery tester with printer -VAS 5097 A-, carry out a visual inspection of the vehicle battery ⇒ [i2.3 nspection of the battery](#), [page 10](#).



Explanations regarding battery test with load-dependent battery tester with printer -VAS 5097 A-:

The load current of the battery tester with printer -VAS 5097 A- and the minimum voltage differ according to the capacity of the battery and are indicated on the sticker of the tester.

The battery voltage drops during this test as a result of the high load on the battery (a high current flows).

If the battery is O.K., the voltage drops only as far as the minimum voltage.

If the battery is faulty or only has a weak charge, the battery voltage will drop very rapidly below the specified minimum voltage.

After completion of the test in case of discharged or poorly discharged batteries, this low voltage is retained for a lengthy period, the voltage rises only slowly again.

2.7 Check current drain when charging



WARNING

- ◆ ***There is a risk of accident when working on the battery. Observe the warning instructions and safety precautions ⇒ 1.3 instructions and safety precautions when working on the battery, page 4 .***
- ◆ ***Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. These batteries must be replaced.***

Information about the state of the discharged battery can be received as fast as possible when charging starts by determining according to the current drain of the battery, if the battery has to be replaced or can be fully charged.



Note

With the battery tester with printer -VAS 6161- the current consumption test must always be carried out if the test result "Carrying out a current consumption test" appears in the display.

By examining the power consumption of a battery during the charging process, it is possible to assess in a short time whether a partially discharged or deeply discharged battery ⇒ d3.2 is-charged batteries, page 22 becomes reusable by recharging.

Test requirements:

- ◆ When charging the battery, the battery temperature must be at least +10 ° C.
 - ◆ The charger must be able to deliver at least 30 A charging current, such as -VAS 5095A- . -VAS 5900-, -VAS 5903-
 - ◆ When charging with the battery charger -VAS 5095A- the current consumption of the battery must be measured with a current clamp e.g. -VAS 5051B/7-. Battery charger -VAS 5900- and battery charger -VAS 5903- show the current consumption at the device. Battery charger -VAS 5900- automatically performs the current consumption test guided by the menu.
- Connect the battery charger and start charging.

- After five minutes, measure the charging current of the battery.

Test results

If the current draw in A is 10% greater than the rated capacity of the battery (e.g., > 6.1A for a 61 Ah battery), then charge the battery and retest.

- Charge the battery when the charging current is higher than 10% of the rated capacity.
- After two hours of rest for the battery, carry out a battery check ⇒ [b2.5.2 attery test with the battery tester with printer-VAS 6161](#), page 13

If the charging current is less than 10% of nominal capacity in amperes five minutes after the charging process has started, (e.g. for a 50 Ah battery <5A) replace the battery. In the event of warranty and goodwill, fill out the battery test sheet.

2.8 No-load voltage measurement - Demonstration vehicles and stock vehicles

Special tools and workshop equipment required

- ◆ Hand multimeter (e.g. -V.A.G 1526E -)



Note

- ◆ *No-load voltage measurement on demonstration and stock vehicles must only be carried out within the prescribed maintenance procedures as a criterion for evaluating the battery state.*
- ◆ *The no-load voltage measurement serves to determine whether the batteries of demonstration and stock vehicles should be charged.*
- ◆ *The battery must not be drained by any electrical equipment for at least 2 hours before the measurement is taken.*
- ◆ *If the battery tester with printer -VAS 6161- is used for the measurement, the result from this tester is the determining factor for assessment of the battery state.*

Follow the procedure described below for measuring the battery voltage in the no-load state:

- Use the hand-held multimeter to measure the battery voltage.

The battery no-load voltage must not fall below 12.5 V.

If the hand-held multimeter indicates 12.5 V or more, the battery voltage is O.K.

If the hand-held multimeter a battery voltage of less than 12.5 V:

- Charge battery ⇒ [b3.1 attery](#), page 20

After charging wait at least 2 hours during which the battery with electrical components must not be subjected to any load or charge:

- Use the hand-held multimeter to measure the battery voltage.

The battery no-load voltage must not fall below 12.5 V.



3 Charge battery

⇒ [b3.1 attery", page 20](#)

⇒ [d3.2 ischarged batteries", page 22](#)

3.1 Charging battery



WARNING

- ◆ *Battery with colourless or bright yellow magic eye must not be subjected to any test or charge. These batteries must be replaced.*
- ◆ *The cell plugs must always be securely tightened when charging the battery, measuring the voltage and conducting a test under load to ensure they are really sealed.*
- ◆ *Do not smoke or use a naked light in rooms in which batteries are being charged. The reason is that a gas is formed by the charging process in the battery and this gas can easily ignite.*
- ◆ *Frozen batteries must be replaced.*

Special tools and workshop equipment required

- ◆ Battery charger e.g. - VAS 5900A-, -VAS 5903-, -VAS 5904-, -VAS 5907-, -VAS 5908-, -VAS 5095A-, -VAS 5901A-, -VAS 622 009-.



Note

- ◆ *All battery chargers offered by the manufacturer can be found in the ⇒ Electronic catalogue of the original parts "ET-KA" in the "TOOLS" group.*
- ◆ *Charge batteries with battery chargers recommended by the manufacturer.*
- ◆ *Carefully read through the Owner's Manual and observe during the charging before using the battery charger.*
- ◆ *The battery must be at a temperature of at least 10 °C.*

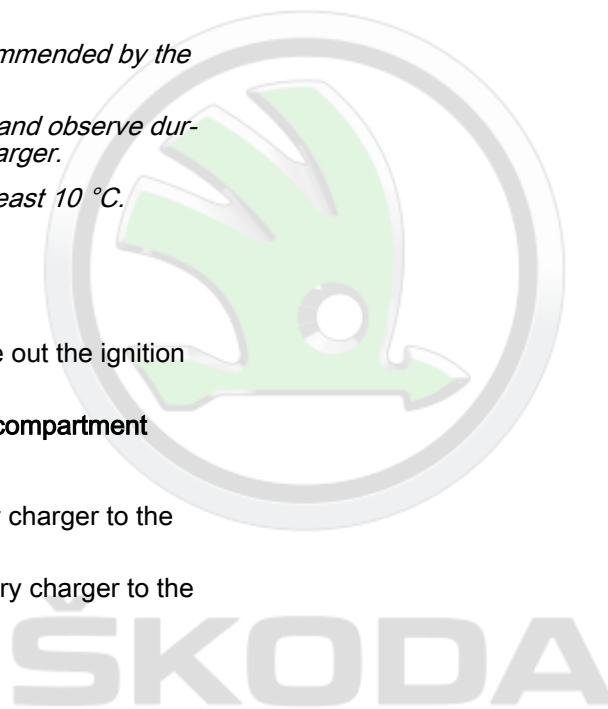
Charging a battery

Battery charger switched off

- Switch off all electrical components and take out the ignition key.

Vehicles with the battery located in the engine compartment

- Open the battery cover.
- Connect the red positive cable of the battery charger to the positive terminal of the battery.
- Connect the black negative lead of the battery charger to the negative terminal.





Caution

On vehicles with the "start-stop" system and with the battery monitoring control unit -J367- installed, the "-" terminal (black) of the charger must be connected to the body mass. If it is connected directly to the negative terminal of the battery, this can lead to the failure of the "start-stop" system after charging.

The "-" terminal (black) of the charger must be connected to the Earth point in engine compartment in such a way as to ensure a firm connection between the charger terminal and the earth point (e.g. to the terminal of the earth lead of the cylinder block or to the lifting eye of the cylinder block).

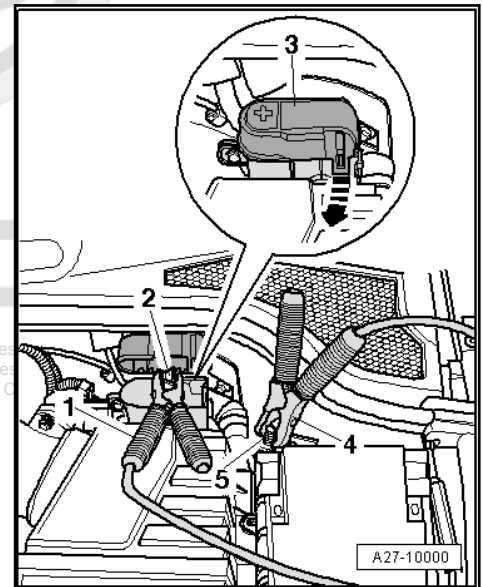
On severely discharged batteries, it can happen that on the battery charger the charging voltage can switch over to the nominal value of 6 V (the battery charger automatically evaluates if it is a 6V battery). In this case, the battery charger must be switched over manually to charge a 12 V battery, see → Owner's Manual of the battery charger.

- Switch on battery charger see → Owner's Manual of the battery charger.
- Leave the front flap open while charging the battery.

Vehicles with the battery located in the luggage compartment

Variant 1:

- Release the cover -3- of the additional positive terminal of the battery in the engine compartment -arrow- and open.

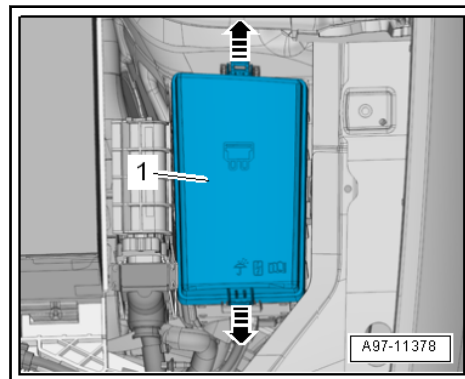


- Connect the positive cable of the battery charger -1- at the additional positive terminal of the battery -2-.
- Connect the negative cable of the battery charger -4- to an earth point in the engine compartment (e. g. -5- or lifting eye of the engine).
- Switch on battery charger see → Owner's Manual of the battery charger.

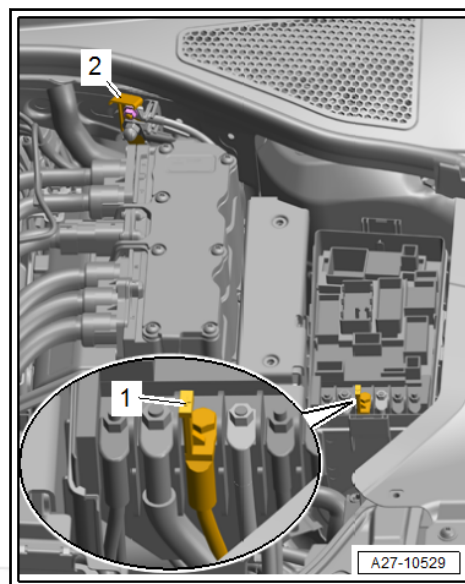
Variant 2:



- Press latches -arrows- and remove e-box cover -1- in the engine compartment.



- Connect the red charging terminal of the charger to the plus tab -1-.



- Connect the black charging clamp of the charger to the earthing point -2-.
- Switch on battery charger see ⇒ Owner's Manual of the battery charger.

3.2 Severely discharged batteries

Explanations regarding severely discharged batteries:

Batteries which have not been operational for a long time, e.g. in stock vehicles, discharge themselves.

A battery is severely discharged if the no-load voltage has dropped below 11.6 V.

If a battery is severely discharged, the battery electrolyte (sulphuric acid/water mixture) consists practically only of water as the sulphuric acid portion is greatly reduced.

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Note

- ◆ *Battery acid in severely discharged batteries can already freeze at low frost-point temperature.*
- ◆ *Frozen batteries must no longer be used.*
- ◆ *On severely discharged batteries, it can happen that on the battery charger the charging voltage can switch over to the nominal value of 6 V (the battery charger automatically evaluates if it is a 6V battery). In this case, the battery charger can be switched over manually to charge a 12 V battery.*

Severely discharged batteries cause sulphation of the plates, i.e. the entire surface of the plates on the batteries harden. The battery acid is not clear but has a weak white colouring.

If a severely discharged battery is re-charged immediately after losing its charge, the sulphate deposit forms again.

If such batteries are not re-charged, the plates continue to harden and this restricts the battery's ability to accept a charge. This results in a loss of battery power.



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4 Cruise control system (CCS)

⇒ [d4.1 description](#), page 24

⇒ [c4.2 cruise control system](#), page 24

4.1 General description

The Cruise control system is controlled by the engine control unit.

- Activate/deactivate cruise control system ⇒ [c4.2 cruise control system](#), page 24 .

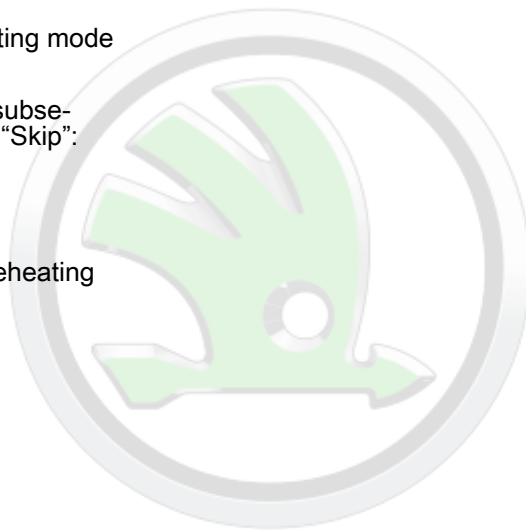
Fault recognition and fault display

Faults from the Cruise control system are transmitted via the engine control unit.

For fault finding, use the ⇒ Vehicle diagnostic tester in the mode "Targeted fault finding".

4.2 Activate/deactivate cruise control system

- Connect ⇒ Vehicle diagnostic tester.
- In the ⇒ Vehicle diagnostic tester, select the operating mode "Targeted fault-finding".
- Select the "Selected Functions/Components" and subsequently the following menu points using the button "Skip":
 - ◆ Drivetrain
 - ◆ 01 – Self-diagnosable systems
 - ◆ 01 - Engine control unit/Direct fuel injection and preheating system
 - ◆ 01 - Functions
 - ◆ Activate/deactivate cruise control system



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92 – Windscreen wash/wipe system

1 Repairing washer fluid level pipes

⇒ [s1.1 olution for plain ended pipe](#)", page 25

⇒ [s1.2 olution for corrugated pipe](#)", page 26

1.1 Repair solution for plain ended pipe



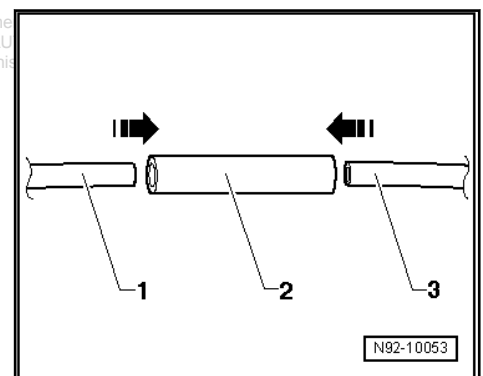
Note

- ◆ Spare parts can be found in the ⇒ *Electronic catalogue of the original parts "ETKA"*.
- ◆ Plain ended pipes with diameter 5 x 1 mm or 6 x 1 mm can be repaired with EPDM hose.

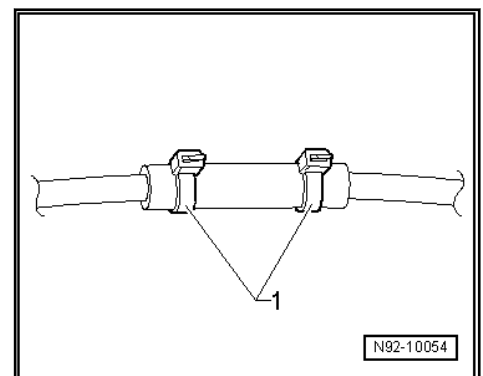
Method:

- Cut the damaged point straight out of the plain ended pipe to be repaired.
- Select the suitable EPDM hose -2- and select a cable strap, see ⇒ *Electronic Catalogue of Original Parts "ETKA"*.

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- Lengthen off the EPDM hose in such a way that both plain ended pipe ends -1- and -3- can be inserted each 10 to 15 mm into the EPDM hose.
- Secure the repair point with cable straps -1-.



- Perform a functional and tightness test.



1.2 Repair solution for corrugated pipe

⇒ [c1.2.1 corrugated washer fluid level pipes - vehicles up to 12.2010](#), page 26

⇒ [c1.2.2 corrugated washer fluid level pipes - vehicles as of 01.2011](#), page 28

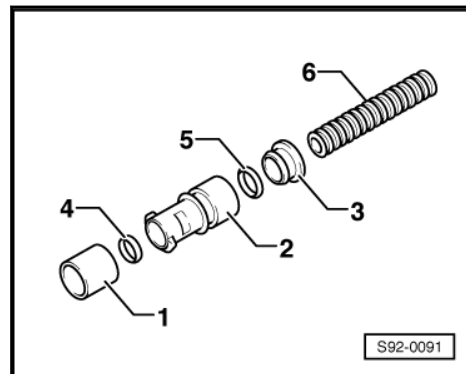
1.2.1 Repairing corrugated washer fluid level pipes - vehicles up to 12.2010



Note

- ◆ *When changing the material of the corrugated pipe, the following procedure cannot be applied to vehicles manufactured as of 01.2011 (this would result in a leaky connection point).*
- ◆ *The other described procedure (⇒ [c1.2.2 corrugated washer fluid level pipes - vehicles as of 01.2011](#), page 28) can also be applied to vehicles manufactured up to 01.2011.*
- ◆ *Spare parts can be found in the ⇒ [Electronic catalogue of the original parts "ETKA"](#)*

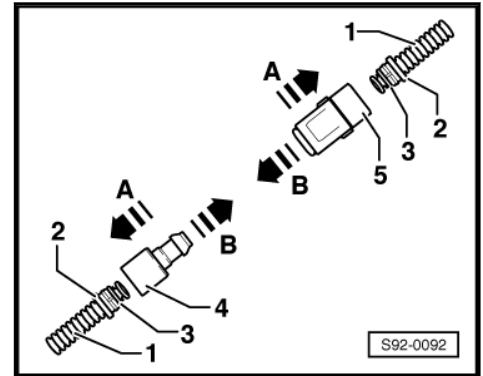
Summary of components of connecting piece



- 1 - Catch clamp
- 2 - Clutch
- 3 - Tensioning ring
- 4 - O-ring
- 5 - O-ring
- 6 - Corrugated pipe

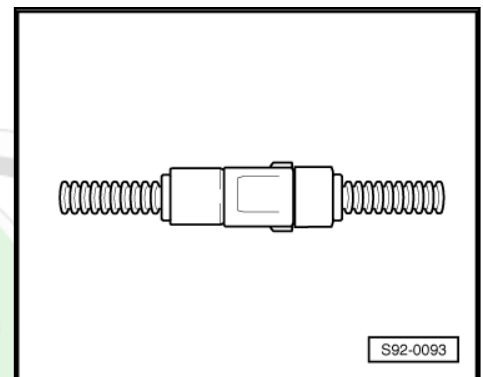
Method:

- Cut the damaged point straight out of the corrugated pipe to be repaired so that the distance between the pipe ends is maximum 20 mm.



i Note

- ◆ *If the damaged point is longer than 20 mm, insert new corrugated pipe and then perform the described work sequence twice.*
- ◆ *The repair point must not be exposed to tension or flexion.*
- Push tensioning rings -2- onto the ends of the pipes -1- in such a way that two shafts of the pipe protrude.
- Then push O-rings -3- onto the ends of the pipe. One shaft of the pipe protrudes.
- Fit pipes with tensioning rings onto the connecting pieces -4- and -5- -arrows A-.
- Compress connecting pieces -4- and -5- -arrows B-.



- Perform a functional and tightness test.

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1.2.2 Repairing corrugated washer fluid level pipes - vehicles as of 01.2011



Note

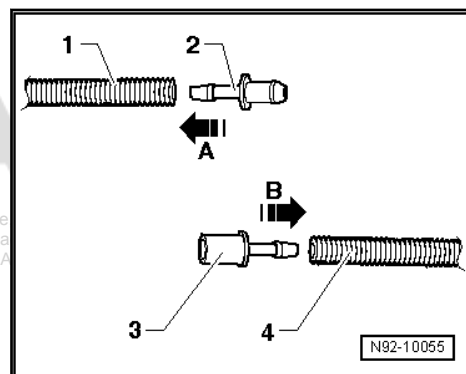
- ◆ *The following repair procedure of corrugated washer fluid level pipes can also be applied to vehicles manufactured up to 01.2011.*
- ◆ *The repair point must not be exposed to tension or flexion.*
- ◆ *If the damaged point is longer than 15 mm, insert new corrugated pipe and then perform the described work sequence twice.*
- ◆ *Spare parts can be found in the ⇒ Electronic catalogue of the original parts "ETKA".*

Special tools and workshop equipment required

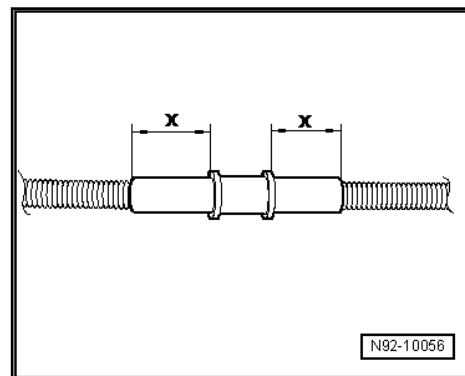
- ◆ Hot-air blower

Work procedure

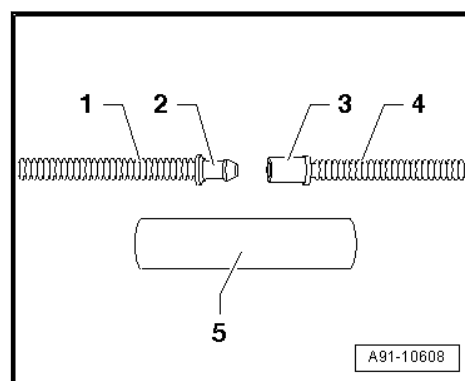
- Cut the damaged point straight out of the corrugated pipe to be repaired so that the distance between the pipe ends is maximum 15 mm.
- Select the suitable connecting pieces -2-, -3- as well as the suitable shrink hose, see ⇒ Electronic Catalogue of Original Parts "ETKA".



- Warm up the end of the corrugated pipe -1- slightly using a hot-air blower.
- Press the connecting piece -2- into the corrugated pipe -arrow A-.
- Warm up the end of the corrugated pipe -4- slightly using a hot-air blower.
- Press the connecting piece -3- into the corrugated pipe -arrow B-.
- Lengthen off the shrink hose so that the corrugated pipe on both sides can be covered by the shrink hose at least 20 mm -dimension X-.



- Slide the shrink hose -5- over the corrugated pipe and connect up the connecting pieces -2- and -3-.



- Secure the repair point with the shrink hose.

i Note

- ◆ *The shrink hose must be heated from the middle outwards until it is completely sealed.*
 - ◆ *During shrinking make sure the hot nozzle does not damage any other cables, plastic parts or insulating materials.*
- Perform a functional and tightness test.

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2 Washer fluid lines

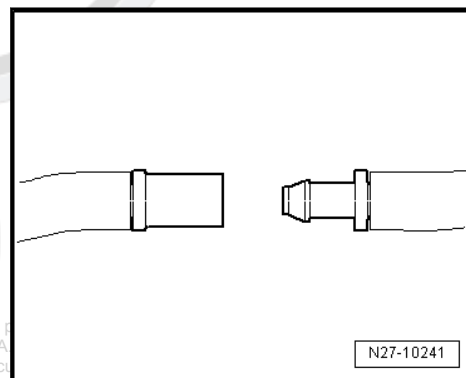
⇒ o2.1 f washer fluid level pipes", page 30

2.1 Connections of washer fluid level pipes

In order to connect the hoses to the washer fluid pumps and the spray nozzles, the following hose couplings are used for example as separating points.

Unsecured hose coupling

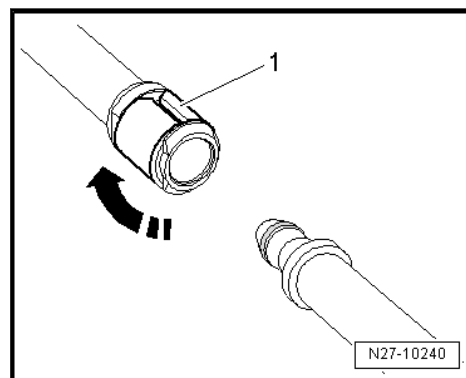
- Pull apart both coupling parts in order to separate the connection.



- In order to connect, firmly press together both coupling parts until they lock audibly. Check for secure locking by pulling at the connection.

Secured hose coupling with circlip

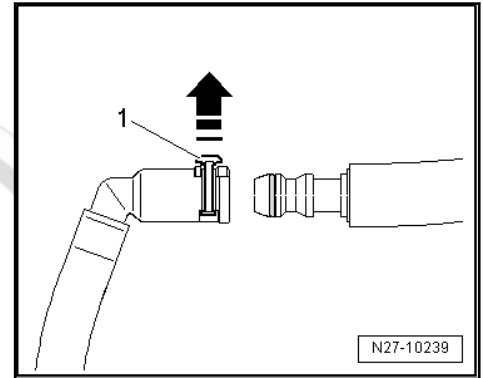
- Turn the circlip -1- by approx. 90° -arrow- in order to separate the connection and pull off the hose connection. After pulling off the circlip -1-, turn back again.



- In order to connect, press together the connections until they lock audibly. Check for secure locking by pulling at the connection.

Secured hose coupling with securing clip, version 1

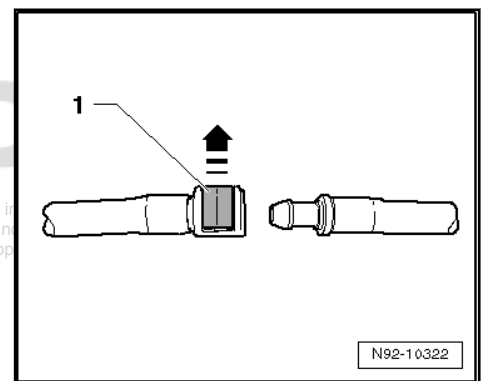
- Pull up the securing clip -1- by approx. 1 mm -arrow- in order to separate the connection and pull off the hose connection.



- In order to connect, press together the connections until they lock audibly. Check for secure locking by pulling at the connection.

Secured hose coupling with securing clip, version 2

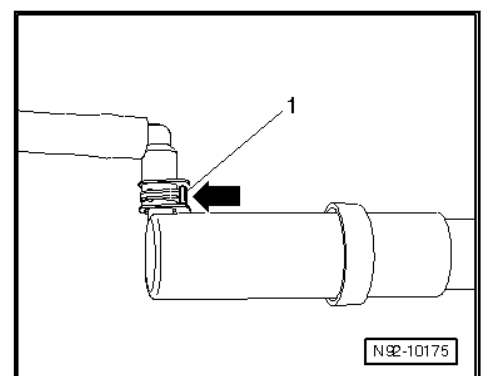
- Pull up the securing clip -1- -arrow- in order to separate the connection and pull off the hose connection.



- In order to connect, press together the connections until they lock audibly. Check for secure locking by pulling at the connection.

Hose coupling for headlight cleaning system with securing clip

- Press the securing clip -1- -arrow- in order to separate the connection and pull off the hose connection.



- In order to connect, press together the connections until they lock audibly. Check for secure locking by pulling at the connection.



3 Joint-free wiper blades

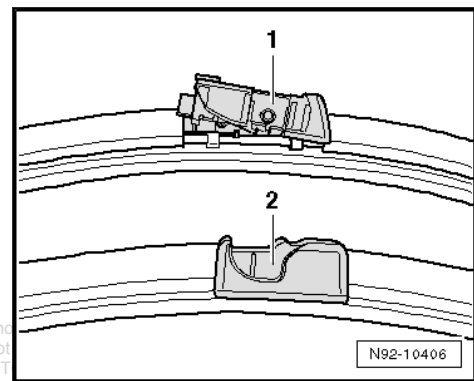
⇒ f3.1 eatures of joint-free wiper blades", page 32

3.1 Distinguishing features of joint-free wiper blades

Distinguishing features of the fastening systems of the wiper blades "Side lock" and "Top lock".

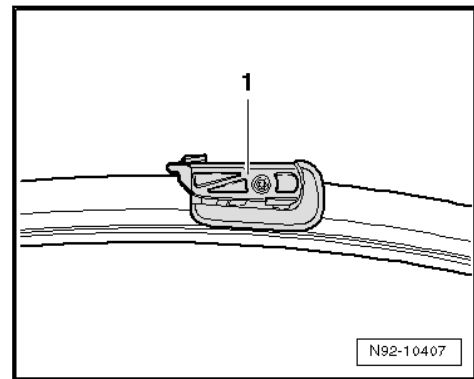
When replacing the wiper blades, pay attention to the manufacturer. The same types of fastening system must be used as was installed by the manufacturer, see ⇒ Electronic Catalogue of Original Parts "ETKA".

Wiper blades, "Side lock" system, variant -1- and -2-



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Wiper blades, "Top lock" system, variant -1-



94 – Lights, bulbs, switches - exterior

1 Gas discharge lamps

⇒ [a1.1 nd safety instructions for gas discharge lamps](#)", page 33

1.1 Use and safety instructions for gas discharge lamps



WARNING

Never change lamps, if one is not familiar with the relevant handling and safety instructions.

If installation is performed on the headlight with gas discharge lamps, pay attention to the following points:

- ◆ Notes for dangerous high voltage / current ⇒ [page 33](#)
- ◆ Notes for pressure, temperature and radiation/arc ⇒ [page 34](#)
- ◆ Mounting instructions for gas discharge lamps ⇒ [page 34](#)
- ◆ Disposal instructions for gas discharge lamps ⇒ [page 34](#)

Special tools and workshop equipment required

- ◆ Protective goggles
- ◆ Gloves

Notes for dangerous high voltage / current



WARNING

- ◆ *Mortal high voltage flows through the control units for light system, plugs or parts of lamp base.*
- ◆ *The control unit for gas discharge lamp must never be operated without gas discharge lamp.*
- ◆ *The battery earth strap must be disconnected before working on the parts of the gas discharge headlight marked with the yellow high voltage symbols (this does not apply if the gas discharge lamp is removed from an already disassembled headlight, e.g. on Octavia II).*
- ◆ *Then switch the low beam light on and off again. Thus remaining voltage is discharged.*



Note

Pay attention to the correct sequence when disconnecting and connecting the battery ⇒ Electrical System; Rep. gr. 27.



Notes for pressure, temperature and radiation/ blinding


WARNING

- ◆ *The gas discharge lamp must only be operated in the headlight housing due to the high voltage (over 28000 V when igniting the gas discharge lamp).*
- ◆ *Glass and bulbs can be very hot - risk of burning!*
- ◆ *Do not look directly into the ray of light because the intensity of the UV ray of the gas discharge lamp is approx. 2.5 times greater than that of the usual halogen light. The visual power can be impaired for a long period.*
- ◆ *Avoid contact with exploded glass.*
- ◆ *Halogen bulbs and gas discharge lamps (Xenon/bi-xenon) are pressurized and can burst when changing the bulb - risk of injury!*
- ◆ *Always wear protective goggles and gloves for removing and installing halogen bulbs and gas discharge lamps.*

Mounting instructions for gas discharge lamps


Caution

- ◆ *Do not touch the glass bulb with bare fingers when changing the gas discharge lamps, use clean material gloves. The remaining finger print would evaporate through the heat of the switched on bulb and condense on the reflector, which impairs the luminosity of the headlight.*
- ◆ *Replace defective gas discharge lamp with a gas discharge lamp of the same version. The designation is on the lamp base or on the glass bulb.*
- ◆ *Lock plug connections correctly in place when installing and pay attention to correct fitting of the connection.*

Disposal instructions for gas discharge lamps


WARNING

- ◆ *Gas discharge lamps must be disposed of as hazardous waste, they do not belong to the usual household waste.*
- ◆ *Gas discharge lamps contain metallic mercury (Hg) and traces of thallium.*
- ◆ *Do not destroy gas discharge lamps, avoid contact with exploded glass.*
- ◆ *Observe the disposal instructions, dispose of gas discharge lamps only in the provided reservoirs at a proper collection point.*

2 LED headlights

⇒ [a2.1 nd safety instructions for LED headlights", page 35](#)

2.1 Application and safety instructions for LED headlights



WARNING

Risk of injury from UV radiation and glare.

- ◆ *Switch off the ignition and all electrical components when working.*
- ◆ *Place the ignition key outside of the vehicle.*
- ◆ *Do not operate the headlight flasher.*
- ◆ *LED headlights may only be dismantled as described in the workshop manual.*

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96 – Lights, bulbs, switches - interior

1 12V power sockets, cigarette lighter

⇒ a1.1 nd installing the 12 V power socket/cigarette lighter in the centre console”, page 36

1.1 Removing and installing the 12 V power socket/cigarette lighter in the centre console

Special tools and workshop equipment required

- ◆ Release tool -T40148-

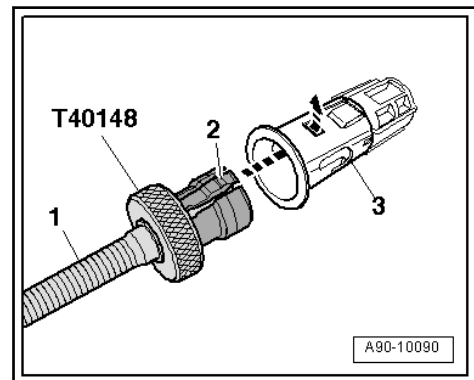
Removing



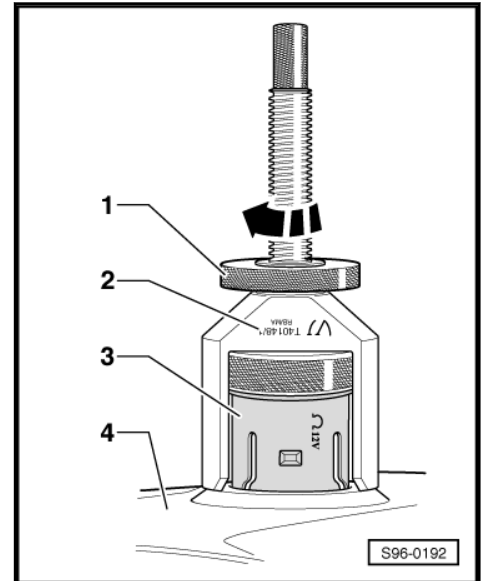
Note

For purposes of clearer presentation, the socket is shown as partly removed in the figure.

- Switch off the ignition and all electrical components.
- Insert the extractor -T40148- in such a way that the retaining tabs lock into the recesses in the socket housing -arrow- at the extractor -2-.



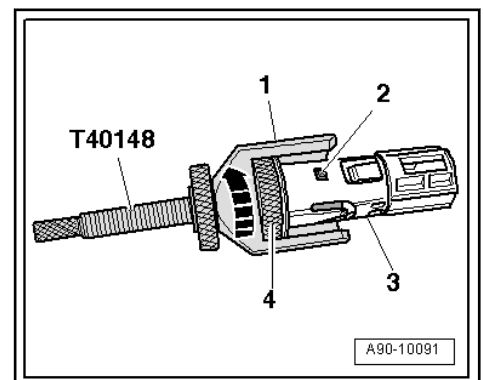
- After locking the retaining tabs, position the clamp -2- and turn with the knurled nut -1- -arrow-, until the socket -3- is completely pulled out of the centre console -4-.



 Note

Pay attention to the wiring length when pulling out the socket.

- Disconnect plug.
- Unscrew the knurled nut and push out the support bracket -1-.

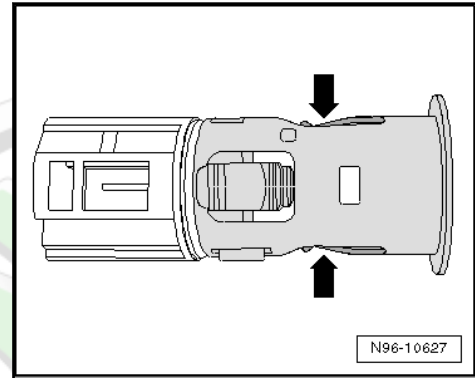


- The retaining tabs -2- are unlocked by pressing on the spindle of the extractor and by turning -arrow- the knurled wheel -4-.
- Push the extractor out of the socket housing -3-.

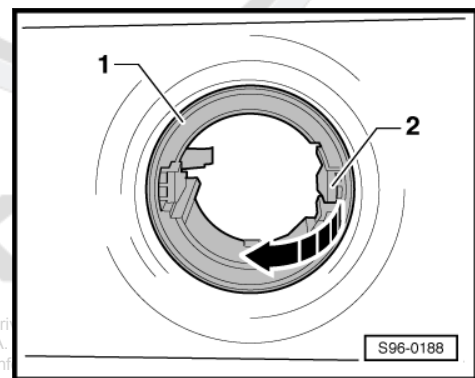
 Note

The retaining springs of the socket are pressed apart by inserting the extractor and the holding torque of the cigarette lighter is reduced.

- Carefully press together again the retaining springs of the socket -arrow-, in order to increase the holding torque.



- Slacken the tensioning sleeve of the socket -1- out of the catch peg -2-, tilt out the tensioning sleeve -arrow- and remove it.



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ted
bility

Installing



Note

When installing, ensure that neither a cigarette lighter nor a plug is in the power socket.

- Insert the tensioning sleeve of the socket into the centre console until it clicks audibly into place.
- Place the connector onto the socket.
- Insert power socket into the tensioning sleeve up to the stop.



Caution

Vehicles with a cigar lighter - check that the cigar lighter works correctly.

After the preheating process, this remains in the removal position, and after the preheating process it remains in the removal position and is not hurled into the vehicle interior.

97 – Wiring

1 Vehicle diagnosis, testing and information systems

⇒ [i1.1 nstructions”, page 39](#)

⇒ [v1.2 ehicle diagnosis, measurement and information system VAS 505x”, page 39](#)

1.1 Safety instructions



WARNING

- ◆ *During test or drives with the vehicle diagnosis, measuring and information system there is a risk of difficult or fatal injuries!*
- ◆ *If the vehicle diagnosis, measurement and information system is operated during a test or measuring drive in the range of influence of the airbag, there is a risk of severe or fatal injuries when activating the airbag!*
- ◆ *A second mechanic should assist during test or measuring drive, who sits at the rear and operates the vehicle diagnosis, measurement and information system.*

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Note

- ◆ *Observe the current Owner's Manual for ⇒ Vehicle diagnostic tester, which is displayed after selecting the buttons “Administration” and “Operating manual”.*
- ◆ *All described work instructions such as adaptations, coding etc. are not performed using the ⇒ Vehicle diagnostic tester*
- ◆ *All work instructions are performed in the operating modes “Targeted fault-finding” and “Targeted functions”.*

1.2 Connect vehicle diagnosis, measurement and information system VAS 505x



Note

Observe the current Owner's Manual for ⇒ Vehicle diagnostic tester, which is displayed after selecting the buttons “Administration” and “Operating manual”.

Special tools and workshop equipment required

- ◆ ⇒ Vehicle diagnostic tester
- ◆ corresponding diagnostic cable

Connect ⇒ Vehicle diagnostic tester

- Apply handbrake.
- On vehicles with manual gearbox, shift the gearshift lever into neutral position.



- On vehicles with automatic gearbox, shift selector lever in "P" or "N" position.
- When the ignition is switched off, connect the ⇒ Vehicle diagnostic tester with the corresponding diagnostic cable at the vehicle diagnostic connection.
- Switch on the ignition.
- Switch off all electrical components.



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2 Wiring harness repair

- ⇒ [i2.1 nstructions for the repair on the vehicle electrics", page 41](#)
- ⇒ [i2.2 nstructions for wiring harness and plug repair ", page 42](#)
- ⇒ [d2.3 escriptions", page 43](#)
- ⇒ [o2.4 f airbag and belt tensioner cables", page 48](#)
- ⇒ [o2.5 f CAN bus lines", page 50](#)
- ⇒ [n2.6 ew contacts", page 51](#)
- ⇒ [o2.7 f 0.13 mm²/ 0.35 mm²/ 0.5 mm² cable", page 54](#)
- ⇒ [a2.8 10 mm²- or 16 mm² cable with an individual joint butt splice connector", page 59](#)
- ⇒ [b2.9 reak with single repair point", page 66](#)
- ⇒ [b2.10 reak with two repair points", page 69](#)
- ⇒ [a2.11 erial cables", page 72](#)

2.1 General instructions for the repair on the vehicle electrics



WARNING

- ◆ *Pay attention to the stickers affixed to the vehicle which indicate components with high voltage. The remaining voltage must be discharged when undertaking repair work (e.g. switch the electrical component on and off again after disconnecting the battery).*
- ◆ *Some tools have a tool locking element which must be pushed over the tip of the tool after use, in order to protect the employee from injury and the tool tip from damage.*



Caution

- ◆ *When disconnecting and connecting the battery, respect the specified procedure ⇒ Electrical System; Rep. gr. 27.*
- ◆ *Before starting a repair, it is absolutely necessary to eliminate the cause of the damage (e.g. sharp-edged body parts, defective electrical components, corrosion etc.).*

- ◆ When carrying out repairs, observe the current instructions in the relevant Workshop Manuals.
- ◆ If possible, do not loosen any earth straps from the body (risk of corrosion).
- ◆ When carrying out repairs, observe the current instructions in the relevant Workshop Manuals.
- ◆ Country-specific regulations must be observed.



2.2 General instructions for wiring harness and plug repair



Caution

Observe the general instructions for the repair on the vehicle electrics ⇒ *i2.1 nstructions for the repair on the vehicle electrics*, page 41 .

Do not solder when carrying out repairs on the vehicle electrics.

After crimping, the crimp connector must be shrunk with the hot-air blower in order to prevent moisture from penetrating.

Shielded cables, such as wheel speed sensor and knock sensor cables, must not be repaired. They must be replaced completely in case of damage.

If the required cable cross-section is not present in the wiring loom repair kit, the larger cross-section must be used.

Mark the repair points with yellow adhesive tape.

The points in the wiring loom marked with the yellow adhesive tape indicate a previous repair.

A functional test must be carried out after each repair. If necessary, the event memories must be interrogated with the ⇒ Vehicle diagnostic tester, erased and/or the systems must be put into the basic setting.

Special tools and workshop equipment required

- ◆ Release tool set -S506815V- . -S506825V-, -S506840V- . -S506850V- or -VAS 1978/35-
- ◆ Wiring harness repair set -S504500V- or -VAS 1978B-

The car tool kit includes necessary tools (except the release tool set) as well as consumables.

The car tool kit ensures optimal repair quality of the vehicle electrics. Repairs of plug connections and line interruptions can be carried out with the tools.

For this purpose, complete repair cables with pre-crimped contacts are used and connected to the vehicle's own wiring loom by means of crimp connectors.

The repair cables can be ordered ⇒ Electronic Catalogue of Original Parts "ETKA".

A stop plier with three different crimp recesses and a hot-air blower for shrinking the crimp connectors ensure a proper electrical connection.

In case of re-ordering, only use the order number of the spare part, which is given on the check-list enclosed with the Owner's Manual.

The release tool set is used to release different primary and secondary locks at the contact plugs.

For example, round plug connector systems, flat contacts with one or two catches as well as single cable seals can be professionally released or installed using the release tool set.

i Note

- ◆ Further information and how to use the set → Owner's Manual of the car tool kit.
- ◆ Refer to the table in the → Owner's Manual of the release tool set in order to allocate the correct release tools.

2.3 Tool descriptions

⇒ [p2.3.1 pier with insert](#)", page 43

⇒ [t2.3.2 tools for contacts](#)", page 44

⇒ [t2.3.3 tools for single cable seals](#)", page 44

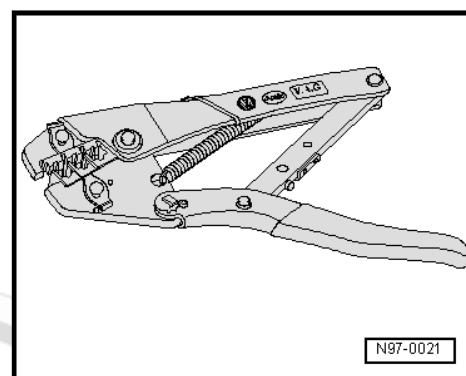
⇒ [s2.3.4 tripper VAS 1978/3](#)", page 45

⇒ [b2.3.5 lower, 220 V, 50 Hz VAS 1978/14](#)", page 46

⇒ [p2.3.6 pier VAS 1978/1A](#)", page 46

2.3.1 Stop plier with insert

The stop plier without insert -VAS 1978/1- with the insert for stop plier -VAS 1978/2- is part of the wiring loom repair set -VAS 1978B-. In addition, the interchangeable head 0.13 - 05 mm² -VAS 1978/1-3- is available.



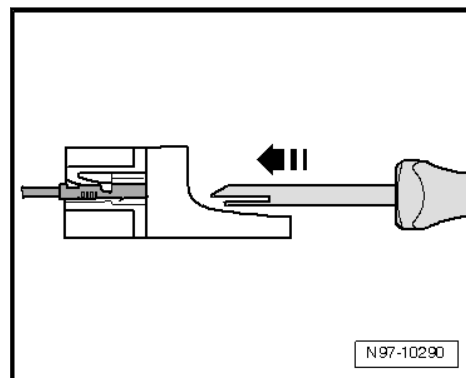
Crimp connector colour	Crimping recess colour	Cable cross-section	Inter-changeable head
transparent	none	0.13 mm ² / 0.35 mm ² / 0.5 mm ²	-VAS 1978/1-3-
yellow	yellow	0.35 mm ²	-VAS 1978/1-1-
red	red	0.5 mm ² - 1.0 mm ²	-VAS 1978/1-1-
blue	blue	1.5 mm ² - 2.5 mm ²	-VAS 1978/1-1-
yellow	yellow	4.0 mm ² - 6.0 mm ²	-VAS 1978/2A-


Note

- ◆ *You must ensure that the correct crimping recess is used for the crimp connector.*
- ◆ *The insulation of the cable must not be crimped at the same time.*

2.3.2 Release tools for contacts

The various release tools are used to remove the various contacts from the socket housings non-destructively.



A selection of release tools is part of the wiring loom repair set -VAS 1978 B- and previous sets.

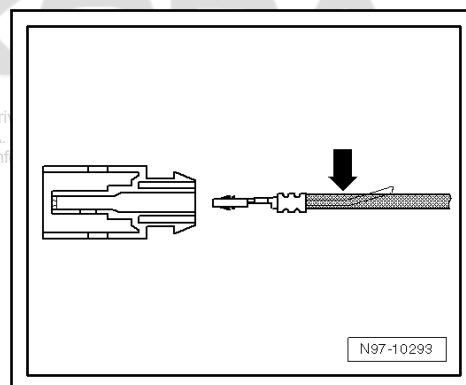

WARNING

- ◆ *Some tools have a tool locking element which must be pushed over the tip of the tool after use, in order to protect the employee from injury and the tool tip from damage.*

Unlocking and disassembling socket housings ⇒ [a4 nd disassembling socket housings](#), page 88 .

2.3.3 Assembly tools for single cable seals

The assembly tools are used to slide the single cable seals into the socket housing up to the stop without damage so that a complete seal is achieved between single cable and socket housing.

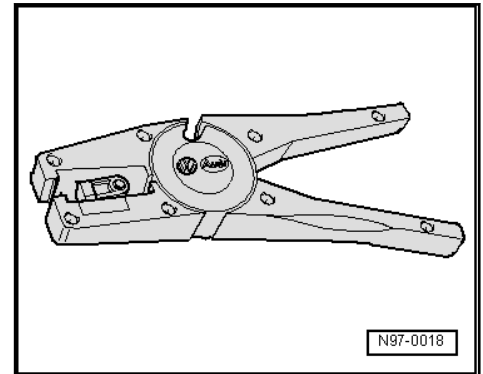


Four assembly tools for single cable seals are part of the wiring loom repair set -VAS 1978 B- and previous sets.

Assembly of single cable seals ⇒ [o3.3 f single cable seals](#)",
[page 85](#) .

2.3.4 Wire stripper -VAS 1978/3-

The wire stripper -VAS 1978/3- is used to strip and cut wires correctly.



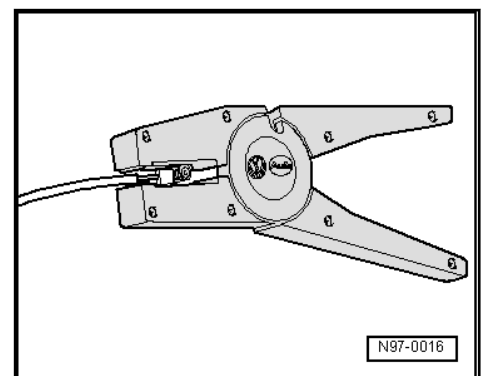
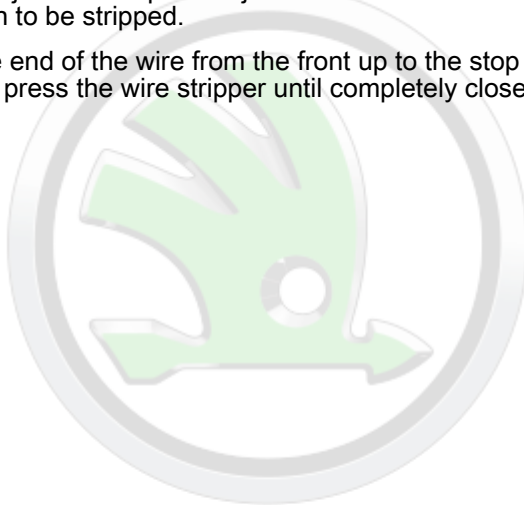
The wire stripper is part of the wiring loom repair set -VAS 1978 B- and previous sets.

The wire stripper has an adjustable stop in its jaws that can be adjusted to the correct length of the wire insulation to be removed.

Stripping

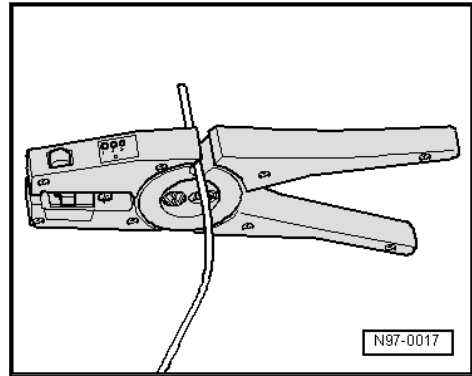
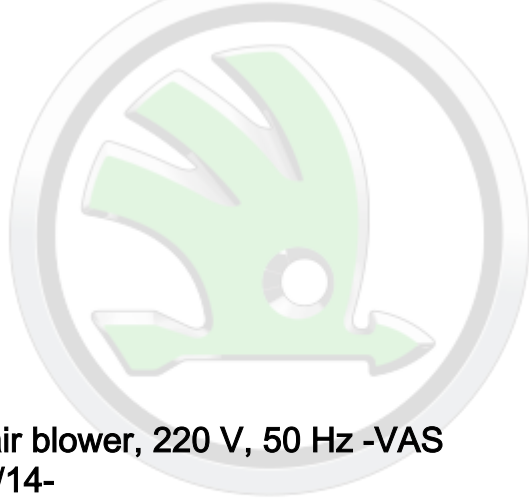
Set the adjustable stop in the jaws to the correct dimension for the length to be stripped.

Place the end of the wire from the front up to the stop in the jaws and press the wire stripper until completely closed.



Open the stripper again and remove the stripped end of the wire.

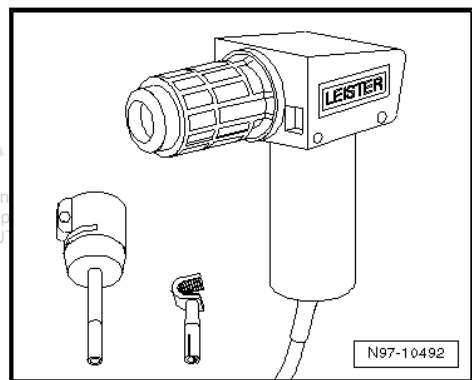
If necessary, use the side cutter function on the top side of the wire stripper to cut wires.



2.3.5 Hot-air blower, 220 V, 50 Hz -VAS 1978/14-



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Caution

When shrinking the crimp connectors, make sure the hot nozzle of the hot-air blower does not damage any other cables, plastic parts or insulating materials.

Follow the Owner's Manual of the hot-air blower!

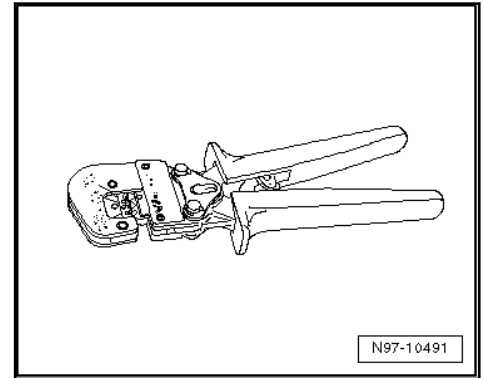
The hot-air blower, 220 V, 50 Hz -VAS 1978/14- is used in conjunction with the shrink adapter for hot-air blower -VAS 1978/15- to shrink the crimp connectors. After crimping, the crimp connector must be shrunk with the hot-air blower in order to prevent moisture from penetrating.

The hot-air blower, 220 V, 50 Hz -VAS 1978/14- is part of the wiring loom repair set -VAS 1978 B- and previous sets.

Example of use ⇒ [b2.9 reak with single repair point](#), page 66 .

2.3.6 Crimping pliers -VAS 1978/1A-

The crimping pliers -VAS 1978/1A- or the crimping pliers (base body) -VAS 1978/1-2-- together with the head adapter 0.35-2.5 mm/2 -VAS 1978/1-1-- or the head adapter 4.0-6.0 mm/2 -VAS 1978/2A- are used to press the crimp connectors from the wiring loom repair sets.



Example of use of the crimping pliers ⇒ [n2.6 ew contacts](#)", page 51 .

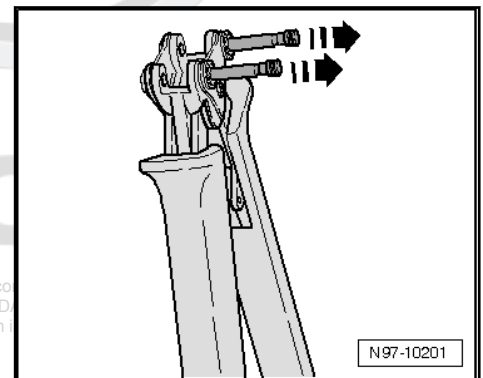
The following head adapters are available for the crimping pliers -VAS 1978/1-2--:

- ◆ Head adapter 0.35 mm² - 2.5 mm²-VAS 1978/1-1--
- ◆ Head adapter 4.0 mm² - 6.0 mm²-VAS 1978/2A-
- ◆ Head adapter for JPT contacts -VAS 1978/9-1--

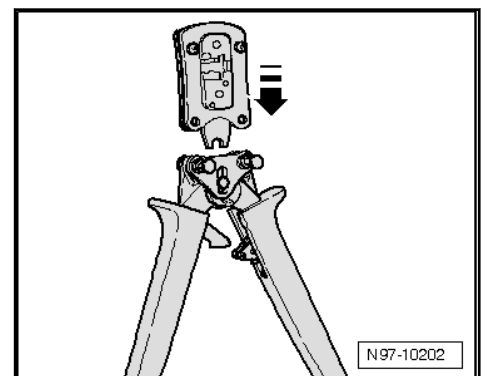
The crimping pliers to crimp contacts on single cables when repairing wire cross-sections of 0.35 mm² -VAS 1978/9-1-- are used in conjunction with the head adapter for JPT contacts ⇒ [n2.6 ew contacts](#)", page 51 .

Swapping head adapter

- Open the crimping pliers completely.
- Unlatch the two locking pins -arrows- from the base body of the crimping pliers.



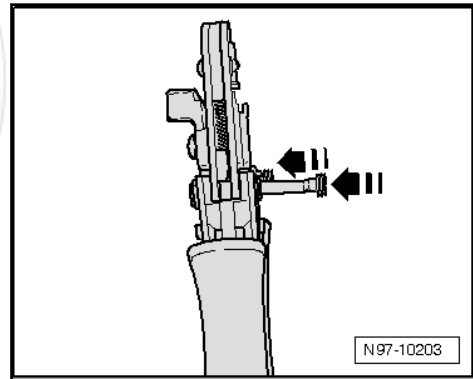
- Insert the required head adapter from above -arrow- into the base body of the crimping pliers.



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- Lock the head adapter into the base body of the crimping pliers by pushing in the pins -arrow-.



2.4 Repair of airbag and belt tensioner cables



Note

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- ◆ *Observe the general instructions for the repair on the vehicle electrics ⇒ [i2.1 instructions for the repair on the vehicle electrics](#), page 41 .*
- ◆ *Observe the general instructions for the wiring loom and plug repair ⇒ [i2.2 instructions for wiring harness and plug repair](#), page 42 .*



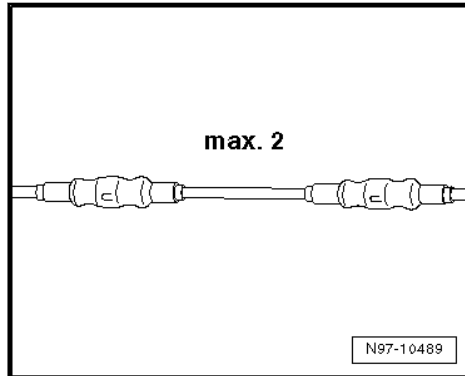
WARNING

Faulty repairs to the airbag and belt tensioner wiring loom can lead to the malfunction of the occupant protection.

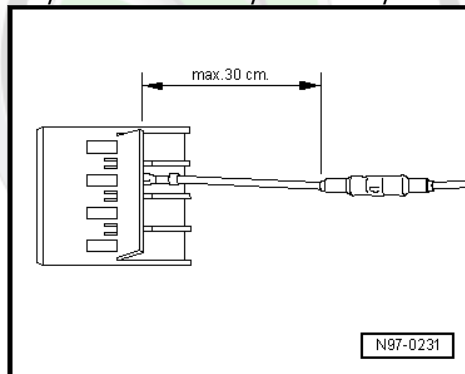
- ◆ **Only use cables of the airbag and belt tensioner wiring loom from the auxiliary measuring set, see ⇒ [h2 annex repair](#), page 41 using original parts (socket housings, plugs and cables see ⇒ *Electronic Catalogue of Original Parts "ETKA"*).**
- ◆ **Do not carry out any repairs to the cables of the individual airbag units.**
- ◆ **In case of damage to the cables or plugs at the airbag units, the related airbag units must be replaced for reasons of safety.**

i Note

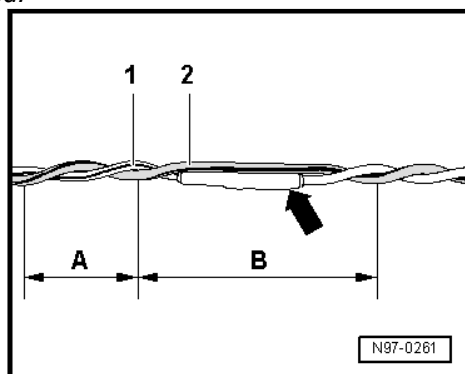
A maximum of two repair points can be repaired when repairing wires for pyrotechnical components. Repair points increase the electrical resistance in the cable and can trigger faults in the self-diagnosis of the system.



- ◆ Do not wrap the repair point again in the vehicle's own wiring loom and visibly mark the repair point with yellow insulating tape.
- ◆ Repairs in the area of the airbag or belt tensioner should only be carried out maximum 30 cm from the next socket housing. Altogether this procedure of marking with yellow insulating tape allows a quick overview of previous repairs.



- ◆ Both cables to the trigger units (airbags) have a stroke length of 20 ± 5 mm when twisting. It is mandatory to comply with these stroke lengths for the lengths of the twisted cables to be repaired.
- ◆ Both cables to the trigger units (airbags) must have the same length when undertaking repair work. The stroke length of -A- = 20 mm must be respected when the cables -1- and -2- are twisted.





Thus, there must be no cable piece (in the area of the crimp connectors -arrow-) longer than -B- = 100 mm without twisting the cables.

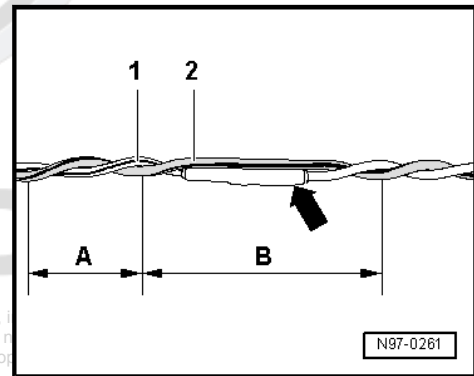
2.5 Repair of CAN bus lines



Note

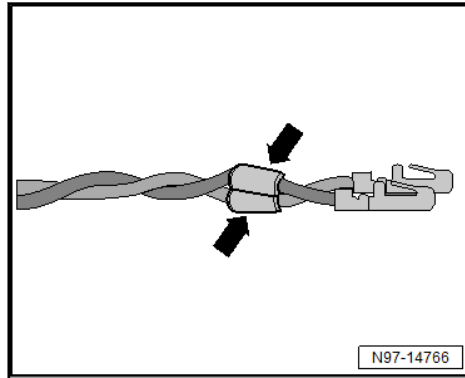
- ◆ Observe the general instructions for the repair on the vehicle electrics ⇒ [i2.1 instructions for the repair on the vehicle electrics](#), page 41 .
- ◆ Observe the general instructions for the wiring loom and plug repair ⇒ [i2.2 instructions for wiring harness and plug repair](#), page 42 .
- ◆ Both CAN bus lines must have the same length when undertaking repair work.
- ◆ The repair of single wires is not permitted.
- ◆ The repair of CAN bus lines must be carried out with a suitable cross-section.
- ◆ Gather the assignment from the ⇒ Electronic Catalogue of Original Parts "ETKA".
- ◆ The repair must not result in excess lengths.
- ◆ Provide the repair area with yellow adhesive tape to indicate a previous repair.

An unshielded two-wire cable -1- and -2- with a cross-section of 0.35 mm² or 0.5 mm² is used as a CAN bus line.



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- ◆ Both CAN bus lines must have the same length when undertaking repair work. The stroke length of -A- = 20 mm must be respected when the cables -1- and -2- are twisted.
- ◆ Thus, there must be no cable piece (in the area of the crimp connectors -arrow-) longer than -B- = 50 mm without twisting the cables.
- ◆ The cable tails must be crimped with connectors in the same way.



- ◆ The repair points -Arrows- may lie on top of each other.

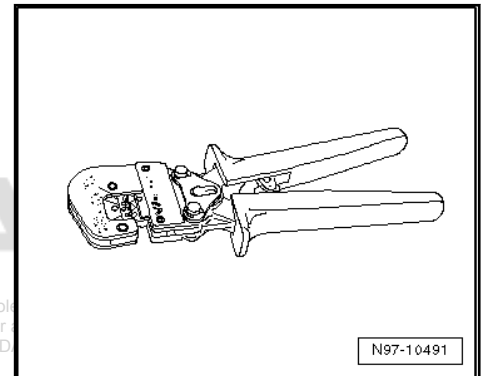
The colour codings of the CAN bus lines are given in the following table:

CAN High line, drive	orange/black
CAN High line, comfort	orange/green
CAN High line, infotainment	orange/purple
CAN - Low - line, all	orange/brown

2.6 Crimp new contacts

Special tools and workshop equipment required

- ◆ Crimping pliers, complete -VAS 1978/1 A-



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- ◆ Head adapter, 0.35 mm² - 2.5 mm² -VAS 1978/1-1-

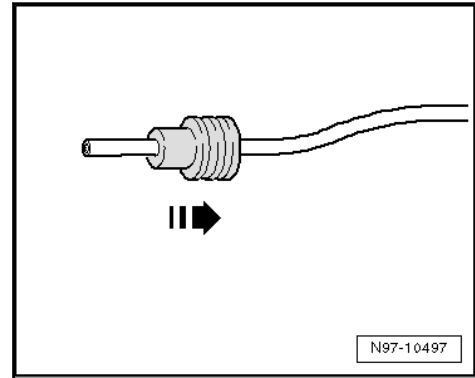
Using the above tools ensures that the connection is correct between crimp contact, wire and single cable seal. The tool may only be used for the described purpose.

Note

Normal and gold-plated contacts must be crimped to the repair wire. The same type as used in the series must also be used as repair contact.

Example of crimping a new contact with single lead seal

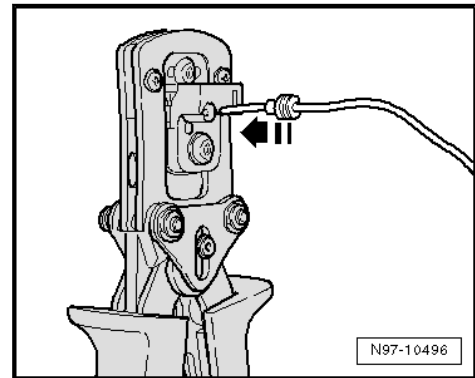
- Insert head adapter for JPT contacts -VAS 1978/9-1- into the crimping pliers (base body) -VAS 1978/1-2- ⇒ [p2.3.6 liers-VAS 1978/1A", page 46](#) .
- Fit the single cable seal onto the repair wire -arrow-.



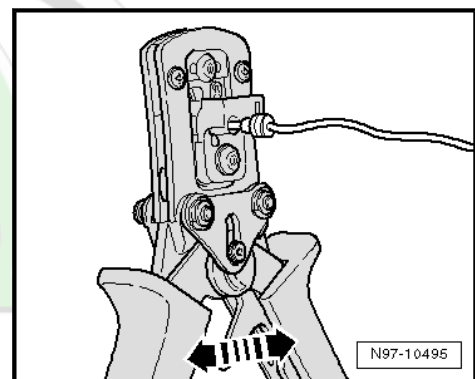
i Note

The smaller diameter of the single cable seal must point in the direction of the contact to be crimped (see Fig.).

- Open the crimping pliers and place the end of the repair wire into the stripping opening -arrow- of the crimping pliers.

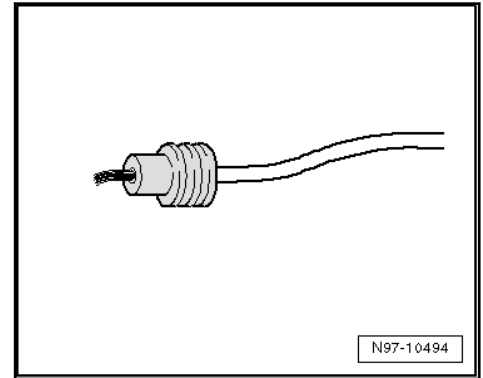


- Complete close the crimping pliers.
- Open the crimping pliers again -arrow- and remove the stripped end of the wire.

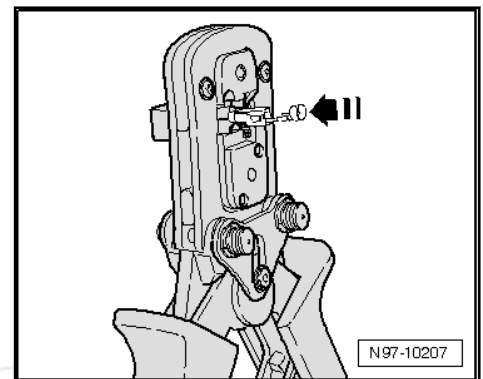


- Slide the single cable seal in the direction of the stripped end of the wire until it is sealed flush with the wire insulation (see Fig.).

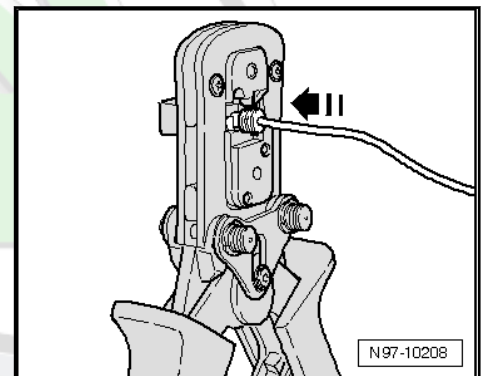




- Place the new crimp contact into the support -arrow- on the crimping pliers.



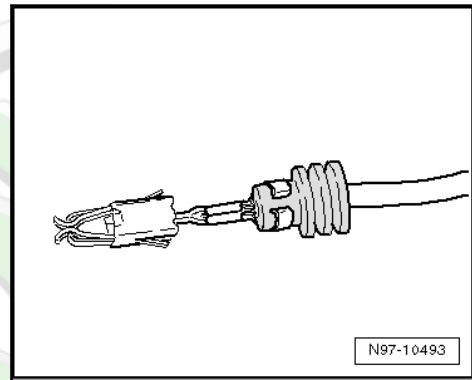
- Insert the stripped end of the wire with the positioned single cable seal into the crimp contact -arrow- until it lies against the "wire stop".



- Crimp the contact, wire and single cable seal by closing the crimping pliers completely.
- Open the crimping pliers again and remove the fully crimped contact.
- Crimping has been performed correctly if the wire and single cable seal in the contact is cleanly crimped and there is a stamp on the back side, which indicates that crimping has been performed correctly and with the correct tool.

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2.7 Repair of 0.13 mm²/ 0.35 mm²/ 0.5 mm² cable

Special tools and workshop equipment required

- ◆ Heat guns -VAS 1978/14A- out Wiring harness repair set -VAS 1978 B-
- ◆ Crimping tool (basic body) -VAS 1978/1-2- out Wiring harness repair set -VAS 1978 B-
- ◆ Head adapter, 0.13 - 0.5 mm² -VAS 1978/1-3-

When repairing wires with a cross-section of up to 0.35 mm², new contacts must always be crimped with the crimping pliers for JPT contacts -VAS 1978/9A- or the crimping pliers (base body) -VAS 1978/1-2- with mounted head adapter for JPT contacts -VAS 1978/9-1-. As a result of the low amperages of these wires in the micro- to milli-range, incorrectly crimped contacts cause contact resistances and faults or complete failure of the applicable system. The most frequent uses of these contacts are as follows:

- ◆ Lambda probe
- ◆ Speed sensor
- ◆ Air mass meter

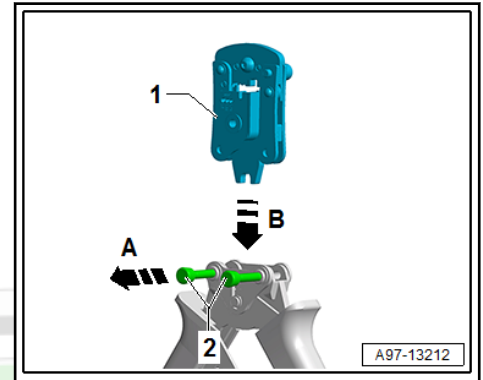


Note

Repair cables with a cross-section of 0.35 mm are available for repair² And 0.5 mm².

Work procedure

- Installing changeover head 0.13 - 0.5 mm² -VAS 1978/1-3- -1- As follows crimping tool (basic body) -VAS 1978/1-2-:
- Open crimping Tool -VAS 1978/1-2-.
- Remove the safety pins -2- to the stop in the direction of the arrow -A-.



- Use the changeover head -VAS 1978/1-3- -1- In the direction of the arrow -B- centrally in the crimping pliers -VAS 1978/1-2-.
- Push in safety pins -2- again until the stop.
- Expose the wire to be repaired approx. 20 cm to each side of the repair point.



Caution

Risk of damage to electrical cables.

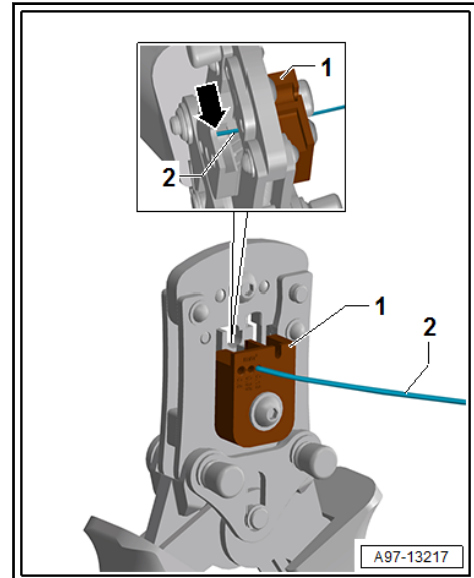
- ◆ ***Carefully expose wrapped wire strands.***

- If necessary, remove the cable wrapping.
- Cut out / cut off the damaged cable piece with a side cutter.

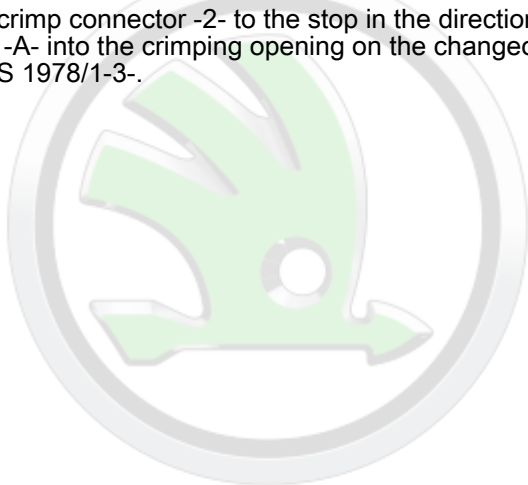


Note

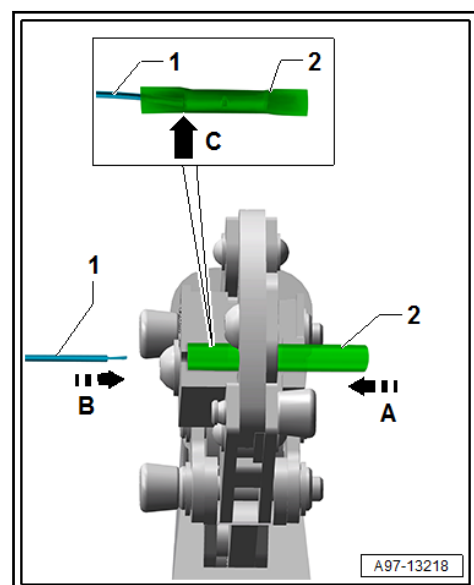
- ◆ ***If the two ends of the single cable in the vehicle are too short after cutting out the damaged section of wire for repair with a single crimp connector, install a correct length of repair wire with two crimp connectors.***
 - ◆ ***When repairing a single cable with a crimped / connected contact, place the yellow repair line next to the damaged vehicle-specific individual cable and cut it to the required length.***
- Plug in the end of the cable -2- As far as the stop -arrow- into the receptacle suitable for the cross section on the changeover head -VAS 1978/1-3- -1-.



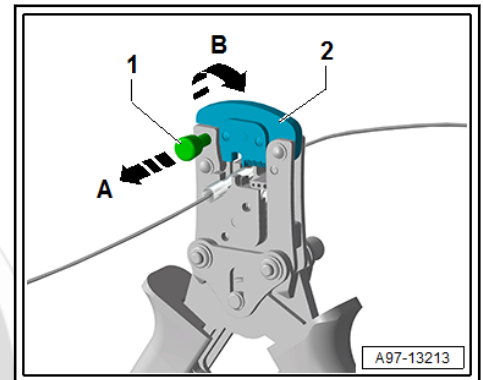
- Press the crimping tool together fully and keep it pressed together.
- Remove the cable end -2- for stripping insulation from the changeover head -VAS 1978/1-3- -1-.
- Open the crimping pliers again.
- The insulation must be neatly cut off and disconnected from the cable
- No insulation residues on stripped wires
- Single wires must not be damaged
- Use small transparent crimp connector from the wiring harness repair set -VAS 1978 B-.
- For 0.13 mm²cables, push another shrink hose onto one of the cables⇒ Electronic catalogue of original parts “ETKA”.
- Slide the crimp connector -2- to the stop in the direction of the arrow -A- into the crimping opening on the changeover head -VAS 1978/1-3-.



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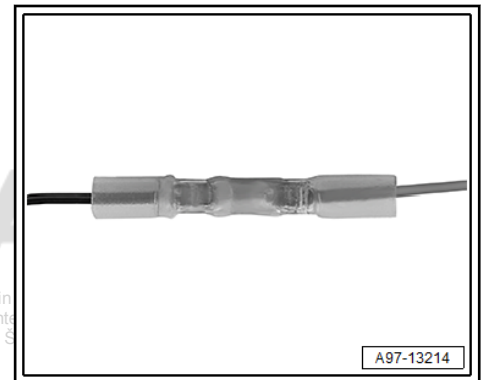


- Slide the stripped cable -1- in the direction of the arrow -B- into the crimp connector -2-.
- All single wires must be pushed in the crimp connector -2-.
- The insulation of the cable, arrow -C- must not be crimped at the same time.
- Push the crimping tool together fully and then open it.
- Remove the cable with a crimp connector.
- Repeat cable crimping with the butt splice connector on the other side as described.
- Remove safety pin -1- to the stop in the direction of the arrow -A-.



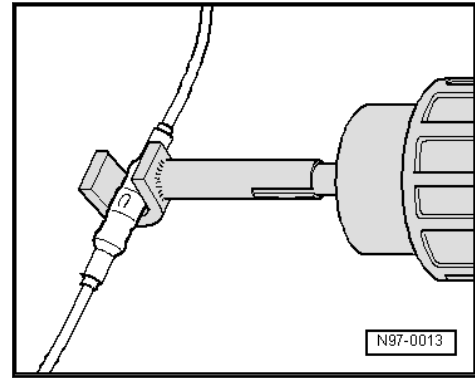
- Swivel the top of the changeover head -VAS 1978/1-3- -2- in the direction of the arrow -B-.
- Remove crimped crimp connector.

Correct crimping result



- After crimping, the crimp connector must be shrunk with the hot-air blower in order to prevent moisture from penetrating.
- For 0.13 mm² cables, the additional shrink hose must be shrunk in order to ensure a complete seal.
- Place the shrink adapter for hot-air blower -VAS 1978/15A- onto the hot-air blower -VAS 1978/14A.-.

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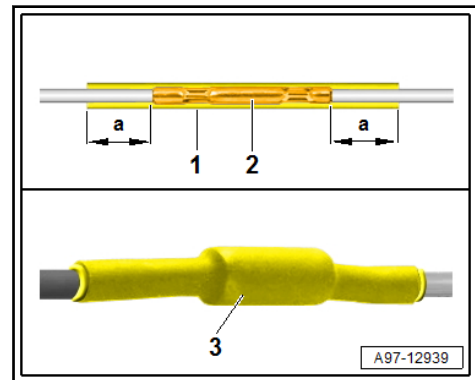
Caution

Risk of damage to electrical cables.

- ◆ **When shrinking the shrinking hose, make sure the hot nozzle of the hot-air blower does not damage any other cables, plastic parts or insulating materials.**

- ◆ **Follow the Owner's Manual of the hot-air blower!**

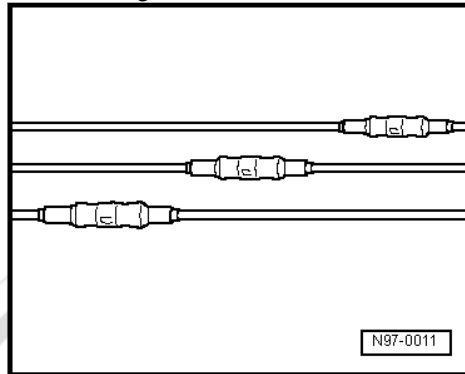
- For 0.13 mm² cables, position the shrink hose -1- by feeling for the contours centrally above the crimp connector -2-.



- Dimension -a- must be approx. the same on both sides.
- Heat the shrinking hose/crimp connector with the hot-air blower lengthways from the centre to the outside until it is completely sealed and the adhesive is coming out at the ends.
- This is how the completed repair point -3- must look.

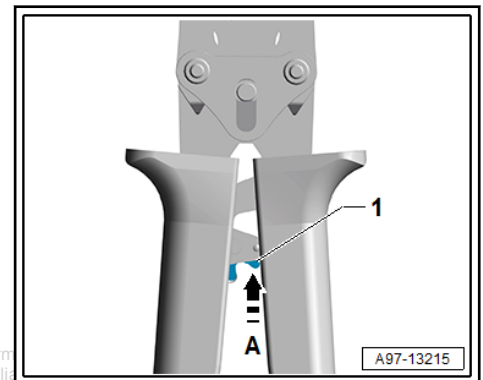
i Note

Ensure that the crimp connectors are not positioned immediately next to each other if there are multiple wires to be repaired. Arrange the crimp connectors slightly offset to ensure that the wiring loom does not become too big.



- ◆ If the repair point has been wrapped previously, the point must be re-wrapped with yellow adhesive tape after repair.
- ◆ Attach the repaired wiring loom, in necessary, with a cable strap to avoid rattling when driving.

Premature unlocking



- Push down the release lever -1- in direction of arrow -A-.
- Push the crimping tool together slightly and then open it at the same time.



Caution

- ◆ Do not use the crimp connector after premature unlocking.

2.8 Repair a 10 mm²- or 16 mm² cable with an individual joint butt splice connector

Special tools and workshop equipment required



- ◆ Heat guns -VAS 1978/14A- out Wiring harness repair set -VAS 1978 B-



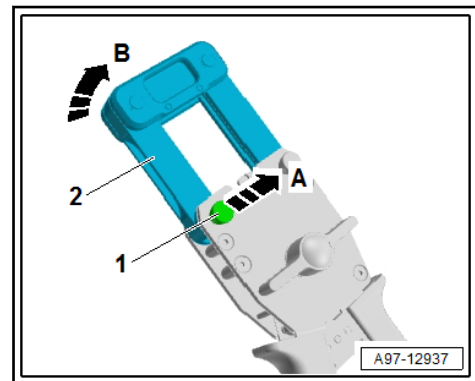
- ◆ Shrink attachment for hot air blower -VAS 1978/15A- from the Wiring harness repair set -VAS 1978 B-
- ◆ Wiring harness repair set -VAS 631 003-



Note

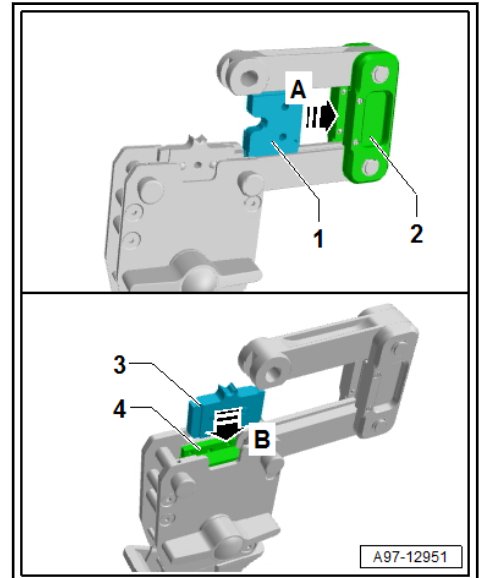
- ◆ Repair cables (by the metre) with a cross-section of 10 mm are available for repair² And 16 mm².
- ◆ In addition, individual repair cables with a crimped / attached contact are available for repair.

Work procedure



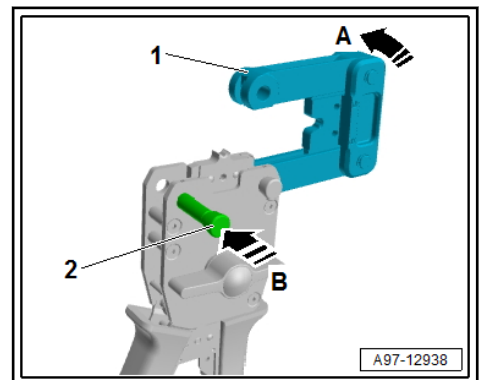
- Attach the crimping anvil and crimping plunger to the crimping pliers as follows:
- Crimping tool from the wiring harness repair set -VAS 631 003-.
- Remove safety pin -1- to the stop in the direction of the arrow -A-.
- Open the adapter -2- in the direction of the arrow -B-.
- Push in the crimping dies -1- into the mount until they audibly click into place -2- on the adapter, arrow -A-.

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- Push in the crimping anvil -3- into the crimping plier mount until it audibly clicks into place -4-, arrow -A-.
- Close the adapter -1- in the direction of the arrow -A-.

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- Push in the safety pin -2- In the direction of the arrow -B- up to the stop.
- Expose the wire to be repaired approx. 20 cm to each side of the repair point.



Caution

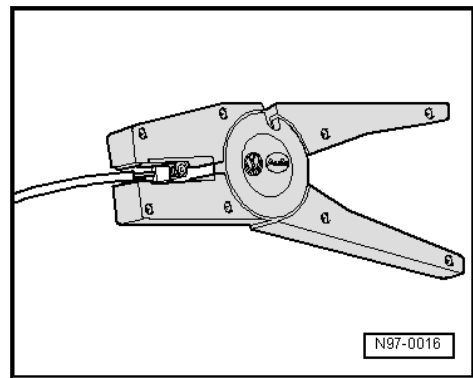
Risk of damage to electrical cables.

- ◆ *Carefully expose wrapped wire strands.*

- If necessary, remove the cable wrapping with a knife.
- Cut out/ cut off the damaged part of the cable with the cable shears from the wiring harness repair set -VAS 631 003-.

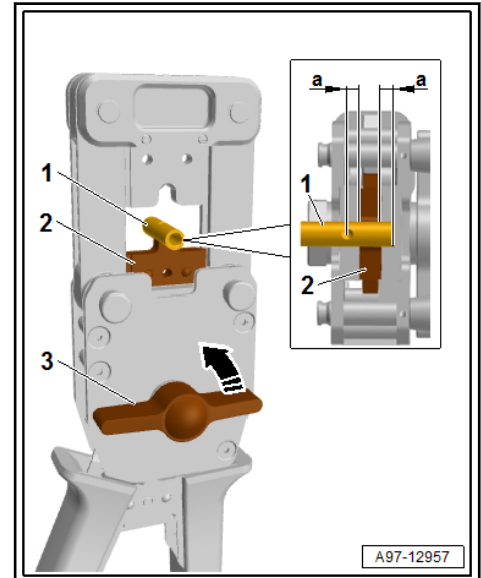

Note

- ◆ *If the two ends of the single vehicle cable are too short for a repair with a single butt splice connector, cut the damaged cable, use a appropriately long piece of yellow repair cable with two connectors.*
- ◆ *When repairing a single cable with a crimped / connected contact, place the yellow repair line next to the damaged vehicle-specific individual cable and cut it to the required length.*
- Adjust the flexible stop in the tongs of the stripping pliers from the wiring harness repair set -VAS 631 003- to the length to be stripped.

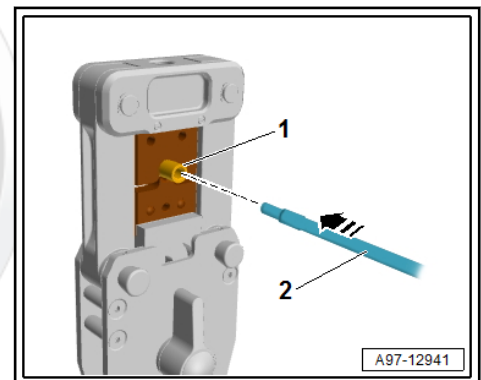


- ◆ 10 mm² cables: 14 mm
- ◆ 16 mm² cables: 16.5 mm
- Place the end of the wire from the front up to the stop in the jaws and press the wire stripper until completely closed.
- Open the stripper again and remove the stripped end of the wire.
- The insulation must be neatly cut off and disconnected from the cable
- No insulation residues on stripped wires
- Single wires must not be damaged
- Remove a suitable butt splice connector and a shrink hose from the wiring harness repair set -VAS 631 003- for repair.
- Place the shrink hose on one of the cables.
- Position butt splice connectors -1- with the first crimping point centrally on the crimping anvil -2-.

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- Dimension -a- must be the same on both sides.
- Turn the quick thrust lever -3- counter-clockwise -arrow-Until the butt splice connector -1- is fixed.
- Push the cable -2- with the stripped wire end to the stop into the butt splice connector -1- -arrow-.



- All single wires must be inserted into the butt splice connector
- Fully close and open the crimping tool several times until the crimping bobbin goes down into the starting position independently.

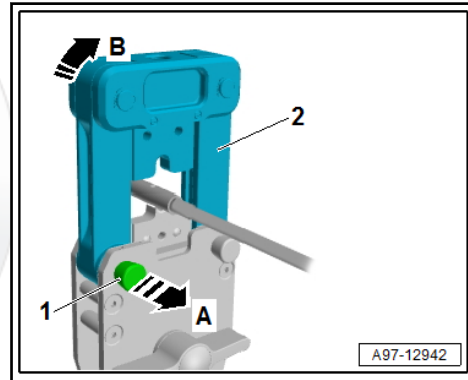


Note

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The insulation of the cable must not be crimped at the same time.

- Repeat cable crimping on the other side as described.
- Remove the safety pin in the direction of the arrow -A-.

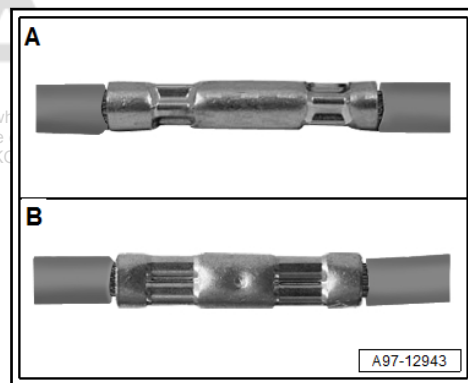


- Open the adapter in the direction of the arrow -B-.
- Remove the crimped butt splice connector.

Correct crimping result



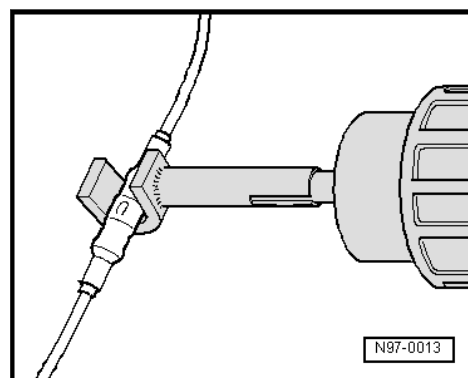
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A - 10 mm², star crimp

B - 16 mm², B crimp

After crimping, the shrink hose must be shrunk via the butt splice connector with the hot-air blower in order to prevent moisture from penetrating.



- Place the shrink adapter for hot-air blower -VAS 1978/15A- onto the hot-air blower -VAS 1978/14A-.

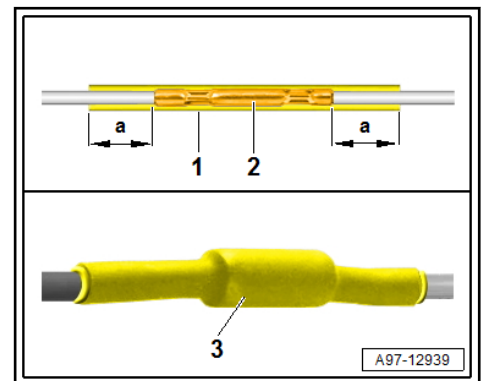


Caution

Danger of damage to surrounding components.

- ◆ ***When shrinking the shrinking hose, make sure the hot nozzle of the hot-air blower does not damage any other cables, plastic parts or insulating materials.***
- ◆ ***Follow the Owner's Manual of the hot-air blower!***

- Position the shrink hose -1- by feeling for the contours centrally above the butt splice connector -2-.

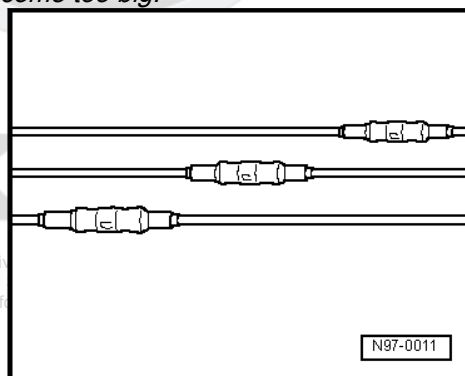


- Dimension -a- must be approx. the same on both sides.
- Heat the shrink hose with the hot-air blower lengthways from the centre to the outside until it is completely sealed and the adhesive is coming out at the ends.
- This is how the completed repair point -3- must look.



Note

Ensure that the crimp connectors are not positioned immediately next to each other if there are multiple wires to be repaired. Arrange the crimp connectors slightly offset to ensure that the wiring loom does not become too big.



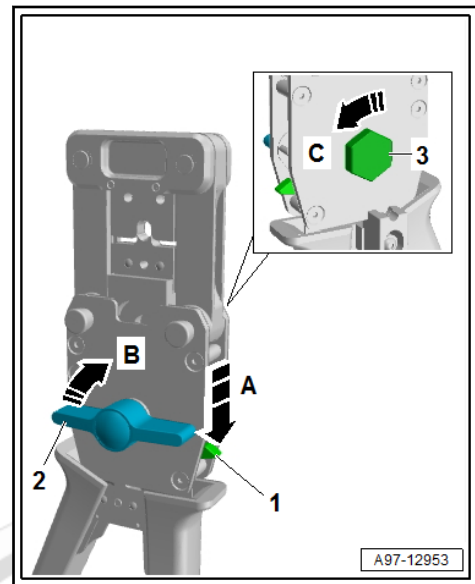
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quality

- ◆ ***If the repair point has been wrapped previously, the point must be re-wrapped with yellow adhesive tape after repair.***
- ◆ ***Attach the repaired wiring loom, in necessary, with a cable strap to avoid rattling when driving.***



Premature unlocking



- Push down handle -1- in direction of arrow -A-.
- Turn the quick thrust lever -2- counter-clockwise in the direction of the arrow -B- until the crimping anvil is in its initial position.

If premature unlocking cannot be done manually, then:

- Push down handle -1- in direction of arrow -A-.
- Place the key from Wiring harness repair set -VAS 631 003- on the screw -3- on the back.
- Turn the key counter-clockwise in the direction of the arrow -C- until the crimping anvil is in its initial position.



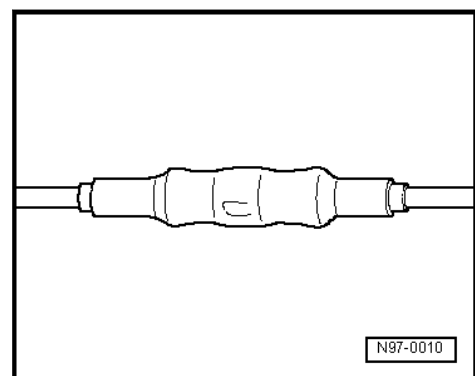
Caution

Do not use the butt splice connector after premature unlocking.

2.9 Line break with single repair point

Repair point with single crimp connector

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- Expose the wire to be repaired (approx. 20 cm to each side of the repair point).

- If necessary, remove the ties of the wiring loom, using the folding knife.
- Cut out the damage section of the wire with the wire stripper -VAS 1978/3-.

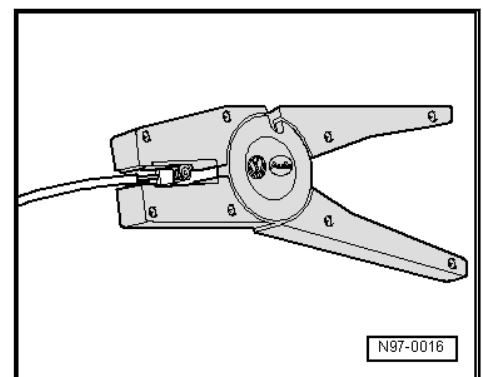
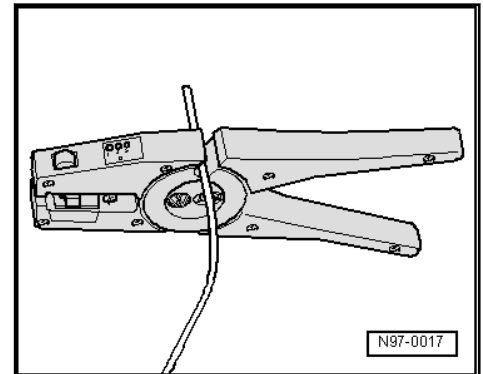
 Note

If the two ends of the single cable in the vehicle are too short after cutting out the damaged section of wire for repair with a single crimp connector, install a correct length of repair wire with two crimp connectors ⇒ [b2.10 reak with two repair points](#)”, [page 69](#) .

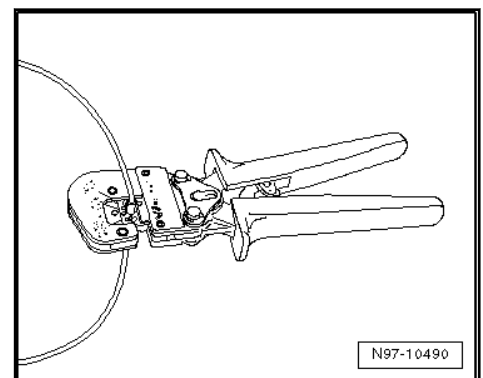
- Strip the ends of the wire by 6-7 mm with the wire stripper.

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- Slide crimp connectors onto the two stripped ends of the vehicle's single cable and crimp them with the crimping pliers.



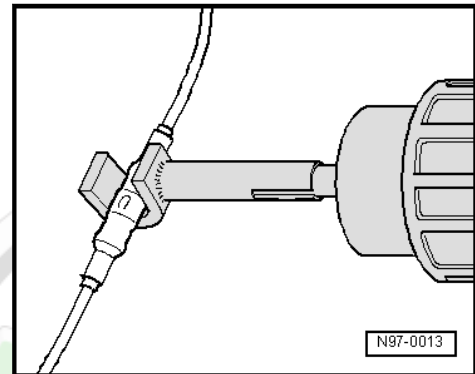


Note

- ◆ *You must ensure that the correct crimping recess is used for the crimp connector ⇒ p2.3.1 **“lier with insert”**, page 43 .*
- ◆ *The insulation of the cable must not be crimped at the same time.*

After crimping, the crimp connector must be shrunk with the hot-air blower in order to prevent moisture from penetrating.

- Place the shrink adapter for hot-air blower -VAS 1978/15- onto the hot-air blower -VAS 1978/14-.



- Heat the crimp connector with the hot-air blower lengthways from the centre to the outside until it is completely sealed and the adhesive is coming out at the ends.



Caution

When shrinking the crimp connectors, make sure the hot nozzle of the hot-air blower does not damage any other cables, plastic parts or insulating materials.

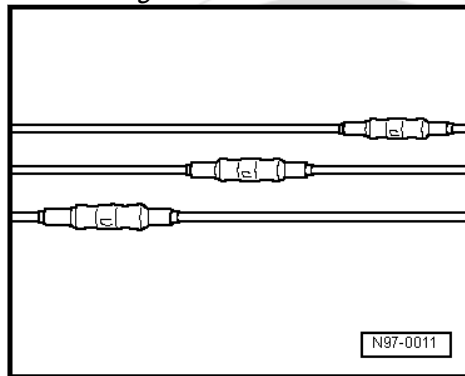
Follow the Owner's Manual of the hot-air blower!

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i Note

Ensure that the crimp connectors are not positioned immediately next to each other if there are multiple wires to be repaired. Arrange the crimp connectors slightly offset to ensure that the wiring loom does not become too big.

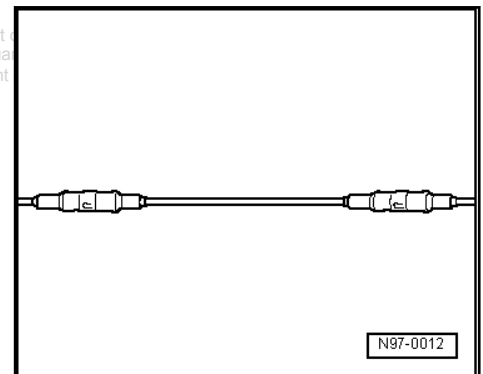


- ◆ *If the repair point has been wrapped previously, the point must be re-wrapped with yellow insulating tape after repair.*
- ◆ *Attach the repaired wiring loom, in necessary, with a cable strap to avoid rattling when driving.*

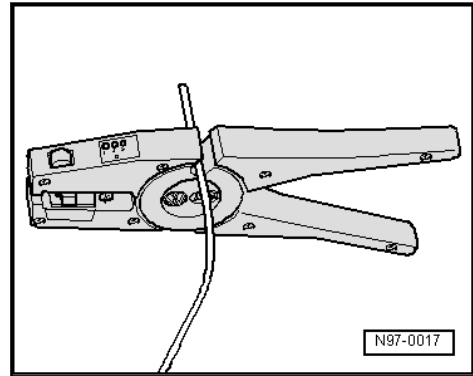
2.10 Line break with two repair points

Repair point with intermediate wire

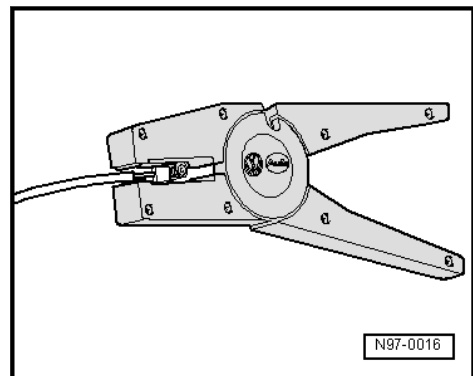
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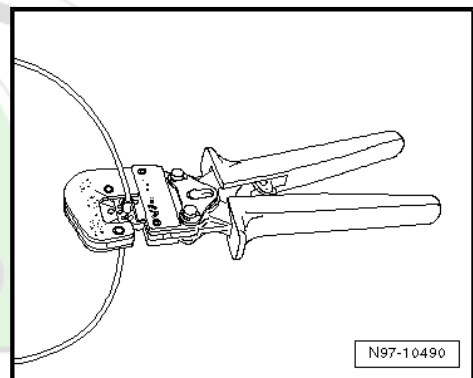
- Expose the wire to be repaired at two points (approx. 20 cm to each side of each repair point).
- If necessary, remove the ties of the wiring loom, using the folding knife.
- Lay the yellow repair wire next to the damaged wiring loom and cut the repair wire to the required length with the wire stripper -VAS 1978/3-.



- Cut the damage section of wire out of the vehicle's single cable.
- Strip the ends of the wire by 6-7 mm with the wire stripper.



- Slide the crimp connector on one side onto the vehicle's single cables and on the other side onto the repair wire.
- Use the crimping pliers to crimp the crimp connector with the two ends of wire.



- Repeat this procedure on the other end of the repair wire.

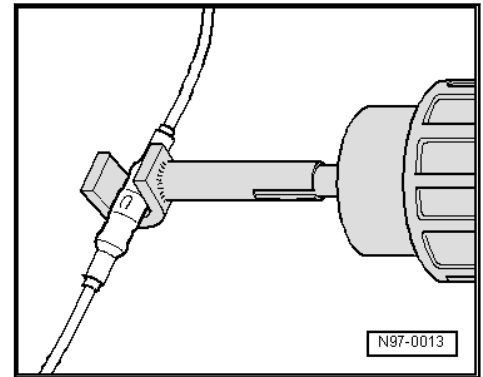


Note

- ◆ You must ensure that the correct crimping recess is used for the crimp connector ⇒ [p2.3.1](#) *lier with insert*, [page 43](#).
- ◆ The insulation of the cable must not be crimped at the same time.

After crimping, the crimp connector must be shrunk with the hot-air blower in order to prevent moisture from penetrating.

- Place the shrink adapter for hot-air blower -VAS 1978/15- onto the hot-air blower -VAS 1978/14-.



- Heat the crimp connector with the hot-air blower lengthways from the centre to the outside until it is completely sealed and the adhesive is coming out at the ends.



Caution

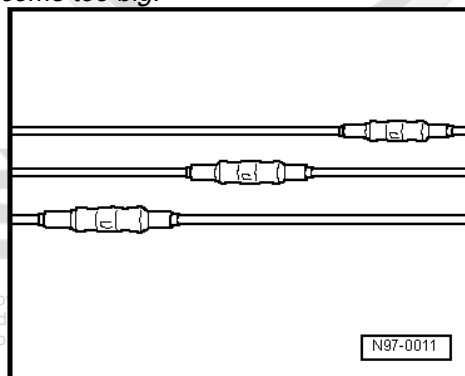
When shrinking the crimp connectors, make sure the hot nozzle of the hot-air blower does not damage any other cables, plastic parts or insulating materials.

Follow the Owner's Manual of the hot-air blower!



Note

Ensure that the crimp connectors are not positioned immediately next to each other if there are multiple wires to be repaired. Arrange the crimp connectors slightly offset to ensure that the wiring loom does not become too big.



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- ◆ *If the repair point has been wrapped previously, the point must be re-wrapped with yellow insulating tape after repair.*
- ◆ *Attach the repaired wiring loom, in necessary, with a cable strap to avoid rattling when driving.*



2.11 Repairing aerial cables

Check the aerial cable ⇒ [page 72](#)

Replace the tool head: ⇒ [page 73](#)

Cut the aerial cable: ⇒ [page 73](#)

Strip the shield: ⇒ [page 74](#)

Strip the outer sheath: ⇒ [page 76](#)

Strip the interior insulation: ⇒ [page 77](#)

Crimp the inner conductor: ⇒ [page 78](#)

Crimp the outer conductor: ⇒ [page 80](#)

Special tools and workshop equipment required

- ◆ Repair kit, aerial cable -VAS 6720-

The repair kit, aerial cable -VAS 6720- ensures optimal repair quality for the repair of aerial cables RG 174 (blue) and RTK 031 (black). The set includes the respective stripping tools and the crimping tools for the two aerial cables. In the case, you will also find all the necessary individual parts to re-attach the original plug at a near-series production level. Only the zero-coded coupler (green) is required. All other connecting cables for the various Infotainment systems can be found using the ⇒ Electronic catalogue of original parts "ETKA" (EL - electrical connection elements) on the panel 035-XX. These special adapter aerial cables, which vary according to vehicle type, must always be ordered separately. You will also find all individual parts on this picture panel for reordering. In the case, the compartments for the consumables are labelled with the part numbers. The repair kit is based on the existing changeover heads and pliers system in the wiring loom repair set -VAS 1978B-.

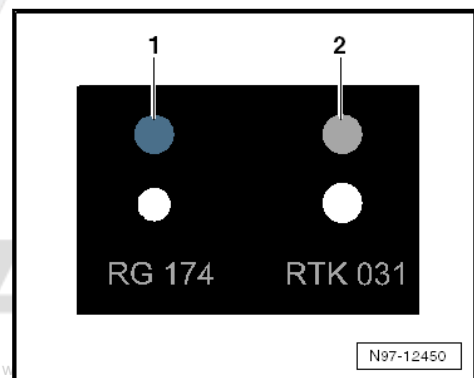


Note

Additional Information: ⇒ *Owner's Manual, repair kit, aerial cable -VAS 6720-*

Check the aerial cable:

Before starting the repair, the gauge must be used to determine which aerial cable is concerned.



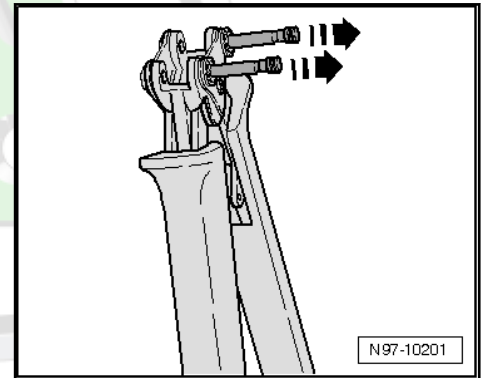
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- ◆ -1- system RG 174 = blue
- ◆ -2- system RTK 031 = grey

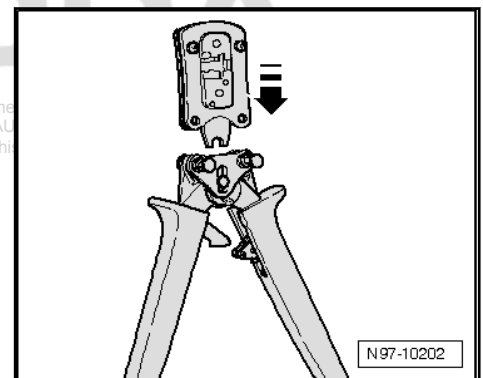
In both systems, the positioners of the tool heads are colour-coded accordingly.

Replace the tool head:

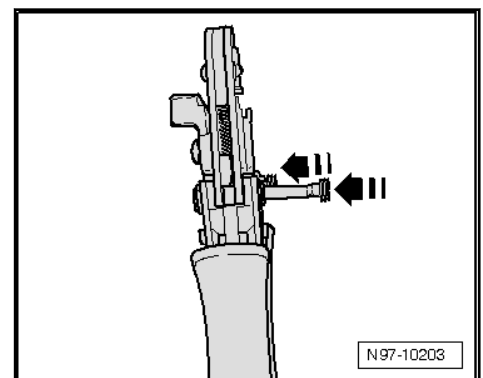
- Select the appropriate tool head in accordance with the aerial cable check ⇒ [page 72](#) .
- Fully open the pliers handle.
- Release and pull out the two locking pins -arrows- from the pliers handle.



- Insert the required tool head from above -arrow- into the pliers handle.

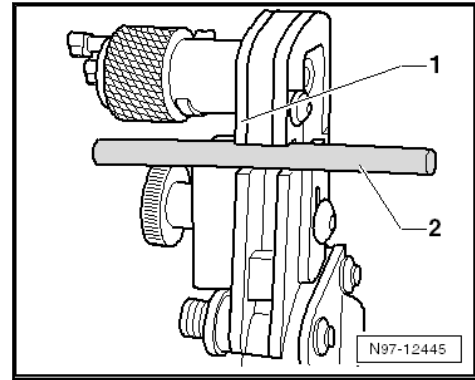


- Lock the tool head in the pliers handle by pushing in the pins -arrows-.



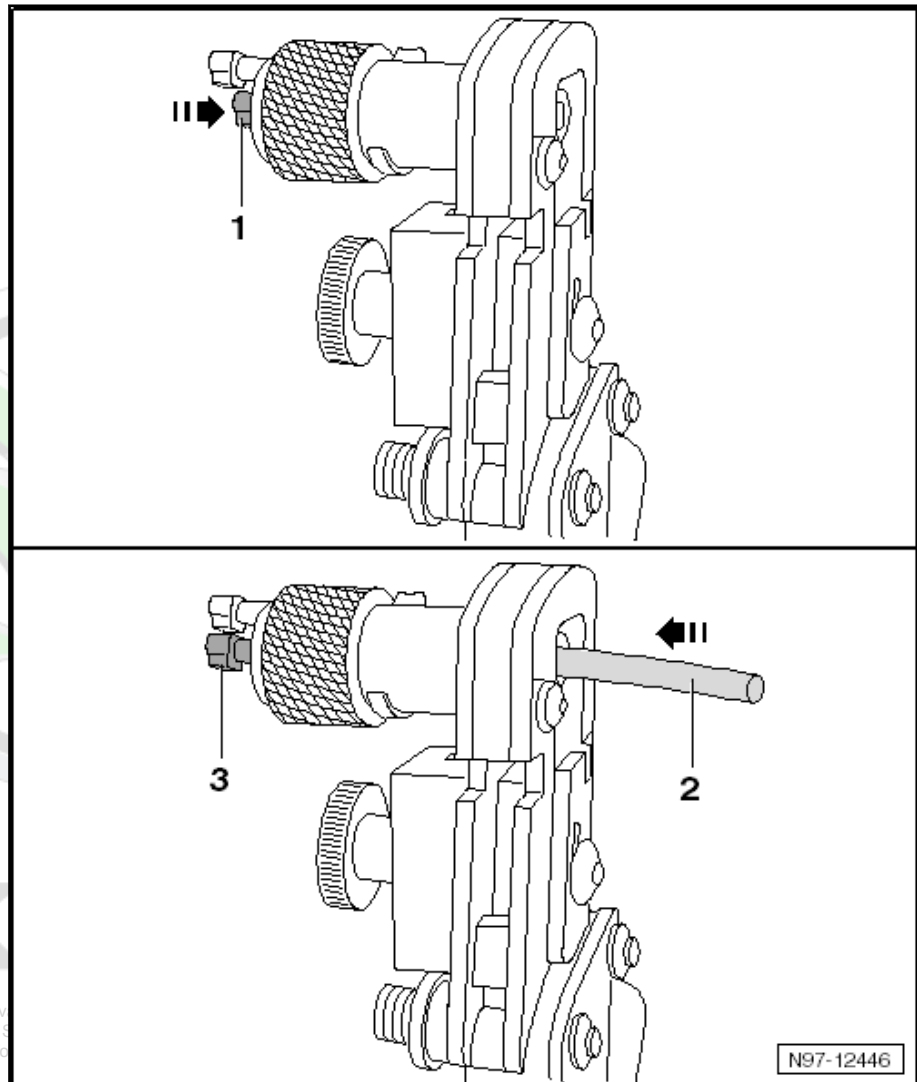
Cut the aerial cable:

- Slide the aerial cable -2- into the cutting device -1-.

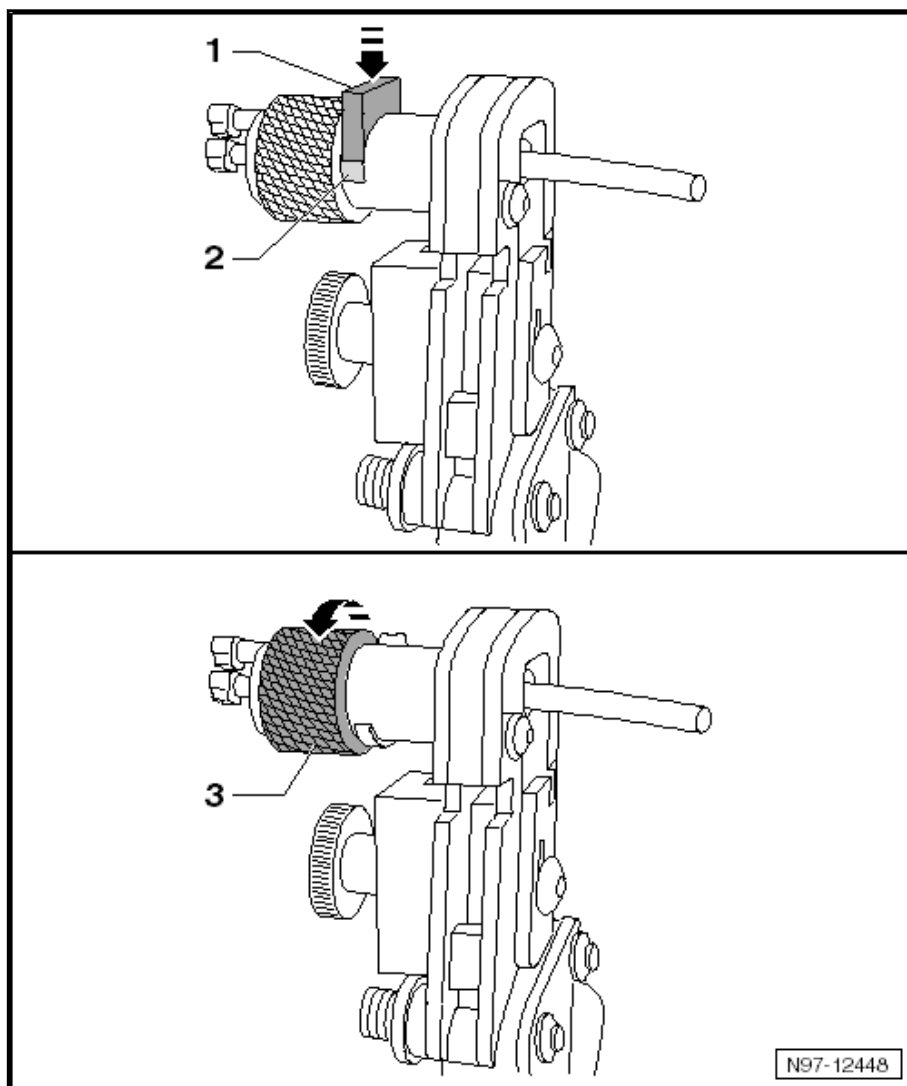


- Close the tool and open it again.
- Pull the aerial cable out of the cutting device.

Strip the shield:

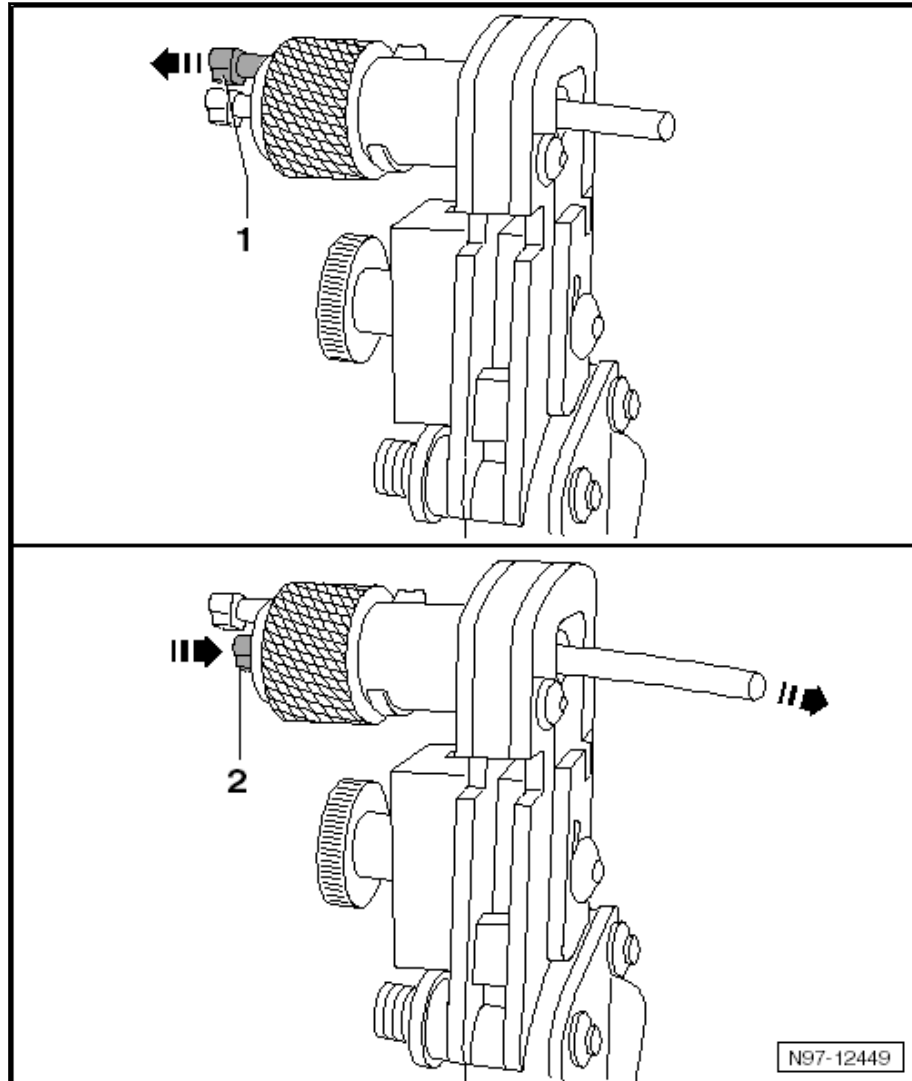


- Slide the positioning pin -1- into the rotary cutting segment until it stops.
- Slide the aerial cable -2- into the rotary cutting segment until it stops. The positioning pin -3- is completely visible again.



- Push the blade holder -1- against the axis of the rotary cutting segment until it clicks into place. The gap -2- under the blade holder is completely closed.
- Hold the aerial cable in place so that it does not rotate.
- Turn the rotary cutting segment -3- twice in the direction of the arrow until it turns smoothly.

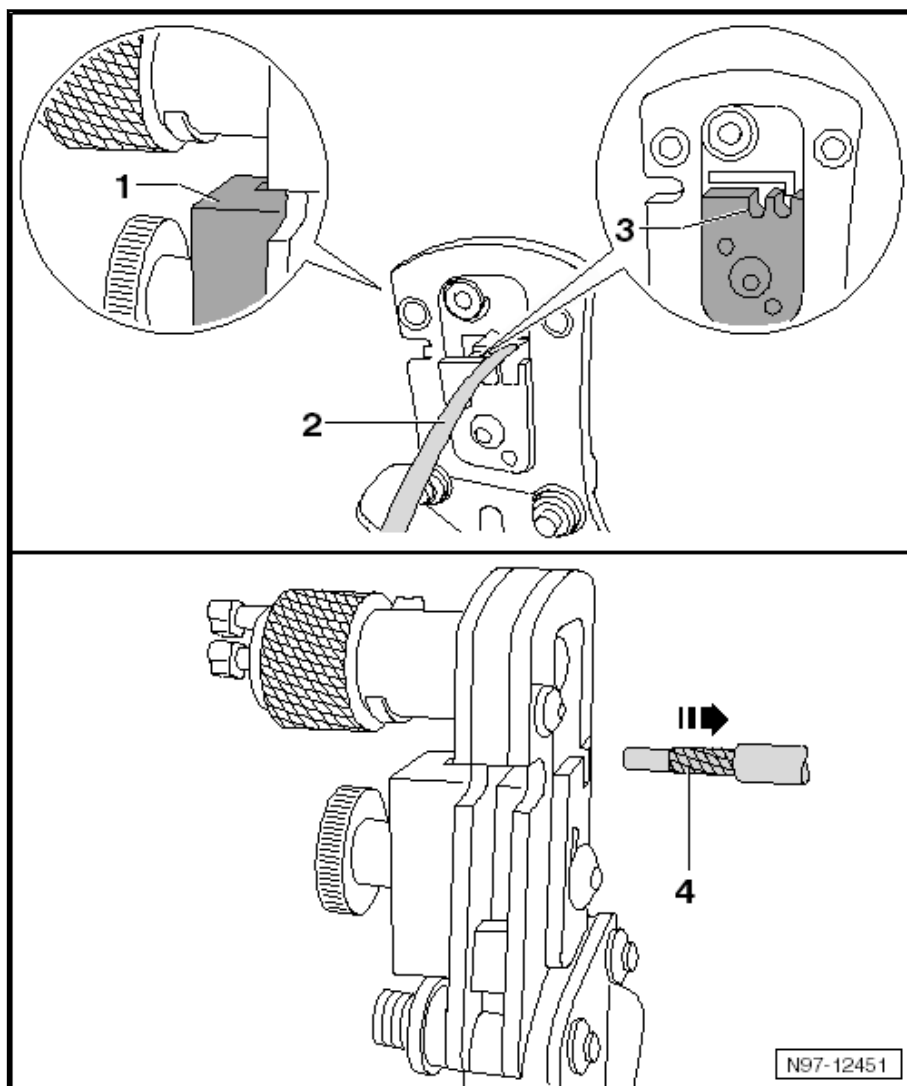
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- Pull the unlocking bolt -1-. The blade holder is released and detached from the aerial cable.
- Slide the positioning pin -2- into the rotary cutting segment until it stops. The aerial cable is pushed out of the rotary cutting segment.
- Remove the shield from the aerial cable.
- Remove any insulation residue from the rotary cutting segment.

Strip the outer sheath:

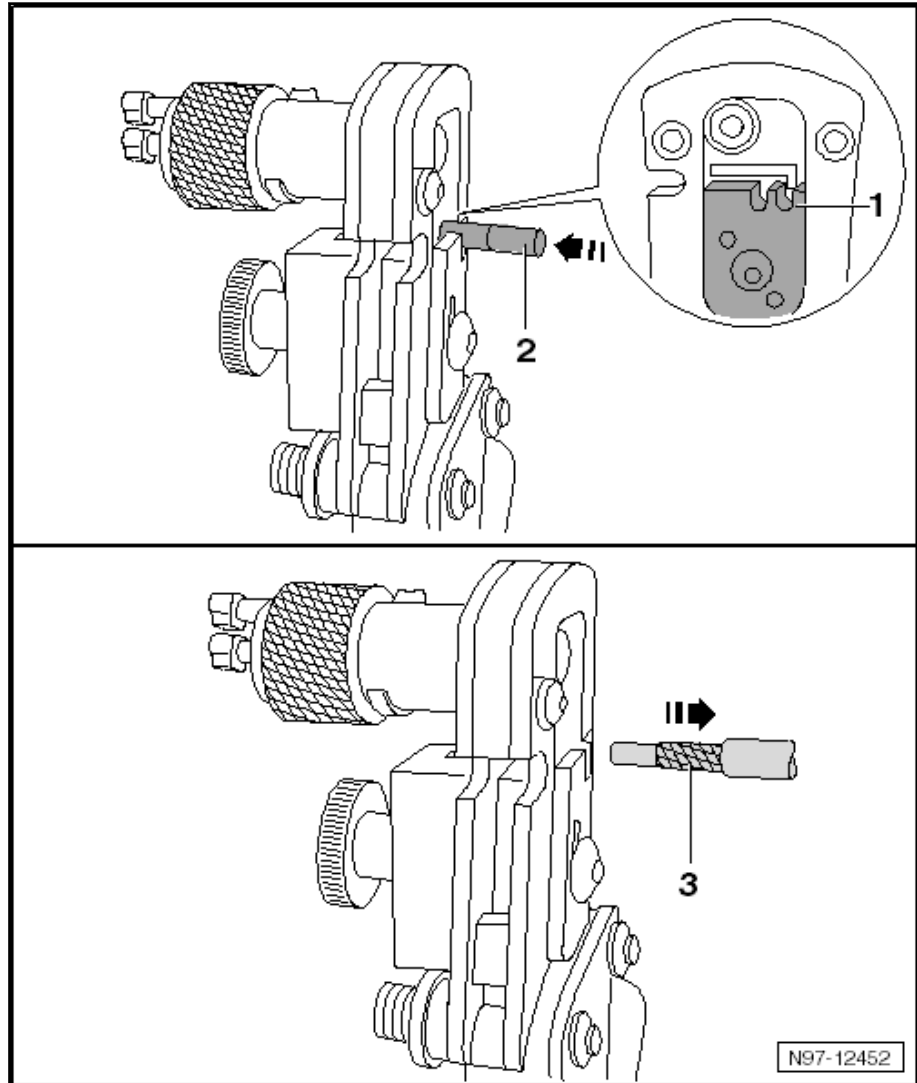


- Slide the aerial cable -2- into the support -3- in the tool head until it stops -1-.
- Close the tool and open it again.
- Pull the aerial cable -4- out.

Strip the interior insulation:



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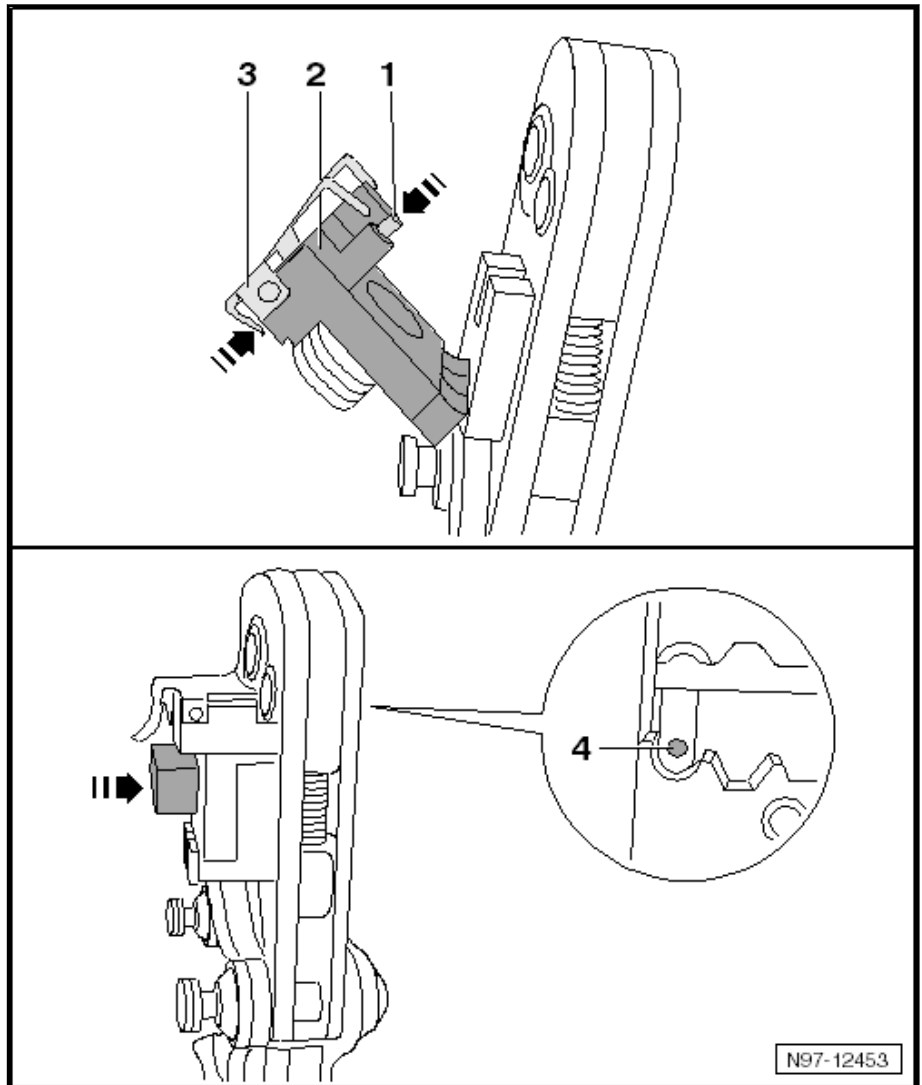


- Slide the aerial cable -2- into the support -1- in the tool head until it stops.
- Close the tool and open it again.
- Pull the aerial cable -3- out.

Crimp the inner conductor:

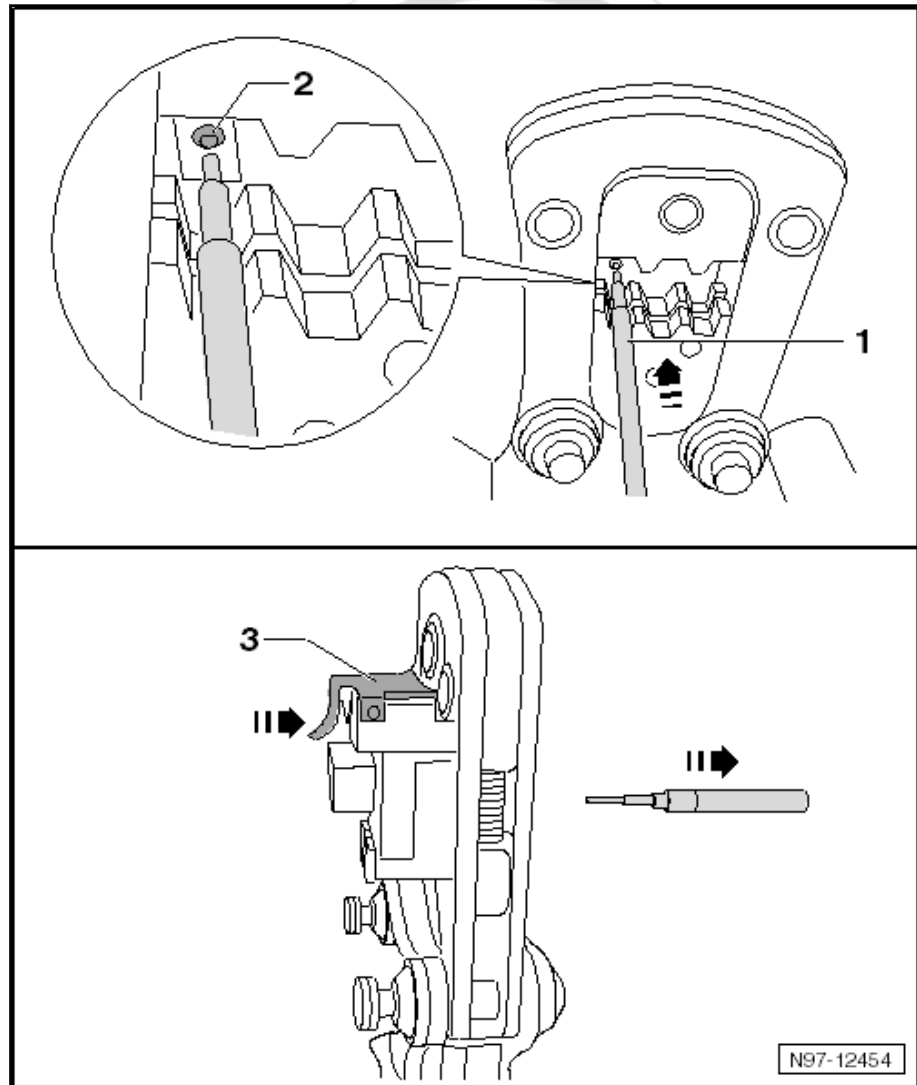
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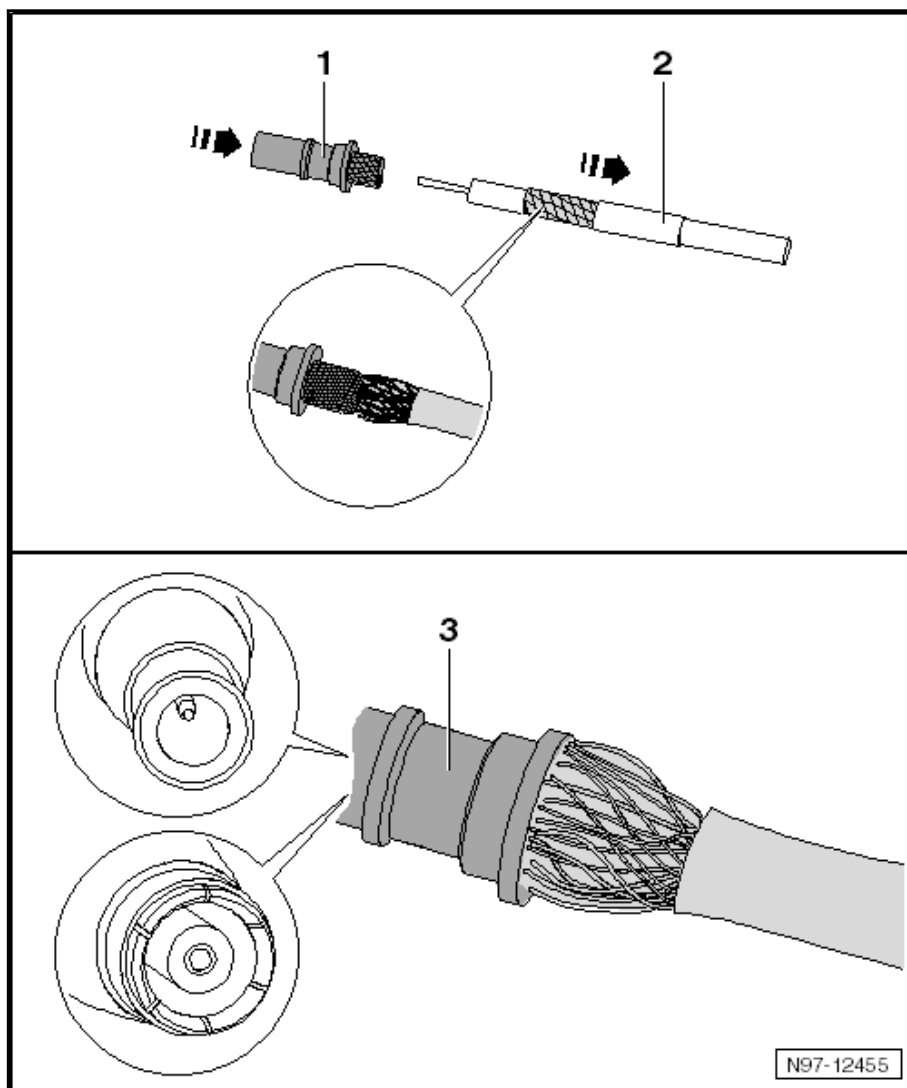
- Select the appropriate tool head ⇒ [page 72](#) in accordance with the aerial cable check ⇒ [page 73](#) .
- Fold out the swivel positioner -2-.
- Open the positioning plate -3-. The positioning plate swings upwards.
- Slide the inner contact -1- into the swivel positioner until it stops and release the positioning plate. The inner contact is fixed.
- Fold in the swivel positioner. The inner contact -4- is positioned in the tool head.

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- Slide the aerial cable -1- into the inner contact -2- in the tool head. While doing so, keep the swivel positioner in position.
- Close the tool until it opens automatically.
- Open the positioning plate -3- and pull out the aerial cable.

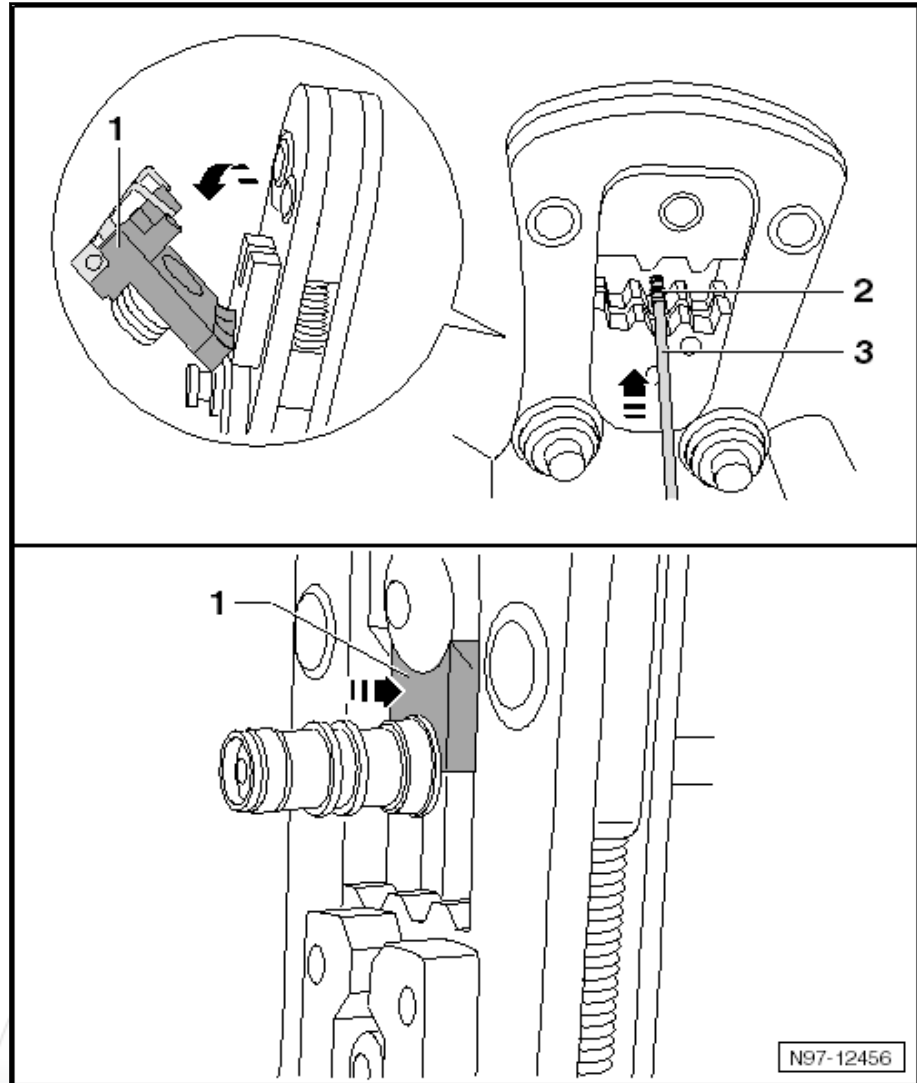
Crimp the outer conductor:



- Push the sleeve -2- and outer contact -1- over the inner conductor. The knurled contact part must be pushed under the shield -3- but over the aluminium foil.
- Slide the outer contact -4- on completely. Make sure that the bushing/pin are in the correct position.

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- Slide the sleeve -3- up to the outer contact.
- Open the tool and fold out the swivel positioner -1-.
- Position the mounted external contact -2- in the tool head in the middle profile at the edge of the unit -4-.
- Close the tool and open it again.
- Pull out the aerial cable.

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3 Repairing socket housings and connectors

⇒ [o3.1 n repairing socket housings and connectors](#)", page 83

⇒ [c3.2 ontacts in socket housings](#)", page 83

⇒ [o3.3 f single cable seals](#)", page 85

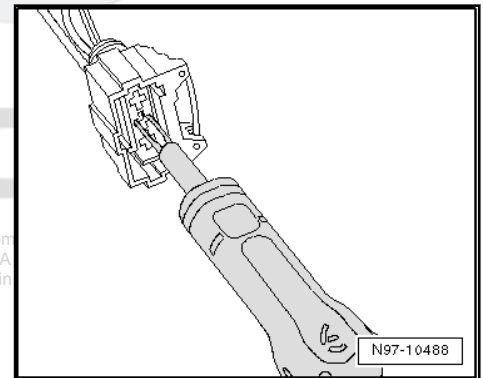
3.1 Notes on repairing socket housings and connectors



- ◆ *The general instructions for repairing vehicle electrics ⇒ [i2.1 nstructions for the repair on the vehicle electrics](#)", page 41 and the general instructions for wiring loom and plug repair ⇒ [i2.2 nstructions for wiring harness and plug repair](#)", page 42 must be followed.*
- ◆ *The appropriate crimp contacts are assigned to the socket housings on the basis of the part number stamped on the socket housing. The part numbers of the socket housings are listed in the ⇒ "ETKA" - Electronic Catalogue of Original Parts with the applicable crimp contacts.*
- ◆ *Damaged socket housings must always be replaced.*

3.2 Repairing contacts in socket housings

- Open and, if necessary, unlock the secondary lock of the socket housing first ⇒ [i4.2 ock](#)", page 88 .
- Unlock the contact (primary lock) with the suitable release tool ⇒ [i4.3 ock](#)", page 89 .



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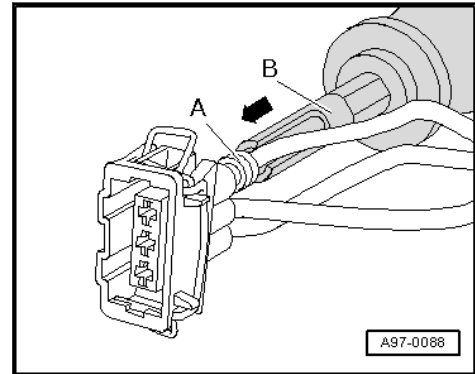
- Pull the contact on the single cable out of the socket housing.
- Take the yellow repair wire with the correct contact from the wiring loom repair kit for the repair.
- Expose the repair point of the vehicle's wiring loom (approx. 20 cm to each side of the repair point).
- If necessary, remove the ties of the wiring loom, using the folding knife.
- Insert the new contact of the repair wire into the socket housing until it clicks into place.
- Fit the single cable seal onto the repair wire.



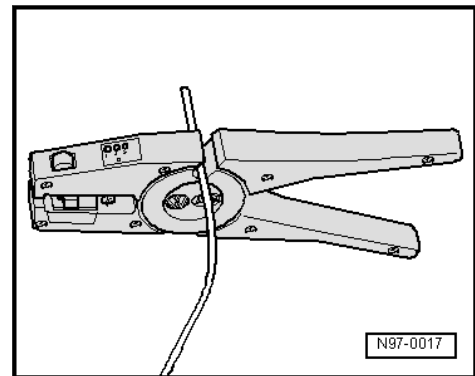
Note

The small diameter of the single cable seal must point to the socket housing.

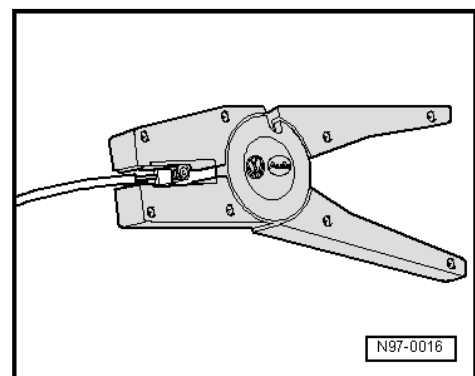
- Slide single cable seal -A- with the correct assembly tool -B- into the socket housing -arrow- ⇒ [o3.3 f single cable seals](#)”, [page 85](#) .



- Shorten the repair wire and single cable of the vehicle's wiring loom as required with the wire stripper -VAS 1978/3-.



- Strip the ends of the repair wire and the vehicle's single cable by 6-7 mm with the wire stripper.



- Crimp the stripped ends of the repair wire and single cable of the vehicle's wiring loom with the crimping pliers and a crimp connector, as described in section ⇒ [b2.9 reak with single repair point](#)”, [page 66](#) .

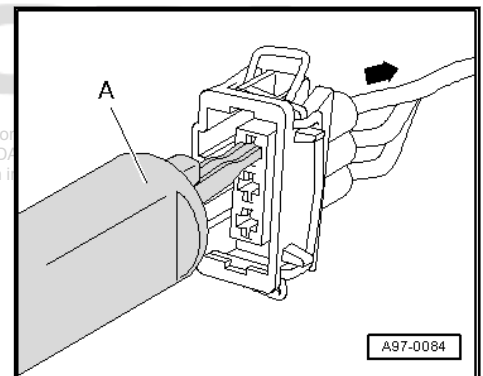
3.3 Assembly of single cable seals

Note

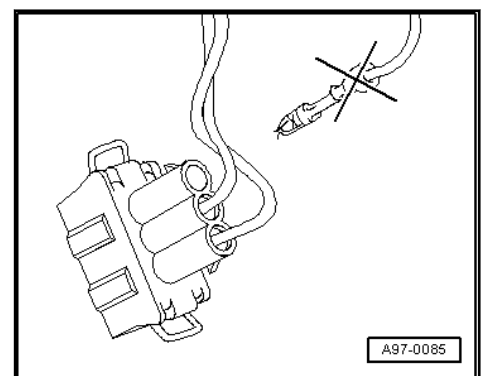
- ◆ *Single cable seals prevent water and dirt getting into the socket housing. They are installed e.g. in the engine compartment and must always be reinstalled after repair.*
- ◆ *As standard in the series, the single cable seal is crimped with the contact on the wire, but this is not the case for repair wires. Before crimping the repair wire, therefore, the single cable seal must be pushed onto the wire.*
- ◆ *Single cable seals must always match the wire cross-section of the repair wire that is used. The outer diameter of the single cable seal is matched to the diameter of the socket housing chamber. Only perform assembly with the correct assembly tool.*

Assembly of the single cable seal

- Use the correct release tool -A- to release the contact lock and then pull the wire with the single cable seal backwards out of the socket housing -arrow-.



- Cut off the old contact with single cable seal from the vehicle's wiring loom.

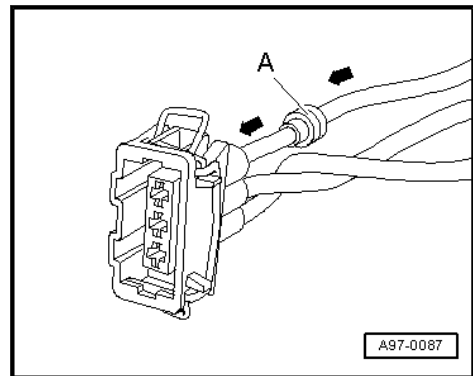
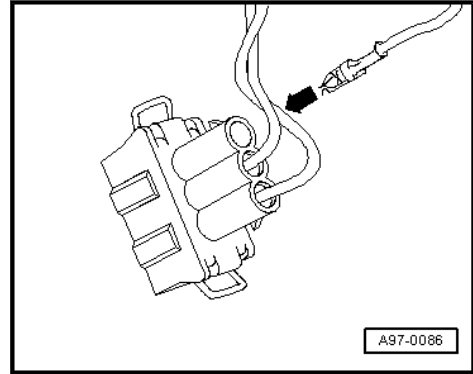


- Slide the repair wire with the new contact into the correct chamber of the socket housing -arrow- until it locks into place.



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- Slide the single cable seal -A- onto the free end of the repair wire -arrow-.

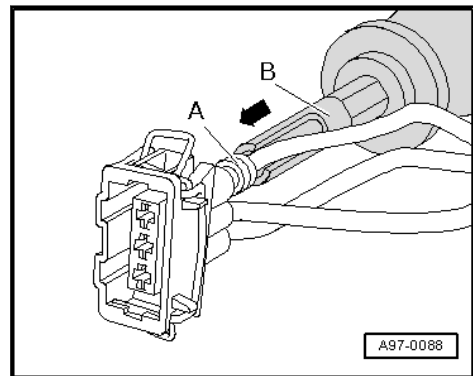


Note

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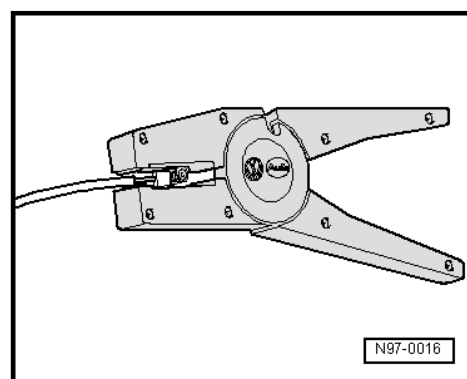
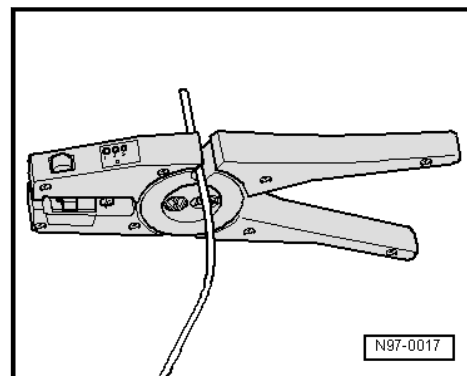
The small diameter of the single cable seal must point to the socket housing.

- Slide the single cable seal -A- with the correct assembly tool -A- up to the stop into the socket housing -arrow-.



- Shorten the repair wire and single cable of the vehicle's wiring loom as required with the wire stripper -VAS 1978/3-.

- Strip the ends of the repair wire and the vehicle's single cable by 6-7 mm with the wire stripper.



- Crimp the stripped ends of the repair wire and single cable of the vehicle's wiring loom with the crimping pliers and a crimp connector, as described in section [⇒ b2.9 reak with single repair point](#), page 66 .

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4 Unlocking and disassembling socket housings

⇒ [04.1 n unlocking and disassembling socket housings”, page 88](#)

⇒ [14.2 ock”, page 88](#)

⇒ [14.3 ock”, page 89](#)

4.1 Notes on unlocking and disassembling socket housings



Note

- ◆ *The general instructions for repairing vehicle electrics ⇒ [i2.1 nstructions for the repair on the vehicle electrics”, page 41](#) and the general instructions for wiring loom and plug repair ⇒ [i2.2 nstructions for wiring harness and plug repair ”, page 42](#) must be followed.*
- ◆ *Always use the correct release tools for unlocking. The contact must not be pulled out of the socket housings with force under any circumstances.*
- ◆ *Damaged socket housings must always be replaced.*
- ◆ *Small screwdrivers must be used to release secondary locks.*
- ◆ *Additional information about the fitting locations of connectors ⇒ [Current flow diagrams, Electrical fault finding and Fitting locations.](#)*

4.2 Secondary lock

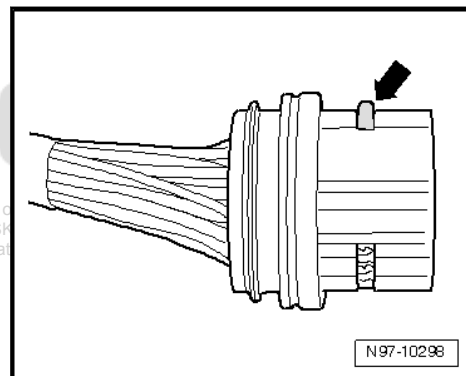
The secondary lock is a housing lock that secures all the wires in a socket housing. If a secondary lock is present on a socket housing, it must always be opened or removed with the applicable tool before unlocking and pulling out individual crimp contact.

The secondary lock has a different colour than the rest of the socket housing. This makes it easier to recognise the secondary lock and highlights its particular function.

The types of socket housing shown here are only a selection that is intended to clarify the different functions of secondary locks by way of example.

Example 1:

The housing lock is unlocked by removing a “crest” -arrow-.

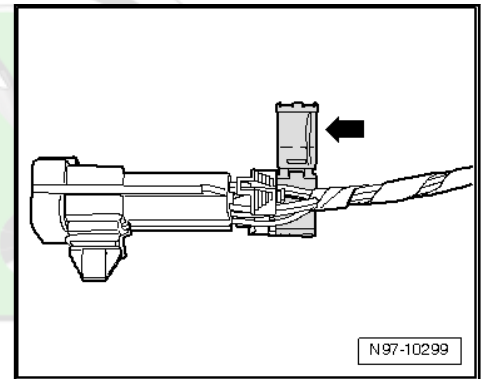


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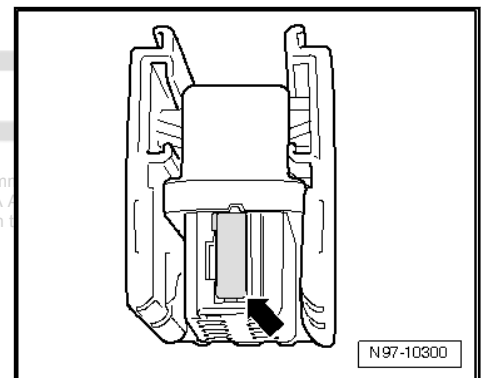
Example 2:

The housing lock is unlocked by opening a “flap” -arrow-.



Example 3:

The housing lock is unlocked by unlatching a “slide” -arrow-.



4.3 Primary lock

The primary lock is the lock for a single crimp contact in the socket housing.

Any applicable housing locks (secondary locks) must be unlocked or removed with the correct tool before unlocking the contacts ⇒ [I4.2 ock”, page 88](#) .

The following types of primary lock shown here are only a selection that is intended to clarify the different functions of primary locks by way of example.

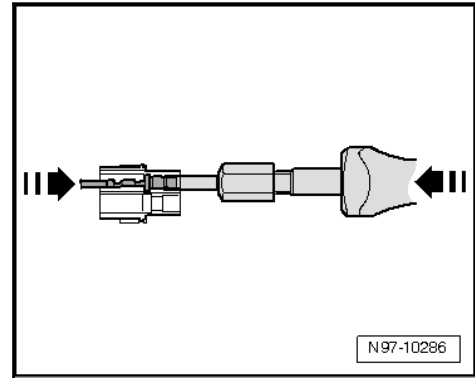
- ◆ ⇒ [p4.3.1 lug connector systems”, page 89](#)
- ◆ ⇒ [p4.3.2 lug connector systems”, page 90](#)
- ◆ ⇒ [c4.3.3 onnector systems”, page 93](#)

4.3.1 Round plug connector systems

Note

Any applicable housing locks (secondary locks) must be unlocked or removed with the correct tool before unlocking the contacts ⇒ [I4.2 ock”, page 88](#) .

- Guide the correct release tool for the socket housing into the unlocking channel on the socket housing.



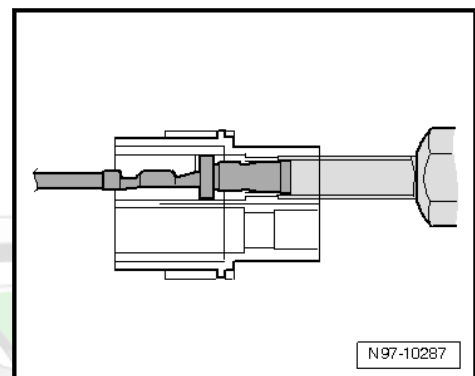
- Take the contact on the wire and press it gently into the socket housing -arrow-.



Note

Pressing the contact in the direction of the socket housing lifts the detents of the contact away from the housing shoulder and they can then be unlocked with the release tool.

- Press the release tool in the direction of the socket housing -arrow- at the same time and pull the unlocked contact out of the socket housing.
- The release tool can be pulled back out of the socket housing after the contact has been removed.



4.3.2 Flat plug connector systems



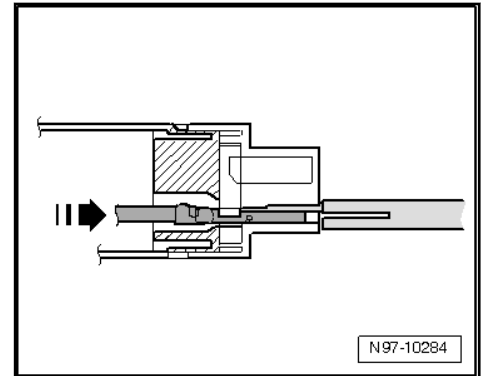
Note

Any applicable housing locks (secondary locks) must be unlocked or removed with the correct tool before unlocking the contacts ⇒ [14.2 ock](#), [page 88](#).

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Flat plug system with a detent.



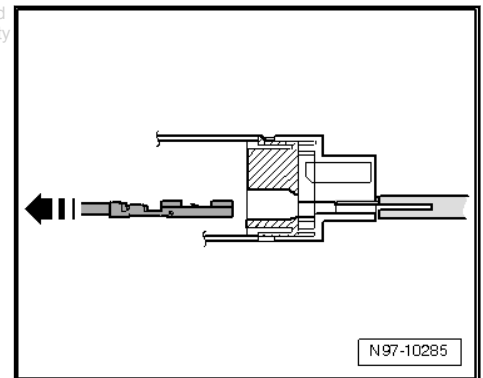
- Guide the correct release tool for the socket housing into the unlocking channel on the socket housing.
- Take the contact on the wire and press it gently into the socket housing -arrow-.

i Note

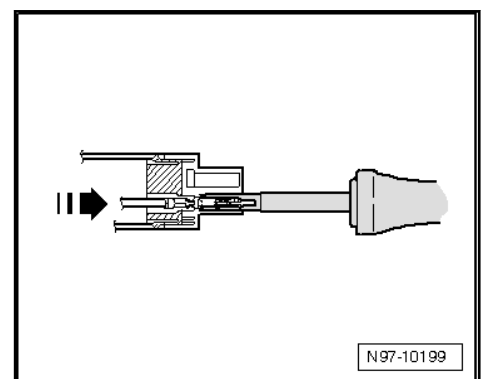
Pressing the contact in the direction of the socket housing lifts the detent of the contact away from the housing shoulder and it can then be unlocked with the release tool.

- Press the release tool in the direction of the socket housing arrow at the same time and pull the unlocked contact out of the socket housing -arrow-.

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Flat plug connector system with two detents



- Guide the correct release tool for the socket housing into the unlocking channel on the socket housing.



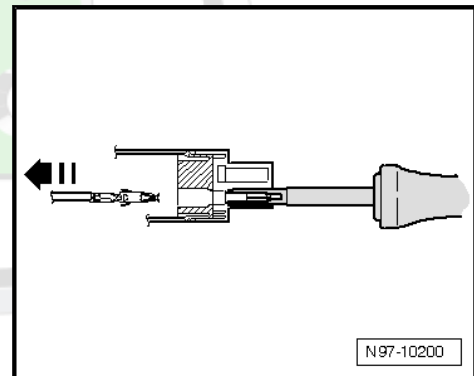
- Take the contact on the wire and press it into the socket housing up to the stop -arrow-.



Note

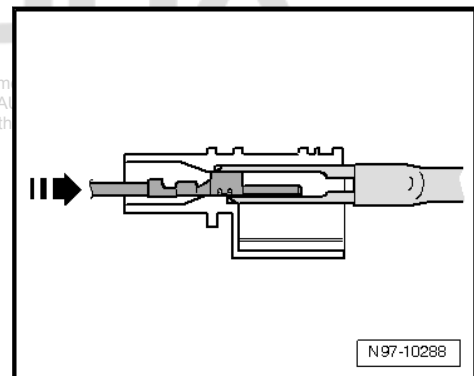
Pressing the contact in the direction of the socket housing lifts the detents of the contact away from the housing shoulder and they can then be unlocked with the release tool.

- Press the release tool in the direction of the socket housing arrow at the same time and pull the unlocked contact out of the socket housing -arrow-.



Asymmetrical

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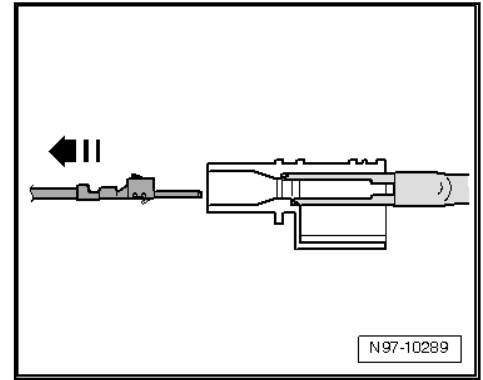
- Guide the correct release tool for the socket housing into the unlocking channel on the socket housing.
- Take the contact on the wire and press it gently into the socket housing -arrow-.



Note

Pressing the contact in the direction of the socket housing lifts the detents of the contact away from the housing shoulder and they can then be unlocked with the release tool.

- Press the release tool in the direction of the socket housing arrow at the same time and pull the unlocked contact out of the socket housing -arrow-.

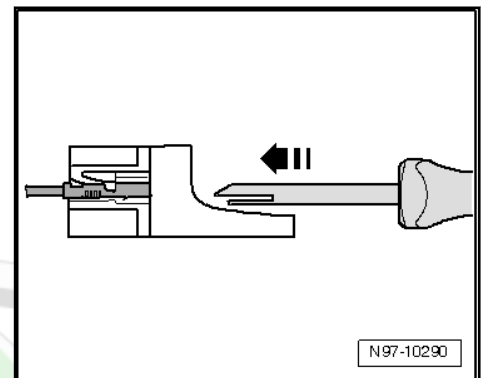


4.3.3 Special connector systems

 Note

Any applicable housing locks (secondary locks) must be unlocked or removed with the correct tool before unlocking the contacts ⇒ [14.2 ock](#), [page 88](#).

FASTON contacts



- Guide the correct release tool for the socket housing into the unlocking channel on the socket housing.
- Take the contact on the wire and press it into the socket housing up to the stop.

 Note

Pressing the contact in the direction of the socket housing lifts the detents of the contact away from the housing shoulder and they can then be unlocked with the release tool.

- Press the release tool in the direction of the socket housing arrow at the same time and pull the unlocked contact out of the socket housing -arrow-.

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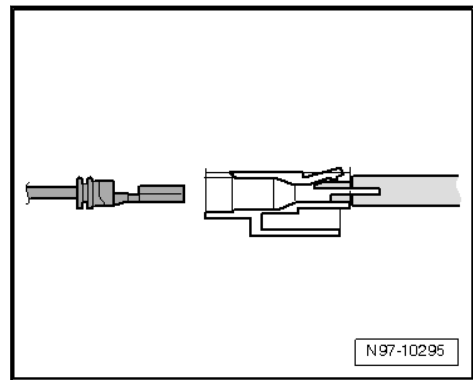
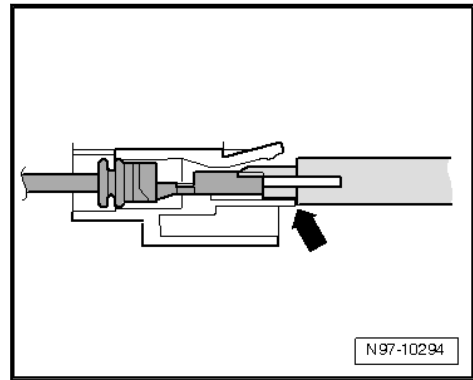
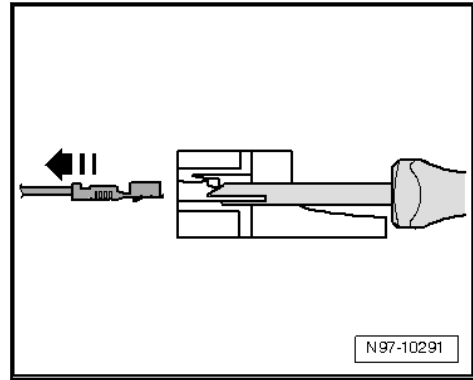
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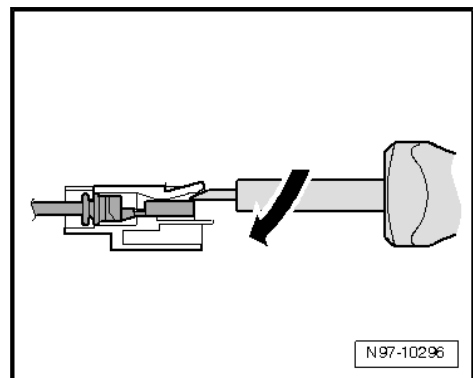
GT 150/280 contacts



- Guide the correct release tool for the socket housing into the socket housing under the detent.
 - Press the tool into the socket housing up to the stop -arrow-
- The contact is ejected from the socket housing

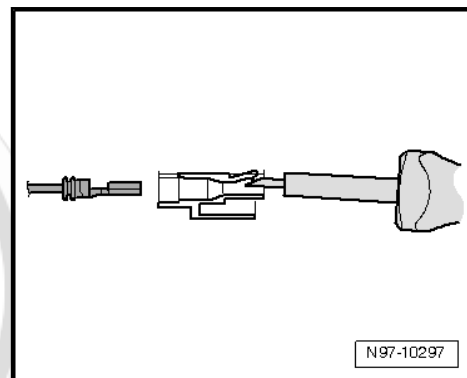


Contacts without detents



- Insert the release tool under the socket housing's detent.
- Press through the release tool up to the stop with a slight lift
-arrow-

The contact is ejected from the socket housing.



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5 Repairing optical fibres

⇒ [p5.1 oints", page 96](#)

⇒ [o5.2 ptical fibres", page 96](#)

⇒ [a5.3 nd installing optical fibre in the housing", page 102](#)

5.1 General points

The exact point of failure is very hard to find. The damaged optical fibre must be replaced by laying a line parallel to the defective optical fibre.



Note

- ◆ *The "Targeted fault-finding" or "Targeted functions" menu items on the vehicle diagnostic tester can be used to determine the components between which the optical fibre is damaged.*
- ◆ *An optical fibre that has already been repaired is "yellow".*

Method for preparing and laying a new optical fibre.



Caution

Optical fibres must not have any sharp kinks. The minimum bending radius must not be less than 25 mm.

Optical fibres must not be laid over sharp edges.

The end of optical fibres must not be dirty or touched with bare fingers.

Optical fibres must not be heated.

You must not twist together two optical fibres or one optical fibre with a copper wire.

Protect the connector and connection cable against dirt. Use protective caps from the case.

5.2 Preparing optical fibres

Special tools and workshop equipment required

- ◆ Optical fibre repair set -VAS 6223B-



Caution

Optical fibres must not have any sharp kinks. The minimum bending radius must not be less than 25 mm.

Optical fibres must not be laid over sharp edges.

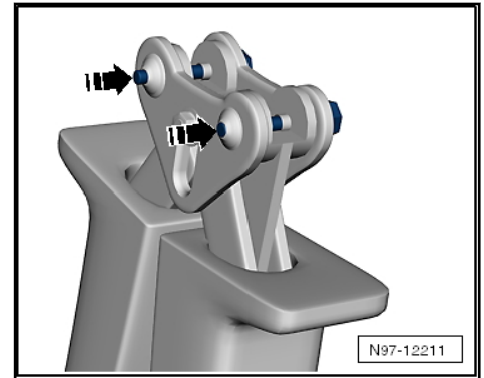
The end of optical fibres must not be dirty or touched with bare fingers.

Optical fibres must not be heated.

You must not twist together two optical fibres or one optical fibre with a copper wire.

Protect the connector and connection cable against dirt. Use protective caps from the case.

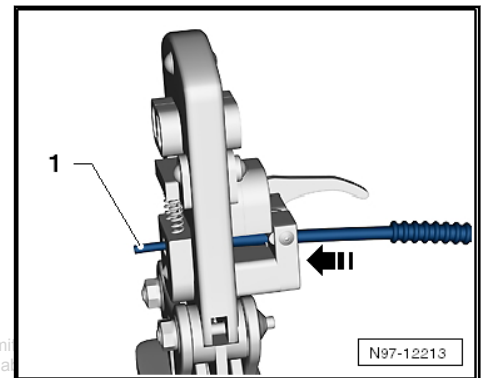
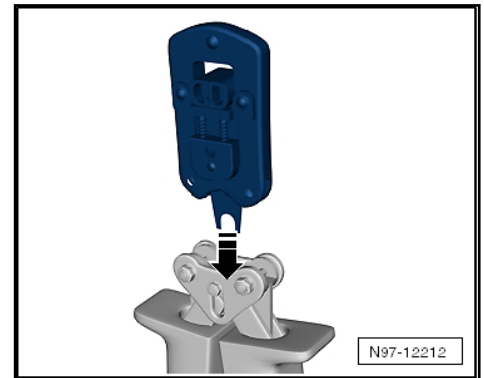
Fit the tool head for the optical fibre pliers -VAS 6223/1-.



- Press out the securing pins -arrows-.
- Mount the tool head -arrow- and press the securing pins back in.



Cutting optical fibre to length

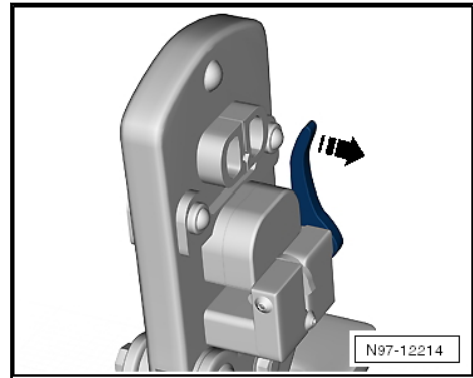


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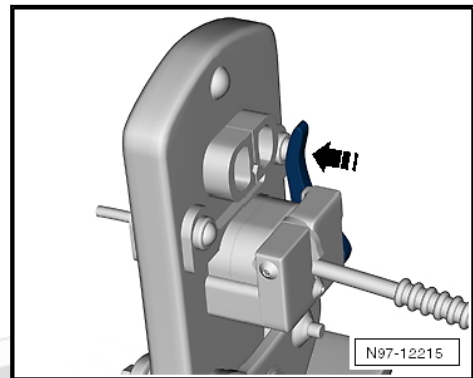
- Determine the length of optical fibre that is required.
- Open the optical fibre pliers and insert optical fibre -1- into the cutting support -arrow-.
- Close the optical fibre pliers to cut the optical fibre to length.



Stripping



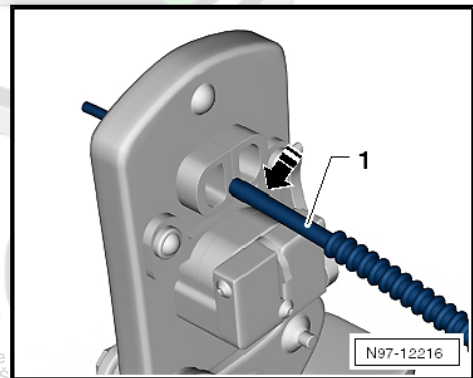
- Open the optical fibre pliers -VAS 6223/1-.
- Bring the stripping lever to the bottom position -arrow-.
- Place the optical fibre into the stripping support.



- The optical fibre must be flush with the rear side of the cutting pliers.
- Close the optical fibre pliers up to the fixed top and hold them closed.
- Swivel the stripping lever upwards -arrow- and take out the optical fibre.

Cutting accurately (creating the optical abutting face)

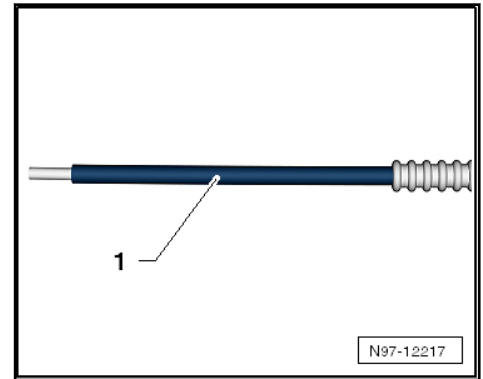
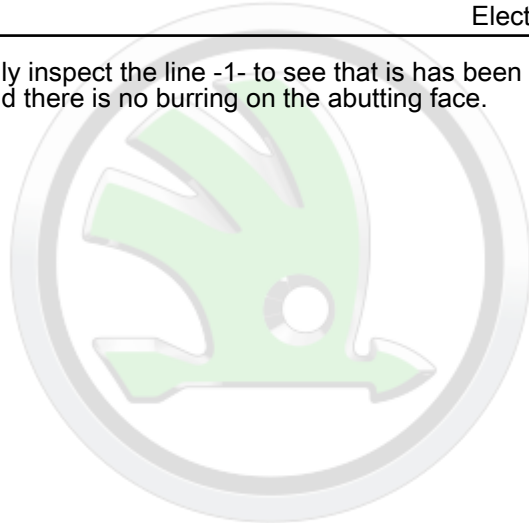
- Slide the optical fibre -1- into the cutting support.



- The insulation -arrow- must be flush with the stop of the cutting station.
- Close the optical fibre pliers -VAS 6223/1- and take out the line.

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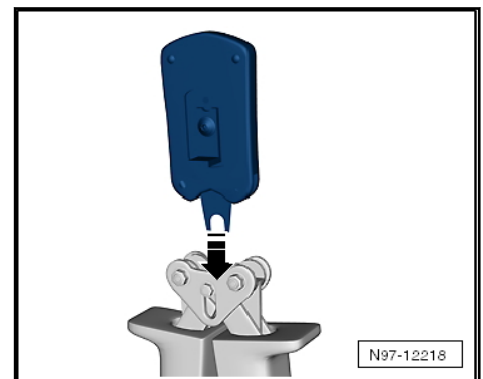
- Visually inspect the line -1- to see that it has been correctly cut and there is no burring on the abutting face.



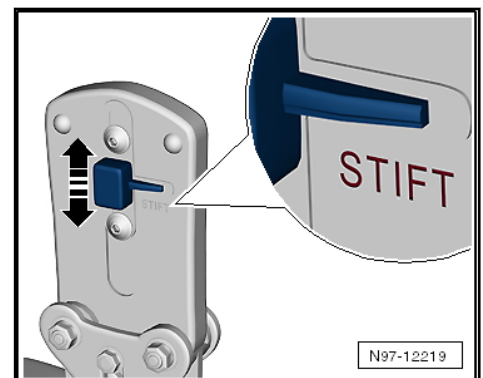
 **Note**

- ◆ *Only lay the optical fibre on a completely clean surface/base or hold it in your hand.*
 - ◆ *Use protective caps if there is a risk that the optical fibre's abutting face may be contaminated.*
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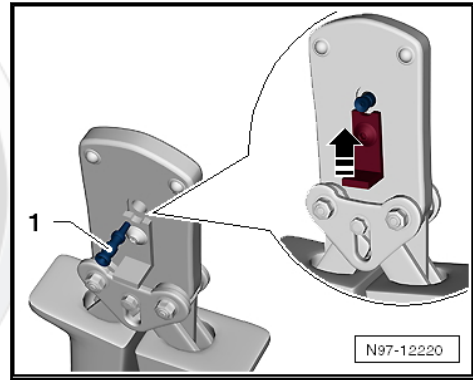
Attaching a brass pin contact to optical fibre



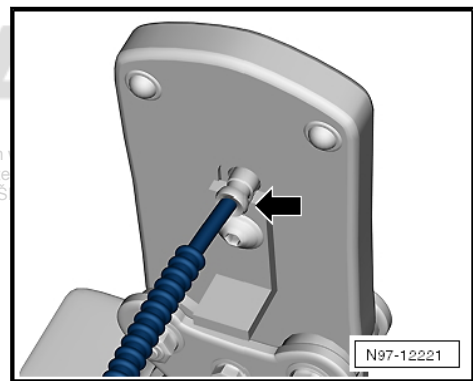
- Swap the tool head -arrow-.
- Slide the locking mechanism on the optical fibre pliers -arrow- until the word "stift (pin)" is visible.



- Place a brass pin contact -1- into the support.



- Close the locking lever on the optical fibre pliers -arrow-.
- Slide the optical fibre into the brass pin contact -arrow- up to the sprung stop and close the optical fibre pliers.



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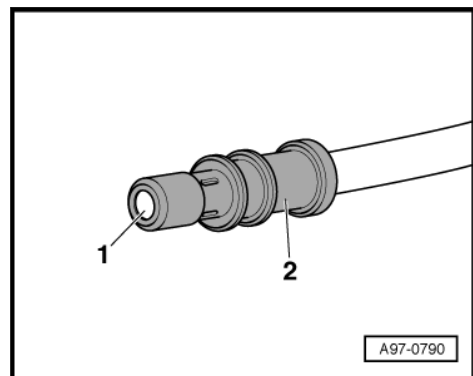
- Open the optical fibre pliers and remove the optical fibre with brass pin contact.



Caution

Optical fibre must not be kinked or bent at a large angle (minimum bending radius of 25 mm).

- Check that the brass pin contact -2- is correctly attached to the optical fibre -1-.



- A total of 4 crimp points must be visible on the brass connecting pin.
- It must not be possible to pull the brass pin contact off the optical fibre by hand.

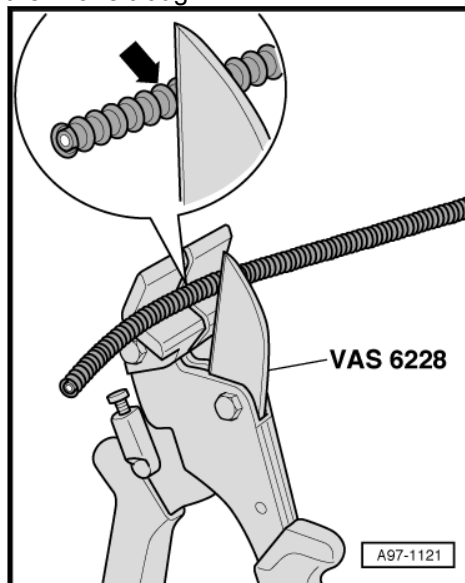
- The abutting face of the optical fibre is 0.01...0.1 mm behind the brass pin contact (visual check).

i Note

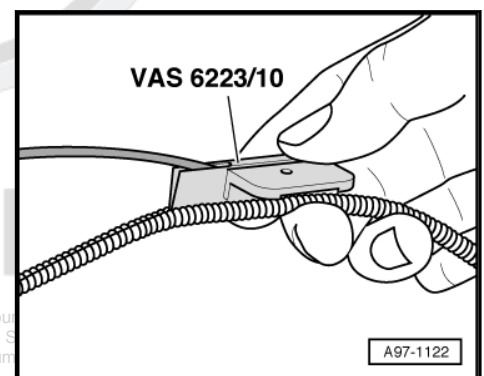
- ◆ Quick couplings are available to connect optical fibre, see the → *Electronic Catalogue of Original Parts "ETKA"*.
- ◆ *Removing and installing the new optical fibre in the plug ⇒ a5.3 nd installing optical fibre in the housing", page 102*

Attaching the corrugated tube to the optical fibre

- Cut the corrugated tube to the correct length.
- Use the cutting pliers -VAS 6228- or a sharp knife for cutting.
- Do not cut the corrugated tube with a side cutter under any circumstances.
- The corrugated tube must be cut through on the "wave peak" (see -arrow-), not on the "wave trough".



- The corrugated tube must audibly lock into the optical fibre housing when assembled.
- Guide the optical fibre as shown in the Fig. into the corrugated tube assembly pliers -VAS 6223/10-.



- Place the corrugated tube assembly pliers on the slit in the corrugated tube.

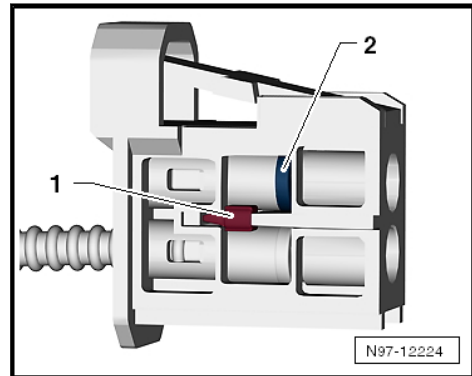


- Slide the corrugated tube assembly pliers in the slit along the corrugated tube. The optical fibre is then inserted into the corrugated tube.

5.3 Removing and installing optical fibre in the housing

Removing

- Disconnect the connectors for the optical fibre from the applicable control unit.
- Unlock the lock in the optical fibre connector -1- by pressing.



- Unlock the secondary lock -2- with a small screwdriver and remove the optical fibre.



Caution

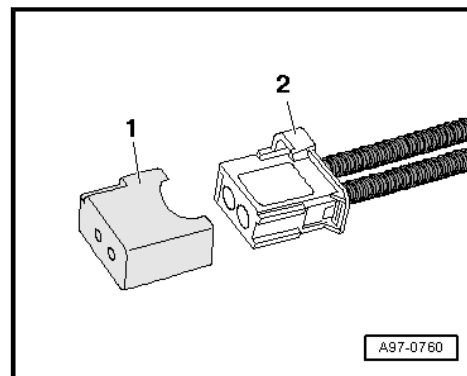
- ◆ *Use protective caps from the optical fibre repair set -VAS 6223B- to protect the optical fibre against dust and dirt.*
- ◆ *Use a new housing, as the secondary lock can be damaged when removing the optical fibre.*
- ◆ *Observe the arrows on the base module for the correct "IN" and "OUT" assignment.*

Installing

Installation is performed in the reverse order, pay attention to the following points:

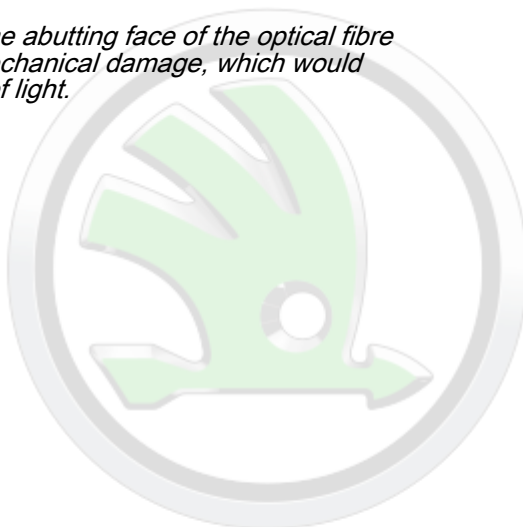
- Install the optical fibre as per the markings.
- Slide the corrugated tube into the connector housing until it audibly locks into place.
- Close the open connector -2- for the optical fibre with the protective cap -1- from the optical fibre repair set -VAS 6223B-.

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 Note

The protective cap prevents the abutting face of the optical fibre becoming dirty or suffering mechanical damage, which would otherwise impair the transfer of light.



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6 Contact surface cleaning set -VAS 6410-

⇒ [c6.1 ontact surface cleaning setVAS 6410", page 104](#)

⇒ [t6.2 he cable eyes", page 104](#)

⇒ [s6.3 crewed connections", page 106](#)

⇒ [t6.4 he battery pole terminals and battery poles", page 108](#)

⇒ [6.5 , page 109](#)

6.1 Use contact surface cleaning set -VAS 6410-

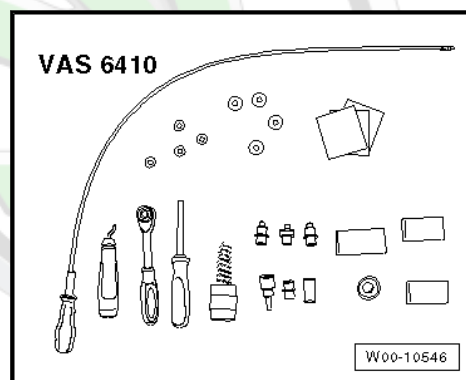
It is possible to carry out repair work in the area of the contact transmitters on the wiring looms for screwed connections in the high current circuit as well as when connecting the battery using the contact surface cleaning set -VAS 6410- (starter and charge current, earth cables, battery pole terminals and battery poles).



Note

The illustrations for the repair work can only be seen as an example.

Contact surface cleaning set -VAS 6410-



6.2 Repairing the cable eyes



Note

- ◆ *It is not permitted to use rust solvent, contact spray or grease on the cable eyes as the tightening torque via the thread to the screwed connection is exceeded through the missing static friction and leads to the fracture of the screwed connection.*
- ◆ *The grey grinding pads are suitable for slight contaminations and "soft surfaces".*
- ◆ *The red grinding pads are suitable for heavy contaminations and "hard surfaces".*

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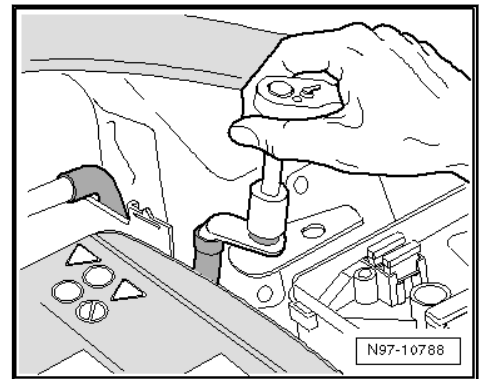


WARNING

Danger of injury!

Observe the warning instructions and safety precautions when working on the battery ⇒ i1.3 nstructions and safety precautions when working on the battery, page 4 .

- Disconnect battery earth strap ⇒ Electrical System; Rep. gr. 27.
- Unscrew the cap nut and remove the cable eye from the screwed connection.



- Check the cable eye for corrosion, contamination, damage etc.
- Select the appropriate adapter and the corresponding grinding pad.



Note

The grinding block can also be used as an alternative.



Caution

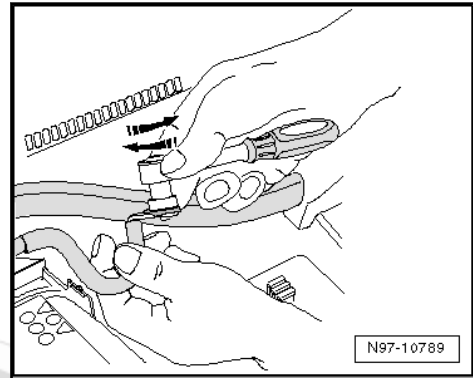
Carefully clean the cable eye so that the tin layer is not excessively worn off.

An intermediate visual inspection of the cleaned surface is required during the cleaning process, because of the different thicknesses of the tin layers.

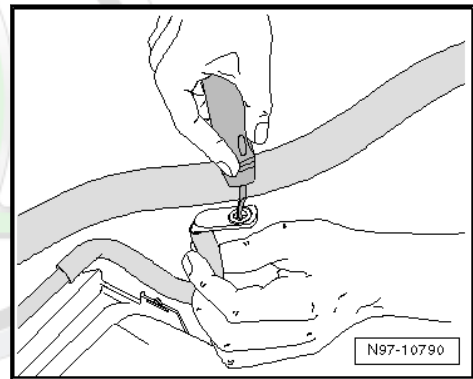
If the tin layer is severely worn off so that the underlying copper is revealed, increased galvanic corrosion effects can occur.

- Position a suitable adapter on the cable eye and grind off the corrosion and contaminations with rotary movements. Continuously check the cleaned surface.

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- Check the burr on the cable eye and remove with the reamer if necessary.



- Position again the cable eye and screw on to the recommended tightening torque.



Note

Optimal contact is ensured if the components to be bolted are screwed to the recommended tightening torque after cleaning

- After tightening the connection, treat it with the appropriate preservative product ⇒ [6.5, page 109](#) .
- Pay attention to the sequence when connecting the battery ⇒ Electrical System; Rep. gr. 27. .

6.3 Repairing screwed connections



Note

- ◆ *It is not permitted to use rust solvent, contact spray or grease on the screwed connection as the tightening torque via the thread to the screwed connection is exceeded through the missing static friction and leads to the fracture of the screwed connection.*
- ◆ *The grey grinding pads are suitable for slight contaminations and "soft surfaces".*
- ◆ *The red grinding pads are suitable for heavy contaminations and "hard surfaces".*

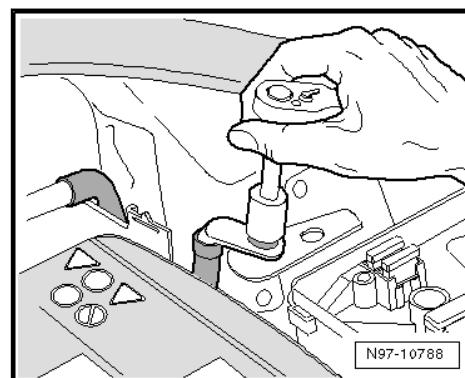


WARNING

Danger of injury!

Observe the warning instructions and safety precautions when working on the battery ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .

- Disconnect battery earth strap ⇒ Electrical System; Rep. gr. 27.
- Unscrew the cap nut and remove the cable eye from the screwed connection.



- Check the screwed connection for corrosion, contamination and damage.
- Select the appropriate adapter and the corresponding grinding pad.



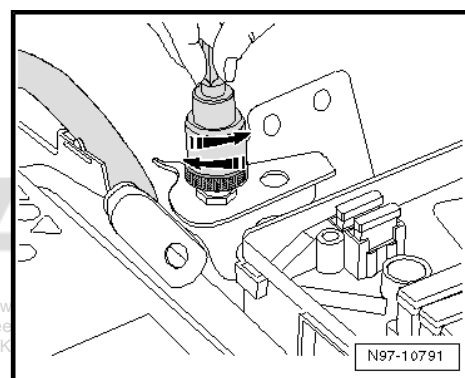
Caution

Carefully clean the screwed connection so that the tin layer is not excessively worn off.

An intermediate visual inspection of the cleaned surface is required during the cleaning process, because of the different thicknesses of the tin layers.

If the tin layer is severely worn off so that the underlying copper is revealed, increased galvanic corrosion effects can occur.

- Position a suitable adapter on the screwed connection and grind off the corrosion and contaminations with rotary movements. Continuously check the cleaned surface.





- Screw on the cleaned connection, if necessary with torsion stop, to the recommended tightening torque.
- Preserve the connections with the appropriate preservative product ⇒ [6.5](#), [page 109](#) .
- Pay attention to the sequence when connecting the battery
⇒ Electrical System; Rep. gr. 27 .

6.4 Cleaning the battery pole terminals and battery poles



WARNING

Danger of injury!

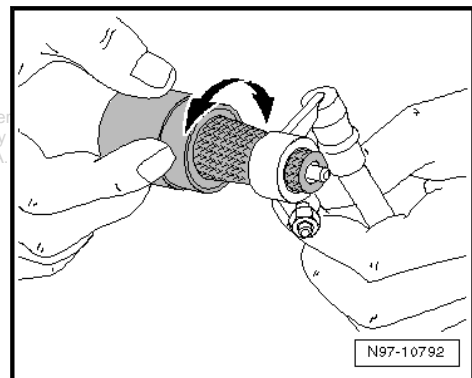
Observe the warning instructions and safety precautions when working on the battery ⇒ [i1.3 nstructions and safety precautions when working on the battery](#), page 4 .



Note

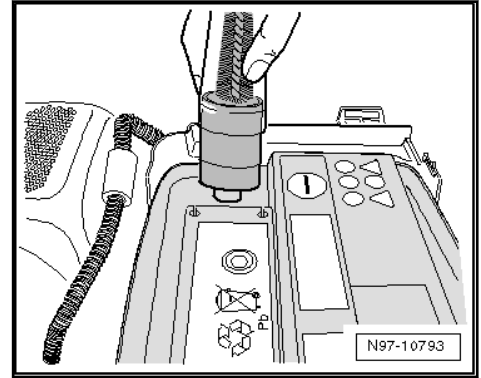
It is not permitted to use rust solvent, contact spray or grease on the battery pole terminals as the tightening torque via the thread to the screwed connection is exceeded through the missing static friction and leads to the fracture of the screwed connection.

- Disconnect battery ⇒ Electrical System; Rep. gr. 27.
- Check the battery pole terminals for corrosion or contamination.
- The battery pole terminals are cleaned with rotary movements using the wire brush of the battery pole cleaner.



- The battery poles are cleaned with rotary movements using the bottom side of the battery pole cleaner.

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- After cleaning, pay attention to the sequence when connecting the battery ⇒ Electrical System; Rep. gr. 27.

6.5 Preserving



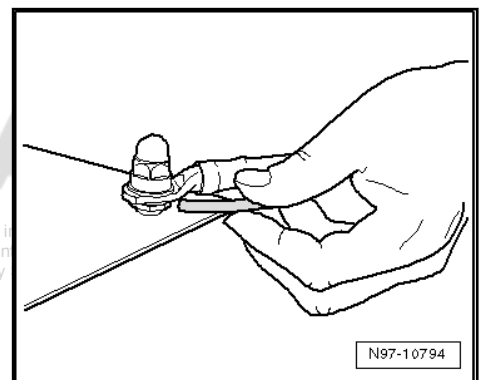
Caution

Lack of preservation leads to errors and damage to the on-board power supply.
Risk of corrosion.



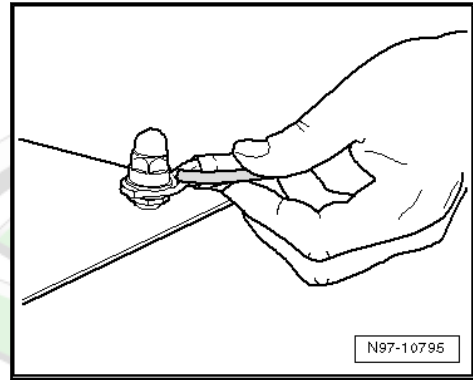
Note

- ◆ *All screwed connections must be tightened to the recommended tightening torque.*
 - ◆ *While preserving, the attached hose must always be used on the preservation can.*
 - ◆ *The preservative wax is used for the cold area.*
 - ◆ *The cavity preservative product is used for the warm area.*
 - ◆ *The preservative product acts independently on the affected areas through the capillary effect.*
- Hold the injector underneath the cable eye and spray all around the bolt and the cable eye.



- Hold the injector above the cable eye and spray all around the bolt and the cable eye.

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7 Replace the lambda probe

⇒ [t7.1 he LSF lambda probe \(4-pole\)](#)", page 111

⇒ [t7.2 he LSU lambda probe \(6-pole\)](#)", page 112

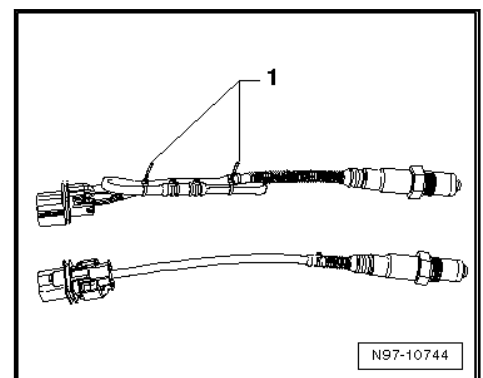
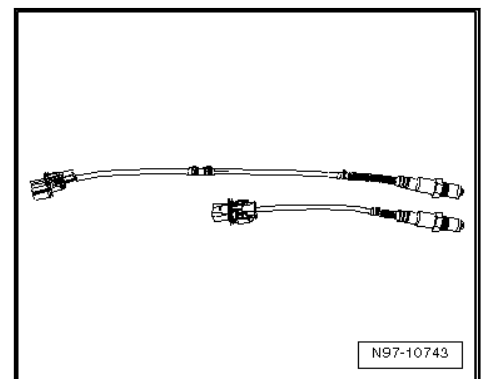
⇒ [p7.3 ipe variants of the unit lambda probes"](#), page 113

7.1 Replace the LSF lambda probe (4-pole)

Note

- ◆ *Where necessary, repair the attachment parts enclosed with the unit probe, cable ties or marking tapes after presenting the faulty probe.*
- ◆ *The cables on the lambda probe must not be repaired as this can lead to malfunction.*
- Remove the defective lambda sensor from the ⇒ engine; Rep. gr. 24, petrol engine or ⇒ engine; Rep. gr. 23, diesel engine.
- Place the two lambda probes next to each other so that the sensor housing is at one height, see fig.

- Fix the excess length of the unit probe (approx. 50 - 250 mm) by tying it back to the length of the cable ties -1-.



- Check whether the timing case of the lambda probe is compatible with the on-board network side.
- Where necessary, replace the on-board connector with the supplied connector housing of the Lambda probe.



Note

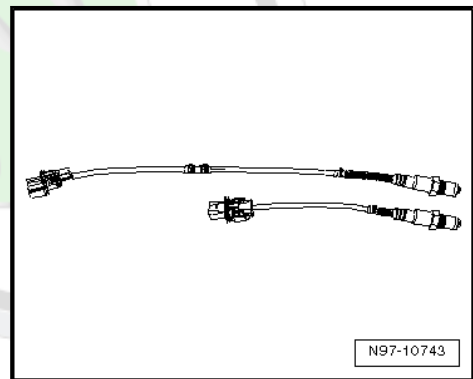
- ◆ *The timing case must be replaced on older vehicles. On new vehicles, the coding of the timing case matches.*
 - ◆ *Observe the plug assignment. To improve the overview, the individual pins in the new housing must be marked with a colour coding.*
 - ◆ *Additional information can be found on the new lambda probe.*
- Install the new Lambda probe in the vehicle.

7.2 Replace the LSU lambda probe (6-pole)

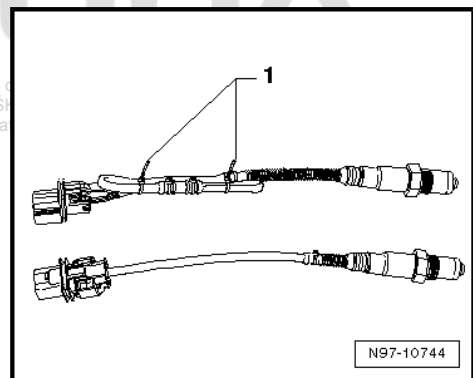


Note

- ◆ *Where necessary, repair the attachment parts enclosed with the unit probe, cable ties or marking tapes after presenting the faulty probe.*
 - ◆ *The cables on the lambda probe must not be repaired as this can lead to malfunction.*
- Remove the faulty lambda probe ⇒ Engine; Rep. gr. 24.
- Place the two lambda probes next to each other so that the sensor housing is at one height, see fig.



- Fix the excess length of the unit probe (approx. 50 - 250 mm) by tying it back to the length of the cable ties -1-.



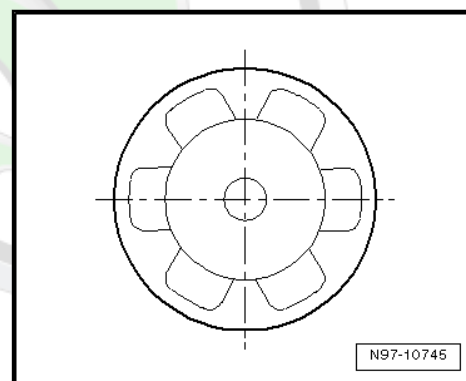
- Install the new Lambda probe in the vehicle.

7.3 Protective pipe variants of the unit lambda probes

 Note

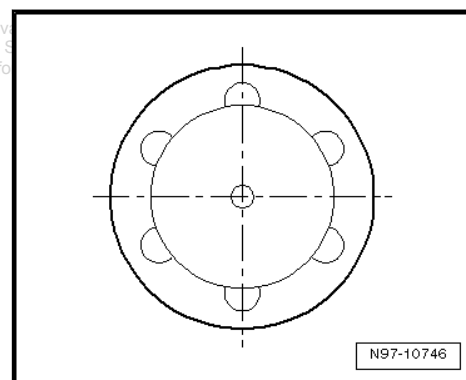
In addition to identification via part number, another identification can also be placed on the protective pipe.

Variant D1, 6 openings each 3.5 mm



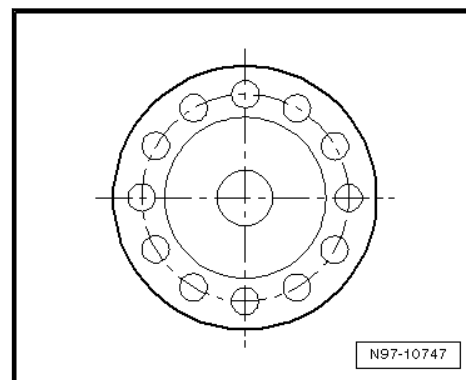
Only used for LSF Lambda probes- 4-pin.

Variant D2, 6 openings each 2 mm



Are used on lambda probes LSF - 4-pin and LSU - 6-pin.

Variant D4, 12 openings each 1.4 mm



Are used on lambda probes LSF - 4-pin and LSU - 6-pin.