Repair Manual

Ameo 2017 ➤ , Arteon 2018 ➤ ,
Atlas 2017 ➤ , Bora 1999 ➤ ,
Bora Variant 1999 ➤ , CC 2010 ➤ ,
CC 2012 ➤ , Eos 2006 ➤ , Golf 1998 ➤ ,
Golf 2004 ➤ , Golf 2009 ➤ ,
Golf 2013 ➤ , Golf 2017 ➤ ,
Golf Cabriolet 2012 ➤ ,
Golf Plus 2005 ➤ , Golf Plus 2009 ➤ ,
Golf Sportsvan 2015 ➤ ,
Golf Sportsvan 2018 ➤ ,
Golf Variant 1998 ➤ ,
Golf Variant 2014 ➤ ,
Golf Variant 2017 ➤ , Lupo 1999 ➤ ,
Lupo 3L 1999 ➤ , Passat 1997 ➤ ,
Passat 2006 ➤ , Passat 2011 ➤ ,
Passat 2015 ➤ ,
Passat (NMS - US) 2012 ➤ ,
Passat (NMS - US) 2016 ➤ ,
Passat CC 2009 ➤ ,
Passat Variant 1997 ➤ ,
Passat Variant 2011 ➤ ,
Passat Variant 2015 ➤ , Phaeton 2003 ➤ ,
Polo 1995 ➤ , Polo 2002 ➤ ,
Polo 2010 ➤ , Polo 2014 ➤ ,
Polo 2018 ➤ , Polo KH IN 2010 ➤ ,
Polo KH IN 2015 ➤ ,
Polo KH MY 2014 ➤ ,
Polo KH MY 2015 ➤ ,
Polo Lim IN 2011 ➤ ,
Polo Lim IN 2016 ➤ ,

Polo Lim MY 2014 ➤ , Polo Lim MY 2016 ➤ , Polo Lim RUS 2011 ➤ , Polo Lim RUS 2016 ➤ , Scirocco 2009 ➤ , Scirocco 2015 ➤ , Sharan 1996 ➤ , Sharan 2011 ➤ , Sharan 2016 ➤ , T-Roc 2018 ➤ , Tiguan 2008 ➤ , Tiguan 2016 ➤ , Tiguan MEX 2017 ➤ , Tiguan RUS 2017 ➤ , Touareg 2003 ➤ , Touareg 2010 ➤ , Touareg 2015 ➤ , Touran 2003 ➤ , Touran 2016 ➤ , XL1 2015 ➤ , e-Golf 2014 ➤ , e-Golf 2017 ➤ , e-up! 2014 ➤ , e-up! 2017 ➤ , up! 2012 ➤ , up! 2017 ➤

Electrical Equipment General Information

Edition 01.2018

List of Workshop Manual Repair Groups

Repair Group

27 - Battery, Starter, Generator, Cruise Control

92 - Wiper/Washer Systems

94 - Exterior Lights, Switches

96 - Interior Lights, Switches

97 - Wiring

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.

Contents

27 – Battery, Starter, Generator, Cruise Control

1 Battery

(Edition 01.2018)

1.1 Battery General Information

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Caution

In order to prevent damage to the battery or vehicle, observe battery type descriptions and notes. Refer to ⇒ “1.2 Types of Batteries”, page 1 .

To guarantee a long service life, the battery must be checked, serviced and maintained as described in this manual.

In addition to supplying the power to start the engine, the battery acts as a power reserve for the entire vehicle electrical system.

1.2 Types of Batteries

General Information

Caution

The following batteries described are maintenance-free batteries. Do not remove any of the labels on the battery and do not add distilled water. Only perform a visual inspection. Note the chapter on battery testing. Refer to ⇒ “2 Battery, Checking”, page 6 .

1.2.1 Battery with »Standard« Color Display

This is a maintenance-free battery with liquid electrolyte (wet battery).

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

This battery has a visual indicator. The visual indicator shows the state of charge and the battery acid level. Visual indicator, checking. Refer to
⇒ “2.5 Visual Display in Battery Cover, Checking”, page 9 .

1.2.2 Battery with Visual Indicator, »Enhanced«

This is a maintenance-free battery with liquid electrolyte (wet battery).

Caution

Do not remove any of the labels on the battery and do not add distilled water. Only perform a visual inspection. Note the chapter on battery testing. Refer to ⇒ “2 Battery, Checking”, page 6 .

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

The battery is installed in certain Stop/Start vehicles due to special requirements. “EFB” is written on the battery cover to identify this battery. “EFB” stands for »enhanced flooded battery« (enhanced wet battery).

An “EFB” battery may only be replaced with another “EFB” battery.

An “EFB” battery has a visual indicator for checking the electrolyte level.

Visual indicator, checking. Refer to
⇒ “2.5 Visual Display in Battery Cover, Checking”, page 9 .

Note

“EFB” batteries are being installed in smaller gasoline engines with the Stop/Start system and a manual transmission starting from 05/2011.

1.2.3 AGM Battery

Maintenance-free battery with specific electrolyte without a visual indicator.

Lead-acid battery, where the electrolyte is fixed in an absorbent glass mat (AGM). The battery is closed and equipped with breather valves.

AGM is the English abbreviation for Absorbent Glass Mat.

These batteries do not have a visual indicator because the electrolyte level is predetermined. AGM is on the battery to identify it.

Note

Always replace an AGM battery with another AGM battery.

1.3 Warnings and Safety Precautions

⇒ “1.3.1 Battery Safety Precautions”, page 3

⇒ “1.3.2 Battery Safety Label”, page 4

⇒ “1.3.3 Working on the Airbag System”, page 5

1.3.1 Battery Safety Precautions

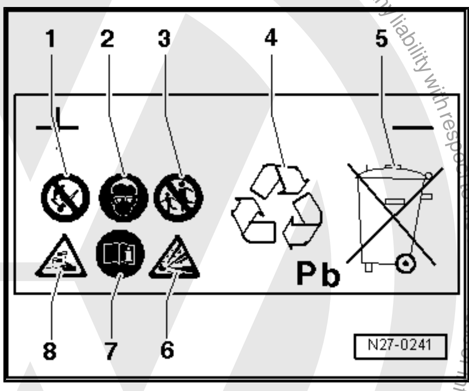
Recognizing and preventing risks

Batteries present risks. Read the warnings on the battery label, in the owner's manual and in ELSA to prevent these risks.

WARNING

- *Personnel instructed in protection, such as a trainee or apprentice, may only perform work on vehicle batteries under the supervision of technical personnel such as a master automotive mechanic or a master automotive electrician.*
- *Acid has strong corrosive properties. If batteries are handled inappropriately, there is a risk that personal injury may result from exposure to harmful electrolyte influences. Therefore, suitable remedies for acid damage must be kept readily available. For example, soap solution is a suitable material.*
- *If electrolyte drips out from the battery, skin can be burned by acid or the vehicle may be affected by acid erosion and corrosion. It is a possibility that safety-related vehicle components can be damaged.*
- *When charging and when resting after charging, explosive gas is present. In extreme cases, if the battery is handled inappropriately, the emitted gases may cause the battery to explode.*
- *Batteries whose visual indicators are bright yellow must be replaced. They may not be tested or charged and jump starting may not be used. There is a risk of explosion during testing, charging or jump starting.*
- *Generating sparks by sanding, welding, separating work and open flame, for example, smoking in vicinity of the battery, is prohibited. Producing sparks through electrostatic discharge must also be avoided. Always touch the vehicle body before touching the battery.*
- *Only perform battery procedures in suitable and well-ventilated locations.*

1.3.2 Battery Safety Label



Battery Safety Label

1. - When working in the area of batteries, fire, sparks, open flame and smoking are prohibited. Avoid sparks when working with cables and electrical devices, and from electrostatic discharge. Avoid short circuits. For this reason, tools should not be rested on the battery.

2. - Wear protective eyewear when working on the battery.

3. - Always keep acid and batteries out of the reach of children.

4. - Disposal: old batteries require special disposal. They may only be disposed of at a suitable collection facility and only in consideration of legal regulations.

5. - Do not dispose of old batteries in household waste.

6. - When handling batteries, there is a risk of explosion. Battery charging produces a highly explosive gas mixture.

7. - Always observe notes on battery in ELSA "Electrical Equipment - General Information" and in the owner's manual.

8. - Danger of burns: battery acid is severely corrosive, therefore protective gloves and eye wear must be worn when working on the battery. The battery must not be tipped because acid may spill from the ventilation openings.

1.3.3 Working on the Airbag System

WARNING

When working on the airbag system (pyrotechnic components, Airbag Control Module - J234- , wiring), the ground cable must be disconnected when the ignition is switched on.

Exceptions: on vehicles with a battery in the vehicle interior, the ignition must be switched off.

- *Then cover the negative terminal.*
- *After disconnecting the battery, a wait time of 10 seconds is required.*
- *The battery must be connected with the ignition switched on.*
- *There must be no one inside the vehicle when connecting the battery.*

If this is the case, make sure to stay out of the airbag deployment and belt tensioner zones.

If the ignition is not switched on after reconnecting the battery (the indicator lamps in the instrument cluster do not illuminate), the ignition (key/button) may only be switched on while sitting in the driver seat in the rearmost position.

1.4 Battery Post/Terminal

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

Caution

In order to prevent damage to the battery terminals and battery posts, observe the following

- *Never use force to attach the battery terminals by hand.*
- *Do not apply grease to battery posts.*
- *The battery terminal clamps should be mounted so that the battery terminal sits flush with the clamp or protrudes out of it.*
- *After tightening the battery terminal clamps to the specified torque, the threaded connections must not be tightened again.*

2 Battery, Checking

2.1 General Information

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Caution

In order to prevent damage to the battery or vehicle, observe battery type descriptions and notes. Refer to ⇒ “1.2 Types of Batteries”, page 1 .

Note

Observe the battery chapter for the respective vehicle. Refer to maintenance.

2.2 Batteries, Checking

2.2.1 Battery with Visual Indicator, Checking

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Perform Battery Checks in the Following Sequence:

1. Visual inspection. Refer to ⇒ “2.3 Visual Inspection”, page 7 .
2. Check the visual indicator: “3-color”. Refer to ⇒ “2.5.1 3-Color Visual Indicator, Checking”, page 9 ; or “2-color”. Refer to ⇒ “2.5.2 2 Color Visual Indicator, Checking”, page 10 .

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

3. Check the battery using the Battery Tester - VAS6161- . Refer to ⇒ “2.6 Battery Tester VAS6161 ”, page 12 .
4. Depending on the battery test result, “perform a current draw test”. Refer to ⇒ “2.8 Current Draw Test ”, page 22 .

2.2.2 AGM Battery, Checking

Perform Battery Checks in the Following Sequence:

1. Visual inspection. Refer to ⇒ “2.3 Visual Inspection”, page 7 .
2. Check the battery using the Battery Tester - VAS6161- . Refer to ⇒ “2.6 Battery Tester VAS6161 ”, page 12 .
3. Depending on the battery test result, “perform a current draw test”. Refer to ⇒ “2.8 Current Draw Test ”, page 22 .

2.3 Visual Inspection

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Prior to performing any measurements, perform a visual inspection of the outer condition. Pay attention to secure fit and the covers of the battery vent openings.

Note

For each vehicle. Refer to for information regarding the battery.

Caution

- *An improperly secured battery can lead to damage.*
- *Excessive vibration due to an improperly secured battery will reduce the battery service life, and the battery hold-down bracket could damage the battery housing and lead to electrolyte leakage.*
- *Check the battery for secure fitting, if necessary tighten the mounting bolt to the tightening specification.*

By Performing Visual Inspection, it can be Determined:

- If the battery case is damaged. Acid can leak out if the case is damaged. Battery acid that has leaked out can cause severe damage to the vehicle. Acid that has leaked onto any part of the vehicle should be immediately treated with acid neutralizer or soap solution.

- If the battery terminals (battery wiring connections) are damaged. If the battery terminals are damaged, contact with battery terminals clamps cannot be guaranteed. When connecting the battery pole shoes, keep in mind that the tightening specification from the “Electrical Equipment” repair manual for the corresponding vehicle is used. If the battery post clamps are not correctly installed and secured, the wiring may burn. Substantial malfunctions to the electrical system are a consequence. Safe operation of the vehicle can no longer be guaranteed.
- If the gas breather hose and the plugs are correctly seated. On vehicles with batteries in the vehicles or luggage compartment pay attention to the correct securing of the gas breather hose. Pay attention that no open vent opening is located in the area of the positive terminal. If in this area a vent opening is open, it must be closed with a plug. The vent opening must be connected in the area of the negative terminal on the opened vent opening. Pay attention to the chapter. Refer to ⇒ “2.4 Notes for Battery Replacement and Battery Venting”, page 8 .

2.4 Notes for Battery Replacement and Battery Venting

- On which side the battery is engaged is safety-related.
- In use cases in which a gas breather hose is used, pay attention to the correct seating of the gas breather hose and the vent opening are secured on the other side.
- When replacing the vehicle battery pay attention to that there is no open bleed hole in the area of the positive terminal. If in this area a bleed hole is opened, it must be closed with a plug and the bleed pipe must be opened in the area of the negative terminal.
- On vehicles with AGM battery and the installation outside of the engine compartment, make sure that the battery is replaced with an AGM battery.
- With the introduction of the Passat 3C (2006) the vent opening is always on the negative terminal side.
- If a protective cap with a sprayed plug is located on the positive terminal of the original battery 000.915.105.DX with the exception 000.915.105.DN and all economy batteries with a simple index, it must be inserted after the use case accordingly on the negative or positive terminal side. The list of the batteries can be found here. Refer to ⇒ page 8 .
- All AGM, EFB+, EFB batteries and the 36AH batteries with the original number 000.915.105.DN, replaced for example in up! and Polo have a protective cap without a sprayed protective cap on the positive terminal. Here the degassing of the positive terminal side is already closed.

If an original replacement battery with the following part numbers is found, on either the plus or negative terminal a red plug must be inserted. If this is not inserted this must be subsequently installed to TDC. Number.: 000.915.506

List of the Batteries with Protective Cap and Sprayed Protective Caps

Original Wet Cell Battery:

- “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 Visual Display in Battery Cover, Checking

⇒ “2.5.1 3-Color Visual Indicator, Checking”, page 9

⇒ “2.5.2 2 Color Visual Indicator, Checking”, page 10

2.5.1 3-Color Visual Indicator, Checking

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Visual Indicator General Information

Applies to all original equipment batteries with index “1J0”, “7N0” and “3B0” and to all replacement batteries, part number -191 915 105 AB- , and beginning with index “000 915 105 AX”.

The visual indicator shows the electrolyte level and the battery state of charge.

To obtain an accurate reading, gently tap the charge indicator with a screwdriver handle or rock vehicle slightly. By doing this, the air bubbles that occur normally during battery charging (even during vehicle operation) that adversely affect charge indicator reading will be displaced. The visual indicator will be more accurate.

Note

- *Air bubbles can especially form under visual indicator when a battery is charged, including when charged while driving. This will cause an incorrect display.*
- *The display is valid for only that one battery cell in which the visual indicator is located. An exact assessment of battery condition should always be confirmed by performing battery charge test* *⇒ "2.6 Battery Tester VAS6161 ", page 12* *.*
- *The visual indicator may be located on different locations on the battery.*

There Are Three Possible Color Indications:

- »Green«: Battery is sufficiently charged.
- »Black«: Insufficiently charged, less than 65% or discharged.
- »Colorless or light yellow«, battery must be replaced.

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

2.5.2 "2 Color" Visual Indicator, Checking

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ "1.3 Warnings and Safety Precautions", page 3* *.*

Visual Indicator General Information

The general introduction of the "2-color" display began as a running change in 2009. The color »green« for the charge level was discontinued on the "2-color" display.

The visual indicator shows the battery acid level.

It is no longer possible to read the battery state of charge using the visual indicator. It is necessary to perform a battery test. Refer to ⇒ "2.6 Battery Tester VAS6161 ", page 12

To obtain an accurate reading, gently tap the charge indicator with a screwdriver handle or rock vehicle slightly. By doing this, the air bubbles that occur normally during battery charging (even during vehicle operation) that adversely affect charge indicator reading will be displaced. Thereby, the color indicator of the visual indicator is more accurate.

Note

- *Air bubbles can especially form under visual indicator when a battery is charged, including when charged while driving. This will cause an incorrect display.*
- *The display is valid for only that one battery cell in which the visual indicator is located. An exact assessment of battery charge is only possible by performing a battery test. Refer to* *⇒ "2.6 Battery Tester VAS6161 ", page 12* *.*
- *The visual indicator may be located on different locations on the battery.*

Two Visual Indicators Are Possible:

- »Black«, the electrolyte level is OK
- »Bright yellow«, the electrolyte level is too low. The Battery must be replaced.

WARNING

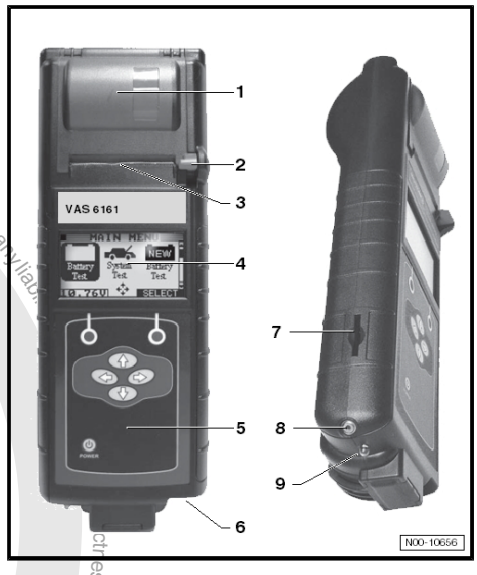
Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

2.6 Battery Tester - VAS6161-

2.6.1 Battery Tester - VAS6161- Device Description



1 - Integrated printer

2 - Operating lever for the paper tray

3 - Paper slot

4 - LCD screen with main menu

5 - ON/OFF switch

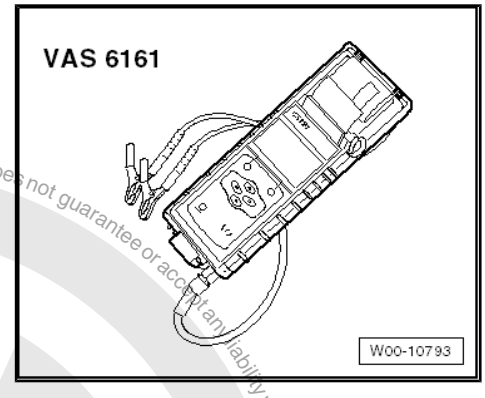
6 - Connection for the battery tester cable

7 - Slot for the memory card

8 - Infrared temperature sensor

9 - PC file transmitter

General Description



WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

It is not necessary to disconnect or remove the battery when using the Battery Tester - VAS6161- .

The Battery Tester - VAS6161- does not load the battery. It is working according to the principle of dynamic conductivity.

All battery types are stored in the tester.

The data can be stored on a SD memory card.

The Battery Tester - VAS6161- can be updated via an interface or a SD card, so that all battery data from Volkswagen is always current.

The integrated temperature sensor increases the quality of the measurements.

An optional 2D scanner is available to carry over the data from the battery 2D code.

Note

Read the Battery Tester - VAS6161- Operating Instructions.

2.6.2 Battery Test, Performing using Battery Tester - VAS6161-

Special tools and workshop equipment required

- Battery Tester - VAS6161-

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

Testing the Battery

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Turn off the ignition and all electrical consumers.
– Battery with visual indicator, checking visual indicator. Refer to ⇒ "2.2.1 Battery with Visual Indicator, Checking", page 6 .
– Switch on the unit.
– Clamp the red clamp "+" of the tester to the positive terminal.

– Clamp the black clamp “-” on the tester to the negative terminal.

Note

Make sure the test clamps make good contact!

– Select one of the following tests:

Note

- *VW original battery test: all VW original batteries are checked with this outside of the warranty.*
- *“Non” VW battery test: all batteries from other manufactures are checked with this.*
- *Storage maintenance: for batteries in storage and inventory.*

- VW original battery. Refer to ⇒ “2.6.3 VW Original Battery Test”, page 14 .
- “Non” VW battery. Refer to ⇒ “2.6.4 Non VW Battery Test”, page 15 .
- Storage maintenance. Refer to ⇒ “2.6.5 Storage Maintenance, Performing”, page 15 .

Note

- *The test is over after approximately 10 seconds.*
- *The results of the test are output through the printer.*
- *It is not necessary to let the tester cool down before performing the next measurement.*

2.6.3 VW Original Battery Test

WARNING

Do not check or charge batteries that have a visual indicator that is light yellow. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Select “VW Original Battery Test” in the menu.
– Select “inside the vehicle” or “outside of the vehicle”.
– Select “at the battery terminal” or “at the battery jump start terminal”.
– Scan in the battery 2D code or manually select battery type and current strength.
– Measure the temperature. Hold the temperature sensor approximately 5 cm above the battery terminal until the temperature is stable.
– Start the test.

– Print out the test report if necessary.

2.6.4 “Non” VW Battery Test

Note

- *The printed test results can differ depending on the software version.*
- *Follow the Battery Tester - VAS6161- Operating Instructions.*

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Select “Non VW Battery Test” in the menu.
– Select “at the battery terminal” or “at the battery jump start terminal”.
– Select the type of battery: “standard”, “AGM”, “2*6V” or “Gel”.
– Select the “CCA”, “JIS”, “DIN”, “SAE”, “IEC” or “EN”.
– Select battery value.
– Measure the temperature. Hold the temperature sensor approximately 5 cm above the battery terminal until the temperature is stable.
– Start the test.
– Print out the test report if necessary.

2.6.5 Storage Maintenance, Performing

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Select “storage maintenance” in the menu.
– Connect the scanner.

Note

If there is no scanner, manually enter the VIN on the printed test results.

– Scan the VIN.
– Select “at the battery terminal” or “at the battery jump start terminal”.

– Scan in the battery 2D code or manually select the type and manufacturer in the menu.

– Measure the temperature. Hold the temperature sensor approximately 5 cm above the terminal connection until the temperature is stable.

– Start the test.

– Print out the test report if necessary.

2.6.6 Service Test, Performing

Note

♦ *The printed test results can differ depending on the software version.*

♦ *Read the Battery Tester - VAS6161- Operating Instructions.*

WARNING

Do not check or charge batteries that have a visual indicator that is bright yellow. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Select “Service Test”.

– Select “at the battery pole” or “at the battery jump start terminal”.

– Select the type of battery: “standard”, “AGM”, “2*6V” or “Gel”.

– Select the “CCA”, “JIS”, “DIN”, “SAE”, “IEC” or “EN”.

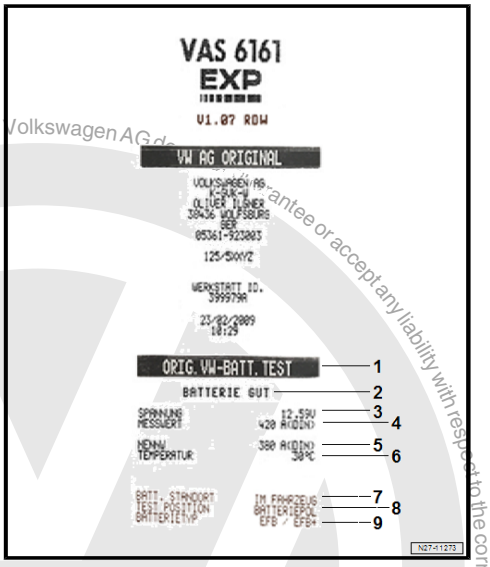
– Select battery value.

– Measure the temperature. Hold the temperature sensor approximately 5 cm above the battery pole until the temperature is stable.

– Start the test.

– Print out the test report if necessary.

2.6.7 Explanation of Test Results



Note

- *The Lay-out of the printed test results can vary depending on the software version.*
- *The printed test results are required for warranty claims.*

1 - Type of test.
2 - Battery test result.
3 - Measured voltage
4 - Measured cold start value.
5 - Cold start nominal value set on the tester
6 - Measured battery temperature
7 - Batter installed location
8 - Location of the battery terminal set at the tester
9 - Selected battery.

2.6.8 Evaluating Test Results

Evaluating the battery test results for the Warranty and Service Tests

Battery Test Result	Measure
Battery good	No measure on the battery
Battery good - recharge	Charge battery. Refer to ⇒ “3 Battery, Charging”, page 24 . If necessary, search for the cause of the discharging
Perform a current draw test	Perform a current draw test. Refer to ⇒ “2.8 Current Draw Test ”, page 22 . Charge the battery completely (refer to ⇒ “3 Battery, Charging”, page 24) and test again.
Replace the battery.	Disconnect the battery and test again. The result “replace the battery” can occur due to a weak cable contact.
Battery cell faulty - replace	Replace the battery.
Check the connection	Connect the cable directly to the battery and not to the battery jump start terminal.
Battery depleted	Replace the battery.

Evaluating the battery test results for the Maintenance test

Battery Test Result	Measure
Battery good	No measure
Charge the battery immediately.	Fully charge the battery. Refer to ⇒ “3 Battery, Charging”, page 24 .
Mark as defective	Mark as defective.

Battery Test Result	Measure
Check the tester connection	Disconnect the battery and test again. The result “check the tester connection” can occur because the cable contact is weak.
Check the connection	Connect the cable directly to the battery and not to the battery jump start terminal.
Noises	Wait until the measured value appears in the display.
Battery depleted	Replace the battery.

2.7 Midtronics Battery Tester - MCR340VKT-

⇒ “2.7.1 General Information”, page 18

⇒ “2.7.2 Battery, Testing using Midtronics Battery Tester MCR340VKT ”, page 19

⇒ “2.7.3 Evaluating Test Results”, page 20

⇒ “2.7.4 Midtronics Battery Tester MCR340VKT , Troubleshooting”, page 21

2.7.1 General Information

WARNING

There is a risk of injury.

Read and follow the Safety Precautions when working with batteries. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Dispose of electrolyte (sulfuric acid/water mixture) safely. Electrolyte must be taken to approved locations that accept it. Follow local disposal ordinances.

Do not check gas batteries. Danger of explosion.

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Note

To prevent damaging the battery or the vehicle, pay attention to the battery type and notes. Refer to ⇒ “1 Battery”, page 1 .

Only Volkswagen approved battery testers may be used to test batteries in Volkswagen vehicles. Use the Midtronics Battery Tester - MCR340VKT- in the USA and Canada.

Read the safety precautions, set- up and operating instructions that come with the Midtronics Battery Tester - MCR340VKT- and follow them exactly.

Refer to Self Study Program; Vehicle Batteries for more information.

The following charging and analysis procedures apply to all batteries, all battery installed locations (engine compartment or luggage compartment) and all battery purposes (for the starter or for the second/convenience battery).

Always follow the Safety Precautions, the instructions for setting up the battery tester, the display menu/display buttons, LEDs and the procedures in the MCR340V Operating Instructions.

Note

Always read all sub-chapters, notes and instructions for testing batteries.

2.7.2 Battery, Testing using Midtronics Battery Tester - MCR340VKT-

Requirements

WARNING

Read and follow the Safety Precautions when working with batteries. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

- Read the General Description. Refer to ⇒ "2.7.1 General Information", page 18 .
- Visually check the battery. Refer to ⇒ "2.3 Visual Inspection", page 7 .
- Open the hood or open the cover if the battery is installed somewhere else.
- Determine if it is a "Standard" battery or an "AGM" battery.
- Remove the covers on the battery positive and negative terminals.
- Use a fender protector or some type of cover before using any equipment inside the engine compartment or inside the passenger compartment.
- Close all the doors.

Note

- *The battery temperature must be at least 10 °C (50 °F).*
- *Refer to the Battery Tester Charger Kit GRX3000VAS Operating Instructions for more information.*

Performing the Test

> **WARNING**
>
> *Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!*
>
> *There is a risk of explosion during testing, charging or jump starting.*
>
> *These batteries must be replaced.*

- Turn off the ignition and all electrical consumers.
- Check the visual indicator. Refer to ⇒ “2.2.1 Battery with Visual Indicator, Checking”, page 6 .
- Switch on the unit.
- Clamp the red clamp “+” of the tester to the positive terminal.
- Clamp the black clamp “-” on the tester to the negative terminal.

Note

Make sure the test clamps make good contact!

- Select “inside the vehicle” or “outside of the vehicle”.
- Select “Warranty Test”.

Note

If the test results are needed to process a warranty claim, use the print function on the Midtronics Battery Tester - MCR340VKT- .

- Determine if it is a “Standard” battery or an “AGM” battery.
- Enter the battery DIN value taken from the battery label. If the label does not state a DIN value, then enter the SAE value.
- Enter the DIN value into the tester and then perform the battery test. Refer to MCR340V Operating Instructions.
- If using an SAE value, go into the menu under “other” and change “DIN” to “SAE”. Refer to MCR340VKT Operating Instructions.

Note

Always use the DIN value on the battery label. Otherwise the test result will be incorrect.

2.7.3 Evaluating Test Results

Battery Test Result

Battery Test Result	Measure
Battery good	None
Good - charge	Charge battery. Refer to ⇒ “3.6 Battery Tester Charger Kit GRX3000VAS ”, page 67 .

Battery Test Result	Measure
Use in charge	Charge battery. Refer to ⇒ “3.6 Battery Tester Charger Kit GRX3000VAS ”, page 67 .
Replace the battery.	Replace the battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery, Removing and Installing
Battery cell defective	Replace the battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery, Removing and Installing

2.7.4 Midtronics Battery Tester - MCR340VKT- , Troubleshooting

Sometimes the display shows the malfunction or the messages based on the condition.

The following is a list of the most frequent displayed messages together with suggested solutions.

Note

Refer to the MCR340V Operating Instructions for messages not listed here.

Display Message	Measure
No display	– Make sure the battery tester terminals are attached securely to the battery terminals. – Make sure the battery terminal is tightened to the tightening specification and is not corroded. – Charge battery. Refer to ⇒ “3.6 Battery Tester Charger Kit GRX3000VAS ”, page 67 .
System noises	– Switch off all electrical consumers. – Wait until all electrical equipment, which are monitored by the vehicle electrical system control module, are switched off. – Remove the ignition key. – Disconnect any doubtful or standard production electrical equipment from the vehicle electrical system.

Wait a few minutes and then perform the test again. Refer to ⇒ “2.7.2 Battery, Testing using Midtronics Battery Tester MCR340VKT ”, page 19 .

Note

If the test was performed at the battery jump start terminal and the message still does not go away, then perform the test directly on the battery.

2.8 Current Draw Test

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Note

- *Make sure the correct charging mode is set on the charger so the current draw test is not inaccurate.*
- *Battery Charger - VAS5095A- . Refer to* ⇒ *"3.1.2 Battery, Charging with Battery Charger VAS5095A ", page 26* .
- *Battery Charger - VAS5900- . Refer to* ⇒ *"3.2 Battery Charger VAS5900 ", page 31* .
- *Battery Charger - VAS5903- . Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

In order to receive an indication as quickly as possible of the battery condition of discharged batteries, a conclusion can be made during the charging process using the battery current draw as to whether the battery should be replaced or charged completely.

Note

In the case of the -VAS6161- , the current draw test must always be conducted when the test result "conduct current draw test" appears in the display.

Always Perform A Current Draw Test When:

- The test result from the -VAS6161- shows the following:

1 - Perform a current draw test

By checking a battery's current draw capacity during the charging procedure, it can be determined in a short time whether a partially discharged or severely discharged battery (refer to ⇒ "3.8 Severely Discharged Batteries", page 72) can become operable again by further charging.

Test Prerequisites

- When charging a battery, the battery temperature must be at least ≥ +10 °C (+50 °F).

- The charger must be able to deliver at least 30 A charge current, for example as on the battery chargers -VAS5095A- , -VAS5900- and -VAS5903- .
- When charging using the -VAS5095A- , the battery current draw must be measured with a current probe, for example, -VAS6356/4A- . The -VAS5900- and the -VAS5903- indicate the current draw on the device. The -VAS5900- automatically performs the menu- guided current draw test.

– Connect the battery to the battery charger and start the charging process.

– Measure the battery charge current after five minutes.

Test Result

When current draw A is greater than 10% of nominal capacity Ah (for example, > 6.1 A at 61 Ah battery), fully charge the battery and retest.

Note

On the Eos with two 6V AGM batteries, the charge current must only be greater than 5% of the battery nominal capacity in amp. As an example for Eos: the 50 Ah battery must have a charge current greater than 2.5 A after charging for five minutes.

– Charge the battery completely when the charge current is greater than 10% of the nominal capacity (note exception for Eos in the note above).

– After resting the battery for two hours, perform a battery test. Refer to
⇒ “2.6.2 Battery Test, Performing using Battery Tester VAS6161 ”, page 13 .

If the charge current is less than 10% of the nominal capacity (two 6 V batteries in the Eos 5%) five minutes after starting the test (that is, for a 50 Ah battery < 5A), then replace the battery. Fill out the battery check sheet for warranty and goodwill cases.

3 Battery, Charging

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to ⇒ “3.3 Battery Charger VAS5903 ”, page 43 .*
- *Battery Charger - VAS5908- . Refer to ⇒ “3.5 Battery Charger VAS5908 ”, page 59 .*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

Caution

In order to prevent damage to the battery or vehicle, observe battery type descriptions and notes. Refer to ⇒ “1.2 Types of Batteries”, page 1 .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

3.1 Battery Charger - VAS5095A-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

In this chapter, the base functions of the -VAS5095A- are described. Refer to -VAS5095A- Operating Instructions for additional information.

Note

- *The effective charging current cannot be read out on this unit. The charging current must be measured externally with a current probe.*
- *Pay attention to the -VAS5095A- Operating Instructions.*

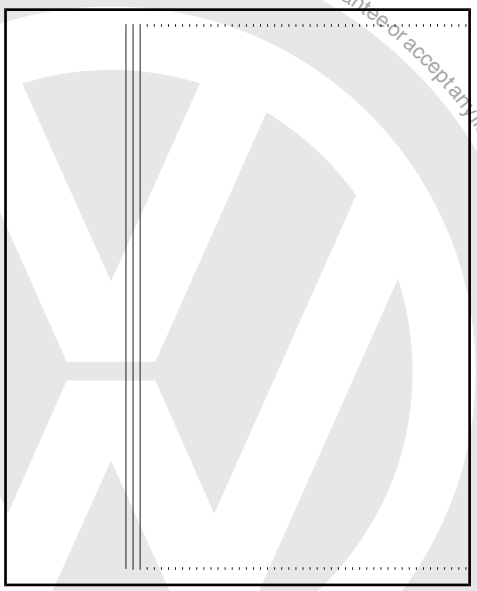
3.1.1 Battery Charger - VAS5095A- Device Description

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

The charge current of the charger is 12A.

The -VAS5095A- is designed to charge all 12 V batteries in the VW group.



The battery is charged without amperage or voltage surges. Thereby the on-board electronics will not be affected. It is not necessary to remove the battery from the vehicle or be disconnected from the electrical system during charging.

-VAS5095A-

1 - Switch ON/OFF (0 = Charger OFF)

2 - Charge current display (I > 12 A)

3 - Charge current display: battery partially charged > 90 %

4 - Charger sustain, lights up green when battery is charged

5 - Interference indicator

6 - Support mode indicator

7 - Support mode/normal mode selector switch

8 - Charger cables, red charging clamp “+”, black charging clamp “-”.

9 - Battery type selector switch (base of loading devices)

3.1.2 Battery, Charging with Battery Charger - VAS5095A-

Special tools and workshop equipment required

- Battery Charger - VAS5095A-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ “3.3 Battery Charger VAS5903 ”, page 43* .
- *Battery Charger - VAS5908- . Refer to* *⇒ “3.5 Battery Charger VAS5908 ”, page 59* .

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ***⇒ “1.3 Warnings and Safety Precautions”, page 3*** .

Caution

While charging, always set the battery type to 2.4 V/C (Volts/Battery Cell)! This applies to all batteries.

Note

The battery temperature must be at least 10 °C (50 °F).

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Turn off the ignition and all electrical consumers.

– Check the battery type setting on the battery type selector. Refer to ⇒ “3.1.1 Battery Charger VAS5095A Device Description”, page 25 . It must be set to 2.4V/C (Volts/Cell).

– Clamp the red charging clamp “+” of the charger to the positive battery terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp “-” must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “-” of the charger to the negative battery terminal.

– Switch on the battery charger. Refer to ⇒ “3.1.1 Battery Charger VAS5095A Device Description”, page 25 .

Charge current displays. Refer to ⇒ Fig. “” -VAS5095A- ””, page 26 -2 and 3- light up yellow. When only the yellow LED -3- is lit, the battery is partially charged (approximately 90 %).

If the green LED. Refer to ⇒ Fig. “” -VAS5095A- ””, page 26 -4- is also lit, the charger has switched to the charge sustain function. The battery is charged.

– Switch off the charger. Refer to ⇒ “3.1.1 Battery Charger VAS5095A Device Description”, page 25 .

– Remove the charger clamps from the battery terminal clamps.

3.1.3 Severely Discharged Battery, Charging with Battery Charger - VAS5095A-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to ⇒ “3.3 Battery Charger VAS5903 ”, page 43 .*
- *Battery Charger - VAS5908- . Refer to ⇒ “3.5 Battery Charger VAS5908 ”, page 59 .*

> ⚠ WARNING
>
> *Risk of injury. Follow all Warnings and Safety Precautions. Refer to* *⇒ "1.3 Warnings and Safety Precautions", page 3 .*

The charger recognizes the severely discharged battery automatically and starts the charging process conservatively with low charging current. The charge current is automatically adjusted to the battery charge state.

> **Note**

- *Observe the notes in chapter. Refer to* *⇒ "3.8 Severely Discharged Batteries", page 72 .*
- *Severely discharged batteries in vehicles must be replaced prior to delivery. Pre-existing damage cannot be ruled out.*
- *The battery voltage must be at least 0.6 V!*

> ⚠ WARNING
>
> *Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.*
>
> *There is a risk of explosion during testing, charging or jump starting.*
>
> *These batteries must be replaced.*

– Charge the battery. Refer to ⇒ "3.1.2 Battery, Charging with Battery Charger VAS5095A ", page 26 .

3.1.4 Support Mode with Battery Charger - VAS5095A-

> **Note**

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ "3.3 Battery Charger VAS5903 ", page 43 .*
- *Battery Charger - VAS5908- . Refer to* *⇒ "3.5 Battery Charger VAS5908 ", page 59 .*

General Information:

The support mode provides the vehicle electrical system with voltage when the battery is removed or disconnected.

Refer to -VAS5095A- Operating Instructions for more information.

The support mode is used for the following situations:

- Vehicle electrical system support mode with the battery not installed
- Maintaining the voltage when the battery is being replaced

- Testing without the battery

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Turn off the ignition and all electrical consumers.

Caution

- *The polarity protection of the charger clamps is not active in the operation mode "charging severely discharged batteries/Support mode". Connect the charger clamps to the battery terminal clamps correctly according to polarity!*
- *It can result in sparks due to short circuit.*
- *This constitutes an explosion risk.*
- *Make sure the charger clamps are secure.*
- *Do not press the START / STOP button when battery cables are connected incorrectly. The charger can be damaged.*

– Remove the battery.

Caution

Whenever the battery is removed, be careful to prevent contact between the connected charge clamp on the battery positive terminal and the body ground. Likewise prevent contact between the battery terminal clamps.

– Connect the red charging clamp "+" to the vehicle battery positive terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp "-" must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp "-" to the vehicle battery negative terminal.

– Check the battery type setting on the battery type selector normal mode/support mode. Refer to

⇒ “3.1.1 Battery Charger VAS5095A Device Description”, page 25 . Support mode must be on.

– Verify that the charger clamps are connected to the correct polarity.

– Switch on charging unit.

The charger begins the support mode.

End the Battery Support Mode:

– Turn off the charger.

– Remove the black charging clamp “-” of the charger from the vehicle battery negative terminal clamp.

– Remove the red charging clamp “+” of the charger from the vehicle battery positive terminal clamp.

– Pull out the electrical system connector of the charger.

3.1.5 Battery Charger - VAS5095A- Maintenance Charging

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ “3.3 Battery Charger VAS5903 ”, page 43* .
- *Battery Charger - VAS5908- . Refer to* *⇒ “3.5 Battery Charger VAS5908 ”, page 59* .

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ “1.3 Warnings and Safety Precautions”, page 3* .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

During maintenance charging, the -VAS5095A- provides safe charging and preserves the charge of the battery.

– Proceed as when charging the battery. Refer to ⇒ “3.1.2 Battery, Charging with Battery Charger VAS5095A ”, page 26 .

Note

- *If the battery is discharged by an electrical consumer during maintenance charging, the -VAS5095A- automatically supplies the appropriate charge.*
- *Maintenance charging can be performed without time restrictions.*
- *The battery can be used constantly.*

3.2 Battery Charger - VAS5900-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ “3.3 Battery Charger VAS5903 ”, page 43 .*
- *Battery Charger - VAS5908- . Refer to* *⇒ “3.5 Battery Charger VAS5908 ”, page 59 .*

> WARNING
>
> *Risk of injury. Follow all Warnings and Safety Precautions. Refer to* *⇒ “1.3 Warnings and Safety Precautions”, page 3 .*

> WARNING
>
> *Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.*
>
> *There is a risk of explosion during testing, charging or jump starting.*
>
> *These batteries must be replaced.*

In this chapter, the base functions of the -VAS5900- are described. Refer to -VAS5900- Operating Instructions for additional information.

Note

- *The effective charging current can be read out directly on this charging device.*
- *Pay attention to the -VAS5900- Operating Instructions.*

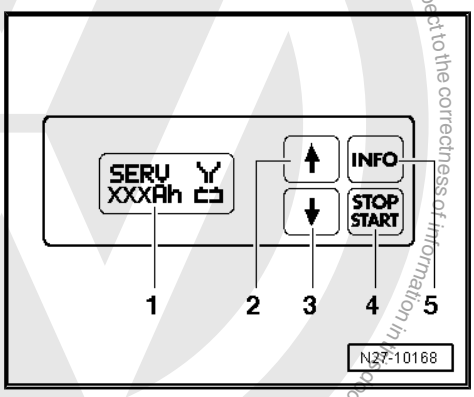
3.2.1 Battery Charger - VAS5900- Device Description

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

The charge current of the charger is 35 A.

The -VAS5900- is designed to charge all 12 V batteries in the VW group.



-VAS5900-

1 - Display

2 - Adjustment button "Up" [↑]

3 - Adjustment button "Down" [↓]

4 - [START / STOP]

5 - [INFO]

3.2.2 Battery, Charging with Battery Charger - VAS5900-

Special tools and workshop equipment required

- Battery Charger - VAS5900-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

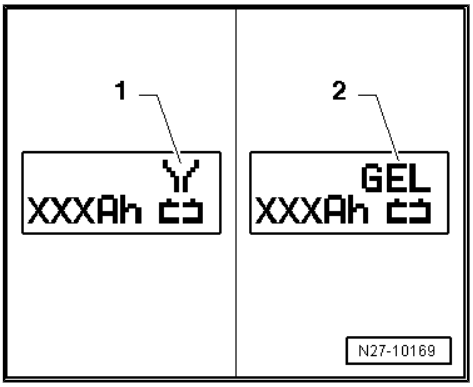
These batteries must be replaced.

Note

The battery temperature must be at least 10 °C (50 °F).

– Turn off the ignition and all electrical consumers.
– Plug in the electrical system connector of the charger. The last selected battery type is shown on the display.
– Select applicable battery type using INFO.

The symbol -1- for “standard charge of wet batteries” or the symbol -2- for “standard charge of Gel/AGM batteries” is indicated in the display.



– Set the capacity (Ah) of the battery to be charged with the corresponding button “Up” ↑ or “Down” ↓.
– Clamp the red charging clamp “+” to the positive battery terminal.

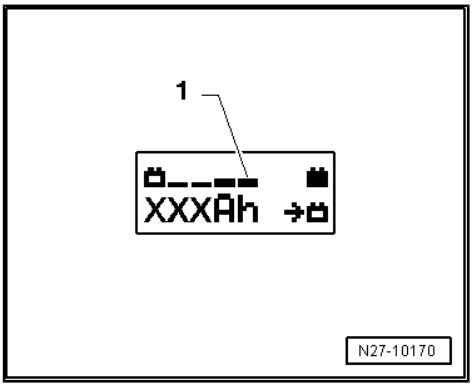
Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

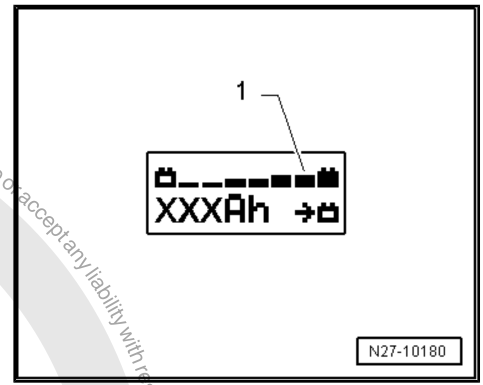
– Connect the black charging clamp “-” to the negative battery terminal.

The battery charger recognizes the nominal voltage of the connected battery (6 V, 12 V or 24 V) and begins the charging process automatically.

At a charge condition of approximately 80 - 85%, charging unit begins the “Final-charging”. The fourth bar is indicated on the display -1-. The battery is now ready to be used.



With a charge status of 100%, all bars are indicated on the display.



Note

- *With the battery type “standard charge”, parallel operation of consumers during the charging process is possible. The charging time is lengthened by this.*
- *Depending on battery type, the charger switches over to sustain charging after approximately 1-7 hours. To achieve a 100% charge status, the battery should remain connected to the charger for that long.*

Possible malfunctions and how they are handled:

1 - Displayed voltage does not match the nominal voltage:

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins.

2 - Displayed battery voltage does not match the nominal voltage - the charging process has already begun:

– Press [START / STOP] twice.

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins again.

3 - The charger does not recognize a battery, when the battery voltage is less than 2 V:

The display remains unchanged.

The selected battery type and Ampere hours (Ah) are displayed.

End battery charging process:

– Press [START / STOP].

– Remove the black charging clamp “-” of the charger from the negative battery terminal.

– Remove the red charging clamp “+” of the charger from the positive battery terminal.

– Pull out the electrical system connector of the charger.

3.2.3 Service Charging with Battery Charger - VAS5900-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ “3.3 Battery Charger VAS5903 ”, page 43 .*
- *Battery Charger - VAS5908- . Refer to* *⇒ “3.5 Battery Charger VAS5908 ”, page 59 .*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

Caution

"Service charging" is not permitted for VW vehicles, because voltage surges can damage the on-board electronics.

If "Service charging" is still used, the battery must always be separated from the vehicle electrical system.

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Caution

During the charging process, always set the operation mode corresponding with the battery. Refer to the -VAS5900- Operating Instructions!

"Service Charging" is suitable for:

- *Wet batteries having a visual indicator which allows charging (visual indicator black or green).*

The "Service charge (SERV)" mode is only used with sulfated batteries. The battery with voltages > 14.4 V is charged. A partial removal of the sulfation layer can result from this. Check the visual indicator after charging, immediately before the battery is used. Refer to
⇒ "2.5 Visual Display in Battery Cover, Checking", page 9 .

Special tools and workshop equipment required

- Battery Charger - VAS5900-

Note

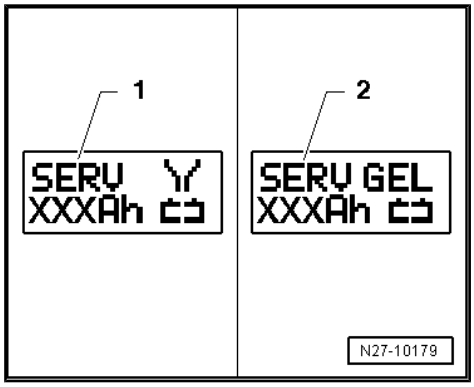
The battery temperature must be at least 10 °C (50 °F).

– Turn off the ignition and all electrical consumers.

– Plug in the electrical system connector of the charger. The last selected mode is shown on the display. Refer to
⇒ "3.2.1 Battery Charger VAS5900 Device Description", page 32 .

– Select battery type using INFO.

The symbol -1- for “service charge of wet batteries” or the symbol -2- for “service charge of Gel/AGM batteries” is indicated in the display.



– Set the capacity (Ah) of the battery to be charged with the corresponding button “Up” ↑ or “Down” ↓.

– Clamp the red charging clamp “+” to the positive battery terminal.

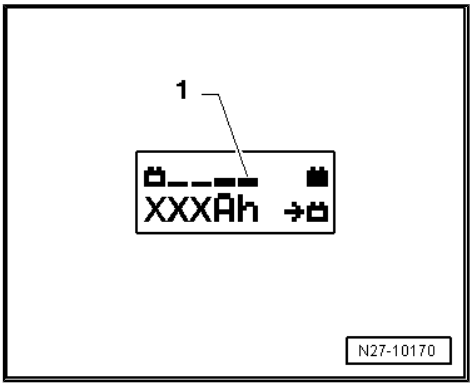
Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp “-” must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “-” to the negative battery terminal.

The battery charger recognizes the nominal voltage of the connected battery (6 V, 12 V or 24 V) and begins the charging process automatically.

At a charge condition of approximately 80 - 85% of the battery voltage, charging unit begins the “Final-charging”. The fourth bar is indicated on the display -1-. The battery is now ready to be used.



Note

A successful “service charge” depends on the degree of sulfation on the battery.

Possible malfunctions and how they are handled:

1 - Displayed voltage does not match the nominal voltage:

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins.

2 - Displayed battery voltage does not match the nominal voltage - the charging process has already begun:

– Press [START / STOP] twice.

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins.

3 - The charger does not recognize a battery, when the battery voltage is less than 2 V:

The display remains unchanged.

The set operating mode and Ampere-hours (Ah) are displayed.

End battery charging process:

– Press [START / STOP].

– Remove the black charging clamp “-” of the charger from the negative battery terminal.

– Remove the red charging clamp “+” of the charger from the positive battery terminal.

– Pull out the electrical system connector of the charger.

3.2.4 Severely Discharged Batteries, Charging with Battery Charger - VAS5900-

Special tools and workshop equipment required

- Battery Charger - VAS5900-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger “VAS5903”. Refer to* ⇒ *“3.3 Battery Charger VAS5903 ”, page 43* .
- *Battery Charger “VAS5908”. Refer to* ⇒ *“3.5 Battery Charger VAS5908 ”, page 59* .

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Caution

- *The polarity protection of the charger clamps is not active in the operation mode "charging severely discharged batteries/Support mode". Connect the charger clamps to the battery terminal clamps correctly according to polarity!*
- *During the charging process, always set the operation mode corresponding with the battery. Refer to the -VAS5900- Operating Instructions!*
- *The severely discharged battery is not recognized by the charger. Refer to ⇒ "3.8 Severely Discharged Batteries", page 72 .*
- *Do not press the START / STOP button when battery cables are connected incorrectly. The charger can be damaged.*

It is not possible for the -VAS5900- to automatically detect batteries with a voltage under 2 Volts.

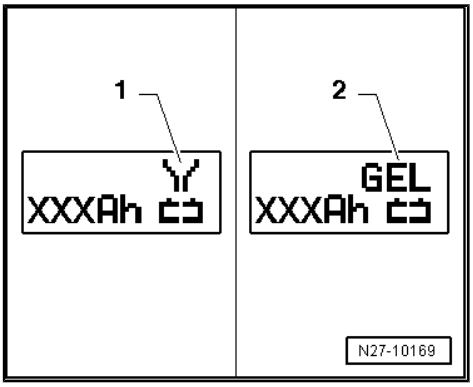
Note

- *Observe the notes in chapter. Refer to ⇒ "3.8 Severely Discharged Batteries", page 72 .*
- *Severely discharged batteries in vehicles must be replaced prior to delivery. Pre-existing damage cannot be ruled out.*
- *The battery temperature must be at least 10 °C (50 °F).*

– Turn off the ignition and all electrical consumers.

– Plug in the electrical system connector of the charger. The last selected operation mode is shown on the display. Refer to ⇒ "3.2.1 Battery Charger VAS5900 Device Description", page 32 .

– Select battery type using INFO.



The symbol -1- for “service charge of wet batteries” or the symbol -2- for “service charge of Gel/AGM batteries” is indicated in the display.

– Set the capacity (Ah) of the battery to be charged with the corresponding button “Up” ↑ or “Down” ↓.

– Clamp the red charging clamp “+” to the positive battery terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “-” to the negative battery terminal.

– Press START / STOP for approximately 5 seconds. The menu item “Charging severely discharged batteries/Support mode” is activated.

– Press the corresponding button “Up” ↑ or “Down” ↓, to set the respective battery voltage (6 V, 12 V or 24 V).

Note

If no button is touched within five seconds, the battery charger will return to the main menu (operating mode selection).

– Confirm the selected battery voltage by pressing the START / STOP button.

Then the inquiry about the correct polarity of the charging clamps is made.

– Verify that the charger clamps are connected to the correct polarity.

– Confirm that the charger clamps are connected to the correct terminals by pressing START / STOP.

The charger begins charging the severely discharged battery.

End Battery Charging Process:

– Press START / STOP.

– Remove the black charging clamp “-” of the charger from the negative battery terminal.

– Remove the red charging clamp “+” of the charger from the positive battery terminal.

– Pull out the electrical system connector of the charger.

3.2.5 Support Mode with Battery Charger - VAS5900-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger "VAS5903". Refer to* *⇒ "3.3 Battery Charger VAS5903 ", page 43 .*
- *Battery Charger "VAS5908". Refer to* *⇒ "3.5 Battery Charger VAS5908 ", page 59 .*

General Information:

The support mode provides the vehicle electrical system with voltage when the battery is removed or disconnected.

Refer to VAS5900 Operating Instructions for more information.

The support mode is used for the following situations:

- Vehicle electrical system support mode with the battery not installed
- Maintaining the voltage when the battery is being replaced
- Testing without the battery

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ "1.3 Warnings and Safety Precautions", page 3 .*

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Turn off the ignition and all electrical consumers.

Caution

- *The polarity protection of the charger clamps is not active in the operation mode "charging severely discharged batteries/Support mode". Connect the charger clamps to the battery terminal clamps correctly according to polarity!*
- *It can result in sparks due to short circuit.*
- *This constitutes an explosion risk.*
- *Make sure the charger clamps are secure.*
- *Do not press the START / STOP button when battery cables are connected incorrectly. The charger can be damaged.*

– Remove the battery.

– Plug in the electrical system connector of the charger. The last selected operation mode is shown on the display. Refer to ⇒ "3.2.1 Battery Charger VAS5900 Device Description", page 32 .

Caution

Whenever the battery is removed, be careful to prevent contact between the connected charge clamp on the positive terminal and the body ground. Likewise prevent contact between the battery terminal clamps.

– Connect the red charging clamp "+" to the vehicle positive terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367-, the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp "+" to the vehicle negative terminal.

– Press START / STOP for approximately 5 seconds. The menu item "Charging severely discharged batteries/Support mode" is activated.

– Press the corresponding button "Up" ↑ or "Down" ↓, to set the respective battery voltage (6 V, 12 V or 24 V).

Note

If no button is touched within five seconds, the battery charger will return to the main menu (operating mode selection).

– Confirm the selected battery voltage by pressing the START / STOP button.

Then the inquiry about the correct polarity of the charging clamps is made.

– Verify that the charger clamps are connected to the correct polarity.
– Confirm that the charger clamps are connected to the correct terminals by pressing START / STOP.

The battery charger starts the battery support mode.

End the Battery Support Mode:

– Press START / STOP.
– Remove the black charging clamp “-” of the charger from the negative battery terminal of the vehicle.
– Remove the red charging clamp “+” of the charger from the positive battery terminal of the vehicle.
– Pull out the electrical system connector of the charger.

3.2.6 Battery Charger - VAS5900- Maintenance Charging

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ *“3.3 Battery Charger VAS5903 ”, page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *“3.5 Battery Charger VAS5908 ”, page 59* .

Note

- *If the battery is discharged by an electrical consumer during maintenance charging, the -VAS5900- automatically supplies the appropriate charge.*
- *Maintenance charging can be performed without time restrictions.*
- *The battery can be used constantly.*
- *Observe the maintenance notes of the battery manufacturer.*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ *“1.3 Warnings and Safety Precautions”, page 3* .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

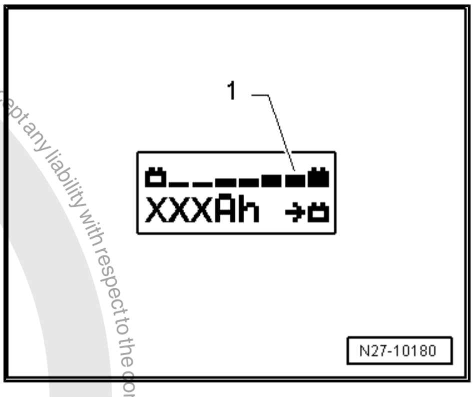
There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

If the battery is fully charged, the -VAS5900- starts maintenance charging.

– Proceed as when charging the battery. Refer to ⇒ "3.2.2 Battery, Charging with Battery Charger VAS5900 ", page 32 .

With a charge status of 100%, all bars are indicated on the display.



3.3 Battery Charger - VAS5903-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5908- . Refer to* *⇒ "3.5 Battery Charger VAS5908 ", page 59 .*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ "1.3 Warnings and Safety Precautions", page 3 .*

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

In this chapter, the base functions of the -VAS5903- are described. Refer to -VAS5903- Operating Instructions for additional information.

Note

Pay attention to the -VAS5903- Operating Instructions.

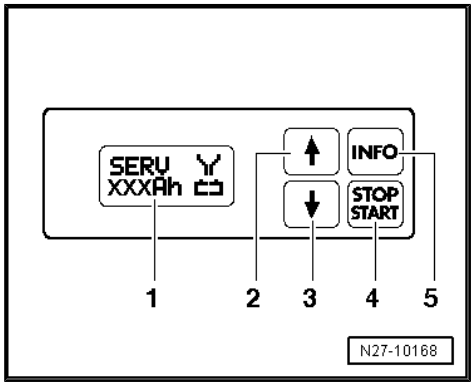
3.3.1 Battery Charger - VAS5903- Device Description

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger "VAS5903". Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger "VAS5908". Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

The charge current of the charger is 70 A.

The -VAS5903- is designed to charge all 12 V batteries in the VW group.



-VAS5903-

1 - Display

2 - Adjustment button "Up" [↑]

3 - Adjustment button "Down" [↓]

4 - [START / STOP]

5 - [INFO]

3.3.2 Battery, Charging with Battery Charger - VAS5903-

Special tools and workshop equipment required

- Battery Charger - VAS5903-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ "3.3 Battery Charger VAS5903 ", page 43 .*
- *Battery Charger - VAS5908- . Refer to* *⇒ "3.5 Battery Charger VAS5908 ", page 59 .*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ "1.3 Warnings and Safety Precautions", page 3 .*

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

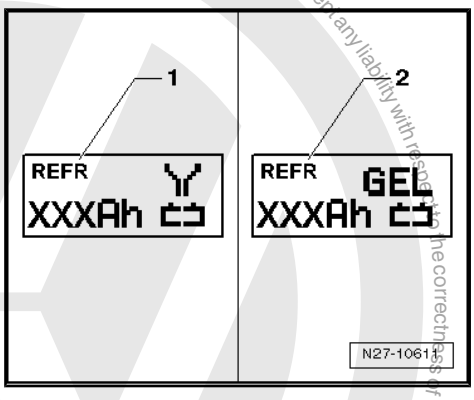
These batteries must be replaced.

Note

The battery temperature must be at least 10 °C (50 °F).

– Turn off the ignition and all electrical consumers.
– Plug in the electrical system connector of the charger. The last selected operation mode is shown on the display. Refer to ⇒ "3.3.1 Battery Charger VAS5903 Device Description", page 44 .

– Select applicable battery type using INFO.



The symbol -1- for “standard charge of wet batteries” or the symbol -2- for “standard charge of Gel/AGM batteries” is indicated in the display.

– Set the capacity (Ah) of the battery to be charged with the corresponding button “Up” ↑ or “Down” ↓.

– Clamp the red charging clamp “+” to the positive battery terminal.

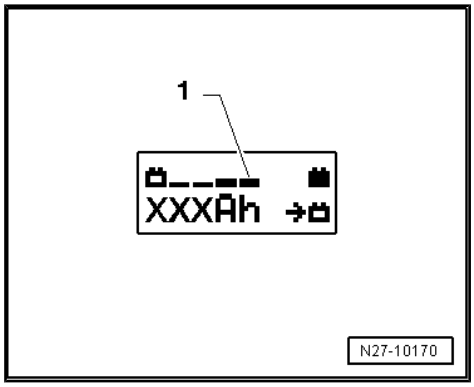
Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

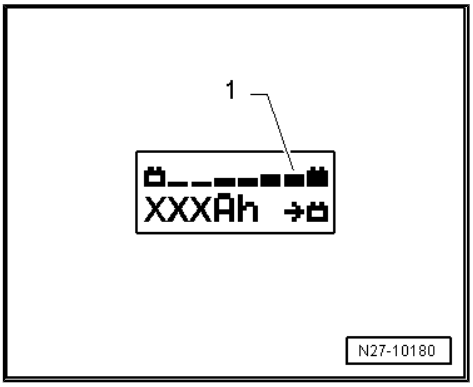
– Connect the black charging clamp “-” to the negative battery terminal.

The battery charger recognizes the nominal voltage of the connected battery (6 V, 12 V or 24 V) and begins the charging process automatically.

At a charge condition of approximately 80 - 85%, charging unit begins the “Final-charging”. The fourth bar is indicated on the display -1-. The battery is now ready to be used.



With a charge status of 100%, all bars are indicated on the display.



Note

- *With the battery type “standard charge”, parallel operation of electrical consumers during the charging process is possible. The charging time is lengthened by this.*
- *Depending on battery type, the charger switches over to sustain charging after approximately 1-7 hours. To achieve a 100 % charge status, the battery should remain connected to the charger for that long.*

Possible malfunctions and how they are handled:

1 - Displayed voltage does not match the nominal voltage:

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins.

2 - Displayed battery voltage does not match rated voltage - charging process has already begun:

– Press [START / STOP] twice.

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins again.

3 - The charger does not recognize a battery, when the battery voltage is less than 2 V:

The display remains unchanged.

The selected battery type and Ampere hours (Ah) are displayed.

End Battery Charging Process:

– Press [START / STOP].

– Remove the black charging clamp “-” of the charger from the negative battery terminal.

– Remove the red charging clamp “+” of the charger from the positive battery terminal.

– Pull out the electrical system connector of the charger.

3.3.3 Refresh Charging with Battery Charger - VAS5903-

Special tools and workshop equipment required

- Battery Charger - VAS5903-

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Caution

“Refresh charging” is not permitted for VW vehicles, because voltage surges can damage the on-board electronics.

If “Refresh charging” is still used, the battery must always be separated from the vehicle electrical system.

Caution

During the charging process, always set the operation mode corresponding with the battery. Refer to the -VAS5903- Operating Instructions!

“Refresh charging” is suitable for:

- *Wet batteries, which can be filled with distilled water.*

Do not use “Refresh charging” on maintenance-free wet batteries.

“Refresh charging (Refr)” mode is only used on batteries that are possibly defective (for example, sulfation). The battery is then charged to the maximum specific gravity of the electrolyte and the plates are reactivated (removal of sulfation layer).

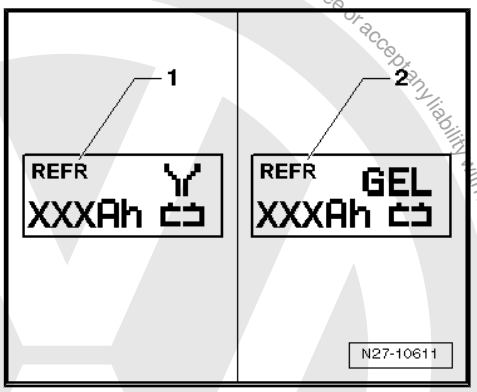
Note

The battery temperature must be at least 10 °C (50 °F).

– Turn off the ignition and all electrical consumers.

– Plug in the electrical system connector of the charger. The last selected mode is shown on the display. Refer to ⇒ “3.3.1 Battery Charger VAS5903 Device Description”, page 44 .

– Select applicable battery type using INFO.



The symbol -1- for “refresh - charging wet batteries” or the symbol -2- for “refresh - charging of Gel/AGM batteries” is indicated in the display.

– Set the capacity (Ah) of the battery to be charged with the corresponding button “Up” ↑ or “Down” ↓.

– Clamp the red charging clamp “+” to the positive battery terminal.

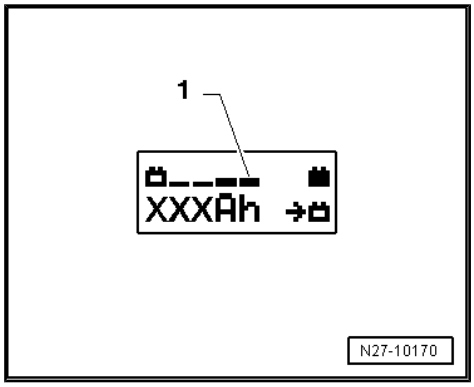
Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “-” to the negative battery terminal.

The battery charger recognizes the nominal voltage of the connected battery (6 V, 12 V or 24 V) and begins the charging process automatically.

At a charge condition of approximately 80 - 85% of the battery voltage, charging unit begins the “Final-charging”. The fourth bar is indicated on the display -1-. The battery is now ready to be used.



Note

A successful “Refresh charge” depends on the degree of sulfation on the battery.

Possible malfunctions and how they are handled:

1 - Displayed voltage does not match the nominal voltage:

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins.

2 - Displayed battery voltage does not match rated voltage - charging process has already begun:

– Press [START / STOP] twice.

– Hold the appropriate button “Up” [↑] or “Down” [↓] until the charging process begins.

3 - The charger does not recognize a battery, when the battery voltage is less than 2 V:

The display remains unchanged.

The set operating mode and Ampere-hours (Ah) are displayed.

End battery charging process:

– Press [START / STOP].

– Remove the black charging clamp “-” of the charger from the negative battery terminal.

– Remove the red charging clamp “+” of the charger from the positive battery terminal.

– Pull out the electrical system connector of the charger.

3.3.4 Severely Discharged Battery, Charging with Battery Charger - VAS5903-

Special tools and workshop equipment required

- Battery Charger - VAS5903-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ “3.3 Battery Charger VAS5903 ”, page 43 .
- *Battery Charger - VAS5908- . Refer to* ⇒ “3.5 Battery Charger VAS5908 ”, page 59 .

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Caution

- *The polarity protection of the charger clamps is not active in the operation mode "charging severely discharged batteries/Support mode". Connect the charger clamps to the battery terminal clamps correctly according to polarity!*
- *During the charging process, always set the operation mode corresponding with the battery. Refer to the -VAS5903- Operating Instructions!*
- *The severely discharged battery is not recognized by the charger ⇒ "3.8 Severely Discharged Batteries", page 72 .*
- *Do not press the START / STOP button when battery cables are connected incorrectly. The charger can be damaged.*

It is not possible for the -VAS5903- to automatically detect batteries with a voltage under 2 Volts.

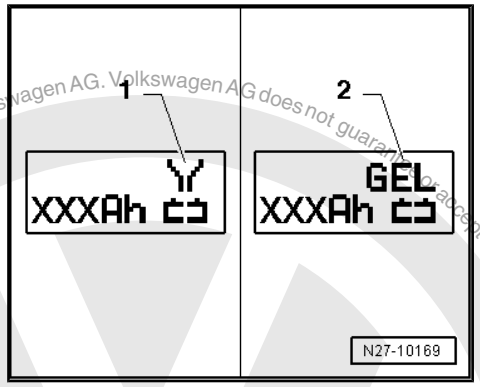
Note

- *Observe the notes in chapter. Refer to ⇒ "3.8 Severely Discharged Batteries", page 72 .*
- *Severely discharged batteries in vehicles must be replaced prior to delivery. Pre-existing damage cannot be ruled out.*
- *The battery temperature must be at least 10 °C (50 °F).*

– Turn off the ignition and all electrical consumers.

– Plug in the electrical system connector of the charger. The last selected operation mode is shown on the display. Refer to ⇒ "3.3.1 Battery Charger VAS5903 Device Description", page 44 .

– Select applicable battery type using INFO.



The symbol -1- for “service charge of wet batteries” or the symbol -2- for “service charge of Gel/AGM batteries” is indicated in the display.

– Set the capacity (Ah) of the battery to be charged with the corresponding button “Up” ↑ or “Down” ↓.

– Clamp the red charging clamp “+” to the positive battery terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “-” to the negative battery terminal.

– Press START / STOP for approximately 5 seconds. The menu item “Charging severely discharged batteries/Support mode” is activated.

– Press the corresponding button “Up” ↑ or “Down” ↓, to set the respective battery voltage (6 V, 12 V or 24 V).

Note

If no button is touched within five seconds, the battery charger will return to the main menu (operating mode selection).

– Confirm the selected battery voltage by pressing the START / STOP button.

Then the inquiry about the correct polarity of the charging clamps is made.

– Verify that the charger clamps are connected to the correct polarity.

– Confirm that the charger clamps are connected to the correct terminals by pressing START / STOP.

The charger begins charging the severely discharged battery.

End Battery Charging Process:

– Press START / STOP.

– Remove the black charging clamp “-” of the charger from the negative battery terminal.

– Remove the red charging clamp “+” of the charger from the positive battery terminal.

– Pull out the electrical system connector of the charger.

3.3.5 Support Mode with Battery Charger - VAS5903-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5908- . Refer to* *⇒ "3.5 Battery Charger VAS5908 ", page 59* .

General Information:

The support mode provides the vehicle electrical system with voltage when the battery is removed or disconnected.

More information can be found in the -VAS5903- Operating Instructions.

The support mode is used for the following situations:

- Vehicle electrical system support mode with the battery not installed
- Maintaining the voltage when the battery is being replaced
- Testing without the battery

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ "1.3 Warnings and Safety Precautions", page 3* .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

– Turn off the ignition and all electrical consumers.

Caution

- *The polarity protection of the charger clamps is not active in the operation mode "charging severely discharged batteries/Support mode". Connect the charger clamps to the battery terminal clamps correctly according to polarity!*
- *It can result in sparks due to short circuit.*
- *This constitutes an explosion risk.*
- *Make sure the charger clamps are secure.*
- *Do not press the START / STOP button when battery cables are connected incorrectly. The charger can be damaged.*

– Remove the battery.

– Plug in the electrical system connector of the charger. The last selected operation mode is shown on the display. Refer to ⇒ “3.2.1 Battery Charger VAS5900 Device Description”, page 32 .

Caution

Whenever the battery is removed, be careful to prevent contact between the connected charge clamp on the positive terminal and the body ground. Likewise prevent contact between the battery terminal clamps.

– Connect the red charging clamp “+” to the vehicle positive terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “+” to the vehicle negative terminal.

– Press START / STOP for approximately 5 seconds. The menu item “Charging severely discharged batteries/Support mode” is activated.

– Press the corresponding button “Up” ↑ or “Down” ↓, to set the respective battery voltage (6 V, 12 V or 24 V).

Note

If no button is touched within five seconds, the battery charger will return to the main menu (operating mode selection).

– Confirm the selected battery voltage by pressing the START / STOP button.

Then the inquiry about the correct polarity of the charging clamps is made.

– Verify that the charger clamps are connected to the correct polarity.

– Confirm that the charger clamps are connected to the correct terminals by pressing START / STOP.

The battery charger starts the battery support mode.

End the Battery Support Mode:

– Press START / STOP.

– Remove the black charging clamp “-” of the charger from the negative battery terminal of the vehicle.

– Remove the red charging clamp “+” of the charger from the positive battery terminal of the vehicle.

– Pull out the electrical system connector of the charger.

3.3.6 Battery Charger - VAS5903- Maintenance Charging

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ "3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* *⇒ "3.5 Battery Charger VAS5908 ", page 59* .

Note

- *If the battery is discharged by an electrical consumer during maintenance charging, the -VAS5903- automatically supplies the appropriate charge.*
- *Maintenance charging can be performed without time restrictions.*
- *The battery can be used constantly.*
- *Observe the maintenance notes of the battery manufacturer.*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ "1.3 Warnings and Safety Precautions", page 3* .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

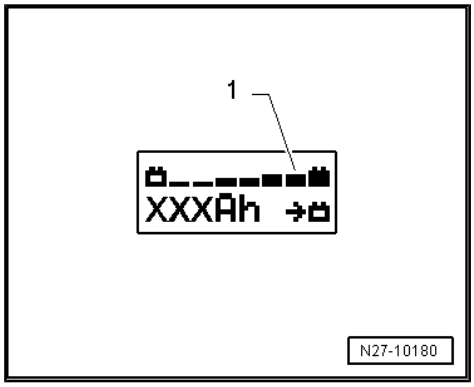
There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

If the battery is fully charged, the -VAS5903- starts maintenance charging.

– Proceed as when charging the battery. Refer to ⇒ "3.3.2 Battery, Charging with Battery Charger VAS5903 ", page 44 .

With a charge status of 100%, all bars are indicated on the display.



3.4 Battery Charger - VAS5906-

3.4.1 General Description

Special tools and workshop equipment required

- Battery Charger - VAS5906-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒ *"3.3 Battery Charger VAS5903 ", page 43* .
- *Battery Charger - VAS5908- . Refer to* ⇒ *"3.5 Battery Charger VAS5908 ", page 59* .

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ ***"1.3 Warnings and Safety Precautions", page 3*** .

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

The charge current of the charger is 30 A.

The -VAS5906- was developed especially for charging the vehicle electrical system while the vehicle is on display.

It supplies for automatic charging of 3 - 300 Ah for starter batteries.

The 14.4 V maximum charging voltage is not exceeded. All electrical consumers will be supported up to 30 A by the support charging.

After the battery is completely charged, the -VAS5906- switches to maintenance charging for long-term operation.

The unit starts automatically and does not require any adjustments. Only the charging terminals and the network cable need to be connected.

More information can be found in the -VAS5906- Operating Instructions.

3.4.2 Battery, Charging with Battery Charger - VAS5906-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to ⇒ "3.3 Battery Charger VAS5903 ", page 43 .*
- *Battery Charger - VAS5908- . Refer to ⇒ "3.5 Battery Charger VAS5908 ", page 59 .*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

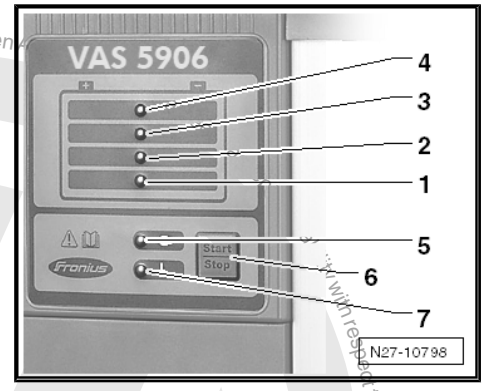
WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Control Panel Overview:



1 - 25% charge display.

2 - 50% charge display.

3 - 75% charge display.

4 - 100% charge display.

5 - Ready-to-use display

6 - Pushing the Start/Stop and setup buttons will stop and start the charging process. Enter into the setup menu and select characteristic line type (hold for 10 seconds)

7 - Display malfunction

– Position the battery charger inside the engine compartment or under the vehicle.

– Connect the network cable to the battery charger and then connect it to the network.

When the battery charger is in idle - the ready-to-use lights up.

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

– Switch off the ignition.

– Connect the red charger cable to the positive terminal "+" on the battery.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging cable to the negative terminal "-" on the battery.

Charging will begin after approximately 2 seconds.

LEDs show the battery charge level. When all the lamps illuminate, the battery is charged.

When the battery is completely charged, the -VAS5906- automatically switches to maintenance charging.

Caution

Sparks can result if the charging terminals are removed too early. Confirm the charging process by pressing the START/STOP button.

– Press the START/STOP button to end the charging.

– Disconnect the black charging cable from the negative terminal "-" on the battery.

– Disconnect the red charging cable from the positive terminal “+” on the battery.

3.5 Battery Charger - VAS5908-

3.5.1 General Description - Battery Charger - VAS5908-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to ⇒ “3.3 Battery Charger VAS5903 ”, page 43 .*
- *Battery Charger - VAS5908- . Refer to ⇒ “3.5 Battery Charger VAS5908 ”, page 59 .*

The -VAS5908- has the following modes available:

- AUTO MODE, maintenance charging with automatic load detection (battery or consumer). Refer to ⇒ “3.5.2 Auto Mode with Battery Charger VAS5908 ”, page 60 .
- CHARGING MODE, battery charging with adjustable parameters. Refer to ⇒ “3.5.3 Battery, Charging with Battery Charger VAS5908 ”, page 62
- FSV MODE, FSV (external power supply), backup power supply. Refer to ⇒ “3.5.4 Support Mode with Battery Charger VAS5908 ”, page 63
- I-CHECK, current draw test with shorted cell testing. Refer to ⇒ “3.5.5 VASI-CHECK Current Draw Test with Battery Charger VAS5908 ”, page 65

Technical Data

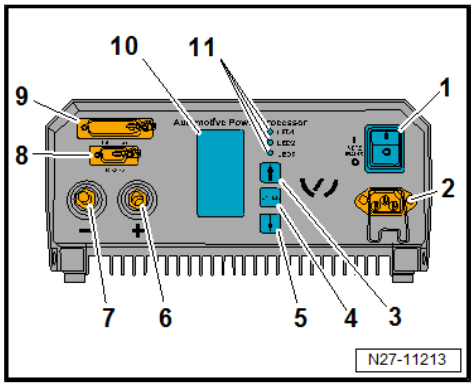
- Input voltage: 100-240 VAC
- Output voltage 14.4 VDC (13.2 VDC retention charge)
- Charge current: 90 A (max. 105 A)
- Weight: 8.2 kg

Replacement Parts

- Charging Cable 5m - VAS5908/1-
- Charger Coupling - VAS5908/2-

Refer to -VAS5908- Operating Instructions for more information.

Device Overview - -VAS5908-



1 - “ON/OFF” Voltage Switch

2 - Voltage Cable Connection

3 - ▲ Up Button for Menu Selection

4 - ENTER Button for Menu Selection or Starting

5 - ▼ Down Button for Menu Selection

6 - + Battery Charging Clamp Connection (Red Pliers)

7 - - Battery Charging Clamp Connection (Black Pliers)

8 - Communication Interface RS232, 9-Pin

9 - Signal Interface, 25-Pin

10 - Menu Selection Display

11 - LED Display for displaying operation and device status

LED Display -11-

The LED display on the front side of the device is to signal the operation and device status. The meaning of green, yellow, blinking red or illuminated LEDs in the different operating conditions is listed in a table. Refer to -VAS5908- Operating Manual, 8) LED and remote indicator index.

Device Menu

Various parameters and default settings to ensure the measured values and the conditions for switching the -VAS5908- on and off can be set in the device menu.

– Switch the -VAS5908- on.

– With the ▲▼ buttons, select the »MENU« line and confirm with the ENTER button.

– With the ▲▼ buttons, select the »DEVICE MENU« line and confirm with the ENTER button.

Refer to -VAS5908- Operating Instructions for more information on the device menu.

3.5.2 Auto Mode with Battery Charger - VAS5908-

Special tools and workshop equipment required

- Battery Charger - VAS5908-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* *⇒ “3.3 Battery Charger VAS5903 ”, page 43* .
- *Battery Charger - VAS5908- . Refer to* *⇒ “3.5 Battery Charger VAS5908 ”, page 59* .

The »AUTO MODE« serves to maintain the voltage in the vehicle electrical system (retention charge) during flashing or diagnostic

procedures, for example. With integrated load detection, the -VAS5908- recognizes if a battery or an electrical consumer is connected with resistive load when in »AUTO MODE«.

Starting Power Supply

Note

If the charging clamps are connected to an electrical consumer or a battery before turning on the charger, the -VAS5908- will start automatically after turning it on with maintenance charging in »AUTO MODE«.

– Switch the -VAS5908- on.

– With the `▲▼` buttons, select `AUTO MODE` and confirm with the `ENTER` button.

– Connect the red charging clamp “+” to the vehicle battery positive terminal.

Note

♦ *On vehicles with a Start/Stop system and an installed Battery Monitoring Control Module - J367- , the black charge terminal “-” must be connected to the body ground.*

♦ *When connecting to the battery negative terminal, the Battery Monitoring Control Module - J367- is bypassed. Malfunctions in the Start/Stop System may result.*

– On vehicles with a Start/Stop System, connect the black charging clamp “-” to the body ground.

– On vehicles without a Start/Stop System, connect the black charging clamp “-” to the vehicle battery negative terminal.

OR

– Connect the charging clamps on the electrical equipment with an resistive load.

– Select `START` in the menu using the `▲▼` buttons and confirm with `ENTER` to start the supply.

Note

The -VAS5908- automatically adapts to the thresholds of power and voltage for the auto mode.

Ending Supply

– Select `STOP` in the menu using the `▲▼` buttons and confirm with `ENTER` to stop the supply.

– Switch the -VAS5908- off.

– Disconnect the black charging clamp “-” on the battery charger from the vehicle battery negative terminal or from the electrical equipment.

– Disconnect the red charging clamp “+” on the battery charger from the vehicle battery positive terminal or from the electrical equipment.

– Remove the charger connector.

3.5.3 Battery, Charging with Battery Charger - VAS5908-

Special tools and workshop equipment required

- Battery Charger - VAS5908-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to* ⇒“3.3 Battery Charger VAS5903 ”, page 43 .

WARNING

Risk of injury. Pay attention to all warnings and safety precautions. Refer to ***⇒ “1.3 Warnings and Safety Precautions”, page 3*** .

WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Note

- *Note the information in the chapter on »severely discharged batteries«. Refer to* ⇒ “3.8 Severely Discharged Batteries”, page 72 .
- *Severely discharged batteries in vehicles must be replaced prior to delivery. Pre-existing damage cannot be ruled out.*
- *The battery temperature must be at least 10 °C (50 °F).*
- *The minimum voltage “Uesp” of the battery to be charged must be at least 5 V.*

Battery, Charging

– Switch off the ignition and all electrical equipment and remove the ignition key.

– Switch the -VAS5908- on.

– Connect the red charging clamp “+” to the vehicle battery positive terminal.

Note

- *On vehicles with a Start/Stop system and an installed Battery Monitoring Control Module - J367- , the black charge terminal "-" must be connected to the body ground.*
- *When connecting to the battery negative terminal, the Battery Monitoring Control Module - J367- is bypassed. Malfunctions in the Start/Stop System may result.*

– On vehicles with a Start/Stop System, connect the black charging clamp "-" to the body ground.

– On vehicles without a Start/Stop System, connect the black charging clamp "-" to the vehicle battery negative terminal.

– With the ▲▼ buttons, select CHARGE MODE and confirm with the ENTER button.

Note

- *The -VAS5908- automatically adapts to the thresholds of power and voltage for the charge mode.*
- *If necessary, preset the different thresholds for power and voltage in the charging menu. Refer to ⇒ page 63 .*

End Battery Charging Process

– Switch the -VAS5908- off.

– Disconnect the black charging clamp "-" on the battery charger from the vehicle battery negative terminal.

– Disconnect the red charging clamp "+" on the battery charger from the vehicle battery positive terminal.

– Remove the charger connector.

Note

After the battery is completely charged, the -VAS5908- automatically switches to maintenance charging for long-term operation.

Charging Menu

The battery charger automatically adapts to the power and voltage thresholds for the charge mode. The parameters for charge mode can also be manually set.

– With the ▲▼ buttons, select the »MENU« line and confirm with the ENTER button.

– With the ▲▼ buttons, select the »CHARGING MENU« line and confirm with the ENTER button.

Refer to -VAS5908- Operating Instructions for more information on the charging menu.

3.5.4 Support Mode with Battery Charger - VAS5908-

Special tools and workshop equipment required

- Battery Charger - VAS5908-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- ...Refer to* *⇒ "3.3 Battery Charger VAS5903 ", page 43* .

The support mode (»FSV mode« external power supply) serves to supply the vehicle electrical system with voltage when the battery is disconnected or removed.

The support mode is used for the following situations:

- Vehicle electrical system support mode with the battery not installed
- Maintaining the voltage when the battery is being replaced
- Testing without the battery

Caution

In »FSV mode« only a resistive load (electrical equipment) may be supplied.

»FSV mode« may not be used when the battery is connected.

Disconnect or remove the battery before using the »FSV mode«.

Performing Support Mode

– Switch off the ignition and all electrical equipment and remove the ignition key.

– Remove the battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery, Removing and Installing .

– Switch the -VAS5908- on.

Caution

Always make sure that the red charging clamp does not make contact with the body ground.

Always make sure that the battery terminal clamps do not contact each other.

– Connect the red charging clamp "+" to the vehicle battery positive terminal clamp.

Note

- *On vehicles with a Start/Stop system and an installed Battery Monitoring Control Module - J367- , the black charge terminal "-" must be connected to the body ground.*
- *When connecting to the battery negative terminal, the Battery Monitoring Control Module - J367- is bypassed. Malfunctions in the Start/Stop System may result.*

– On vehicles with a Start/Stop System, connect the black charging clamp “-” to the body ground.
– On vehicles without a Start/Stop System, connect the black charging clamp “-” to the vehicle battery negative terminal clamp.

Note

- *The -VAS5908- automatically adapts to the thresholds of power and voltage for the support mode.*
- *If necessary, preset the different thresholds for power and voltage in the FSV menu. Refer to ⇒ page 65 .*

– With the ▲▼ buttons, select FSV MODE and confirm with the ENTER button.

Ending Support Mode

– Switch the -VAS5908- off.
– Disconnect the black charging clamp “-” on the battery charger from the vehicle battery negative terminal clamp.
– Disconnect the red charging clamp “+” on the battery charger from the vehicle battery positive terminal clamp.
– Remove the charger connector.

FSV Menu

The battery charger automatically adapts to the power and voltage thresholds for the support mode. The parameters for support mode can also be manually set.

– With the ▲▼ buttons, select the »MENU« line and confirm with the ENTER button.
– With the ▲▼ buttons, select the »FSV MENU« line and confirm with the ENTER button.

Refer to -VAS5908- Operating Instructions for more information on the FSV menu.

3.5.5 VASI-CHECK Current Draw Test with Battery Charger - VAS5908-

Special tools and workshop equipment required

- Battery Charger - VAS5908-

Note

- *If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A must be used in order to avoid problems during software updates and flash campaigns/actions.*
- *Battery Charger - VAS5903- . Refer to ⇒ “3.3 Battery Charger VAS5903 ”, page 43 .*

The current draw test quickly determines the battery condition when the battery is drained. Based on the current draw test result, it can be stated whether the battery needs to be replaced or if it must be fully recharged.

Note

Make sure the battery is checked without electrical equipment connected in parallel when performing the battery current draw test.

Perform a Current Draw Test

– Disconnect both battery terminals so that the test result is not falsified due to vehicle-specific electrical equipment. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Disconnecting and Connecting .

– Turn on the -VAS5908- and connect the charging clamps to the correct terminals on the battery.

– With the ▲▼ buttons, select »AUTO MODE« and activate with the ENTER button (display blinks).

– With the ▲▼ buttons, select I-CHECK and confirm with the ENTER button.

– Press the ENTER button to activate the entry for battery capacity »Qbat:« (blinking).

– With the ▲▼ buttons, set the capacity (Ah) of the battery to be checked and confirm with the ENTER button.

– With the ▲▼ buttons, select the »TEST START« menu item and confirm with the ENTER button to start the current draw test. Pay attention to any connection error messages. Refer to ⇒ page 67 .

»TEST« will blink in the display while the current draw test is in progress. The button locks are activated, and the test in progress can only be canceled if the charging clamps are removed. Pay attention to any interruption error messages. Refer to ⇒ page 67 .

Test results with the current draw I less than 100% (battery is faulty)

If the current draw »I« is less than 100% at the end of the test, the battery voltage supply is interrupted and »MAKE WARRANTY CLAIM« appears in the display.

– Select »OK« using the ▲▼ buttons and confirm with the ENTER button to display the result values from the test.

The current draw percentage is displayed in the results window under »I«. The displayed data can be transferred to the battery test sheet.

– With the ▲▼ buttons, select »TEST END« and confirm with the ENTER button to end the current draw test.

Test results with current draw I greater than 100% (battery intact, but insufficiently charged)

If the current draw »I« is greater than 100% at the end of the test, the voltage supply continues when charging the battery.

– Select »RESULT« using the ▲▼ buttons and confirm with the ENTER button to display the result values from the test.

The current draw percentage is displayed in the results window under »I«.

– With the ▲▼ buttons, select »OK« or »TEST END« and confirm with the ENTER button to switch to the “I-Check charge mode” and to continue to charge the battery.

»CHARGING« blinks in the display when in I-Check charge mode until the battery is completely charged. After the charging process is finished, the device automatically switched to maintenance charging. »RETENTION« blinks in the display.

Note

- *A shorted cell test is automatically activated while the battery charges in "I-Check charge mode".*
- *When the shorted cell test is activated, the battery charging is interrupted twice for approximately 30 seconds to measure the voltage.*
- *If the shorted cell test is positive, the charging process is interrupted and »SHORTED CELL« appears in the display.*

Connection Error Messages

- »APPLICATION ERROR - CONTACT« = no battery detected or no battery connected.
- »APPLICATION ERROR - REVERSE POLARITY« = battery was connected with incorrect polarity.
- »APPLICATION ERROR - LOW CHARGE« = voltage of connected battery is below the defined voltage activation limit (Uesp) in the charging menu.

Interruption Error Messages

- »APPLICATION INTERRUPTION - CONTACT« = battery was disconnected during the text.
- »APPLICATION INTERRUPTION - SHORT CIRCUIT« = short circuit detected at the battery cables.

3.6 Battery Tester Charger Kit - GRX3000VAS-

⇒ "3.6.1 Battery Tester Charger Kit GRX3000VAS General Description", page 67

⇒ "3.6.2 Battery Tester Charger Kit GRX3000VAS Battery, Charging", page 68

⇒ "3.6.3 Battery Tester Charger Kit GRX3000VAS Troubleshooting", page 70

3.6.1 Battery Tester Charger Kit - GRX3000VAS- General Description

Only Volkswagen approved chargers may be used to charge batteries in Volkswagen vehicles. Only the -GRX3000VAS- charger is used in the USA and Canada.

The -GRX3000VAS- battery charger combines battery charging with checking the charge level and testing the battery.

The following charging and analysis procedures apply to all batteries, all battery installed locations (engine compartment or luggage compartment) and all battery designated usage (for the starter or for the second/convenience battery).

Always follow the Safety Precautions, the instructions for setting up the battery charger, the display menu/display buttons, LEDs and the procedures in the -GRX3000VAS- Operating Instructions.

Carefully read the -GRX3000VAS- Operating Instructions.

Refer to Self Study Program - Vehicle Batteries for more information.

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

Keep open flame or sparks away from the batteries and do not smoke.

The battery charger must be switched off whenever connecting or disconnect the cable.

Do not remove the plugs while charging.

Overcharging sulfated batteries can cause an explosion.

Precision tools may not be kept in areas where batteries are charged. Chemical reactions can lead to corrosion.

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

3.6.2 Battery Tester Charger Kit - GRX3000VAS- Battery, Charging

Note

If software updates or flash campaigns/actions must be performed on a vehicle, a charger with at least 70 A (for example Battery Charger "VAS5903") must be used in order to avoid problems during software updates and flash campaigns/actions. Refer to ⇒ "3.3 Battery Charger VAS5903", page 43

Requirements

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

-GRX3000VAS- output - setup performed (unit number, date/time). Refer to -GRX3000VAS- Operating Instructions.

– General information, checking. Refer to ⇒ "3.6.1 Battery Tester Charger Kit GRX3000VAS General Description", page 67 .

– Open the hood or open the cover if the battery is installed somewhere else.

– Visually inspect the battery. Refer to ⇒ “2.3 Visual Inspection”, page 7 .

– Determine if it is a “standard” battery (wet battery) or an “AGM” battery.

– Close all the vehicle doors.

Note

♦ *The battery temperature must be at least 10 °C (50 °F).*

♦ *Refer to the -GRX3000VAS- Operating Instructions for more information.*

Perform Charging Procedure

– Turn off all electrical consumers.

– Turn off the ignition and remove the key.

– Clamp the red charging clamp “+” of the charger to the positive battery terminal.

Note

In the case of vehicles with a start/stop function and an installed Battery Monitoring Control Module - J367- , the black charging clamp (-) must be connected to the body ground. The start/stop system will malfunction if it is connected to the negative terminal on the battery.

– Connect the black charging clamp “-” of the charger to the negative battery terminal.

– Connect the -GRX3000VAS- battery charger to a grounded socket.

– Switch the “ON/OFF” switch on the -GRX3000VAS- battery charger to “ON”.

– Select the charge mode “automatic” or “manual”.

– Select the test: “inside the vehicle” or “outside of the vehicle”.

– Determine if it is a “standard” battery or an “AGM” battery.

– Select the type of test: “Warranty” or “other”. Note any other additional details (depending on the type of test).

Note

♦ *Refer to the -GRX3000VAS- Operating Instructions for more information.*

♦ *If necessary, go through all the menu points when performing a “Warranty” test. Refer to Warranty Service Circulars.*

The -GRX3000VAS- battery charger checks the battery and starts the charging process. The display then show one of three results with the exact charging time.

Result:	Measure:
Battery good	The battery can be used again.

Result:	Measure:
Charging is required	♦ The test shows a low state of charge. ♦ The charging process begins and the exact duration for the charging will be displayed ♦ The cold start performance and the remaining charging time are displayed and updated regularly.
Replace the battery.	Battery faulty. The charging process is interrupted. Replace the battery.

Note

If other malfunction messages or text displays, other than the ones already mentioned, appear in the display on the -GRX3000VAS- battery charger, then refer to chapter. Refer to ⇒ "3.6.3 Battery Tester Charger Kit GRX3000VAS Troubleshooting", page 70 .

WARNING

If the battery starts to vent gas heavily, stop the charging process. Press the "Stop" button on the front side.

After the charging and testing process is completed, the -GRX3000VAS- battery charger will display "battery good" or "replace the battery" and the total charging time.

Depending on the individual circumstance (Warranty Claim, Repair Order, Evaluation and File), there are three possible messages

- Produce a test code (possible only after automatic charging and testing).
- Print last test result (for Warranty)
- Display the last test result.

Note

Refer to the -GRX3000VAS- Operating Instructions for more information.

3.6.3 Battery Tester Charger Kit - GRX3000VAS- Troubleshooting

Sometimes the display shows the malfunction or the messages based on the condition.

The following is a list of the most frequent displayed messages together with suggested solutions.

Note

Refer to the -GRX3000VAS- Operating Instructions for messages not listed here.

Display Message	Measure
Connection, Checking	– Make sure the battery charger terminals are attached securely to the battery terminals. – Make sure the battery terminal is tightened to the tightening specification and is not corroded.
Terminals connected?	Tester safety function. – Connect the terminals to the battery before charging.
System noises	– Switch off all electrical consumers. – Wait until all electrical equipment, which are monitored by the vehicle electrical system control module, are switched off. – Remove the ignition key. – Disconnect any doubtful or standard production electrical equipment from the vehicle electrical system.

Wait a few minutes and repeat the charging process. Refer to ⇒ “3.6.2 Battery Tester Charger Kit GRX3000VAS Battery, Charging”, page 68 .

3.7 Solar Panel - 10 Panels - VAS6102B-

3.7.1 Solar Panel - 10 Panels - VAS6102B- Maintenance Charging

Special tools and workshop equipment required

- Solar Panel - 10 Panels - VAS6102B-

General Description

The -VAS6102B- supports the vehicle electrical system and prevents the battery from self-discharging.

The -VAS6102B- reaches a maximum voltage of 14.3 V and a maximum charge current of 255 mA.

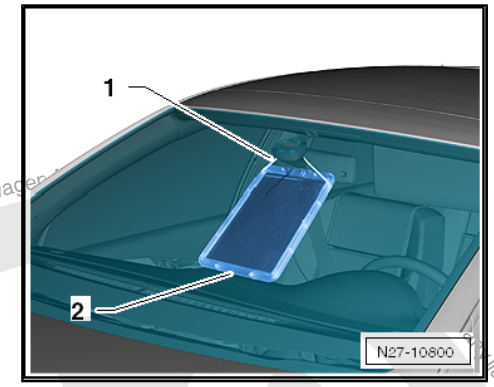
All chargeable lead- or lead gel batteries can be charged with the -VAS6102B- .

The -VAS6102B- is connected to the data link connector in the vehicle.

There is a green LED inside the frame, which displays the function. The brighter the LED, the higher the charging current.

It is not possible to overcharge the battery due to the integrated electronics.

– Secure the -VAS6102B- to the interior rearview mirror -1-.
– Lay the bottom on the instrument panel -2-.



Note

The -VAS6102B- must not touch the instrument panel completely. Only the bottom edge may be used for support. If it touches completely, the color of the instrument panel could change.

– Pull the securing string together so that the -VAS6102B- is close to the glass.
– Connect the -VAS6102B- to the vehicle data link connector. Connecting is the same as with the Vehicle Diagnostic Tester . Refer to
⇒ “1.1 Vehicle Diagnostic Tester , Connecting”, page 94 .
– Check the -VAS6102B- function. The green LED shows the functionality of the -VAS6102B- .

3.8 Severely Discharged Batteries

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

For a battery to be indicated as “severely discharged”, the resting voltage must be less than 11.6 V.

WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. Jump starting must not be used!

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

Caution

- ***Severely discharged batteries freeze earlier.***
- ***Batteries that have been frozen must no longer be used.***

Note

- *Severely discharged batteries in vehicles must be replaced prior to delivery. Pre-existing damage cannot be ruled out.*
- *Batteries which have not been used in driving operation for a long time, for example vehicles in storage, discharge themselves.*
- *For severely discharged batteries, the electrolyte consists almost completely of water, because the acid portion has been greatly reduced.*
- *Severely discharged batteries become sulfated, meaning all the battery plate surfaces become hardened.*
- *The sulfating process may be largely reversed if a severely discharged battery is recharged immediately.*
- *If the battery is not recharged, the plates will continue to harden, and the ability to accept a charge will decrease. This results in reduction of battery performance.*

– Check the battery resting voltage. Refer to ⇒ “3 Battery, Charging”, page 24 .

4 Cruise Control System

⇒ “4.1 Cruise Control System, Activating and Deactivating”, page 74

4.1 Cruise Control System, Activating and Deactivating

General Description

Cruise control system functions are controlled by the engine control module.

– The cruise control system can be activated/deactivated. Refer to ⇒ “4.1 Cruise Control System, Activating and Deactivating”, page 74 .

DTC Recognition and Display

Malfunctions in relation to the cruise control system are sent via the engine control module.

Use the Vehicle Diagnostic Tester in the “Guided Fault Finding” mode for fault finding.

– Connect the Vehicle Diagnostic Tester . Refer to ⇒ “1 Vehicle Diagnosis, Testing and Information Systems”, page 94 .

– On the Vehicle Diagnostic Tester , select “Guided Fault Finding”.

– Using the “GO TO” button, select “Functions/Component selection” and the following menu options in sequence:

♦ Powertrain

♦ Engine code

♦ 01 - On Board Diagnostic (OBD) capable systems

♦ Engine management system or Diesel Direct Injection & Glow Plug System

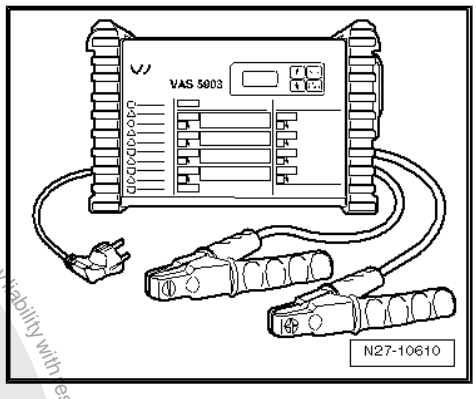
♦ Functions

♦ Cruise Control System, Activating and Deactivating

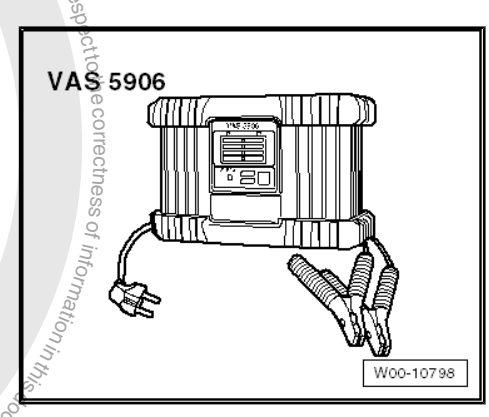
5 Special Tools

Special tools and workshop equipment required

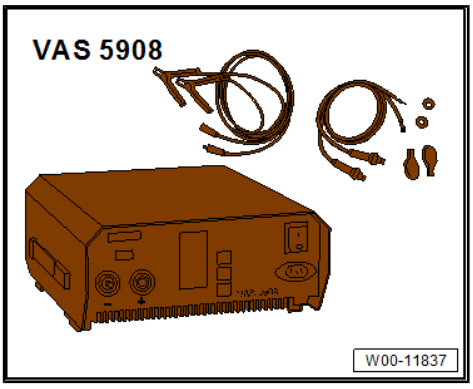
- Battery Charger - VAS5903-



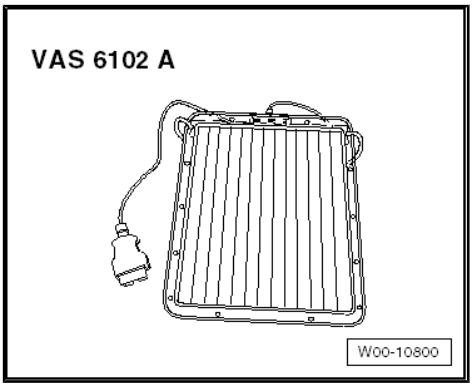
- Battery Charger - VAS5906-



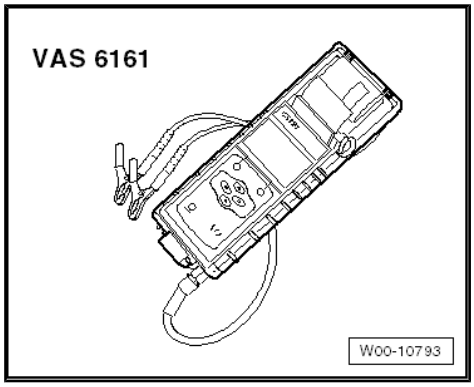
- Battery Charger - VAS5908-



- Solar Panel - 10 Panels - VAS6102B-



- Battery Tester - VAS6161-



92 – Wiper/Washer Systems

1 Washer Fluid Line Hose Connections

⇒ "1.1 Windshield and Rear Window Washer System", page 77

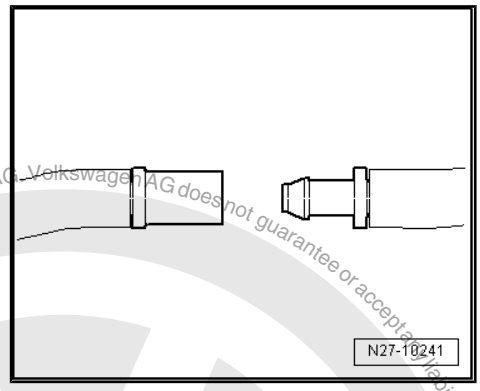
⇒ "1.2 Headlamp Washer System", page 78

1.1 Windshield and Rear Window Washer System

The following hose connection types are used for connecting hoses to pumps and spray nozzles or as separating points:

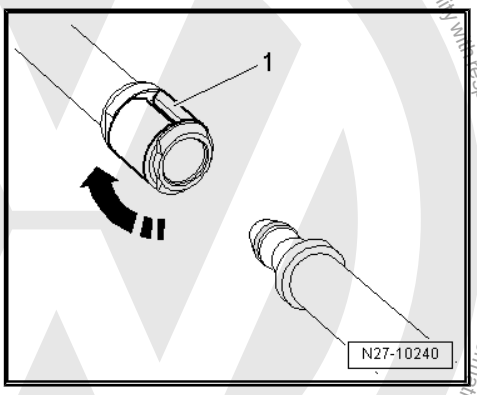
– To loosen the connection, pulling both halves of the coupling apart.

– To secure the connection, push both halves of coupling together until felt and heard to engage.



– To loosen the connection, turn the securing clip -1- 90° in direction of -arrow- and then pull the hose connection off.

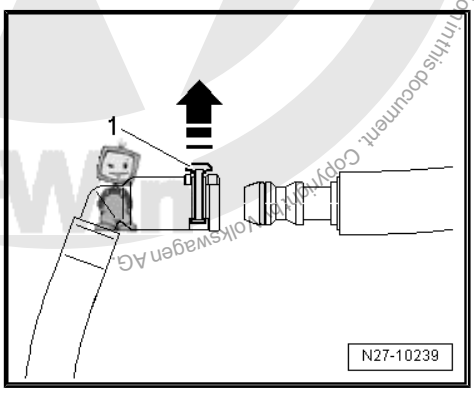
– To secure the connection, attach the hose connection and turn the securing clip -1- -arrow- until it engages.



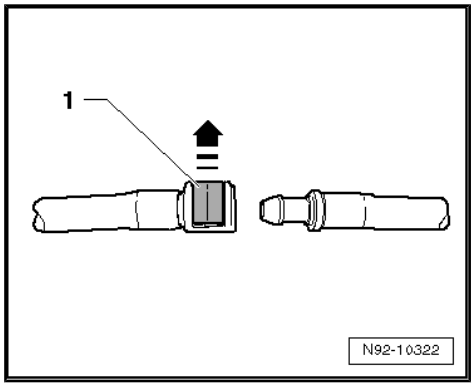
– To loosen the connection, lift the securing clip -1- approximately 1 mm -arrow- and then remove the hose connection.

– To secure the connection, attach the hose connection and press in the securing clip -1- until it engages.

– To secure the connection, attach the hose connection and press in the securing clip -1- until it engages.



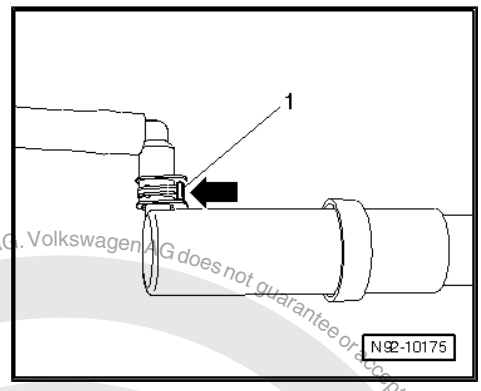
– To loosen the connection, pull the securing clip upward -1- in direction of -arrow- and remove the hose connection.
– To secure the connection, attach the hose connection and press in the securing clip -1- until it engages.



1.2 Headlamp Washer System

The following hose connection types are used for connecting hoses to pumps and spray nozzles or as separating points

– Disconnect by depressing clip -1- -arrow- and then separating coupling from jet.
– Reconnect by keeping clip -arrow- depressed while pushing coupling onto jet until it engages. Check securing clip for secure locking by attempting to pull it off without depressing clip.



2 Hoses, Repairing

2.1 General Information

A new repair concept has been developed for repairing washer system hoses. Various individual hose connectors, adapters, Ethylene Propylene Diene Methylene (EPDM) rubber hoses and shrink tubing will be offered as replacement parts.

- The replacement parts can be found in the Parts Catalog.
- The replacement parts are available both for the repair of a smooth tube as well as for the repair of a corrugated tube.

2.2 Smooth Tube, Repairing

A new repair concept has been developed for repairing washer system hoses. Various individual hose connectors, adapters, Ethylene Propylene Diene Methylene (EPDM) rubber hoses and shrink tubing will be offered as replacement parts.

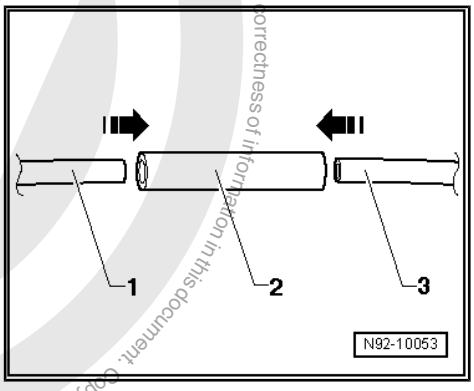
Smooth hoses with a diameter of 5 x 1 mm or 6 x 1 mm can be repaired with a EPDM repair hose section.

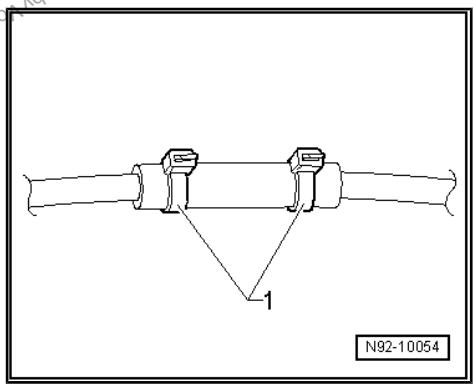
– Trim and remove damaged sections of hose.

– Select the corresponding EPDM hose -2- and cable ties according to the parts catalog.

– Extend the EPDM hose -2- so that the smooth tube ends -1 and 3- can each be inserted approximately 10 mm into EPDM hose -2-.

– Secure with cable ties as illustrated -1-.





2.3 Corrugated Tube, Repairing

Special tools and workshop equipment required

- Hot Air Blower - VAS5179- or
- Hot Air Blower - VAG1416- or
- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-

A new repair concept has been developed for repairing washer system hoses. Various individual hose connectors, adapters, Ethylene Propylene Diene Methylene (EPDM) rubber hoses and shrink tubing will be offered as replacement parts.

Note

- *Area to be repaired must not be under stress of stretching or bending.*
- *If the damaged area is longer than 20 mm, a new section of corrugated hose must be inserted and the procedure described in the following must be performed twice.*

– Trim and remove damaged sections of hose.

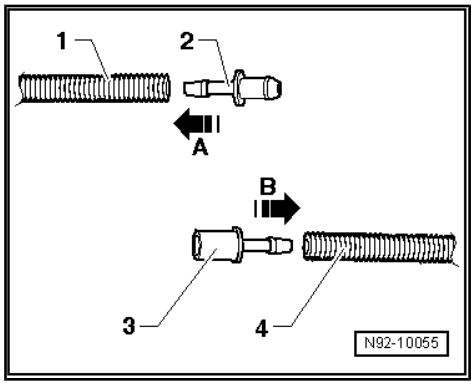
– Select the appropriate connecting pieces -2 and 3- as well as the corresponding heat-shrinkable tube according to the Parts Catalog.

– Carefully warm end of hose -1-.

– Insert the connecting piece -2- into the corrugated tube -2- in direction of -arrow A-.

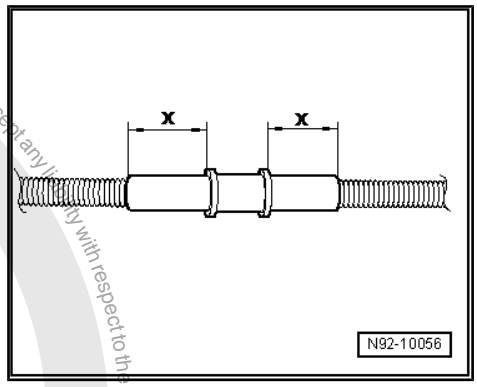
– Carefully warm the end of the corrugated tube -4-.

– Insert the connecting piece -3- into the corrugated tube -4- in direction of -arrow B-.



– Trim the heat-shrinkable tube so that the corrugated tube is covered with a minimum of 20 mm dimension -x- of heat-shrinkable tube on both sides.

– Slide the heat-shrinkable tube over the corrugated tube, attach the connecting pieces together and secure the repaired section with heat-shrinkable tubing.



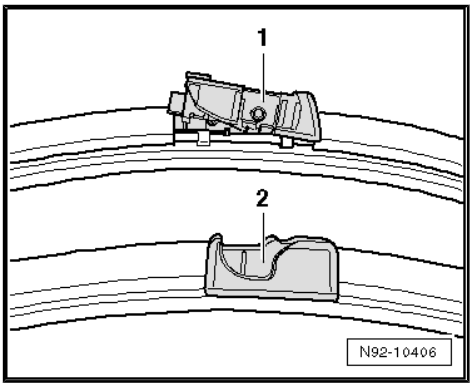
3 Joint-Free Wiper Blade Characteristics

Characteristics for Bosch and Federal Mogul

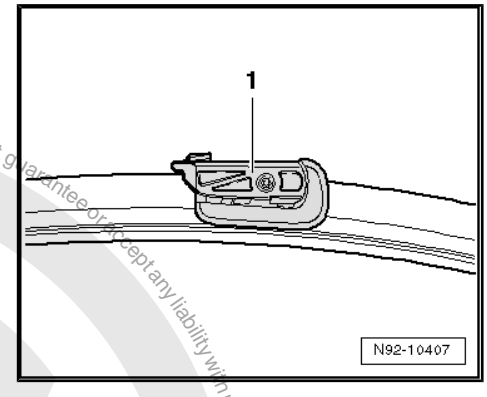
Check the manufacturer when replacing the wiper blades. Always replace them with blades made by the same manufacturer.

The wiper blades can be identified by the wiper arm mount.

Bosch Wiper Blades -1 and 2-



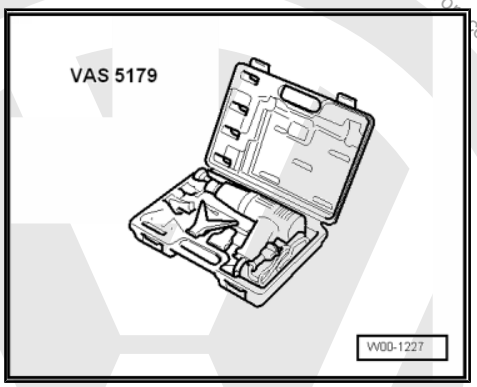
Federal Mogul Wiper Blades -1-



4 Special Tools

Special tools and workshop equipment required

- Hot Air Blower - VAG1416-
- Heat Gun - VAS1978/14-
- Hot Air Blower - VAS5179-



94 – Exterior Lights, Switches

1 HID Headlamp Usage and Safety Precautions

Special tools and workshop equipment required

- ♦ Protective Eyewear
- ♦ Gloves

– Note the following if working with HID headlamps:

- ♦ Information on Dangerous High-Voltage/Currents. Refer to ⇒ page 83
- ♦ Information on pressure, temperature and radiation/arc. Refer to ⇒ page 84
- ♦ Assembly Instructions for HID Headlamp Bulbs. Refer to ⇒ page 85 .
- ♦ Disposal Regulations for HID Headlamp Bulbs. Refer to ⇒ page 85 .

WARNING

Always make sure to disconnect the battery ground cable before performing work on parts of the headlamp with a gas discharge lamp marked with yellow high voltage symbols.

Then switch the low beams on and back off. This removes any possible residual voltage.

The gas discharge lamp control module should not be operated without the gas-discharge lamp.

Due to the high voltage (over 28000 V when igniting the lamp), the gas-discharge lamp should only be operated inside the headlamp housing.

WARNING

- ♦ *Never replace bulbs if you are not familiar with the procedures, safety precautions and tools.*

Notes on Hazardous High Voltage/Currents

WARNING

Light system control modules, connectors or components in the bulb socket area conduct dangerous high voltage

Control module and igniter operation is only permitted with lamp.

WARNING

- *Turn off the ignition and all electric consumers and remove the key.*
- *Make sure all components have zero potential when working on headlamp system, even residual voltage after switching off headlamps must be discharged.*
- *Residual voltages are discharged by switching low beam on and off again after ignition key was removed.*
- *Make sure lamps cannot be switched on when working on headlamp system.*

Notes on Pressure, Temperature and Radiation/Glare

WARNING

- *Lamp must only be operated in headlamp housing (protection against contact because of hot lamp, absorption of ultraviolet radiation, avoiding danger of glare, explosion protection).*
- *Glass cones of bulbs can become very hot – danger of burns!*
- *Avoid looking directly into light beam, since UV radiation of the HID lamp is approximately 2.5 times higher than that of standard Halogen lamps.*
- *Avoid looking into light beam (danger of glare); vision can be impaired for a longer period of time.*

WARNING

- *Avoid contact with burst glass cone.*
- *H7 bulbs and HID bulbs (Xenon/Bi-Xenon) are under pressure and can burst when replaced - danger of injury!*
- *When removing and installing HID bulbs, always wear safety glasses and gloves.*

Assembly Notes on HID Headlamp Bulbs

Caution

- *Before replacing a bulb, the corresponding consumer must always be switched off.*
- *Turn off the ignition and all electric consumers and remove the key.*
- *Do not touch glass cone of bulb with bare fingers, use clean cloth gloves. The remaining fingerprint would evaporate due to the heat of the operated bulb and condense on the reflector which would impair headlamp luminosity.*
- *A bulb must only be replaced with one of the same version. Bulb identification can be found on bulb socket or glass cone.*
- *Harness connectors must engage correctly when installed and must be checked for proper connection.*

Disposal Regulations for HID Headlamp Bulbs

WARNING

- *HID lamps must be disposed of as hazardous waste, never dispose of HID lamps via domestic waste.*
- *HID lamps contain metallic mercury (Hg) and traces of thallium, they must not be destroyed.*
- *These components must be returned for proper recycling in accordance with national legislation.*
- *Dispose of only in the designated containers at the responsible collection point.*

96 – Interior Lights, Switches

1 12 V Socket

⇒ “1.1 12 V Socket , Removing and Installing”, page 86

⇒ “1.2 Socket Illumination Bulb L42 , Removing and Installing”, page 86

1.1 12 V Socket , Removing and Installing

Caution

Using force to remove cigarette lighter sockets without illumination can result in damage to the mounting sleeve retainers.

The Cigarette Lighter Release Tool - T40148- can only be used to remove cigarette lighter sockets with illumination.

The puller is not capable of releasing the retainers on power sockets without illumination.

Sockets without illumination usually cannot be removed without damage.

Cigarette Lighter - U1- , removing and installing. Refer to ⇒ “2 Cigarette Lighter U1 ”, page 87 .

1.2 Socket Illumination Bulb - L42- , Removing and Installing

The Socket Illumination Bulb - L42- is removed in the same manner as the Cigarette Lighter Illumination Bulb - L28- . Refer to ⇒ “2.4 Cigarette Lighter Illumination Bulb L28 , Removing and Installing”, page 91 .

2 Cigarette Lighter - U1-

2.1 General Information

The following descriptions also apply to Left Rear Cigarette Lighter - U3- , Right Rear Cigarette Lighter - U7- , Rear Cigarette Lighter - U9- , 12 V Socket 2 - U18- , 12 V Socket 3 - U19- , 12 V Socket 4 - U20- , Cigarette Lighter 2 - U25- and 12 V Socket 5 - U26- if they are illuminated.

Caution

Using force to remove cigarette lighter sockets without illumination can result in damage to the mounting sleeve retainers.

The Cigarette Lighter Release Tool - T40148- can only be used to remove cigarette lighter sockets with illumination.

The puller is not capable of releasing the retainers on power sockets without illumination.

Sockets without illumination usually cannot be removed without damage.

Caution

Using force to remove cigarette lighter sockets without illumination can result in damage to the mounting sleeve retainers.

The Cigarette Lighter Release Tool - T40148- can only be used to remove cigarette lighter sockets with illumination.

The puller is not capable of releasing the retainers on power sockets without illumination.

Sockets without illumination usually cannot be removed without damage.

On some vehicle equipment levels, socket illumination is via Light Emitting Diode (LED) instead of a bulb. These LEDs are integrated with the illumination housing and cannot be serviced or replaced separately.

Various versions of illumination housing with bulb exist. One version allows separate replacement of the illumination bulb, and another where the bulb cannot be serviced or replaced separately. In this case, the entire illumination housing must be replaced.

There are different versions of the sockets and cigarette lighter sockets due to different installation locations and construction. The differences are primarily In the length and type of electrical connectors. On sockets or cigarette lighter sockets with an electrical cable pig tail, additional work may be necessary to access the connector.

2.2 Overview - Cigarette Lighter - U1-

Caution

Using force to remove cigarette lighter sockets without illumination can result in damage to the mounting sleeve retainers.

The Cigarette Lighter Release Tool - T40148- can only be used to remove cigarette lighter sockets with illumination.

The puller is not capable of releasing the retainers on power sockets without illumination.

Sockets without illumination usually cannot be removed without damage.

1 - Cigarette Lighter Socket with Cable Pig Tail

2 - Cigarette Lighter

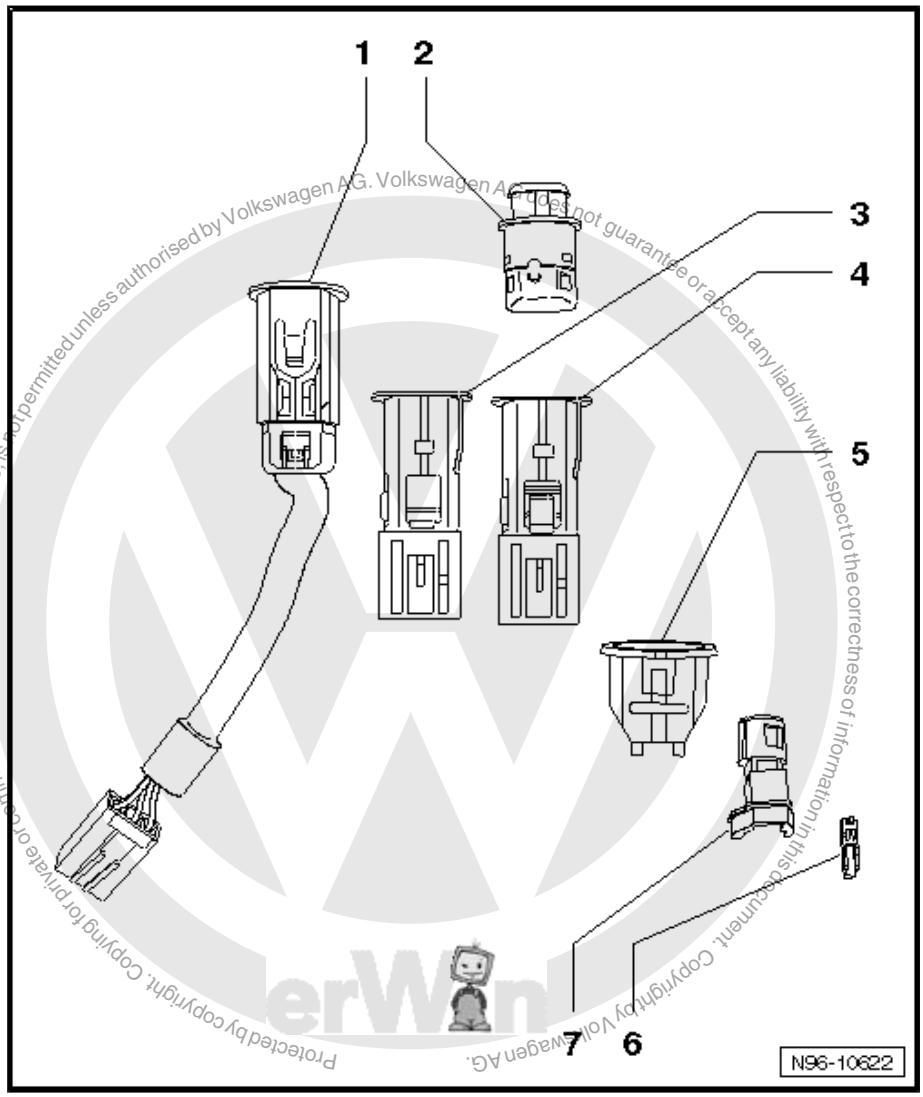
3 - Socket

4 - Cigarette Lighter Receptacle

5 - Mounting Sleeve

6 - Bulb W 5 12V 1.2 Watt

7 - Bulb Holder



2.3 Cigarette Lighter Socket, Removing and Installing

Special tools and workshop equipment required

- Cigarette Lighter Release Tool - T40148-

Note

The removal and installation for all sockets is performed in the same way and is only described for the cigarette lighter socket.

Caution

Using force to remove cigarette lighter sockets without illumination can result in damage to the mounting sleeve retainers.

The Cigarette Lighter Release Tool - T40148- can only be used to remove cigarette lighter sockets with illumination.

The puller is not capable of releasing the retainers on power sockets without illumination.

Sockets without illumination usually cannot be removed without damage.

Removing

– Remove the cigarette lighter, blank plug, etc. from the socket, if necessary.

Note

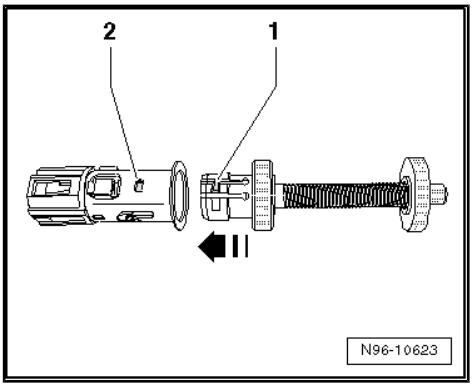
The illustration shows the socket removed.

Caution

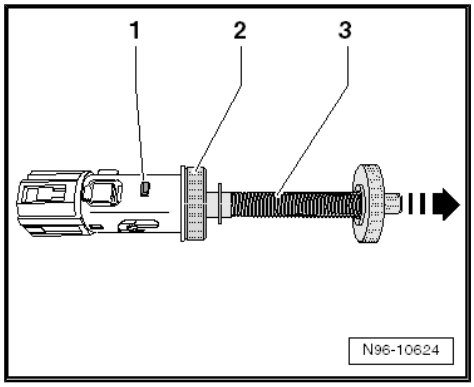
The socket or mounting sleeve can be damaged.

Make sure the puller is seated properly or the mounting sleeve retainers will not release.

– Insert puller in direction of -arrow- in receptacle so retainers -1- engage in recesses -2-.



– Release the mounting sleeve retainers by pulling on grip piece -3- in direction of -arrow-.
– Pull receptacle with puller out of mounting sleeve.

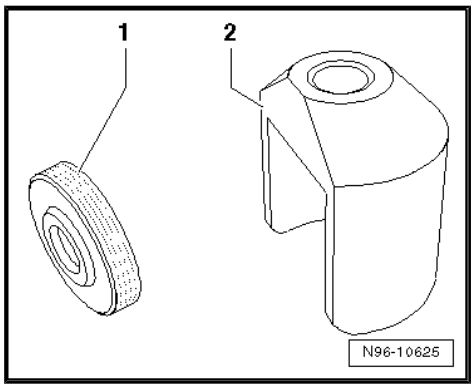


Caution

The wiring for the socket could get damaged.

Pay attention to the lengths of the electrical wires when removing the outlet.

Depending on installation location, it is recommended to use the -T40148/1- -2- with knurled nut -1-.



Caution

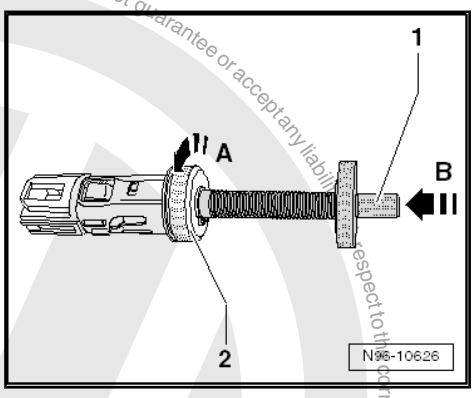
Make sure none of the surrounding components are damaged when using the thrust piece.

– Disconnect electrical connection.

Note

There are different versions of the sockets and cigarette lighter sockets due to different installation locations and construction. The differences are primarily In the length and type of electrical connectors. On sockets or cigarette lighter sockets with an electrical cable pig tail, additional work may be necessary to access the connector.

– Release the puller retaining tabs by pressing the spindle -1- in the direction of -arrow B-. Then release the press -2- by turning it slightly to left in direction of -arrow A-. Remove the puller from the outlet.



Note

Make sure the puller retainers are not spread.

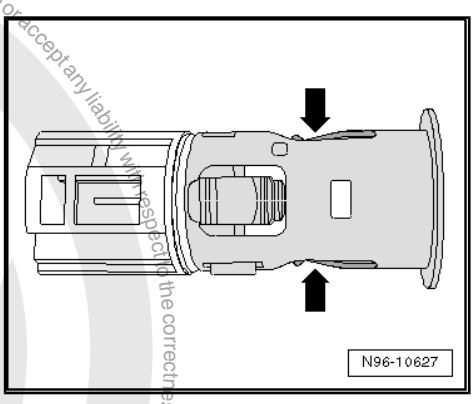
Caution

The cigarette lighter can be ejected from the socket when the heating cycle is complete.

Inserting the puller into the socket spreads the socket retainer springs and reduces their ability to retain the cigarette lighter insert.

After removing the socket, bend the retainer springs together carefully to tighten them and make sure the insert remains in the socket when the heating cycle is complete.

– Carefully bend retainer springs together -arrows-.
– Make sure the cigarette lighter insert is not ejected completely into vehicle interior on completion of glow cycle, and remains in receptacle.



Installing

Install in reverse order of removal.

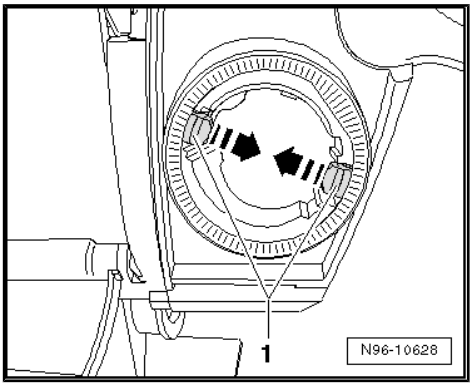
2.4 Cigarette Lighter Illumination Bulb - L28- , Removing and Installing

Note

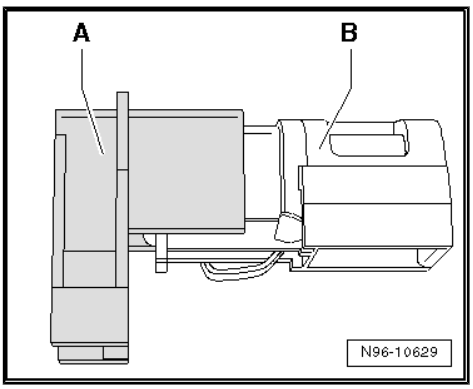
- *On some vehicle equipment levels, socket illumination is via Light Emitting Diode (LED) instead of a bulb. These LEDs are integrated with the illumination housing and cannot be serviced or replaced separately.*
- *Various versions of illumination housing with bulb exist. One version allows separate replacement of the illumination bulb, and another where the bulb cannot be serviced or replaced separately. In this case, the entire illumination housing must be replaced.*

Removing

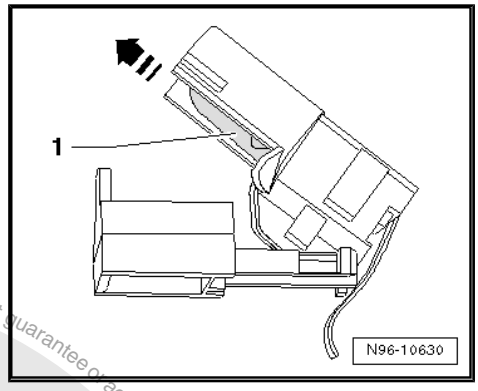
– Remove the socket. Refer to
– Depress retainers in direction of -arrows- and remove mounting sleeve with bulb holder.
– Unclip bulb holder from mounting sleeve.



– Separate bulb holder sections -A and B-.
– Open bulb holder section -B-.



– Remove bulb in direction of -arrow-.



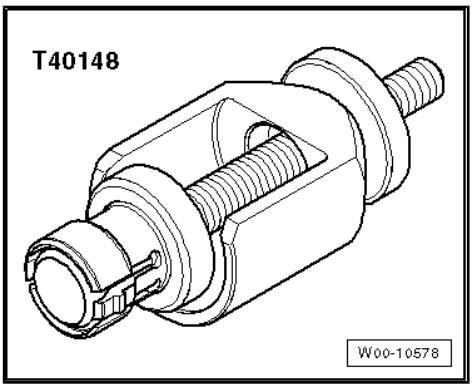
Installing

Install in reverse order of removal.

3 Special Tools

Special tools and workshop equipment required

- Release Tool for Cigarette Lighter - T40148-



97 – Wiring

1 Vehicle Diagnosis, Testing and Information Systems

⇒ “1.1 Vehicle Diagnostic Tester , Connecting”, page 94

⇒ “1.2 Vehicle Diagnostic Tester , Connecting, Golf MY 1998 through 2003”, page 95

1.1 Vehicle Diagnostic Tester , Connecting

Special tools and workshop equipment required

- Vehicle Diagnostic Tester
- Vehicle Diagnosis System - Diagnostic Cable - VAS5051/6A- (5 m)
- Vehicle Diagnosis System - Updated Cable - 3m - VAS5051/5A- (3 m)

WARNING

- *During road tests using a vehicle diagnostic and information system, there is the hazard of extreme to lethal injuries!*
- *If vehicle diagnostic and information system is deposited in the action area of an airbag during a road test, here is the hazard of extreme to lethal injuries in the event the airbag deploys!*
- *During road tests, have a person sitting in the rear seat to operate the vehicle diagnostic and information system.*

Note

- *All of the procedures described such as adaptations and coding can be performed with the Vehicle Diagnostic Tester .*
- *All work instructions can be reached in the operating modes “Guided Fault Finding” and “Guided Functions”.*
- *Additional information:*

Self Study Program 202

Self Study Program 256

Self Study Program 294

– Connect the Vehicle Diagnostic Tester . Refer to ⇒ “1.1 Vehicle Diagnostic Tester , Connecting”, page 94 .

Note

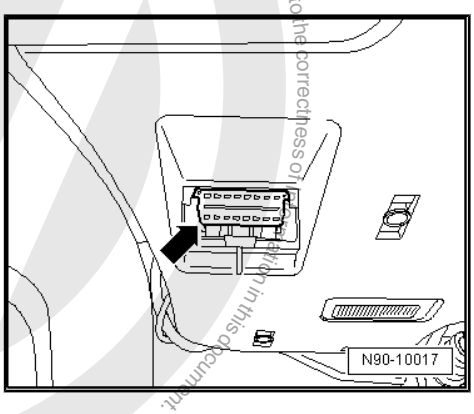
Follow the current operating instructions for the Vehicle Diagnostic Tester , which can be displayed by selecting the “Administration” and “operator's handbook” buttons.

Note

For the diagnosis, only the diagnostic cables listed above are to be used since only these are equipped with CAN wires and permit a CAN diagnostic or CAN communication.

Connect the Vehicle Diagnostic Tester .

- Apply the parking brake.
- In vehicles with automatic transmission, move the selector lever to the “P” or “N” position.
- In vehicles with manual transmissions, move the shift lever to the neutral position.
- With the ignition switched off, connect the Vehicle Diagnostic Tester with the -VAS5051/6A- to the data link connector -arrow- in the vehicle.
- Turn on the ignition.
- Turn off all electrical consumers.

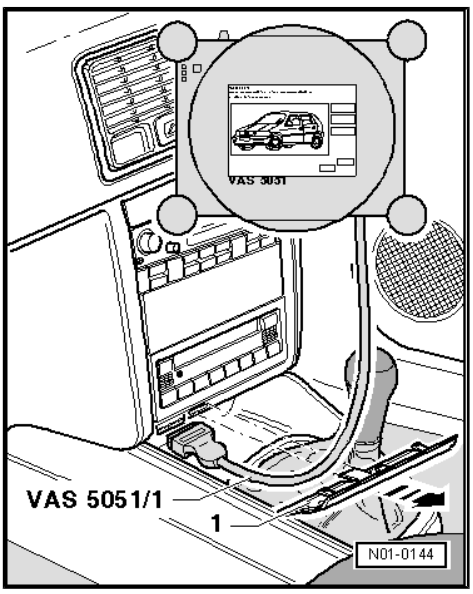


Note

The connection of all other and the following diagnostic operation system or vehicle diagnosis and service system occurs in the previously described sequence.

1.2 Vehicle Diagnostic Tester , Connecting, Golf MY 1998 through 2003

- Apply the parking brake.
- In vehicles with automatic transmission, move the selector lever to the “P” or “N” position.
- In vehicles with manual transmissions, move the shift lever to the neutral position.
- Remove trim -1- in direction of -arrow-.
- With the ignition switched off, connect the Vehicle Diagnostic Tester with the Diagnostic Cable to the data link connector in direction of -arrow- in the vehicle.
- Turn on the ignition.
- Turn off all electrical consumers.



Note

The connection of all other and the following diagnostic operation system or vehicle diagnosis and service system occurs in the previously described sequence.

2 Wiring Harness and Connector Repairs

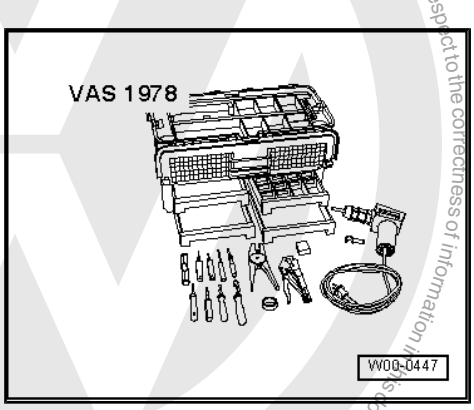
2.1 Vehicle Electrical System, General Repair Information

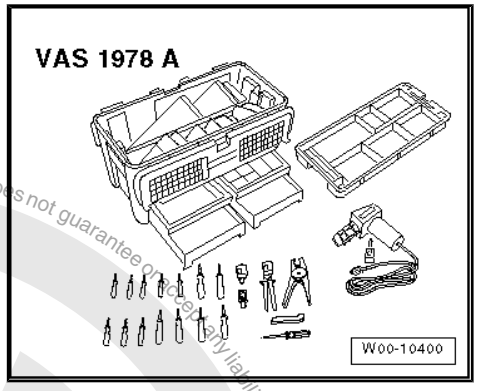
Caution

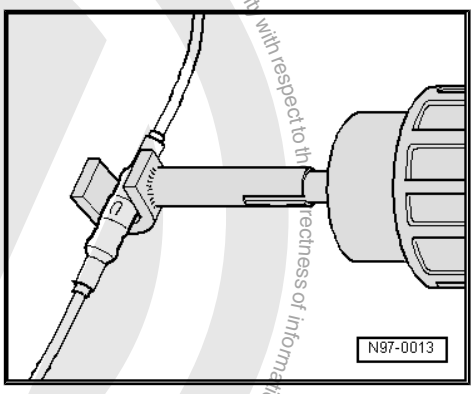
Follow the procedure in the repair manual when disconnecting and connecting the battery.

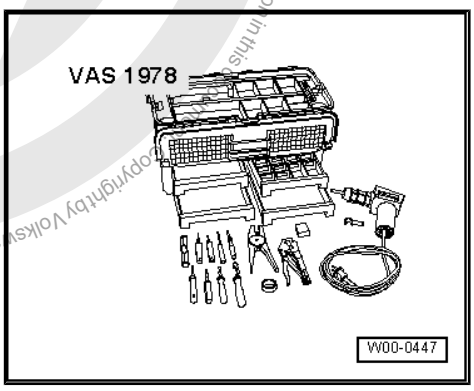
WARNING

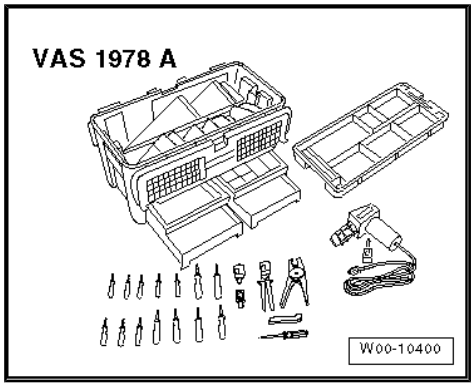
Some tools are supplied with a tool safety clip, which is slid over the tool points after using the tool, in order to protect other workers from injuries and tool points from damage.









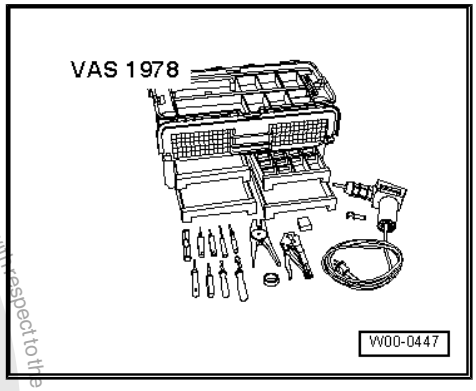


- Observe the current notes in the corresponding repair manual for all repairs.
- Observe country-specific regulations.
- Before working on the electrical system, the battery ground cable must be disconnected. By disconnecting the battery ground cable (current disruption), the electrical system is guaranteed to be safe to work on. Disconnecting the positive battery cable is only required when removing the battery.
- Before commencing repair work, always eliminate cause of damage, for example, sharp body edges, faulty components, corrosion etc.
- Further information, for example, installing and removing the individual components, can be found in the appropriate Repair Manual.
- Soldering is not permissible for repairs to the vehicle electrical system.
- Repair to the wiring harnesses and connectors on the vehicle electrical system may only be performed using the -VAS1978B- and with previous versions. Only use the yellow wires from the -VAS1978B- .
- Wiring harness repairs may not be performed again in the wrapping of the vehicle-specific wiring harness and are to be marked with yellow adhesive tape. This indicated a previous repair.
- Crimp connections must never be repaired. If necessary, lay a wire parallel to the faulty wire. After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.
- Always observe also the supplementary notes for repairing wiring harnesses on airbag- and seat belt tensioner systems, fiber optic cables, CAN-Bus wires, antenna wires and wire cross-sections up to 0.35 mm^2. Refer to ⇒ “2.4.4 0.13 mm2/0.35 mm2/0.5 mm2 Wire, Repairing”, page 108 .
- A function test must be performed after every repair. If necessary, check DTC memory, erase and/or bring systems into basic setting.
- If possible, do not loosen grounding straps from the body (danger of corrosion).
- Not all wire cross-sections in the vehicle are contained in the -VAS1978B- and its previous versions. If the required wire cross-section is not present, the next greater cross-section must be used.
- Shielded harnesses may be repaired. Camera system wires are the exception. If faulty, the entire harness must be replaced.
- Heat-resistant wires have been installed in the vehicle at various locations, mainly in the engine compartment. Heat-resistant wires can be recognized by their somewhat duller and softer insulation. Only heat-resistant wires may be used to repair these wires.

2.2 Wiring Harness Repair Set

2.2.1 Wiring Harness Repair Set - VAS1978-

The -VAS1978- makes optimal repair quality possible in the realm of vehicle electronics. Using the tools, repairs affecting harness connectors and for breaks in wiring can be performed. For this purpose, complete repair wires with terminals already crimped on are used and can be connected to vehicle-specific wiring harness by the use of crimp connections. A pair of crimping pliers with three different crimp slots and a hot air gun for shrinking the crimp connections provide trouble-free electrical connection.



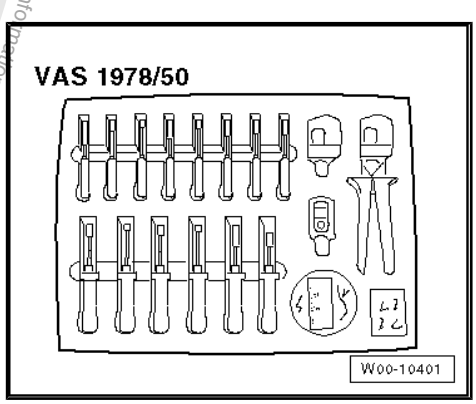
Note

Additional information:

Refer to -VAS1978- Operating Instructions.

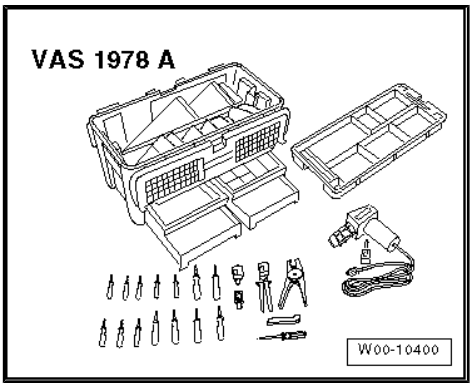
2.2.2 Upgrade Kit For VAS1978 - VAS1978/50-

The -VAS1978/50- is required in order to bring the “old” -VAS1978- up to the new standard of the -VAS1978A- . The upgrade kit contains four assembly- and ten release tools as well as new crimping pliers for crimp connections with Crimping Heads for 0.35 - 2.5 mm ^{2} -VAS1978/1-1- , 4.0 - 6.0 mm^2 -VAS1978/2A- and the -VAS1978/9-1- . Furthermore it contains new stickers, a new set of user instructions, crimp connections for 0.35 mm^2 - wire cross sections and a roll of black felt adhesive tape.



2.2.3 Wiring Harness Repair Set - VAS1978A-

The new -VAS1978A- makes optimal repair quality possible in the realm of vehicle electronics. Using the new pliers, repairs affecting harness connectors and for breaks in wiring can be performed. For this purpose, complete repair wires with terminals already crimped on are used and can be connected to vehicle-specific wiring harness by the use of the four different types of crimp connections. A pair of new crimping pliers with crimping heads and a hot air gun for shrinking the crimp connections provide trouble-free electrical connection.



Note

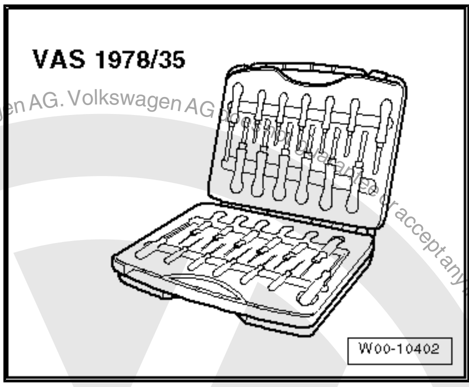
Additional information:

Refer to -VAS1978A- Operating Instructions.

2.2.4 Release Tool Set - VAS1978/35-

The -VAS1978/35- is used to release the various primary and secondary locking mechanisms on VW-group vehicles. The set consists of 26 different tools which can be used to professionally release or assemble for example round connector systems, flat terminals with one or two locks as well as single wire seals.

The allocation of the correct release tools to the respective locking mechanisms can be found in the table in the -VAS1978/35- Operating Instructions.



2.3 Tool Descriptions

⇒ “2.3.1 Crimping Pliers with Insert”, page 100

⇒ “2.3.2 Contact Release Tools”, page 101

⇒ “2.3.3 Single Wire Seal Assembly Tools”, page 101

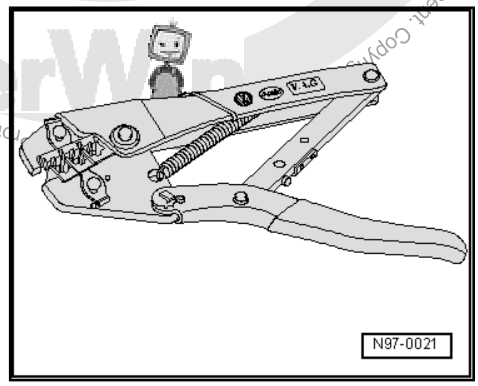
⇒ “2.3.4 Wiring Harness Repair Set - Wire Strippers VAS1978/3 ”, page 101

⇒ “2.3.5 Wiring Harness Repair Set - Hot Air Blower VAS1978/14A ”, page 102

⇒ “2.3.6 Crimping Pliers - .35-2.5mm VAS1978/1A ”, page 103

2.3.1 Crimping Pliers with Insert

The Crimping Pliers without Insert - VAS1978/1- with Crimping Pliers - Insert 2 - VAS1978/2- is a component of the Wiring Harness Repair Set - VAS1978- and is used to crimp the connector during the wiring harness repair.

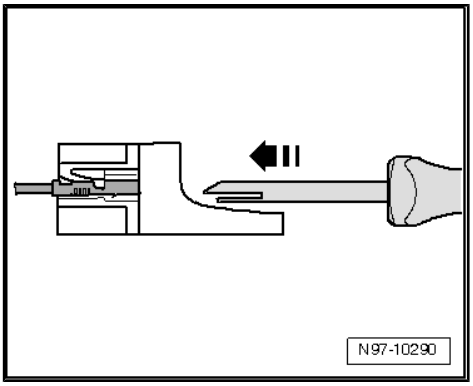


Color of Crimp Connectors	Color of Crimping Slot	Wire Cross-Section
Yellow	Yellow	0.35 mm^2
Red	Red	0.5 mm^2 - 1.0 mm^2
Blue	Blue	1.5 mm^2 - 2.5 mm^2
Yellow	Yellow	4.0 mm^2 - 6.0 mm^2

Note

- *The Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2- can also be used together with the Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS1978/1-1- or Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS1978/2A- to crimp the connectors as an alternative. Refer to* *⇒ “2.3.6 Crimping Pliers - .35-2.5mm VAS1978/1A ”, page 103* .
- *Always be sure to use the correct crimping slot for the crimping connection used.*
- *Do not crimp wire insulation.*

2.3.2 Contact Release Tools



Various release tools are used to remove the different terminals from terminal housings without damage.

A selection of release tools are a component of the Wiring Harness Repair Set - VAS1978- and the Wiring Harness Repair Set - VAS1978A- . The Release Tool Set - VAS1978/35- contains the entire set of release tools. Refer to
⇒ “2.2.4 Release Tool Set VAS1978/35 ”, page 100 .

WARNING

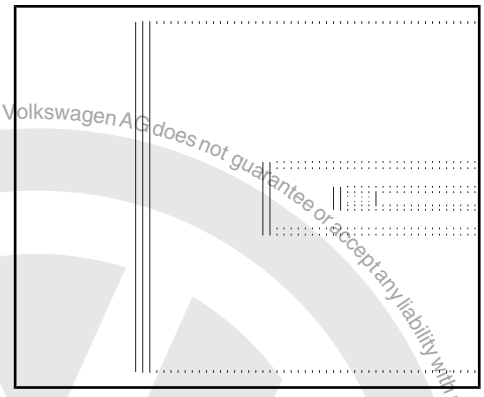
Some tools are supplied with a tool safety clip, which is slid over the tool points after using the tool, in order to protect other workers from injuries and tool points from damage.

Contact housings, releasing and disassembling. Refer to
⇒ “2.8 Contact Housings, Releasing and Disassembling”, page 145 .

2.3.3 Single Wire Seal Assembly Tools

Special tools and workshop equipment required

- Wiring Harness Repair Set - VAS1978B-



Assembly tools serve the purpose of allowing the single wire seals to be slid without damage into terminal housing up to stop, this achieves a complete seal between single wire and terminal housing.

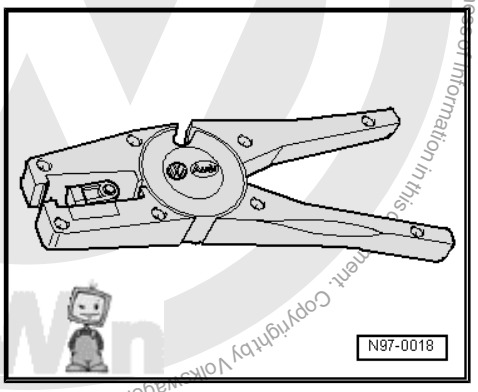
Four assembly tools for single wire seals are components of the -VAS1978B- and its previous versions.

Assembly of single wire seals. Refer to
⇒ “2.7.3 Single Wire Seals, Installing”, page 143 .

2.3.4 Wiring Harness Repair Set - Wire Strippers - VAS1978/3-

Special tools and workshop equipment required

- Wiring Harness Repair Set - Wire Strippers - VAS1978/3-



The -VAS1978/3- is used for professional stripping and cutting of wires.

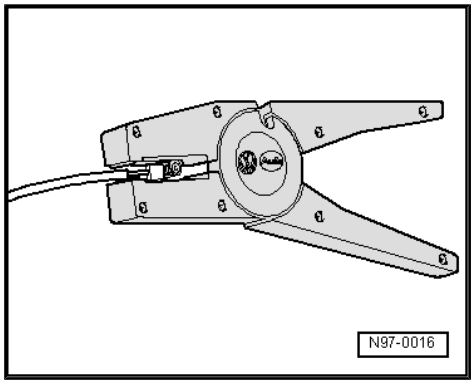
The -VAS1978/3- is a component of the -VAS1978B- and its previous versions.

Wire stripper has an adjustable stop in its pliers-jaws which can be set to the desired length of wire insulation to be removed.

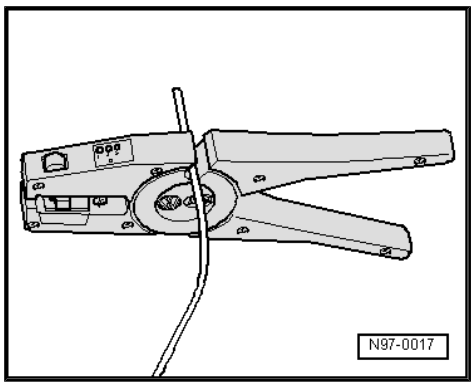
Stripping

– Set the slideable stop in pliers-jaws to the desired length dimension to be stripped.

– Insert wire end from front up to stop into jaws of pliers and squeeze the pliers completely.
– Open pliers again and remove the stripped wire end.



– If necessary, cut wires using side-cutter function on the top of the wire stripper.



2.3.5 Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-

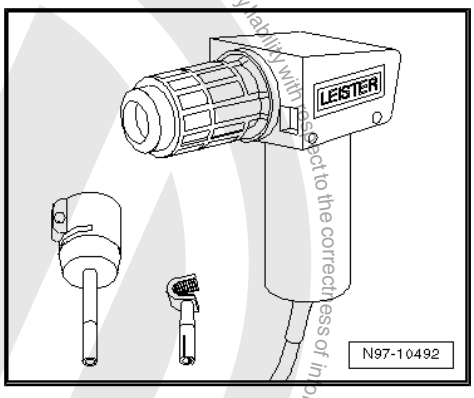
Special tools and workshop equipment required

- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-
- Wiring Harness Repair - Blower - Shrink Element - VAS1978/15A-
- Wiring Harness Repair Set - VAS1978B-
- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-

Caution

When heat-shrinking crimp connections, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air gun.

Always observe operating instructions of heat gun.

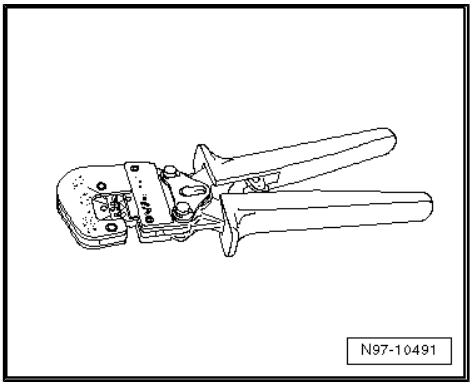


The -VAS1978/14A- is used together with the -VAS1978/15A- to heat-shrink the crimp connectors. After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

The -VAS1978/14A- is a component of the -VAS1978B- and its previous versions.

Crimp connectors, heat-shrinking using the -VAS1978/14A- . Refer to ⇒ “2.4.8 Wire Break with Dual Repair Point”, page 122 .

2.3.6 Crimping Pliers - .35-2.5mm - VAS1978/1A-



The Crimping Pliers - .35-2.5mm - VAS1978/1A- or the Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2- together with the Wiring Harness Repair - Crimping Head - . 35-2.5mm - VAS1978/1-1- , or the Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS1978/2A- from the wiring harness repair set is used to compress the crimp connectors.

Crimp connectors, pressing using the Crimping Pliers - . 35-2.5mm - VAS1978/1A- . Refer to
⇒ “2.4.8 Wire Break with Dual Repair Point”, page 122 .

The following crimping heads are available for the Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2-

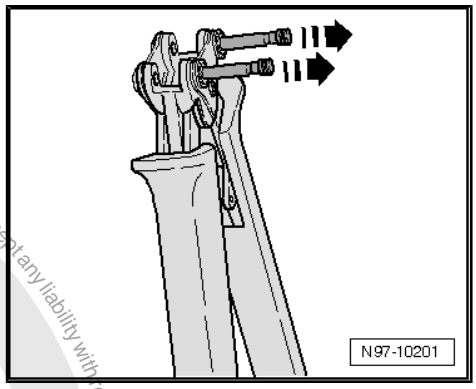
- Crimping Head 0.35 mm ^{2} - 2.5 mm ^{2} Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS1978/1-1-
- Crimping Head 4.0 mm ^{2} - 6.0 mm ^{2} Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS1978/2A-
- Wiring Harness Repair Set - Crimping Head - JPT - VAS1978/9-1-

In conjunction with Wiring Harness Repair Set - Crimping Head - JPT - VAS1978/9-1- , the crimping pliers are used to crimp contacts onto individual wires when repairing wiring cross-sections up to 0.35 mm^2. Refer to
⇒ “2.4.4 0.13 mm2/0.35 mm2/0.5 mm2 Wire, Repairing”, page 108 .

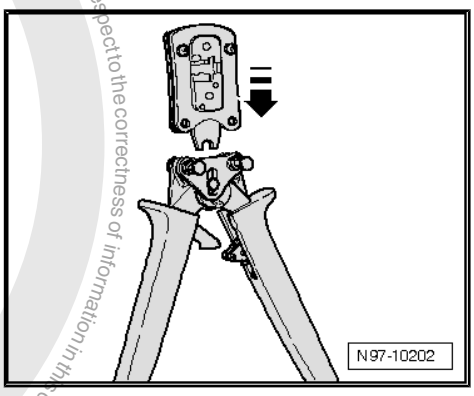
Changing the Crimping Head

– Open crimp pliers completely.

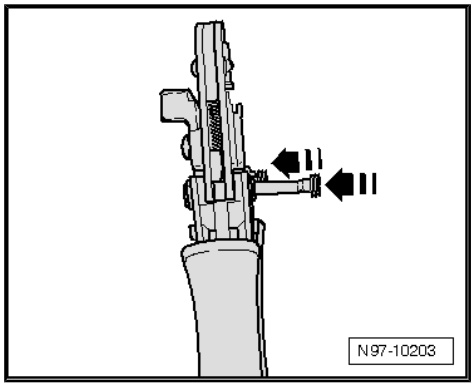
– Disengage both locking pins in direction of -arrows- from crimp pliers basic tool.



– Insert the required crimping head from above in direction of -arrow- in crimp pliers basic tool.



– Lock the crimping head by pressing in the pins in direction of -arrows- into crimp pliers basic tool.



2.4 Wiring Harnesses, Repairing

⇒ “2.4.1 Airbag and Belt Tensioner Wire Repair Information”, page 104

⇒ “2.4.2 CAN Bus Wires, Repairing”, page 107

⇒ “2.4.3 Antenna Wires, Replacing”, page 107

⇒ “2.4.4 0.13 mm2/0.35 mm2/0.5 mm2 Wire, Repairing”, page 108

⇒ “2.4.5 10 mm2- or 16 mm2 Wires with Separate Butt Connectors, Repairing”, page 112

⇒ “2.4.6 2.,5 mm2, 4 mm2 or 6 mm2 Aluminum Wires with Separate Butt Connectors, Repairing”, page 116

⇒ “2.4.7 Wire Break with Single Repair Point”, page 121

⇒ “2.4.8 Wire Break with Dual Repair Point”, page 122

2.4.1 Airbag and Belt Tensioner Wire Repair Information

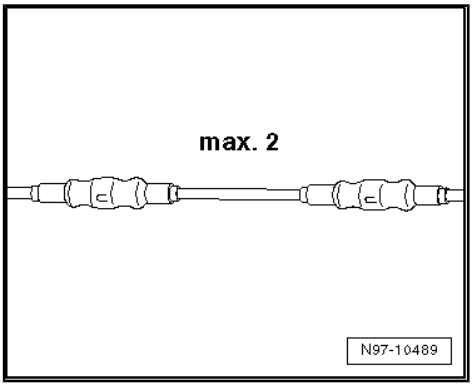
Note

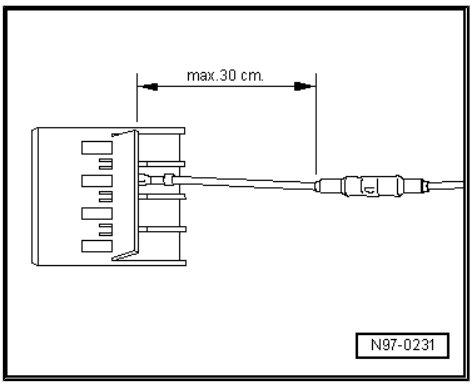
Observe general notes for repairs on the vehicle electrical system. Refer to
⇒ “2.1 Vehicle Electrical System, General Repair Information”, page 96 .

In addition to the general repairs on wiring harnesses, the following methods and instructions must be observed for repairs on airbag- and seat belt tensioner wires

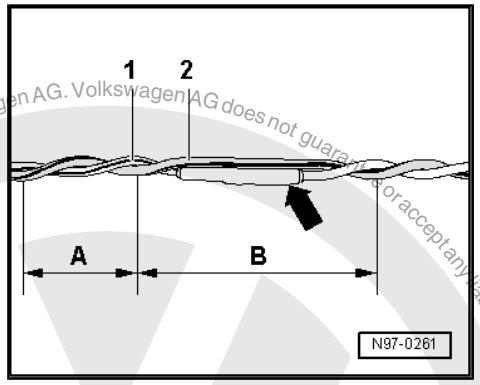
WARNING

- *The airbag and seat belt tensioner system can fail.*
- *Faulty repairs performed on airbag and seat belt tensioner system can lead to malfunction in passenger protection.*
- *When performing repairs on airbag and seat belt tensioner wiring harness, use only terminals, connectors and wires designated for it. Refer to the Parts Catalog.*



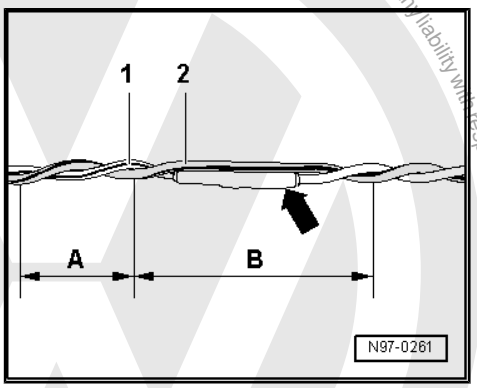


Note



- *Air bag wires and the safety belt tensioner wiring harness may repaired only with the -VAS1978B- and previous versions.*
- *Observe general notes for repairs on the vehicle electrical system. Refer to ⇒ "2.1 Vehicle Electrical System, General Repair Information", page 96 .*
- *Pay attention to decals designating high voltage components. When performing repairs, the residual voltage must be discharged. Refer to ⇒ Body Interior; Rep. Gr. 69 ; Passenger Protection .*
- *A maximum of two repairs may be performed when repairing wires of airbag- and seat belt tensioner system. Repairs increase the electrical resistance in the wire and may trigger malfunctions in the system On Board Diagnostic (OBD).*
- *When repairing wiring harness of airbag- and seat belt tensioner system, the crimp connectors must always be heat-shrunk to prevent corrosion.*
- *Do not wrap the repair point again into the vehicle-specific wiring harness and mark the repair point quite visibly with yellow insulating tape.*
- *Repairs in the area of the airbag or seat belt tensioner should be performed a maximum of 30 cm from the next contact housing. Together with the identification via yellow insulating tape, this procedure makes it possible to obtain a quick overview of previously performed repairs.*
- *Wires to the deploying units (airbags) have a wire-twisting with a length of lay of 20 mm ± 5 mm in series production. This length of lay is guaranteed via the norm part numbers for wire pairs in series production and must be observed strictly for the repair lengths of twisted wires.*
- *During repair work, wires to deploying units (airbags) must have the same length. When twisting together wires -1 and 2-, length of lay of -A- = 20 mm ±5 must be strictly observed.*
- *While doing this, no section of the wire, for example, in area of crimp connectors -arrow-, may be greater than B = 100 mm without twisting of the wires.*

2.4.2 CAN Bus Wires, Repairing



- Unshielded two-strand wiring -1 and 2- with a cross section of 0.35 mm ^{2} or 0.5 mm ^{2} can be used as CAN bus wiring.
- The color coding of CAN bus wires can be found in the following table:

CAN High wire, powertrain	orange/black
CAN High wire, Convenience	orange/green
CAN High wire, Infotainment	orange/violet
CAN-Low lead (all)	orange/brown

- Repairs on CAN-Bus wires can be performed with repair wire with matching cross section and also with twisted wires “green/yellow” or “white/yellow” from Parts Catalog.
- When repairing Bus leads, both wires must be of the same length. When twisting together wires -1 and 2-, the lay length of -A- = 20 mm must be observed.
- While doing this, no section of the wire, for example, in area of crimp connectors -arrow-, may be greater than -B- = 50 mm without twisting of the wires.
- Wrap repair points with yellow adhesive tape to mark a performed repair.

2.4.3 Antenna Wires, Replacing

A new repair concept has been developed for repairing antenna wires. Refer to ⇒ “2.6 Antenna Wires, Repairing”, page 129 .

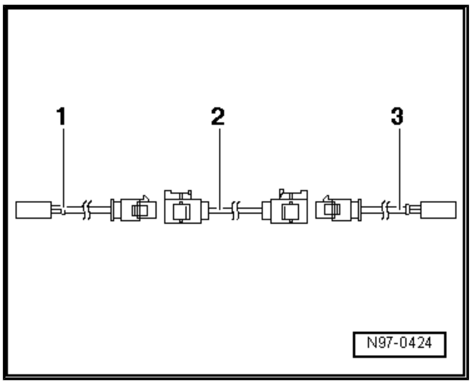
Instead of a complete antenna wire, connecting wires of different lengths and various adapter leads are now available as replacement parts.

General Description

- Replacement parts can be found in Parts Catalog.
- These original replacement parts are suitable for all antenna wires and wire cross sections to be replaced.
- Connector housing for antenna wires can be obtained as a replacement part only in one color, but can be used for all antenna connector colors.
- The replacement of individual antenna connectors during repair work is not intended.
- The wires are appropriate for use on all VW models with equipped antenna wiring cross-sections.
- All adapter leads and connecting wires are suitable for various transmission and reception signals.
- This repair concept can also be used for testing or as an aftermarket solution.

Assembly Overview of Antenna Wire

Example: antenna wire from the radio to the antenna is faulty. The following wires are required for repair



1 - Adapter lead for connection to radio. Length approximately 30 cm.

2 - Connecting wire, available in various lengths.

3 - Adapter lead, for connection to antenna. Length approximately 30 cm.

Installation of a New Antenna Wire

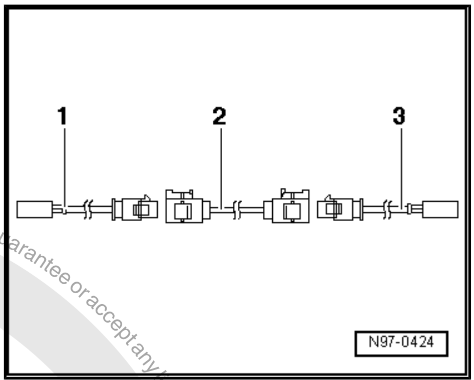
Note

Depending on vehicle equipment, make sure that the total length of antenna wire can be divided into partial lengths by control modules for antenna selection, control modules for traffic monitoring or antenna amplifier. Only the defective sections need to be replaced.

– Separate the connectors of the faulty antenna wiring from their components.

– Determine the path of the faulty antenna wire in the vehicle and measure the total length of antenna wire to be replaced.

The entire length of the antenna wire consists of the length of the required adapter leads -1 and 3- as well as the connecting wire -2-.



– Subtract 60 cm from the total length calculation for an antenna wire to provide for the required length of connecting wire -2- to be installed.

– Obtain the required adapter cables -1 and 3- as well as the calculated length of connecting wire -2- as genuine replacement part according to the Parts Catalog.

– Cut the connectors off of the faulty antenna wiring.

Leave the rest of the defective antenna wire in the vehicle.

– Connect adapter leads -1 and 3- to modules in vehicle.

– Route and secure connecting wire -2- in the immediate vicinity of the series-installed wire routing.

Note

Antenna wires must not be kinked or excessively bent! The bending radius must not be less than 50 mm.

– Connect the connecting wire with the adapter leads.

– Perform a function test.

2.4.4 0.13 mm²/0.35 mm²/0.5 mm² Wire, Repairing

Special tools and workshop equipment required

♦ Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- from the Wiring Harness Repair Set - VAS1978B-

♦ Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2- from Wiring Harness Repair Set - VAS1978B-

- Wiring Harness Repair - Interchangeable Head - VAS1978/1-3-

Note

For the repair there are repair wires with a 0.35 mm² and 0.5 mm² cross section.

Procedure

– Install the - VAS1978/1-3- -1- as follows on the -VAS1978/1-2- :

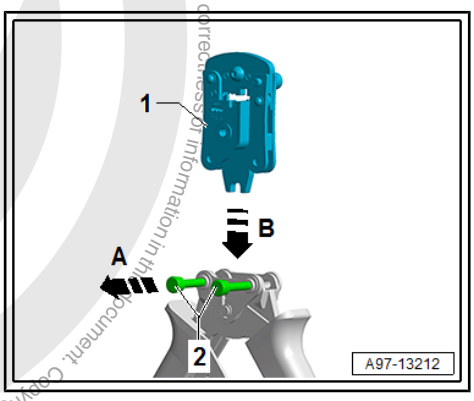
– Open the -VAS1978/1-2- .

– Remove the locking pin -2- all the way in the direction of -arrow A-.

– Insert the -VAS1978/1-3- -1- in the direction of -arrow B- centered in the -VAS1978/1-2- .

– Push back in the locking pin -2- all the way.

– Free up the wire to be repaired approximately 20 cm on both sides of the repair point.



Caution

Risk of damaging the wires.

- ***Expose wrapped wiring harnesses carefully***

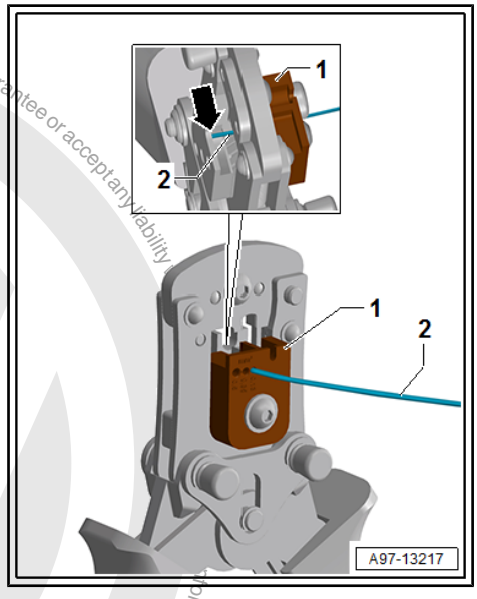
– If necessary remove the iring harness wrapping.

– Cut out the damaged wire section using a cutting wire.

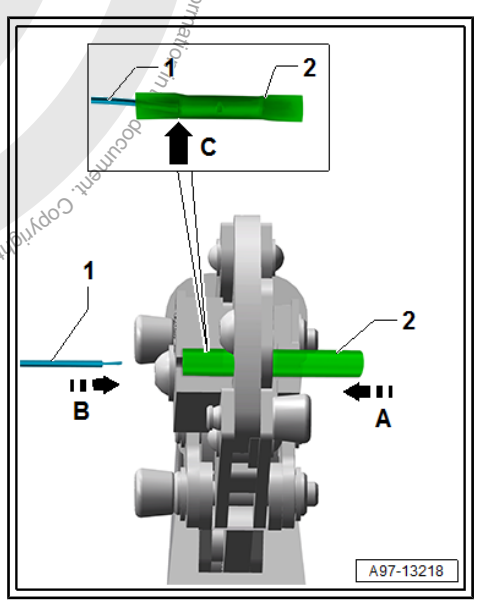
Note

- *When both ends of the vehicle-specific single wire are too short after cutting out the damaged wire section for a repair with a separate crimp connector, insert a corresponding long piece of yellow repair wire with two crimp connectors.*
- *When repairing the single wire with crimped on/connected contact place the yellow repair wire near the damaged vehicle-specific single wire and cut to the required length.*

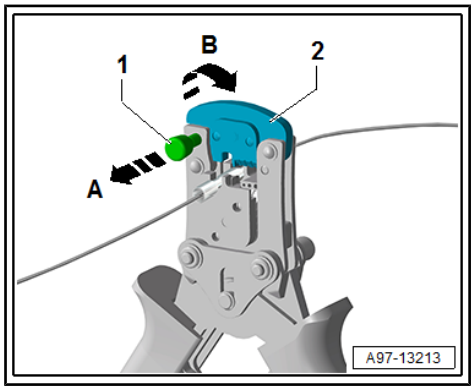
– Insert the wire end -2- all the way -arrow- in the cross section fitting mount on the -VAS1978/1-3- -1-.
– Completely push together the crimping pliers and hold them together.
– Remove the wire end -2- from the -VAS1978/1-3- -1- to strip.
– Open the crimping pliers again.
• The insulation must be cut cleanly and removed from the wires.
• No insulation can remain on bare wires.
• The single wires must not be damaged.
– Use the small transparent crimp connector from the -VAS1978B- .
– For 0.31 mm^2 wires additionally push a heat-shrinkable tube on the wires. Refer to the Parts Catalog.



– Push the crimp connector -2- all the way in the direction of -arrow A- in the clamp opening on the -VAS1978/1-3- .
– Push the striped wire -1- in the direction of -arrow B- in the crimp connector -2-.
• All single wires must be pushed in the crimp connector -2-
• Do not crimp wire insulation -arrow C-.
– Push the crimping pliers completely together and then open.
– Remove the wire with the crimp connector.
– Repeat the wire crimping with the crimp connector on the other side as described.



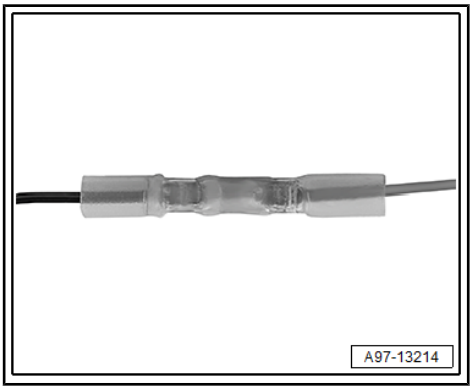
– Remove the locking pin -1- all the way in the direction of -arrow A-.
– Pivot the upper section on the -VAS1978/1-3- -2- in the direction of -arrow B-.
– Remove the crimped crimp connector.



Correct crimping results

– After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

• On 0.31 mm^2 wires and additional heat-shrinkable tube must be heat-shrunk to ensure a complete seal.

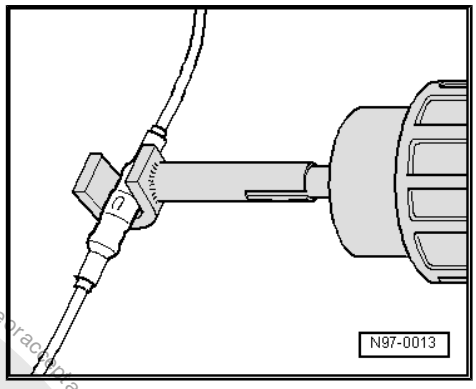


– Insert the -VAS1978/15A- on the -VAS1978/14A- .

Caution

Risk of damaging the wires.

- ***When heat-shrinking the heat-shrinkable tube, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air blower.***
- ***Always observe operating instructions of heat gun.***

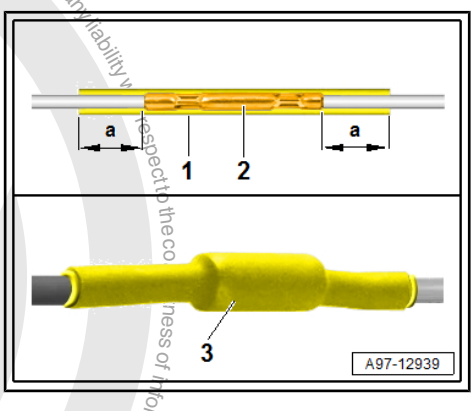


– For 0.13 mm^2 wires position the heat-shrinkable tube -1- by feeling the contours centered over the crimp connector -2-.

• The dimension -a- must be approximately the same on both sides.

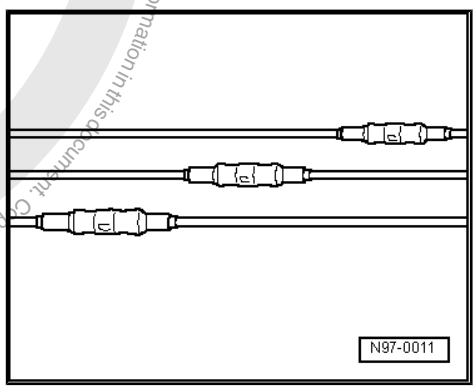
– Heat the heat-shrinkable tube/crimp connector using the hot air blower lengthwise from center outward until it is sealed completely and adhesive comes out the ends.

• The completed repair location -3- must look like so.



Note

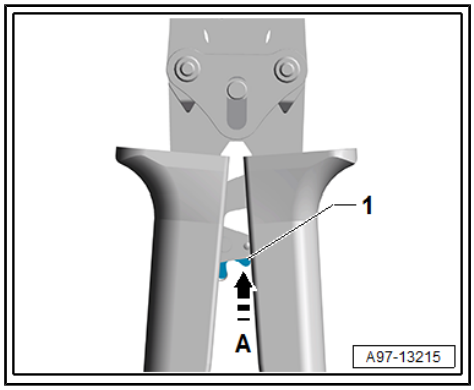
- *Make sure that crimp connections do not lie directly next to each other when several wires need to be repaired. Arrange the crimp connectors at a slight offset so that the circumference of the wiring harness does not become too large.*
- *If the repair point was previous taped, this point must be taped again with yellow insulating tape after repairs.*
- *Secure the repaired wiring harness if necessary with a cable tie to prevent flapping noises while driving.*



Early Release

– Push the operating lever -1- upward in the direction of -arrow A-.

– At the same time push the crimping pliers together and then open.



Caution

- *Do not use the crimp connector after it is early released.*

2.4.5 10 mm²- or 16 mm² Wires with Separate Butt Connectors, Repairing

Special tools and workshop equipment required

- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- from the Wiring Harness Repair Set - VAS1978B-
- Wiring Harness Repair - Blower - Shrink Element - VAS1978/15A- from the Wiring Harness Repair Set - VAS1978B-
- Wiring Harness Repair Set VAS631003 - VAS631003-

Note

- *For the repair there are repair wires with a 10mm² or 16mm² cross section.*
- *There are also separate repair wires with a crimped on/connected contact available for the repair.*

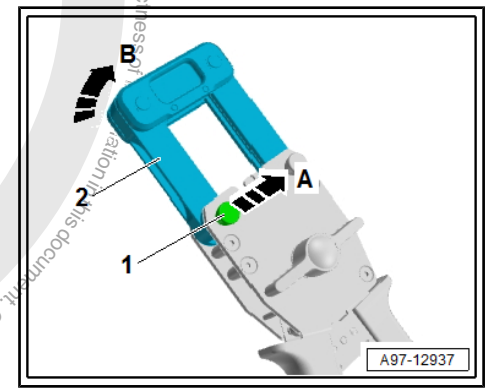
Procedure

– For the wire cross-section install the suitable crimp insert and crimp stamp as follows on the crimping pliers:

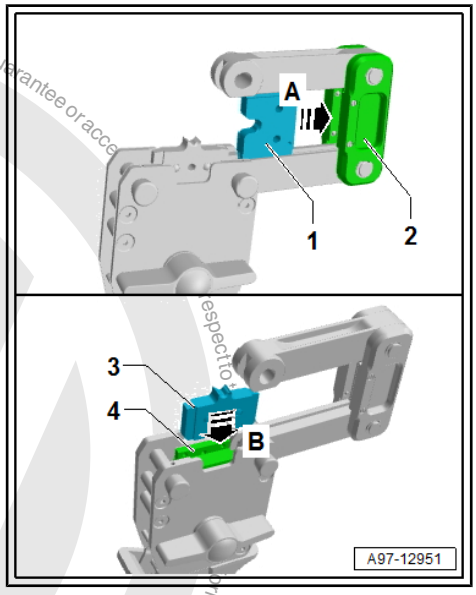
– Open the crimping pliers from the Wiring Harness Repair Set - VAS631003- .

– Remove the locking pin -1- all the way in the direction of -arrow A-.

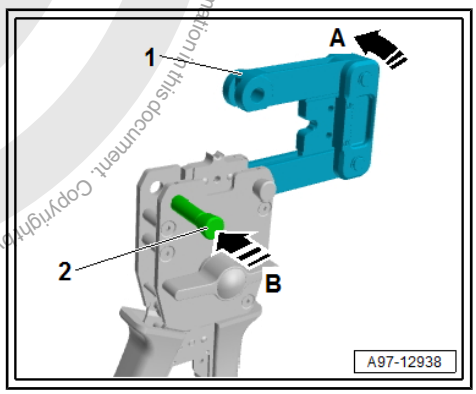
– Open the adapter -2- in the direction of -arrow B-.



– Push in the crimp stamp -1- until it clicks into place in the mount -2- on the adapter -arrow A-.
– Push in the crimp insert -3- until it engages audibly in the mount -4- of the crimping pliers in direction of -arrow B-.



– Close the adapter -1- in the direction of -arrow A-.
– Push the locking pin -2- in the direction of -arrow- all the way.
– Free up the wire to be repaired approximately 20 cm on both sides of the repair point.



Caution

Risk of damaging the electrical wires.

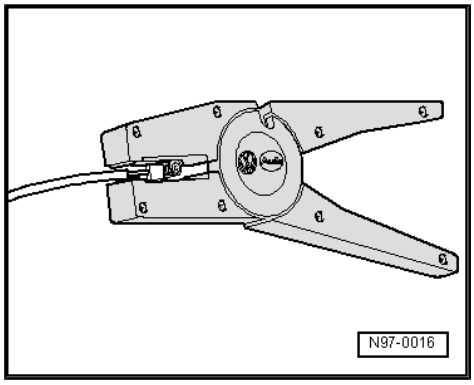
- ***Expose wrapped wiring harnesses carefully.***

– If necessary, removing the wiring harness wrapping using a knife.
– Cut the damaged section of the wire with wire cutters from the -VAS631003- .

Note

- *When both ends of the vehicle-specific single wire are too short after cutting out the damaged wire section for a repair with a separate butt connector, insert a corresponding long piece of yellow repair wire with two butt connectors.*
- *When repairing the single wire with crimped on/connected contact place the yellow repair wire near the damaged vehicle-specific single wire and cut to the required length.*

– Adjust the sliding stop in the wire stripper pliers jaws from the -VAS631003- to the length for the wire to be stripped.



♦ 10 mm^2 wires: 14 mm

♦ 16 mm^2 wires: 16.5 mm

– Insert wire end from front up to stop into jaws of pliers and squeeze the pliers completely.

– Open pliers again and remove the stripped wire end.

• The insulation must be cut cleanly and remove from the wires.

• No insulation can remain on bare wires.

• The single wires must not be damaged.

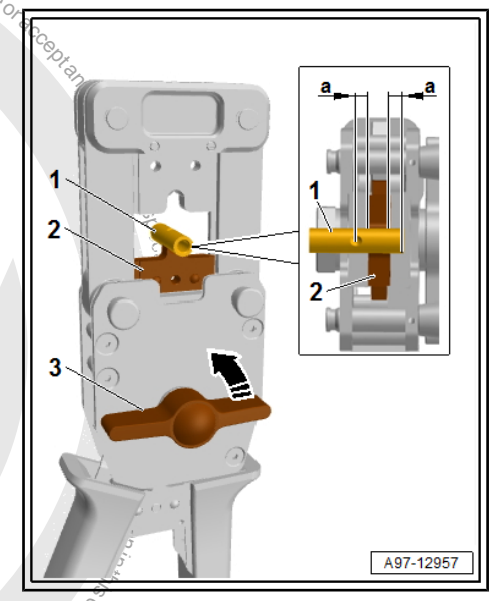
– For the repair remove the corresponding butt connection and a heat-shrinkable tube from the -VAS631003- .

– Push the heat-shrinkable tube on one of the wires.

– Position the butt connection -1- with the first crimping position centered on the crimp insert -2-.

• The dimension -a- must be the same on both sides

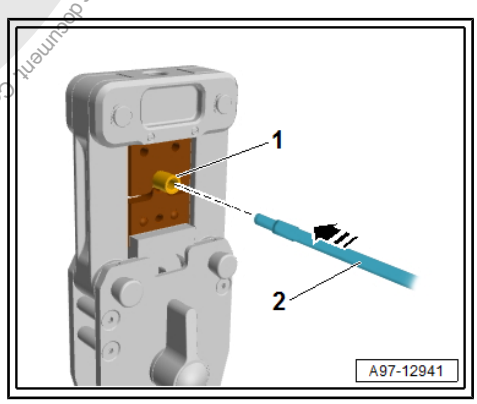
– Turn the quick feed lever -3- counter-clockwise -arrow- until the butt connection -1- is secured.



– Insert the wire -2- with the bare wire end all the way in the butt connection -1- -arrow-.

• All single wires must be pushed into the butt connection.

– Completely close and open the crimping pliers several times, until the crimp insert goes downward by itself in its original position.

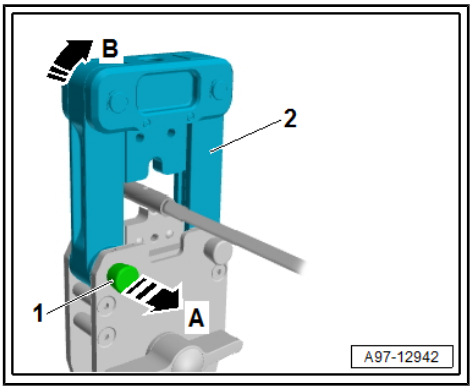


Note

The wire insulation must not be crimped at the same time.

– Repeat the wire crimping on the other side as described.

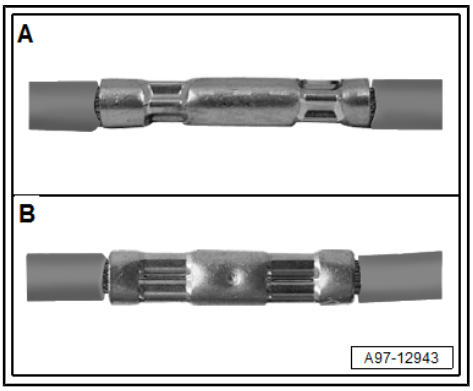
– Remove the securing pin in the direction of -arrow A- until it stops.
– Open the adapter in the direction of -arrow B-.
– Remove the crimped butt connectors.



Correct crimping results

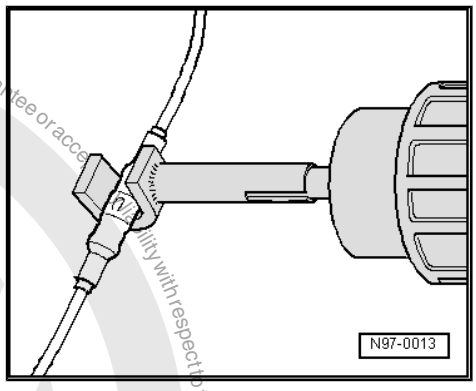
A - 10 mm^2, Star crimp

B - 16 mm^2, B-Crimp



After crimping the heat-shrinkable tube must positioned over the butt connection and heat-shrunk with a hot air gun, to prevent moisture from entering.

– Insert the -VAS1978/15A- on the -VAS1978/14A- .



Caution

Risk of damaging surrounding components.

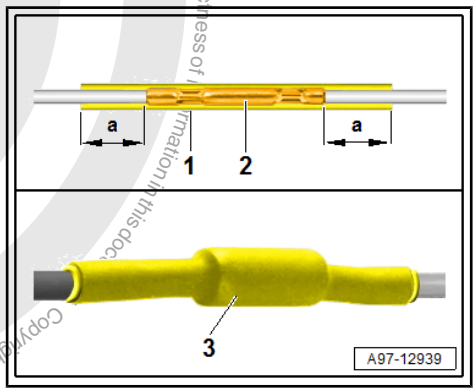
- ***When heat-shrinking the heat-shrinkable tube, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air blower.***
- ***Always observe operating instructions of heat gun.***

– Position the heat-shrinkable tube -1- by feeling the contours centered over the butt connection -2-.

• The dimension -a- must be approximately the same on both sides

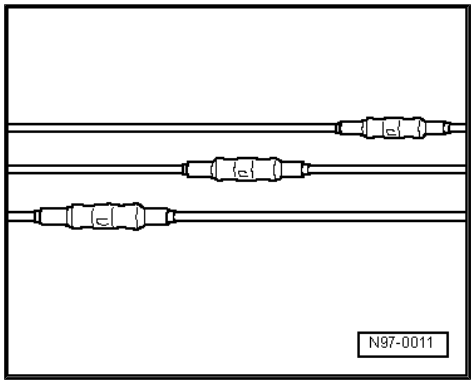
– Heat the heat-shrinkable tube using the hot air blower length-wise from center outward until it is sealed completely and adhesive comes out the ends.

• The completed repair location -3- must look like so.



Note

- *Make sure that the butt connections do not lie directly next to each other when several wires need to be repaired. Arrange the butt connection at a slight offset so that the circumference of the wiring harness does not become too large.*
- *If the repair point was previous taped, this point must be taped again with yellow insulating tape after repairs.*
- *Secure the repaired wiring harness if necessary with a cable tie to prevent flapping noises while driving.*



Early Release

– Push the lever -1- downward in direction of -arrow A-.

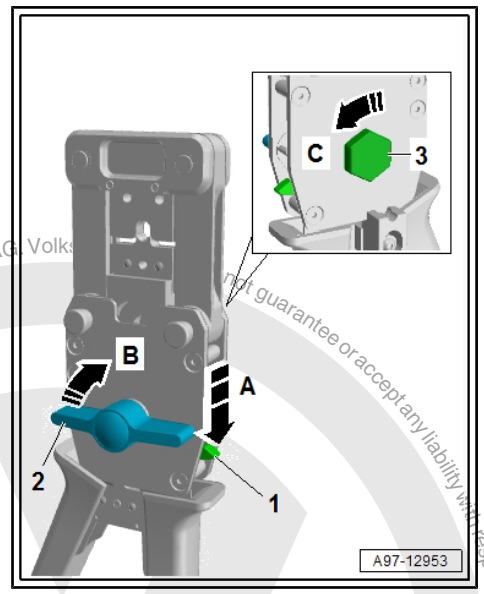
– Turn the quick feel lever -2- clockwise in direction of -arrow B- until the crimp insert is in its original position.

If releasing by hand is not possible then:

– Push the lever -1- downward in direction of -arrow A-.

– Place the socket from the -VAS631003- on the bolt -3- on the rear side.

– Turn the socket counter-clockwise in direction of -arrow C- until the crimp insert is in its original position.



Caution

Do not use the butt connectors after they are early released.

2.4.6 2.,5 mm², 4 mm² or 6 mm² Aluminum Wires with Separate Butt Connectors, Repairing

Special tools and workshop equipment required

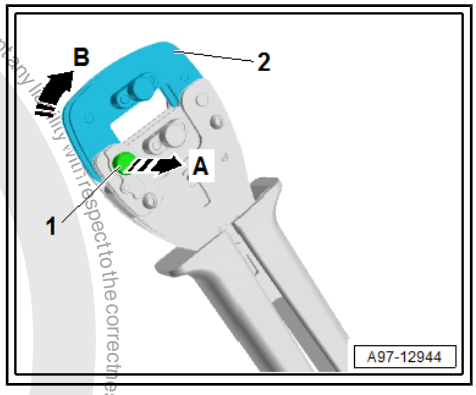
- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- from the Wiring Harness Repair Set - VAS1978B-
- Wiring Harness Repair - Blower - Shrink Element - VAS1978/15A- from the Wiring Harness Repair Set - VAS1978B-
- Wiring Harness Repair Set - VAS631001-

Note

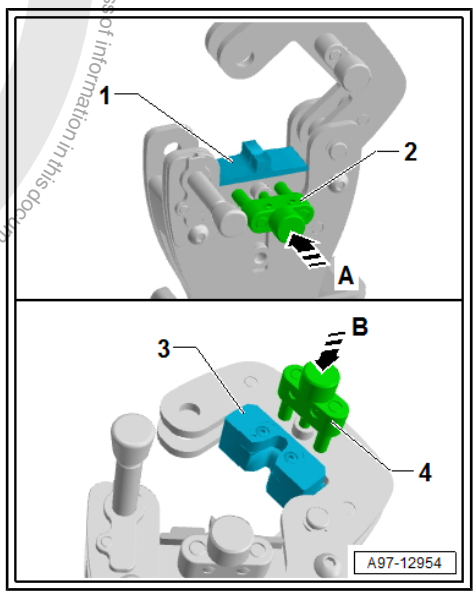
- *For the repair there are copper repair wires with a 2.5mm² or 4 mm² or 6 mm² cross section.*
- *There are also separate copper repair wires with a crimped on contacts available for the repair.*

Procedure

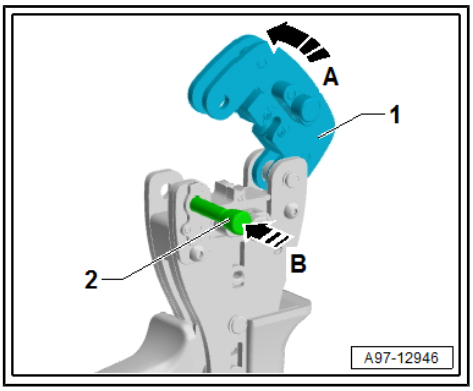
– Install the corresponding crimp insert, crimp stamp and contact positioner for the wire cross-section with the contact cross bar as follows on the crimping tool.
– Open the crimping tool from the -VAS631001- .
– Remove the locking pin -1- all the way in the direction of -arrow A-.
– Open the mount -2- in the direction of -arrow B-.



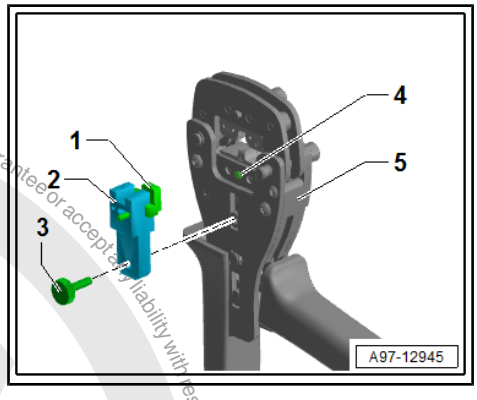
– Insert the crimp insert -1- in the crimping tool so that the crimp insert -1- is flush with the front of the clamps.
– Tighten the crimp insert with the pins -2- in direction of -arrow A- and the knurled screw hand tight.
– Insert the crimp stamp -3- that fits the crimp insert in the mount.
– Secure the crimp stamp with the pin -4- in direction of -arrow B- and the knurled screw hand-tight.



– Close the adapter -1- in the direction of -arrow A-.
– Push the locking pin -2- in the direction of -arrow- all the way.



– Insert the contact cross bar -1- in the contact positioner -2-.
– Position the contact positioner with the contact cross bar on the crimping tool -5- at the same time push the holes in the contact positioner -2- over the knurled screw -4-.
– Install the knurled bolt -3- and tighten hand-tight.
– Free up the wire to be repaired approximately 20 cm on both sides of the repair point.



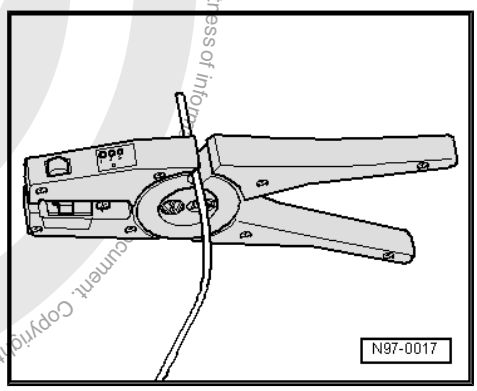
Caution

Risk of damaging the electrical wires.

- ***Expose wrapped wiring harnesses carefully.***

– If necessary, removing the wiring harness wrapping using a knife.

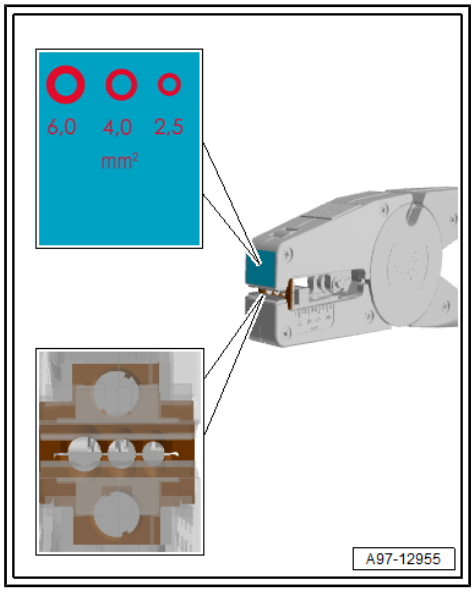
– Cut the damaged section of the wire with wire stripper from the -VAS631001- .



Note

When both ends of the vehicle-specific single wire are too short after cutting out the damaged wire section for a repair with a separate butt connector, insert a corresponding long piece of yellow copper repair wire with two butt connectors.

– Insert the wire end from the front all the way in to the wire cross-section corresponding mount in the jaws of the pliers.
– Push the pliers completely together.
– Open pliers again and remove the stripped wire end.
• The insulation must be cut cleanly and remove from the wires.
• No insulation can remain on bare wires.
• The single wires must not be damaged.
– For the repair remove the corresponding butt connection with a heat-shrinkable tube from the -VAS631001- .
– Push the heat-shrinkable tube on one of the wires.

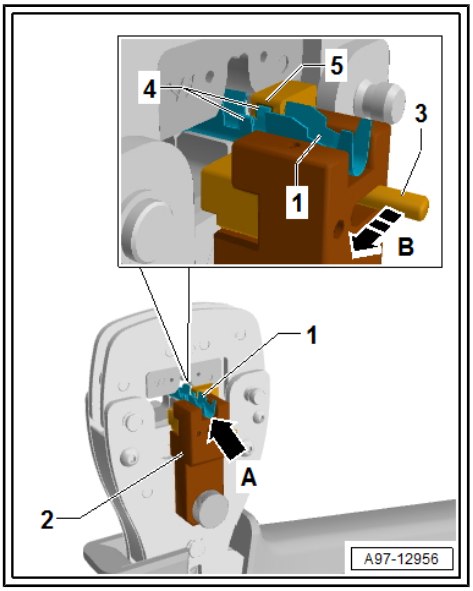


– Place the butt connection -1- in the contact positioner -2-.

• The butt connection -1- must be flush with the contact positioner -2- -arrow A-.

– Push the contact cross bar -3- all the way in the direction of -arrow B- and secure it with the butt clamp -1-.

• The tab -4- on the butt connection -1- must engage in the groove -5- on the contact cross bar -3-.

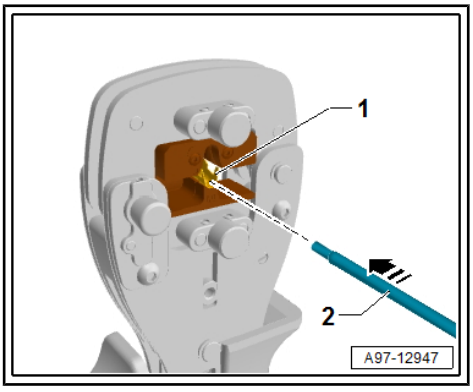


– Insert the wire -2- with the bare wire end all the way in the butt connection -1- in direction of -arrow-.

• All single wires must be pushed into the butt connection.

• The insolation end can at a maximum be flush with the front edge of the insolation crimps.

– Close the crimping tool completely until it reopens by itself.

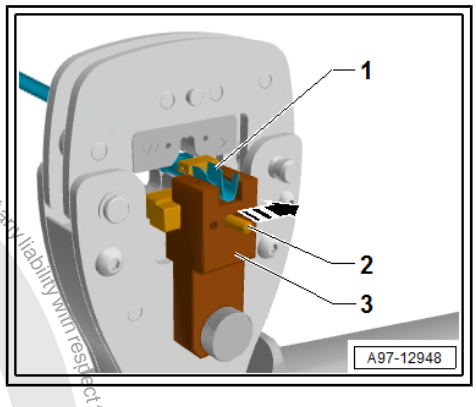


– Push the contact cross bar -2- all the way in the direction of -arrow-.

– Remove the butt connection -1- from the contact positioner -3-.

– Turn the crimping tool for the second crimping.

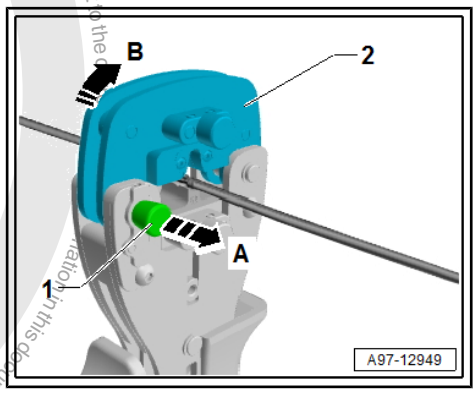
– Repeat the wire crimping on the other side as described.



– Remove the securing pin -1- in the direction of -arrow A- until it stops.

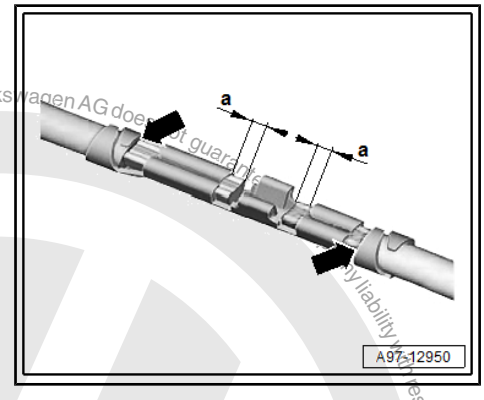
– Open the mount -2- in the direction of -arrow B-.

– Remove the crimped butt connectors.



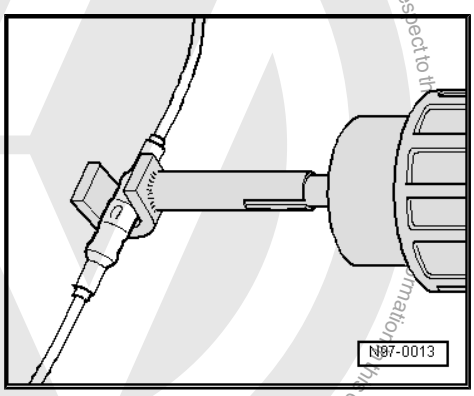
Correct crimping results

- The wire ends must project 0.1 mm to 1.0 mm on the front edge of the wire crimps, dimension -a-
- The insolation end must not be crimped in the wire crimps.
- The insolation end can at a maximum be flush with the front edge of the insolation crimps -arrows-.



After crimping the heat-shrinkable tube must positioned over the butt connection and heat-shrunk with a hot air gun, to prevent moisture from entering.

– Insert the -VAS1978/15A- on the -VAS1978/14A- .



Caution

Risk of damaging surrounding components.

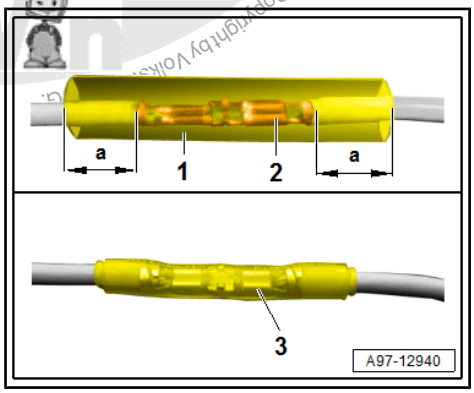
- ***When heat-shrinking the heat-shrinkable tube, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air blower.***
- ***Always observe operating instructions of heat gun.***

– Position the heat-shrinkable tube -1- centered over the butt connection -2-.

- The dimension -a- must be approximately the same on both sides

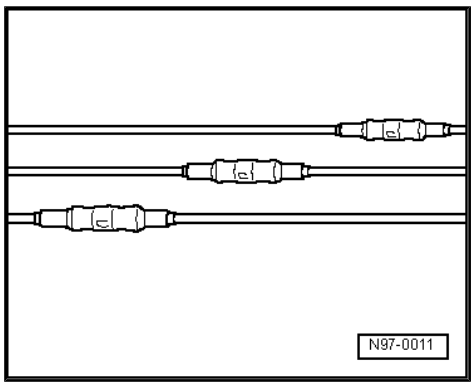
– Heat the heat-shrinkable tube using the hot air blower length-wise from center outward until it is sealed completely and adhesive comes out the ends.

- The completed repair location -3- must look like so.



Note

- *Make sure that the butt connections do not lie directly next to each other when several wires need to be repaired. Arrange the butt connection at a slight offset so that the circumference of the wiring harness does not become too large.*
- *If the repair point was previous taped, this point must be taped again with yellow insulating tape after repairs.*
- *Secure the repaired wiring harness if necessary with a cable tie to prevent flapping noises while driving.*

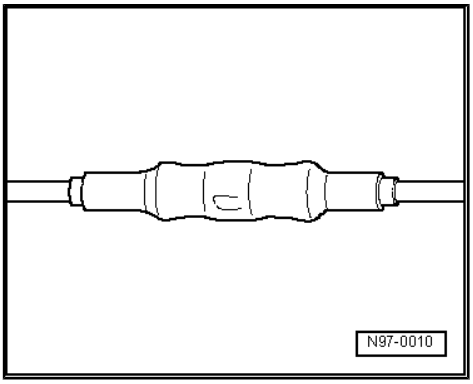


2.4.7 Wire Break with Single Repair Point

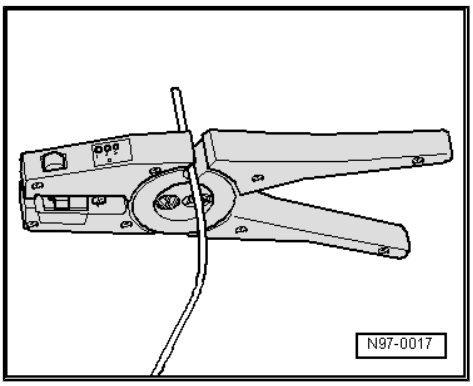
Repair point with single crimp connection

– Free up wire intended for repair (approximately 20 cm to both sides of repair point).

– If required, remove wiring harness wrapping using a folding knife.



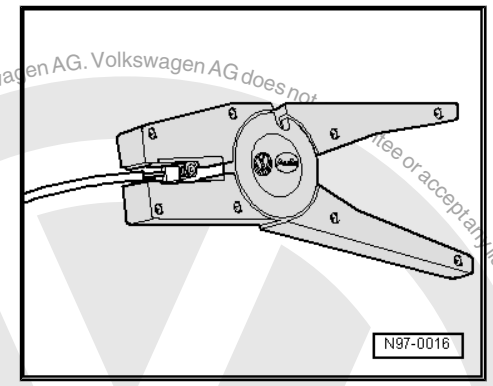
– Cut out the damaged section of wire using the -VAS1978/3- .



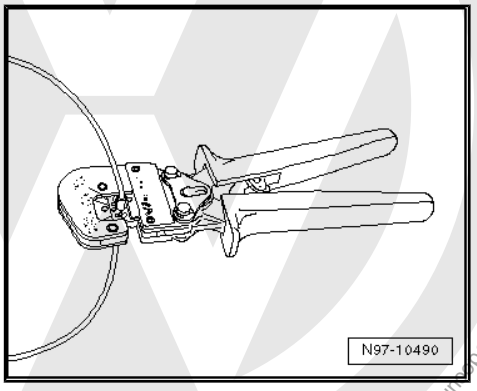
Note

If, by cutting out the damaged wire section, both ends of the vehicle-specific single wire are too short for a repair using a single crimp connection, insert a repair wire section of matching length with two crimp connections. Refer to
⇒ "2.4.8 Wire Break with Dual Repair Point", page 122 .

– Strip the wire ends using the 6 - 7 mm wire stripper.



– Slide crimp connection onto both stripped wire ends of vehicle-specific single wire and crimp them using crimp pliers.



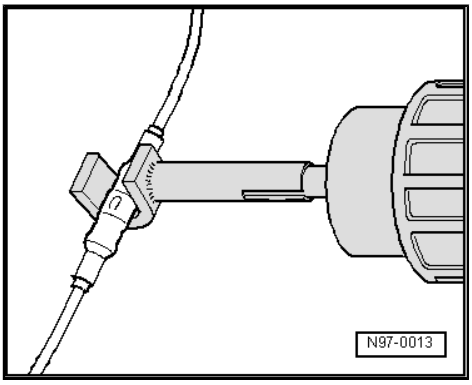
Note

- *Always be sure to use the correct crimping slot for the crimping connection used. Refer to*
⇒ "2.3.1 Crimping Pliers with Insert", page 100 .
- *Do not crimp wire insulation.*

After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

– Place the -VAS1978/15A- on the -VAS1978/14A- .

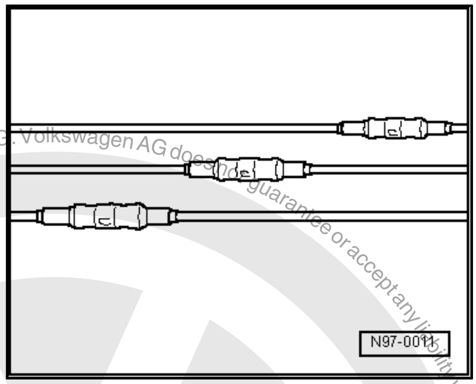
– Heat crimp connection using hot air gun lengthwise from center outward until it is sealed completely and adhesive comes out the ends.



> **Caution**
>
> *When heat-shrinking crimp connections, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air gun.*
>
> *Always observe operating instructions of heat gun.*

Note

- *Make sure that crimp connections do not lie directly next to each other when several wires need to be repaired. Arrange the crimp connectors at a slight offset so that the circumference of the wiring harness does not become too large.*
- *In the event the repair point was previous taped, this point must be taped anew with yellow insulating tape after repairs.*
- *Secure the repaired wiring harness if necessary with a cable tie to prevent flapping noises while driving.*

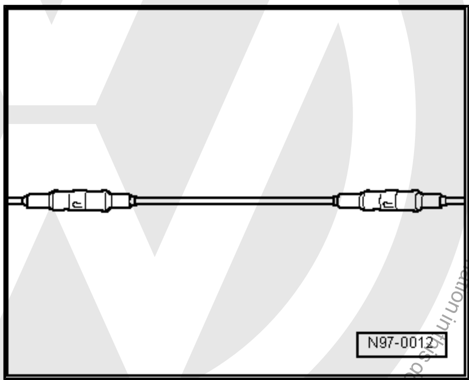


2.4.8 Wire Break with Dual Repair Point

Repair point with intermediate wire section

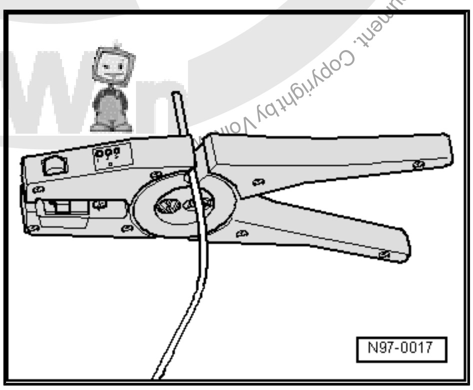
– Free up wire intended for repair at two points (approximately 20 cm to both sides of respective repair points).

– If required, remove wiring harness wrapping using a folding knife.



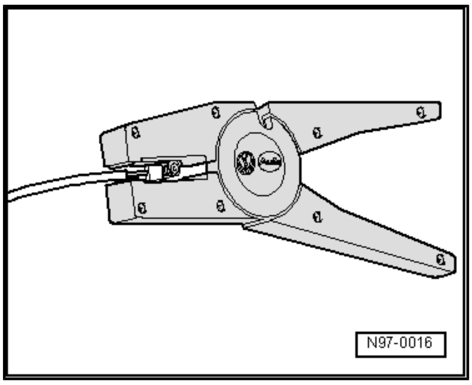
– Route the yellow repair wire next to the damaged wiring harness and cut the repair wire to the required length using the -VAS1978/3- .

– Cut damaged wire section from the vehicle-specific single wire.



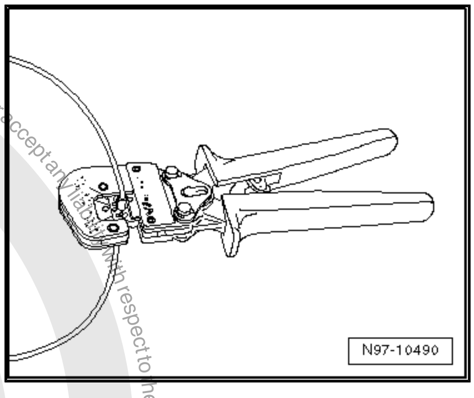
– Strip the wire ends using the 6 - 7 mm wire stripper.

– Slide crimp connection onto vehicle-specific single wire at one side and onto repair wire at the other side.



– Crimp the crimp connection at both wire ends using crimp pliers.

– Repeat this procedure at the other repair wire end.



Note

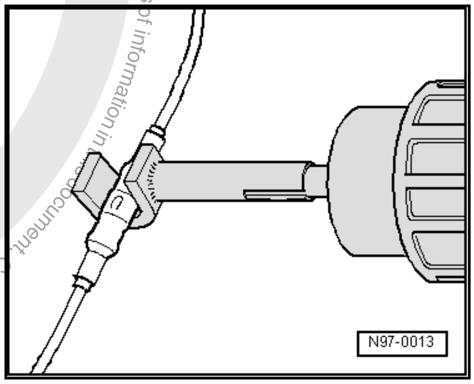
♦ *Always be sure to use the correct crimping slot for the crimping connection used. Refer to* *⇒ “2.3.1 Crimping Pliers with Insert”, page 100* .

♦ *Do not crimp wire insulation.*

After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

– Place the -VAS1978/15A- on the -VAS1978/14A- .

– Heat crimp connection using hot air gun lengthwise from center outward until it is sealed completely and adhesive comes out the ends.



Caution

When heat-shrinking crimp connections, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air gun.

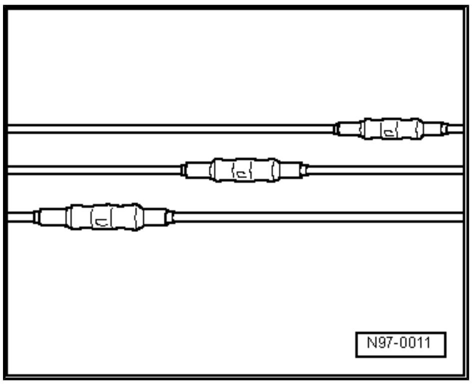
Always observe operating instructions of heat gun.

Note

♦ *Make sure that crimp connections do not lie directly next to each other when several wires need to be repaired. Arrange the crimp connectors at a slight offset so that the circumference of the wiring harness does not become too large.*

♦ *In the event the repair point was previous taped, this point must be taped anew with yellow insulating tape after repairs.*

♦ *Secure the repaired wiring harness if necessary with a cable tie to prevent flapping noises while driving.*



2.5 Fiber-Optic Cables, Repairing

⇒ “2.5.1 Fiber-Optic Cable, Assembling”, page 124

⇒ “2.5.2 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector”, page 128

2.5.1 Fiber-Optic Cable, Assembling

Special tools and workshop equipment required

- Fiber-Optic Conductor Repair Set - VAS6223A-
- Hose Cutting Pliers - VAS6228-
- Vehicle Diagnostic Tester

It is very difficult to find the exact location of the problem. Replace the damaged fiber-optic cable and lay a new wire parallel to the defective fiber-optic cable.

Note

- *Select the damaged fiber-optic cable components with the “Guided Fault Finding” or “Guided Functions” from the Vehicle Diagnostic Tester menu options.*
- *A fiber-optic cable that needs repair is represented by a “yellow” color.*

Procedure

– Choose “Guided Fault Finding” or “Guided Functions” in the Vehicle Diagnostic Tester . Refer to Vehicle Diagnostic Tester .

– Assemble the fiber-optic cable. Refer to ⇒ “2.5.1 Fiber-Optic Cable, Assembling”, page 124 .

Caution

Do not bend the fiber-optic cable too much. The bending radius must be no less than 25 mm.

Fiber optic cables must not be routed over sharp edges.

The fiber-optic cable must not be dirty or touched with bare fingers.

Fiber optic cables may not be heated.

It is not permitted to twist together 2 fiber optic cables or one fiber optic cable with a copper wire.

Protect the connector and the connection box from dust. Place the cap on the trunk.

Caution

Do not bend the fiber-optic cable too much. The bending radius must be no less than 25 mm.

Fiber optic cables must not be routed over sharp edges.

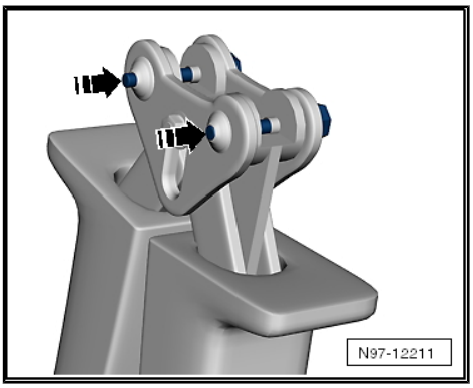
The fiber-optic cable must not be dirty or touched with bare fingers.

Fiber optic cables may not be heated.

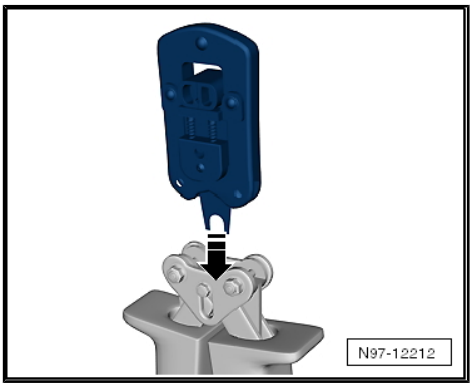
It is not permitted to twist together 2 fiber optic cables or one fiber optic cable with a copper wire.

Protect the connector and the connection box from dust. Place the cap on the trunk.

Mount the Tool Head for the -VAS6223/1- .

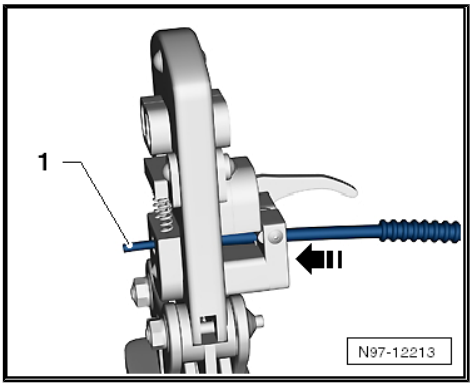


– Remove the locking pin in direction of -arrows-.
– Remove the tool set -arrow- and pull the locking pin back.



Fiber Optic Cable, Cutting to Length

– Establish length of fiber optic cable required.
– Open the -VAS6223/1- and lay the fiber-optic cable -1- in the mount.
– Close the -VAS6223/1- to cut the fiber-optic cable lengths.



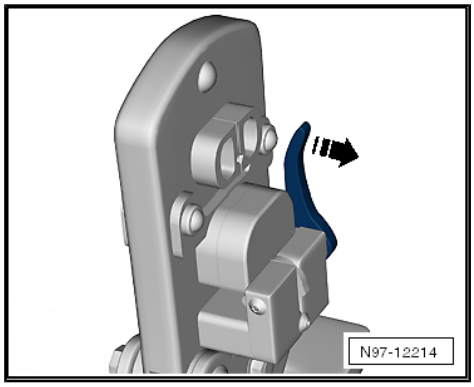
Stripping

– Open the -VAS6223/1- .

– Position the wire stripper in the lower position in direction of -arrow-.

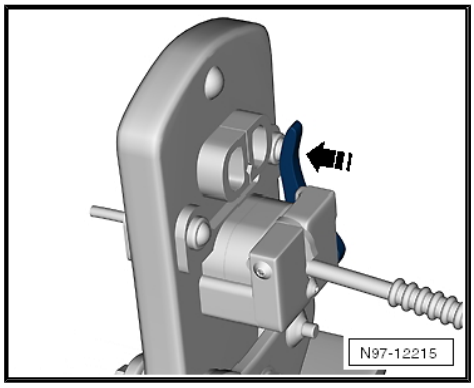
– Insert fiber-optic cable into the stripping station.

• The end of the fiber-optic cable must be flush with the rear side of the cutting pliers.



– Close the -VAS6223/1- until the stop and keep closed.

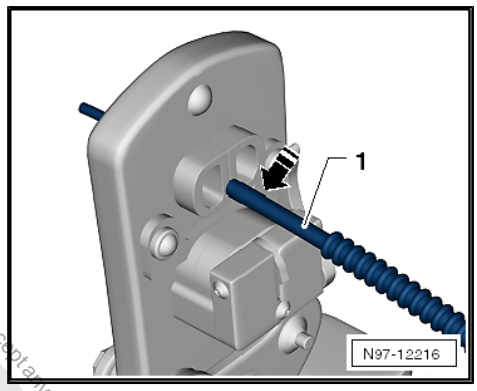
– Bend the wire stripper upward in direction of -arrow- and remove the fiber-optic cable.



Precision Cutting (Production of Optical End Face)

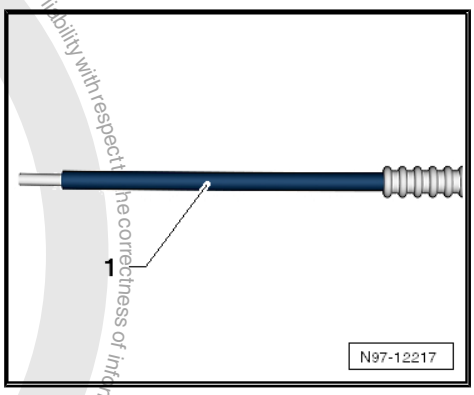
– Push the fiber-optic cable -1- into the cutting station.

• Insulation must make contact with cutting point stop.



– Close the -VAS6223/1- and remove the wire.

– Visually inspect the wire -1- to make sure that it was cut correctly and that there are no burrs on the front surface.

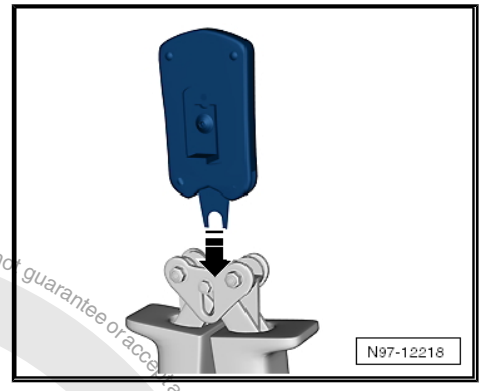


Note

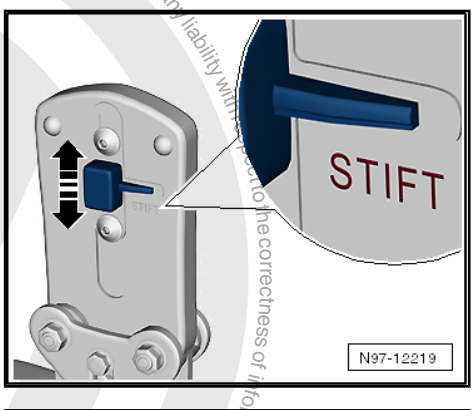
♦ *Fiber-optic cable is only to be placed on an absolutely clean surface or held in hand.*

♦ *Use the cap if there is a risk of the fiber-optic cable surface becoming dirty.*

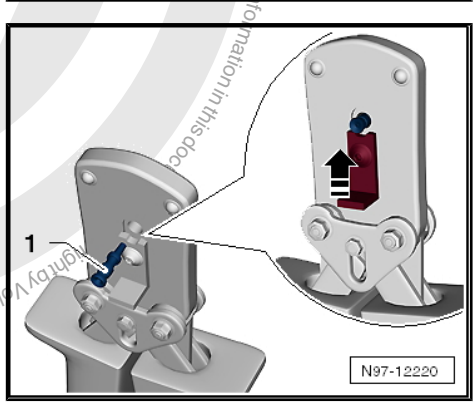
Attaching Brass Pin Contact to Fiber-Optic Cable



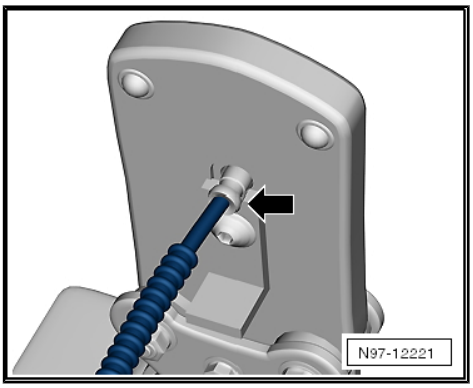
– Change tool head in direction of -arrow-.
– Slide the safeguard on the -VAS6223/1- in direction of -arrow- so that the word “Stift” (pin) is legible.



– Insert a brass pin contact -1- in the mount.
– Close the securing lever on the -VAS6223/1- in direction of -arrow-.



– Insert the fiber-optic cable into the brass pin contact in direction of -arrow- all the way up to the threaded stop and then close the -VAS6223/1- .
– Open the fiber-optic cable pliers and remove the fiber-optic cable along with the brass contact pin.

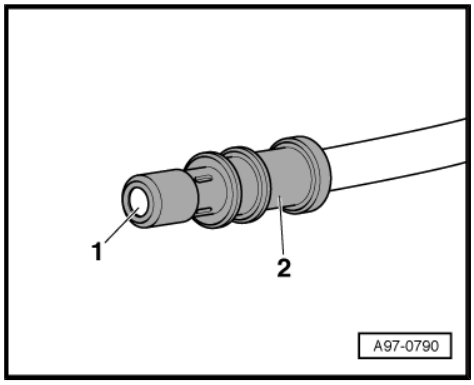


Caution

Do not excessively bend or kink the fiber-optic cables (minimum bending radius 25 mm).

– Make sure the brass pin contact -2- is secured properly on the fiber-optic cable -1-.

- 4 crimped points must be visible on the brass connecting pin.
- The brass pin contact must not be able to be removed by hand from fiber-optic cable.
- The front surface of the fiber-optic cable is 0.01 to 0.1 mm behind the brass pin contact (visual check).



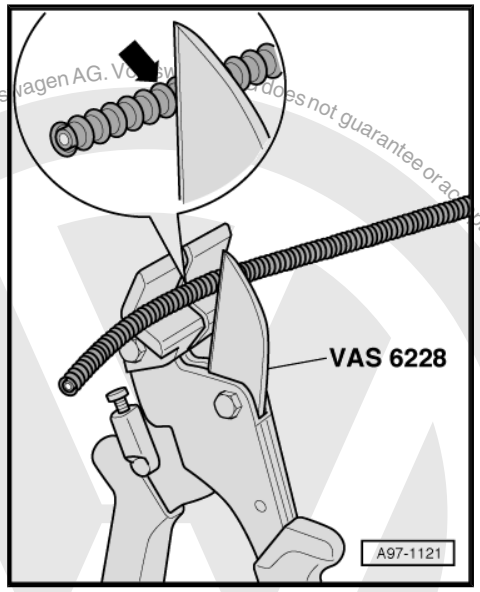
Note

- *Connector couplings are available for connecting the fiber-optic cables. Refer to Parts Catalog.*
- *To install the new fiber optic cable in wiring harness connector. Refer to* *⇒ "2.5.2 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector", page 128* .

Corrugated Tube, Install on Fiber Optic Cable

– Cut corrugated tube to appropriate length.

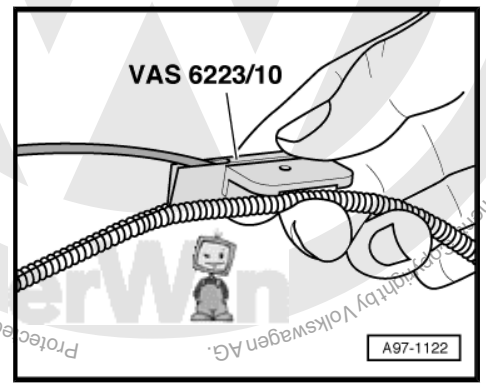
- Use the -VAS6228- or a sharp knife for cutting.
- The corrugated tube must not be cut through using a side cutter under any circumstances
- The corrugated tube must be cut on the wave peak -arrow-, not in the wave trough.
- The corrugated tube must audibly engage in the fiber-optic cable housing when installing.



– Guide the fiber-optic cable into the -VAS6223/10- as shown.

– Position corrugated tube assembly pliers on slot on the tube.

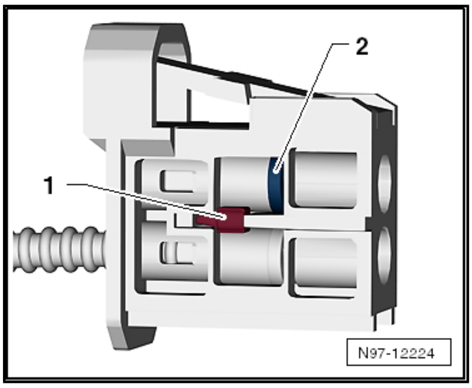
– Position crimping pliers for fiber-optic cable at slot of corrugated tube. The fiber optic cable is then routed in the corrugated tube.



2.5.2 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector

Removing

– Unplug connector for fiber optic cable from appropriate control unit.



– Release the locking mechanism in the fiber-optic cable connector -1- by pushing on it.

– Release the secondary lock -2- with a small screwdriver.

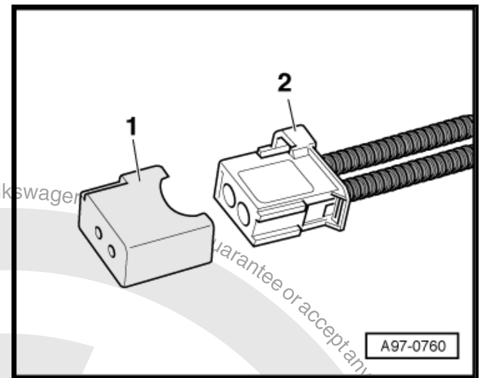
– Remove the fiber-optic cable.

> **Caution**
>
> - *Install the cap on the trunk, in order to protect the fiber-optic cable from dust and dirt.*
> - *Use a new housing since it is likely that the secondary lock was damaged during the removal of the fiber-optic cable.*
> - *Note the arrows for allocation on the base module "IN" and "OUT".*

Installing

Install in reverse order of removal. Note the following

– Install the fiber-optic cable according to the markings.



Note

- *Push the corrugated tube into the connector housing until it audibly engages.*
- *Cover the open connector -2- for the fiber-optic cable using the -VAS6223/9- -1-.*
- *The protective cap prevents contamination of or mechanical damage to end face of fiber optic cable which would impair signal transmission.*

2.6 Antenna Wires, Repairing

⇒ "2.6.1 Aerial Cable Repair Set VAS6720 ", page 129

2.6.1 Aerial Cable Repair Set - VAS6720-

Special tools and workshop equipment required

- Repair Set, Aerial Cable - VAS6720-

Checking the antenna wire. Refer to ⇒ page 130

Replacing the tool head. Refer to ⇒ page 130

Cutting the antenna wire. Refer to ⇒ page 131

Removing the Insulation from they. Refer to ⇒ page 131

Removing the outer jacket of insulation. Refer to ⇒ page 134

Removing the inner insulation. Refer to ⇒ page 135

Crimping the inner conductor. Refer to ⇒ page 136

Crimping the outer conductor. Refer to ⇒ page 138

The Repair Set, Aerial Cable - VAS6720- makes it possible to perform a quality repair on antenna wires RG 174 (blue) and RTK 031 (black). The set contains the insulation removal tools and the crimping tools for both antenna wires. Moreover, all the individual parts needed are in the kit. Only the zero-coded coupler (green) is needed. All other connection wires for the different infotainment systems can be found in the Parts Catalog in table 035-XX. These

adapter antenna wires must always be ordered separately depending on the vehicle type. All part numbers needed for reordering can be found in this table. The each compartment in the kit has a part number. The repair kit is based on the Wiring Harness Repair Set - VAS1978B- .

Note

Additional information: Repair Set, Aerial Cable - VAS6720- Operating Instructions.

Checking the Antenna Wire:

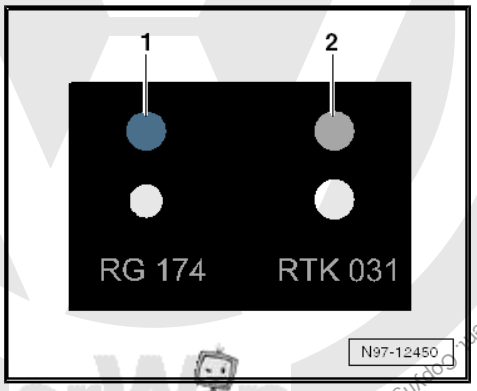
Before starting the repair, determine which antenna wire using the gauge.

- -1- System RG 174 = blue
- -2- System RTK 031 = gray

The adjusters on the heads of the tools are color coded on both systems.

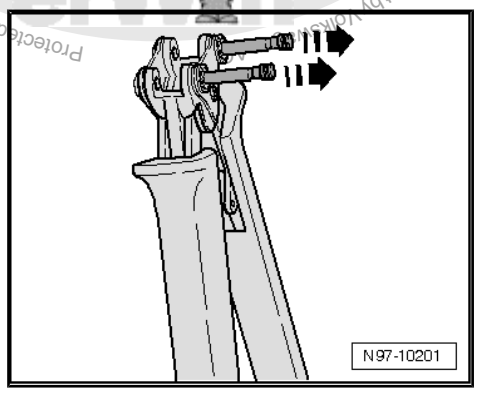
Replacing the Tool Head:

– Select the appropriate tool head based on the antenna wire test. Refer to ⇒ page 130 .

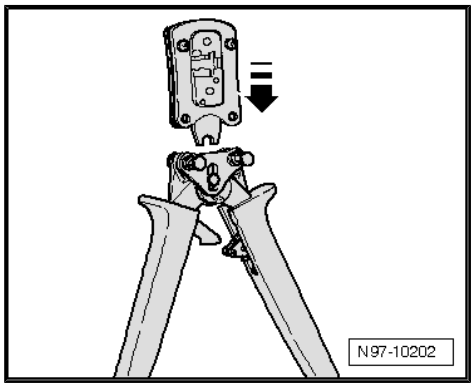


– Open the handle on the pliers all the way.

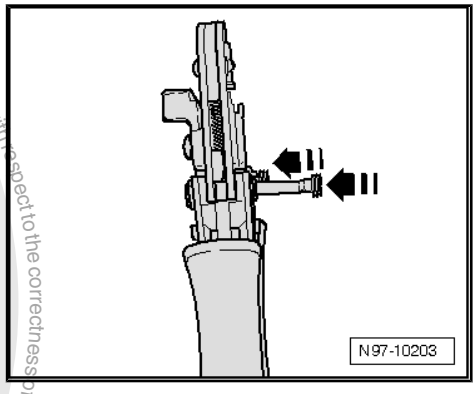
– Release and remove both locking pins in direction of -arrows- from the handle.



– Attach the necessary tool head to the handle from the top in direction of -arrow-.

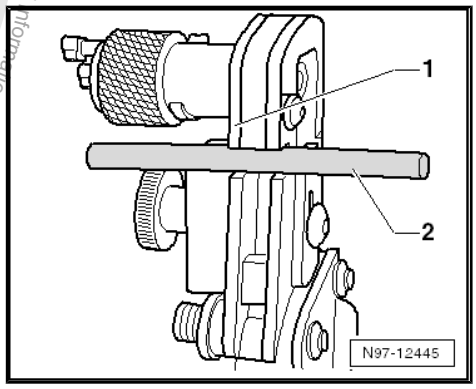


– Insert the pins in direction of -arrows- into the handle in order to lock the tool head into place.

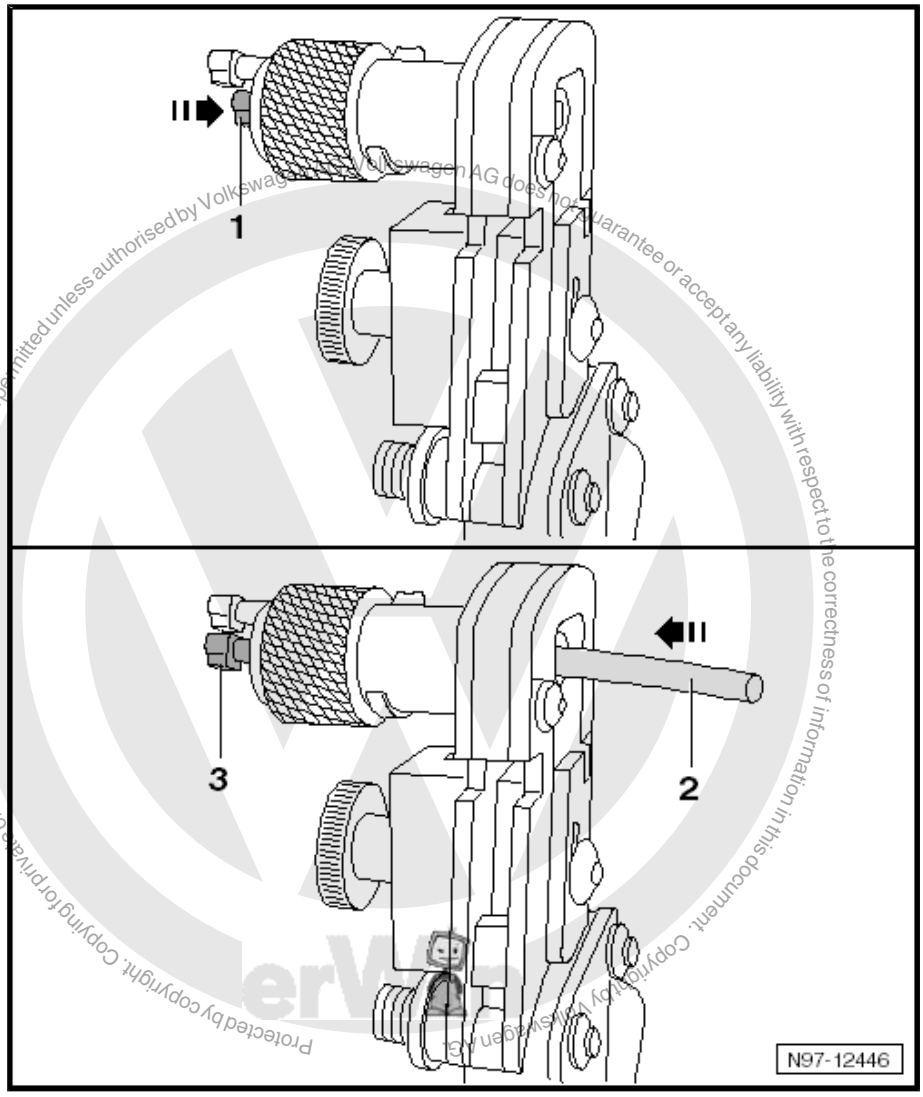


Cutting the Antenna Wire:

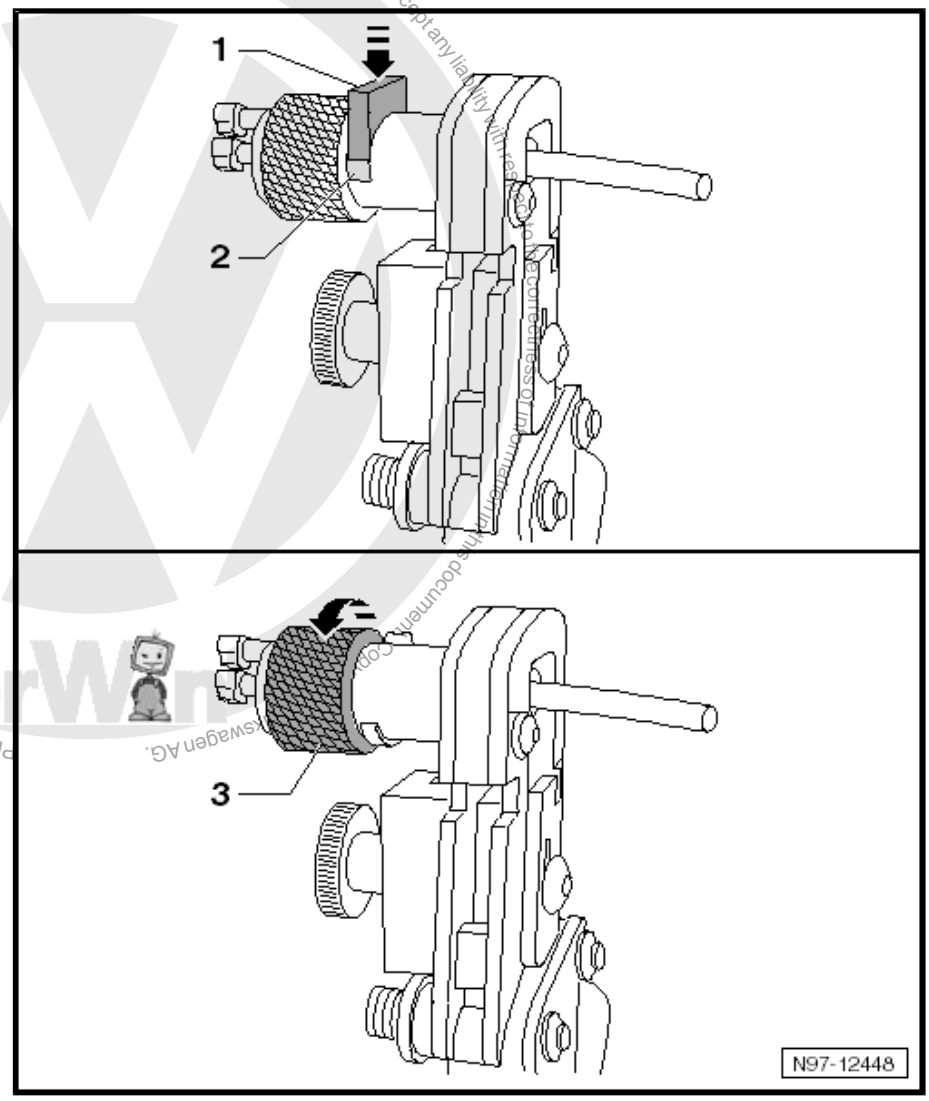
– Slide the antenna wire -2- into the cutting device -1-.
– Close the tool then open it again.
– Pull the antenna wire out of the cutting device.



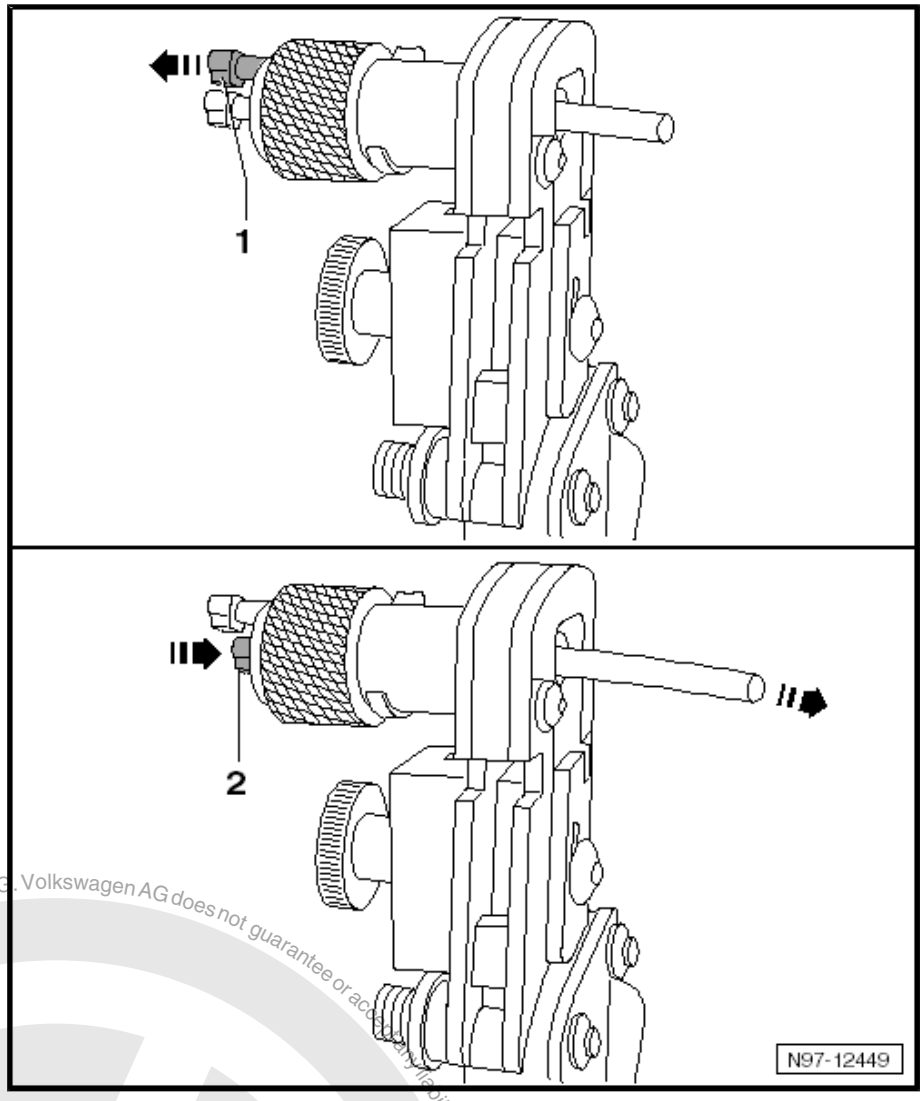
Removing the Insulation from the Shield:



– Push the locking pin -1- all the way into the rotating cutting piece.
– Push the antenna wire -2- all the way into the rotating cutting piece. The locking pin -3- can not be seen completely.

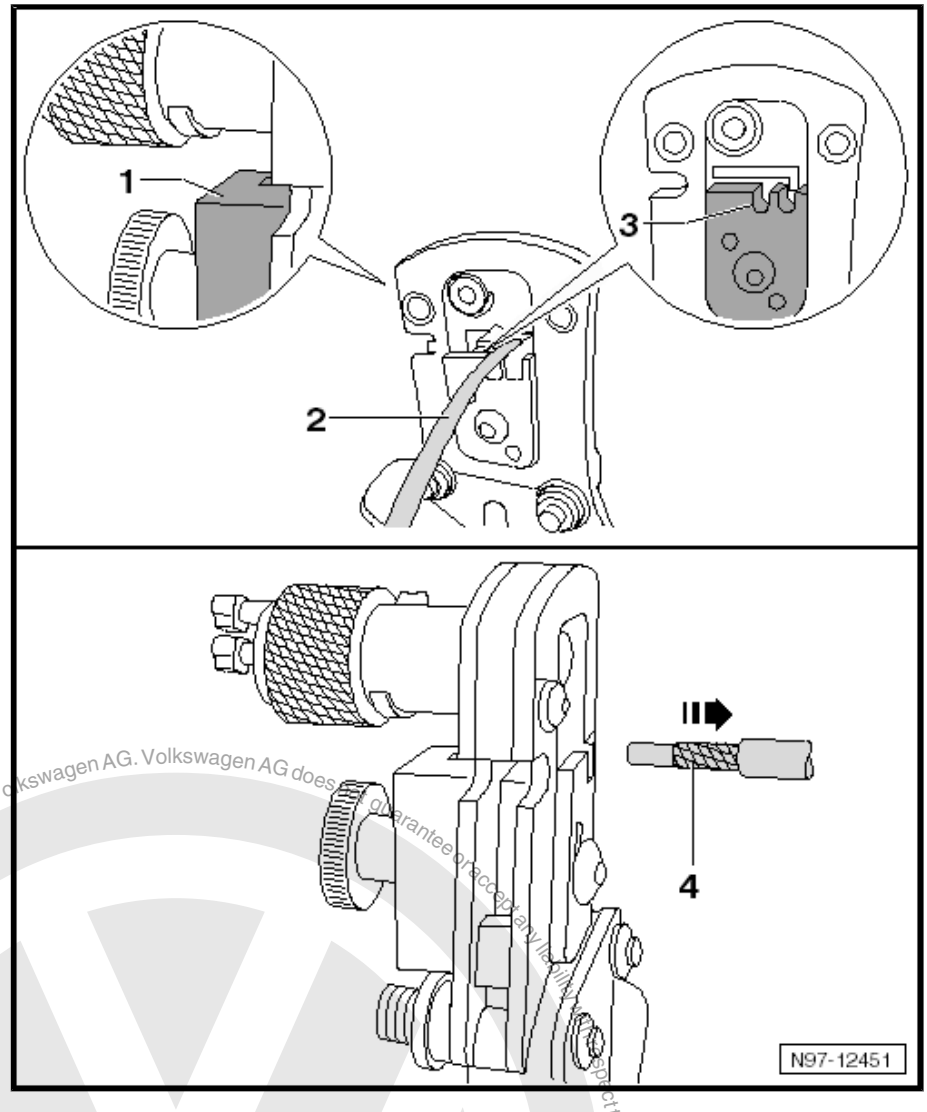


– Push the blade holder -1- against the axle of the rotating cutting segment until it locks into place. The gap -2- under the blade holder is completely closed.
– Hold the antenna wire so that it cannot turn.
– Turn the rotating cutting segment -3- 2 times in direction of -arrow- until it starts to turn easily.



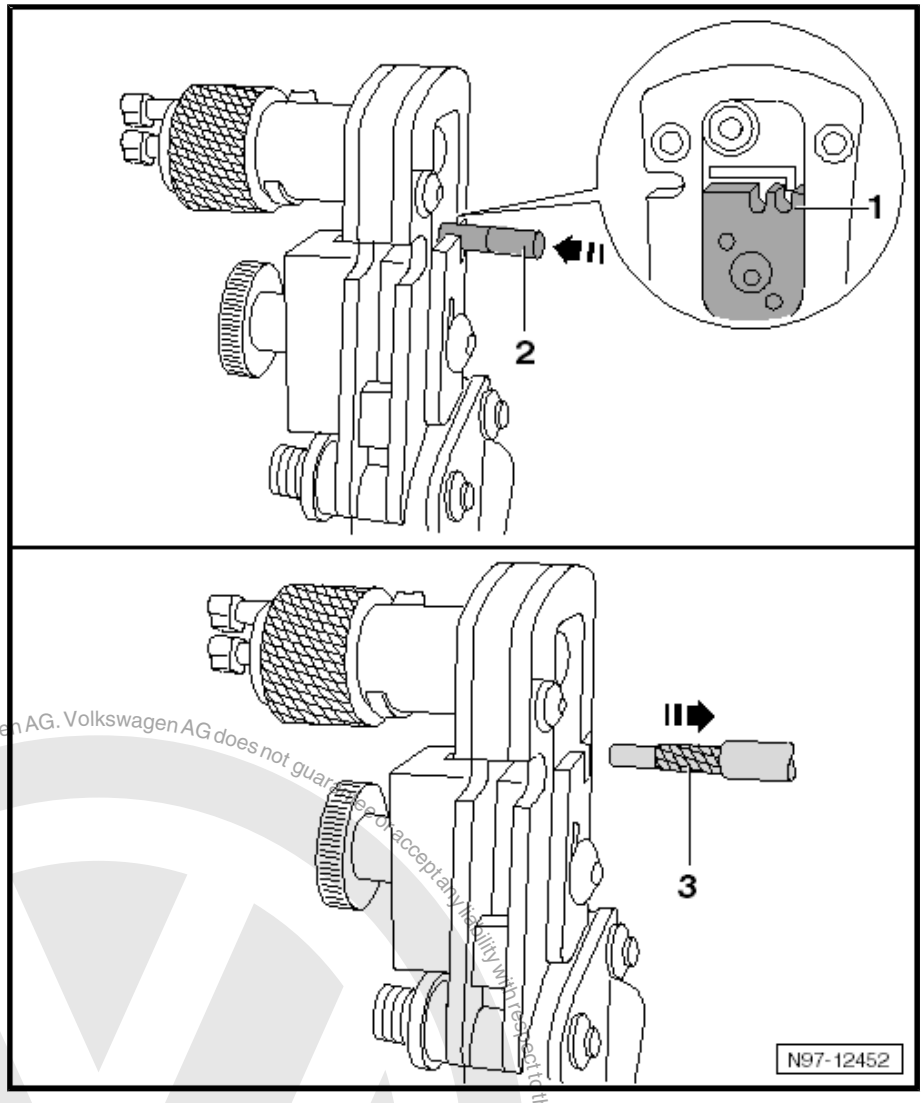
– Pull the release pin -1-. The blade holder unlocks and separates from the antenna wire.
– Push the locking pin -2- all the way into the rotating cutting piece. The antenna wire is pushed out of the rotating cutting segment.
– Remove insulation from the antenna wire.
– Remove any insulation remaining on the rotating cutting segment.

Removing the Outer Jacket of Insulation:



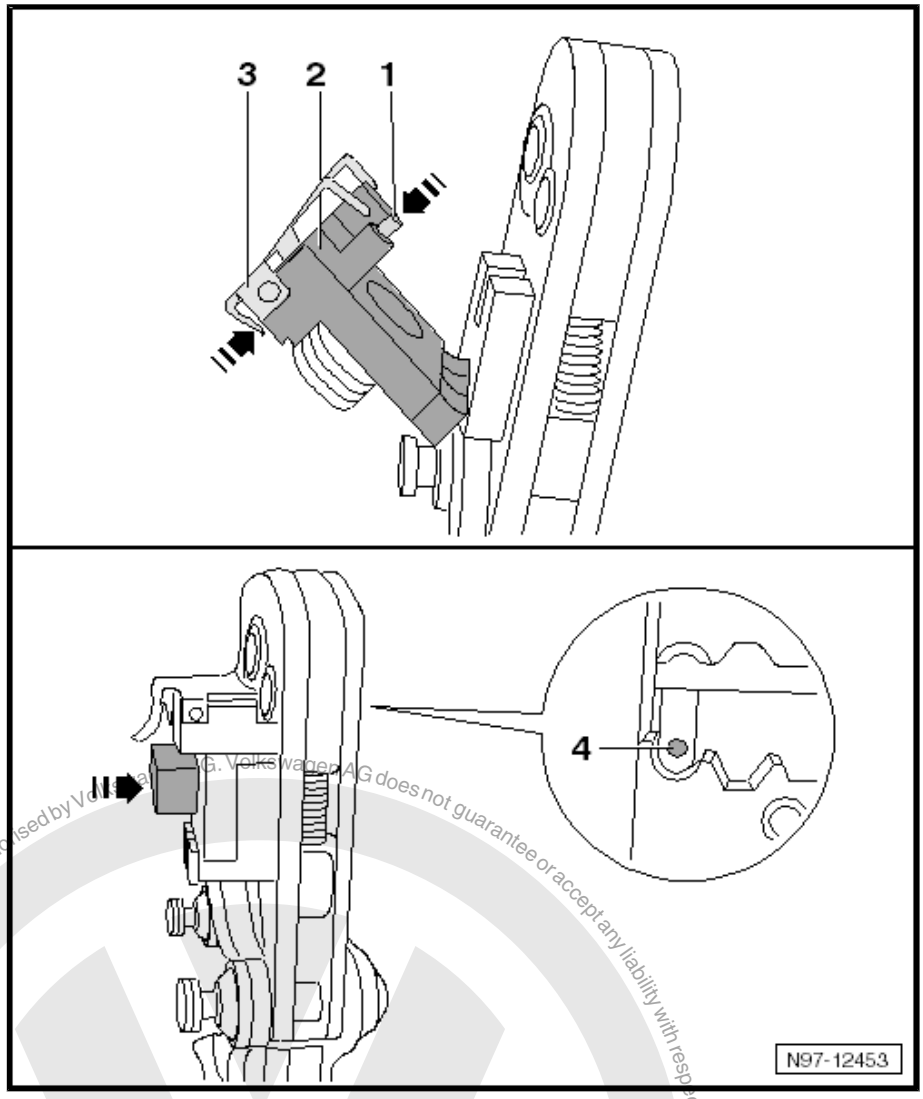
– Slide the antenna wire -2- in the mount -3- into the tool head until it stops -1-.
– Close the tool then open it again.
– Remove the antenna wire -4-.

Removing the Inner Insulation:

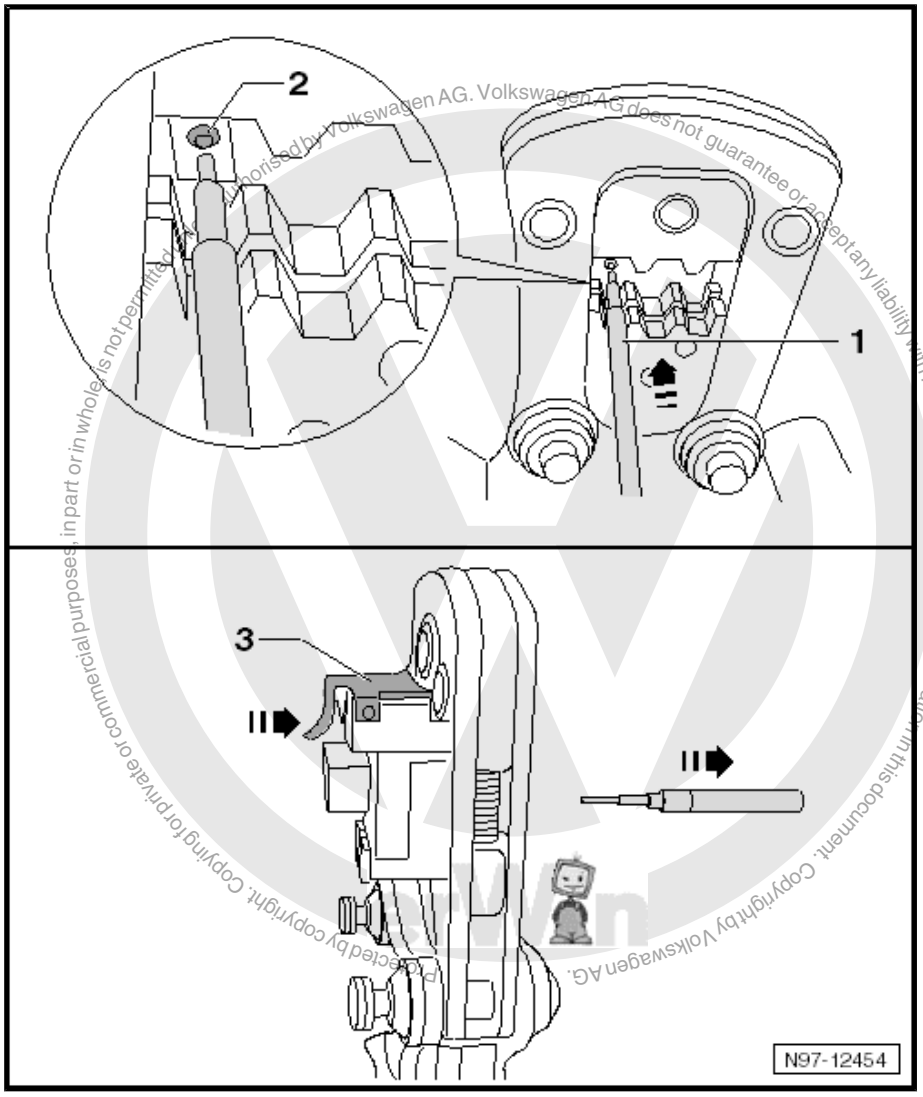


– Push the antenna wire -2- in the mount -1- all the way into the tool head.
– Close the tool then open it again.
– Remove the antenna wire -3-.

Crimping the Inner Conductor:

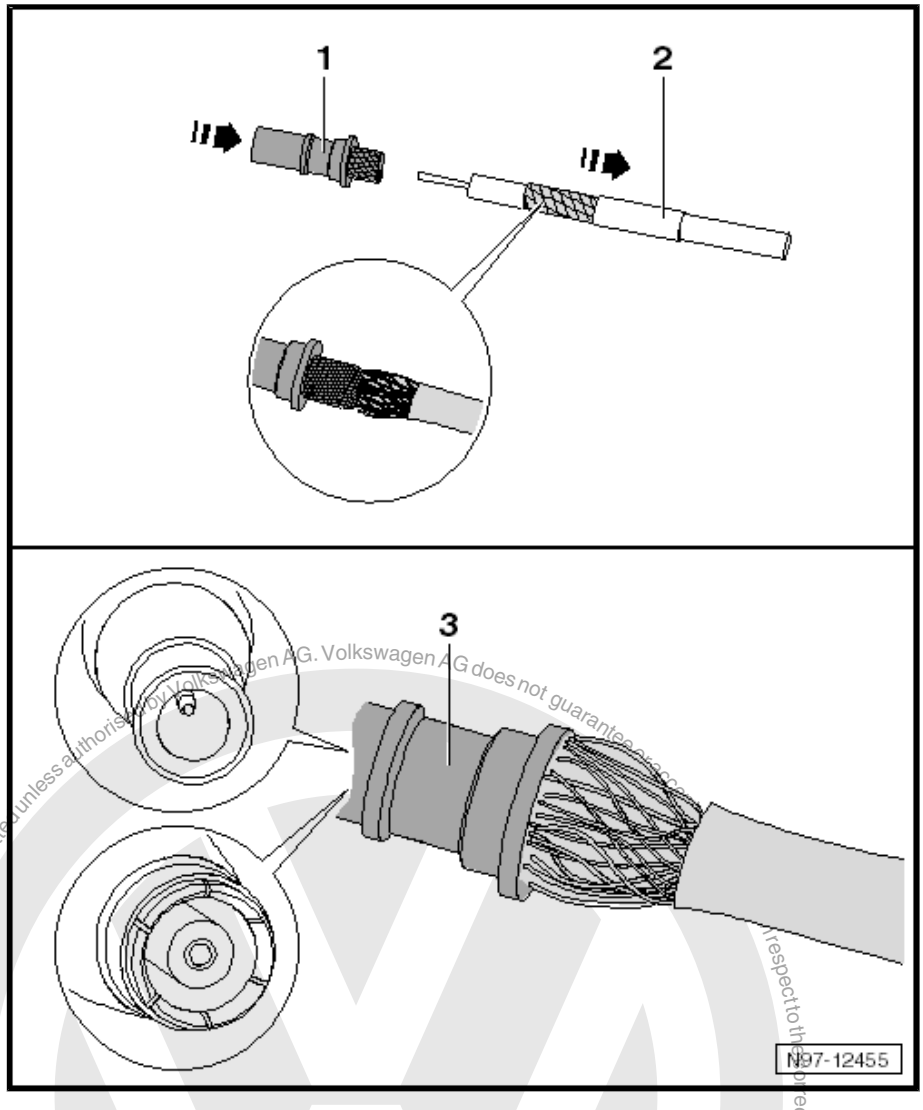


– Select the appropriate tool head based on the antenna wire test. Refer to ⇒ page 130 .
– Unfold the positioner -2-.
– Open the positioning plate -3-. The positioning plate swivels upward.
– Push the inner contact -1- all the way into the positioner and loosen the positioning plate. The inner contact is attached.
– Fold the positioner back in. The inner contact -4- is positioned inside the tool head.

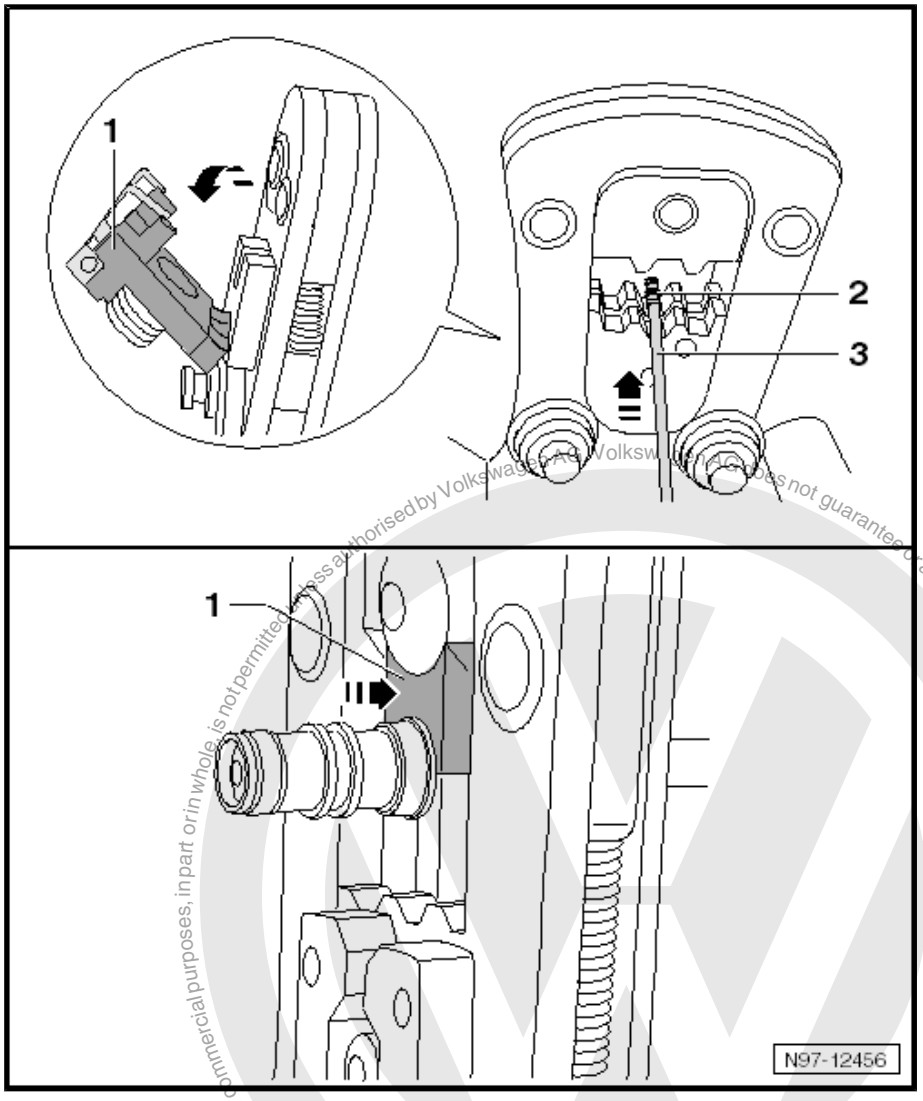


– Slide the antenna wire -1- into the inner contact -2- in the tool head. Hold the positioner tight while doing this.
– Lock the tool until it opens by itself.
– Open the positioning plate -3- and pull out the antenna wire.

Crimping the Outer Conductor:



– Slide the sleeve -2- and outer contact -1- over the inner conductor. The knurled contact piece must be pushed under the shield -3-, but over the aluminum foil.
– Slide the outer contact -4- all the way on. Make the bushing/ pin fit correctly when doing this.



– Push the sleeve -3- up to the outer contact.
– Open the tool and fold out the positioner -1-.
– Position the outer contact -2- in the tool head on the contact edge -4-.
– Close the tool then open it again.
– Pull out the antenna wire.

2.7 Contact Housings and Connectors, Repairing

⇒ “2.7.1 Contact Housings and Connectors, Repair Information”, page 141

⇒ “2.7.2 Contacts in Contact Housing, Repairing”, page 141

⇒ “2.7.3 Single Wire Seals, Installing”, page 143

⇒ “2.7.4 Contact Housings, Repairing Wire Terminals”, page 144

2.7.1 Contact Housings and Connectors, Repair Information

Note

- *Observe general notes for repairs on the vehicle electrical system. Refer to ⇒ “2.1 Vehicle Electrical System, General Repair Information”, page 96 .*
- *Allocation of crimp contacts with correct fit to contact housing is performed according to the part number stamped in on the contact housing. Part numbers of contact housing are listed in conjunction with the respective crimp contacts with correct fit in plate 198 (electrical connecting elements) in Parts Catalog.*
- *Damaged contact housings must always be replaced.*
- *New contact housings may be ordered via OTC Kassel.*

2.7.2 Contacts in Contact Housing, Repairing

– First, open or release if necessary the secondary lock of the contact housing. Refer to ⇒ “2.8 Contact Housings, Releasing and Disassembling”, page 145 .

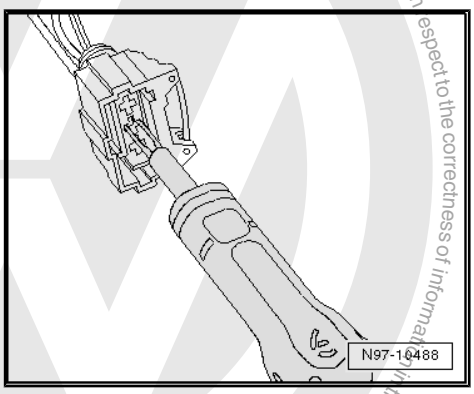
– Release contact (primary lock) using the appropriate release tool. Refer to ⇒ “2.8 Contact Housings, Releasing and Disassembling”, page 145 .

– Pull contact at single wire out of contact housing.

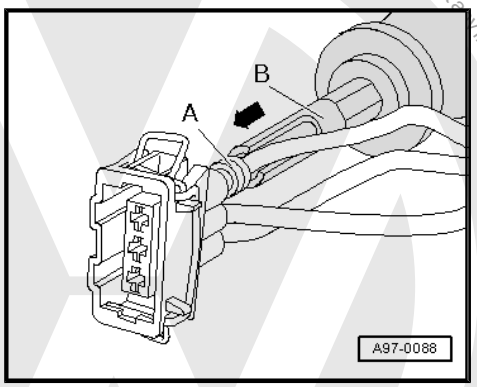
– Take the yellow repair wire with the correct contact out of the -VAS1978- .

– Free up repair point of vehicle-specific wiring harness (approximately 20 cm to both sides of repair point).

– If required, remove wiring harness wrapping using a folding knife.



– Insert new contact of repair wire into contact housing until it engages.
– Slide a single wire seal onto the repair wire.

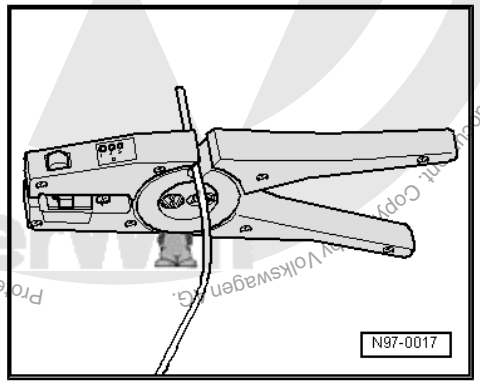


Note

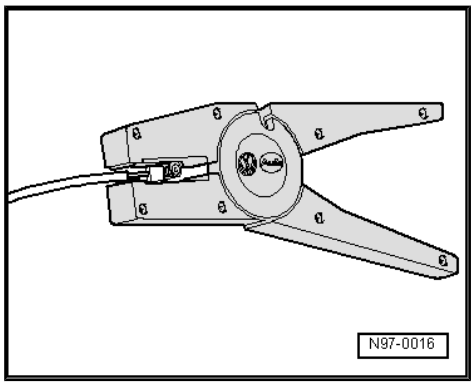
When doing this, small diameter of single seal must point toward contact housing.

– Slide single wire seal into contact housing using the correct assembly tool. Refer to
⇒ “2.7.3 Single Wire Seals, Installing”, page 143 .

– Shorten the repair wire and the vehicle-specific wiring harness single wire as needed using the -VAS1978/3- .

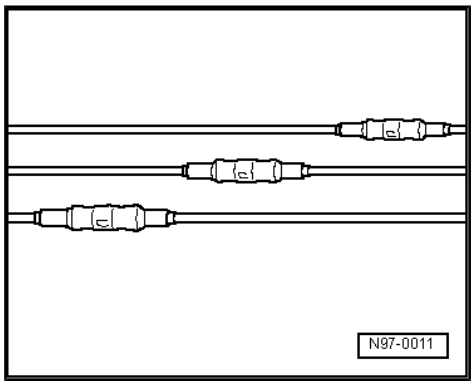


– Strip ends of repair wire and of vehicle-specific single wire using 6 - 7 mm wire stripper.
– Crimp the stripped ends of repair wire and single wire of vehicle-specific wiring harness using crimp pliers and a crimp connection as described in chapter “Wire break with single repair point”. Refer to
⇒ “2.4.7 Wire Break with Single Repair Point”, page 121 .



Note

- *Make sure that crimp connections do not lie directly next to each other when several wires need to be repaired. Arrange the crimp connectors at a slight offset so that the circumference of the wiring harness does not become too large.*
- *In the event the repair point was previous taped, this point must be taped anew with yellow insulating tape after repairs.*
- *Secure the repaired wiring harness if necessary with a cable tie to prevent flapping noises while driving.*



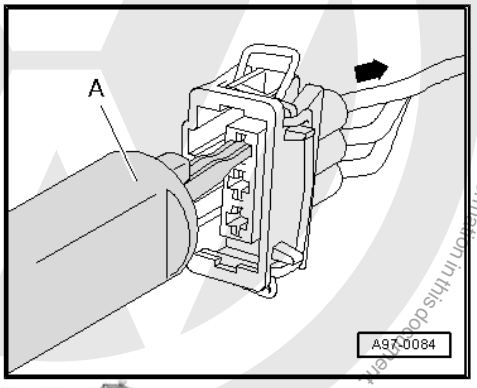
2.7.3 Single Wire Seals, Installing

Note

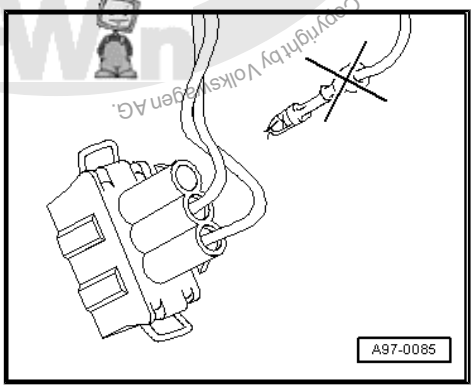
- *Single wire seals prevent the penetration of water and dirt into the contact housing. They are installed, for example, in the engine compartment and must be reinstalled after a repair.*
- *Single wire seal is crimped on at the factory together with contact on the wire, this is not the case for repair wires. Single wire seal must be slid onto wire first before crimping the repair wire.*
- *Single wire seals must always fit with the repair wire cross-section. Outer circumference of single wire seal is aligned according to chamber circumference of the contact housing. Perform assembly using only the assembly tool with correct fit.*

Assembling Single Wire Seal

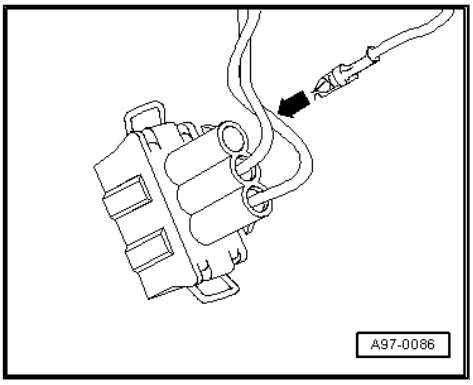
– Release contact lock using assembly tool with correct fit -A- and then pull wire with single wire seal toward rear -arrow- out of contact housing.



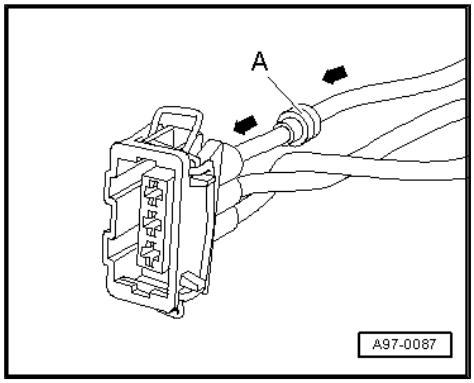
– Cut off the old contact with single wire seal from the vehicle-specific wiring harness.



– Slide repair wire with new contact into corresponding chamber of contact housing until it engages.



– Put single wire seal -A- onto free end of repair wire.

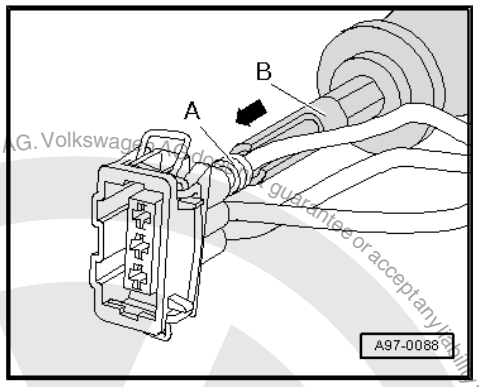


Note

When doing this, small diameter of single wire seal must point toward contact housing.

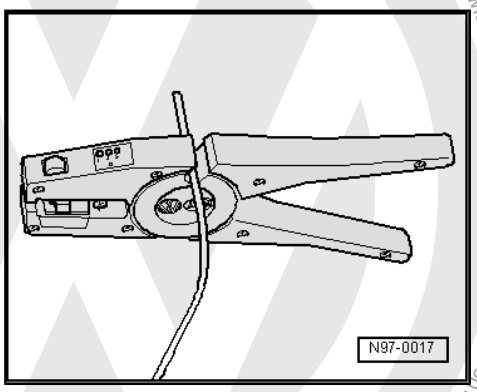
– Slide single wire seal -A- onto repair wire up to the contact housing.

– Slide single wire seal -A- into contact housing until it stops using the corresponding assembly tool -B-.



– Shorten the repair wire and the vehicle-specific wiring harness single wire as needed using the -VAS1978/3- .

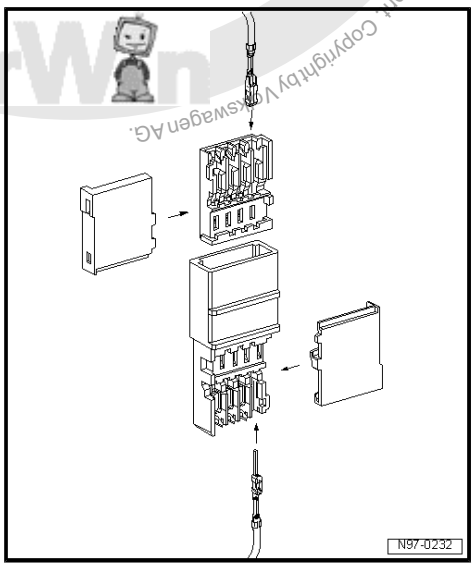
– Crimp the stripped ends of repair wire and single wire of vehicle-specific wiring harness using crimp pliers and a crimp connection as described in chapter "Wire break with single repair point". Refer to
⇒ "2.4.7 Wire Break with Single Repair Point", page 121 .



2.7.4 Contact Housings, Repairing Wire Terminals

Note

- *For technical reasons, the contact housing for the wire terminals can be supplied only with the contacts pushed in.*
- *These contacts can be removed at every other contact housing in the event they are not required.*
- *Repair wires which have already been equipped with corresponding contacts crimped on are available. Refer to Parts Catalog.*



2.8 Contact Housings, Releasing and Disassembling

2.8.1 Releasing and Disassembly Contact Housings, General Information

Note

- *Observe general notes for repairs on the vehicle electrical system. Refer to ⇒ “2.1 Vehicle Electrical System, General Repair Information”, page 96 .*
- *Always use the release tools intended for the releasing process. Under no circumstances may terminals be pulled forcefully out of terminal housings.*
- *Damaged contact housings must always be replaced. New contact housings may be ordered via OTC Kassel.*
- *Small screwdrivers may be used as an aid to release the secondary locks.*
- *Chamber/pin assignment is located partially stamped in on secondary lock or rear side of terminal housing.*
- *Detailed information on component locations of harness connectors. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.*

The allocation of the correct release tools to the respective locking mechanisms can be found in the table in the -VAS1978/35- Operating Instructions.

2.8.2 Secondary Lock

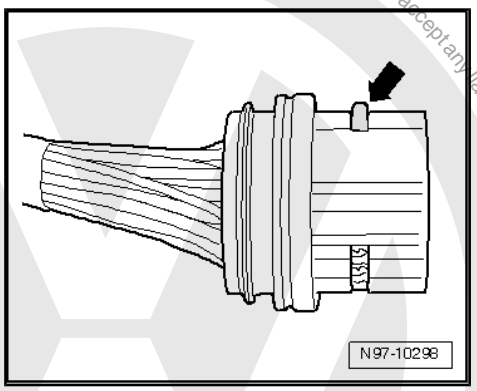
The secondary lock is a housing securing mechanism (second locking mechanism) that secures all wires in one contact housing. If a secondary lock is installed at a contact housing, it must always be opened or removed using specified tool before releasing and pulling out individual crimp contacts.

Secondary lock is distinguished by a different color from the rest of the contact housing. It simplifies recognizing the secondary lock and clarifies its function.

The shapes of the terminal housings depicted here are only a selection which, as an example, should make clear the various functions of the secondary lock.

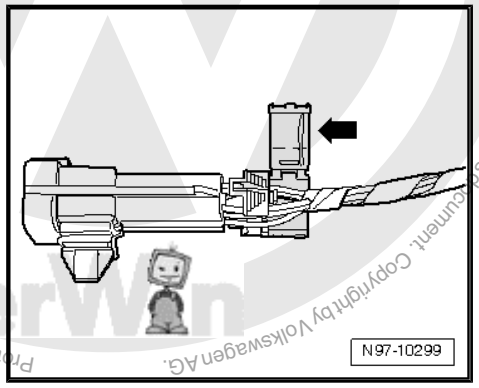
Example 1

Housing securing mechanism is released by removing a “comb” -arrow-.



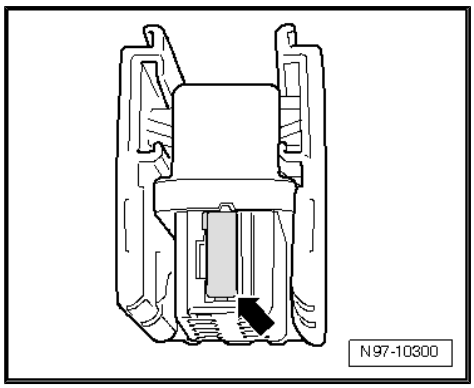
Example 2

Housing securing mechanism is released by opening a “flap” -arrow-.



Example 3

Housing securing mechanism can be released by disengaging a “slider” -arrow-.



2.8.3 Primary Lock

The primary lock is the locking mechanism of an individual crimp contact in the contact housing.

If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ⇒ “2.8.2 Secondary Lock”, page 145 .

The shapes of the primary locks depicted in the following are only a selection which, as an example, should make clear the various functions of the primary lock.

- Round connector systems. Refer to ⇒ “2.8.4 Round Connector Systems”, page 147 .
- Flat connector systems. Refer to ⇒ “2.8.5 Flat Connector Systems”, page 147 .
- Special connector systems. Refer to ⇒ “2.8.6 Special Connector Systems”, page 149 .

The allocation of the correct release tool for the respective locks can be found in the table in the -VAS1978/35- Operating Instructions.

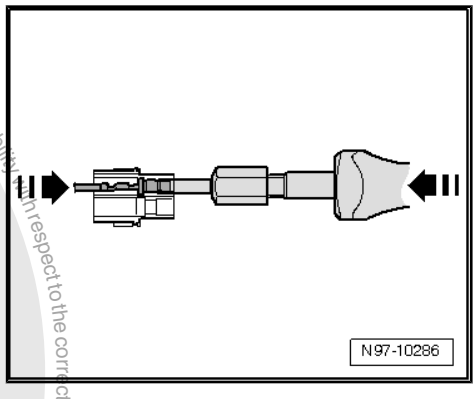
2.8.4 Round Connector Systems

Note

If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ⇒ "2.8.2 Secondary Lock", page 145 .

– Guide the release tool which fits the contact housing into release channel on contact housing.

– Grasp contact at wire and push it gently into contact housing in direction of -arrow-.

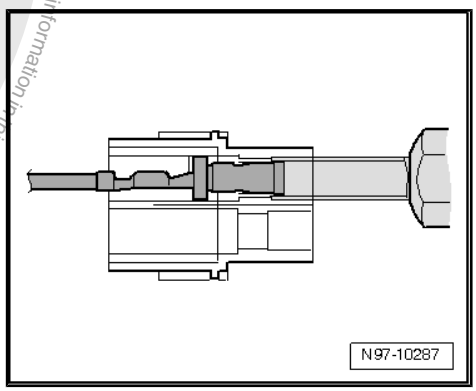


Note

By pushing the contact in the direction of the contact housing, the contact retaining tabs are lifted off the housing shoulder and can be released using the release tool.

– At the same time, push release tool in direction of contact housing -arrow- and pull the released contact out of contact housing.

– After removing the contact, release tool can be pulled out of the contact housing again.



2.8.5 Flat Connector Systems

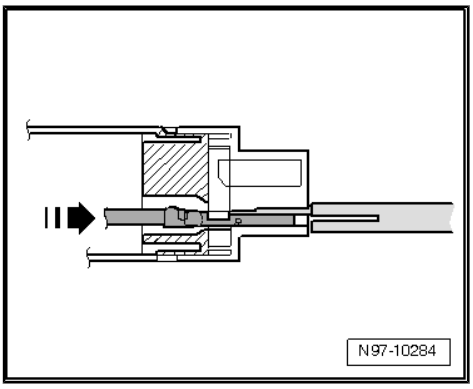
Note

If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ⇒ "2.8.2 Secondary Lock", page 145 .

Flat Connector System with One Retaining Tab

– Guide the release tool which fits the contact housing into release channel on contact housing.

– Grasp contact at wire and push it gently into contact housing in direction of -arrow-.

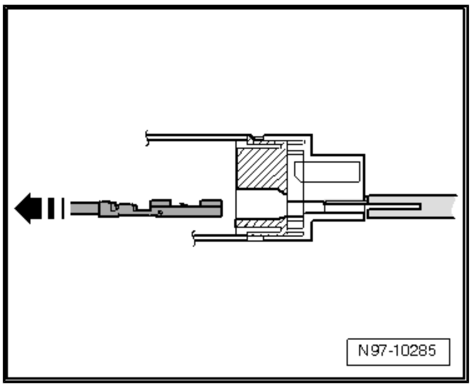


Note

By pushing the contact in the direction of the contact housing, the contact retaining tab is lifted off the housing shoulder and can be released using the release tool.

– At the same time, push release tool in direction of contact housing and pull the released contact out of contact housing in direction of -arrow-.

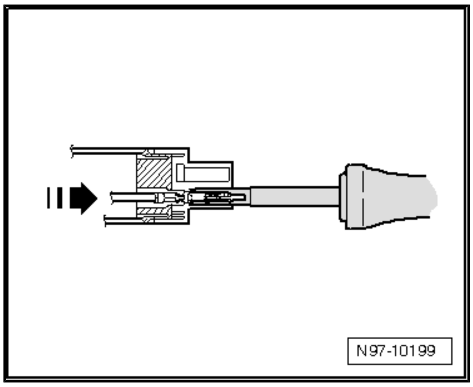
– After removing the contact, release tool can be pulled out of the contact housing again.


N97-10285

Flat Connector System with Two Retaining Tabs

– Guide the release tool which fits the contact housing into release channel on contact housing.

– Grasp contact at wire and push it gently into contact housing until it stops in direction of -arrow-.

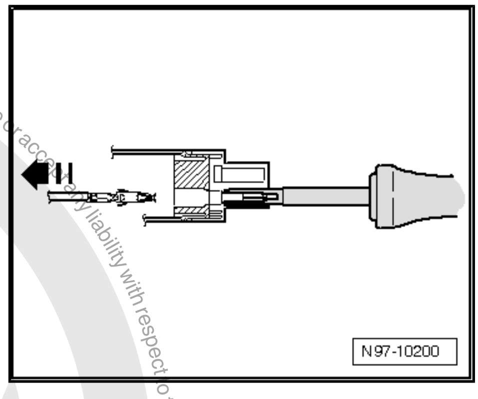

N97-10199

Note

By pushing the contact in the direction of the contact housing, the contact retaining tabs are lifted off the housing shoulder and can be released using the release tool.

– At the same time, push release tool in direction of contact housing and pull the released contact out of contact housing in direction of -arrow-.

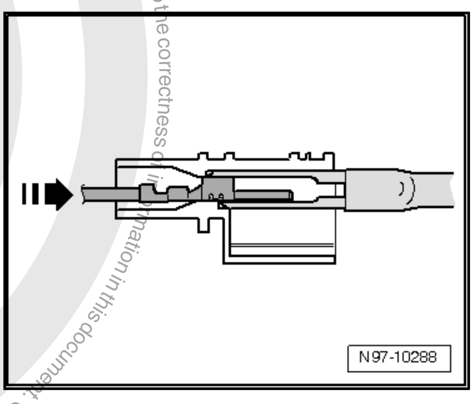
– After removing the contact, release tool can be pulled out of the contact housing again.


N97-10200

Asymmetrical

– Guide the release tool which fits the contact housing into release channel on contact housing.

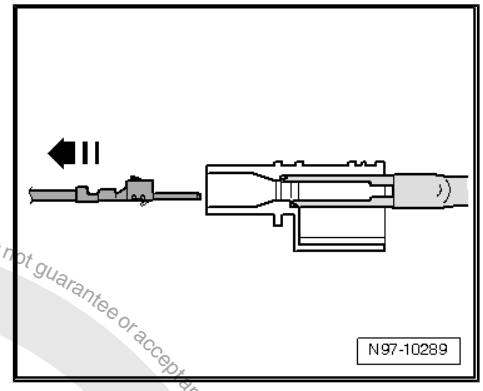
– Grasp contact at wire and push it gently into contact housing -arrow-.


N97-10288

Note

By pushing the contact in the direction of the contact housing, the contact retaining tabs are lifted off the housing shoulder and can be released using the release tool.

– At the same time, push release tool in direction of contact housing and pull the released contact out of contact housing in direction of -arrow-.
– After removing the contact, release tool can be pulled out of the contact housing again.



2.8.6 Special Connector Systems

Note

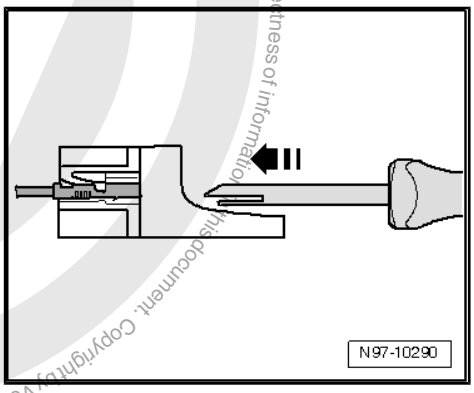
If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ⇒ "2.8.2 Secondary Lock", page 145 .

Faston Contacts

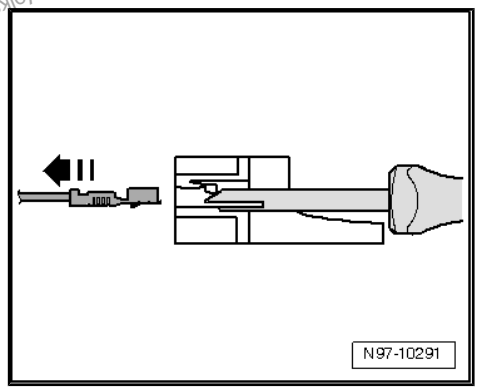
– Guide the release tool which fits the contact housing into release channel on contact housing.
– Grasp contact at wire and push it gently into contact housing.

Note

By pushing the contact in the direction of the contact housing, the contact retaining tabs are lifted off the housing shoulder and can be released using the release tool.

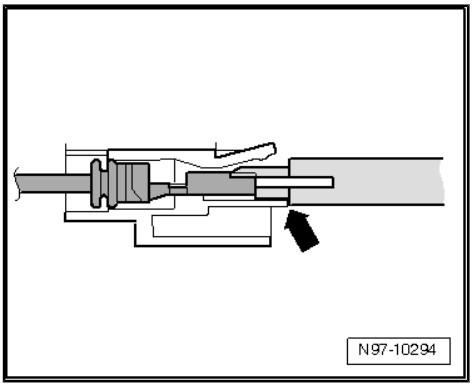


– At the same time, push release tool in direction of contact housing and pull the released contact out of contact housing in direction of -arrow-.
– After removing the contact, release tool can be pulled out of the contact housing again.



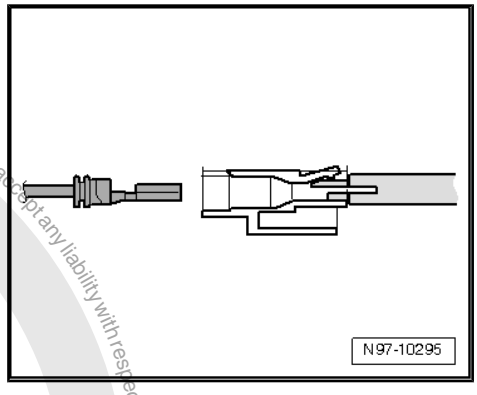
GT 150/280 Contacts

– Guide the release tool which fits the contact housing under retaining tab into contact housing.
– Push tool into contact housing until it stops -arrow-.



Contact is ejected from the contact housing.

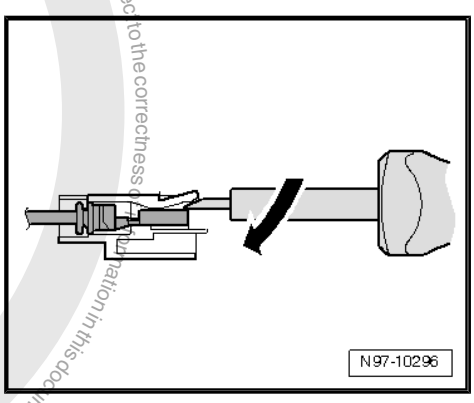
– After ejecting the contact, release tool can be pulled out of contact housing again.



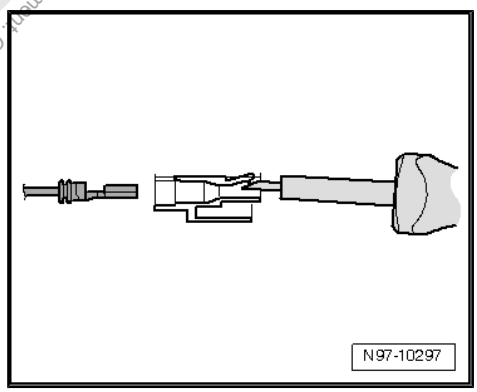
Contacts without Retaining Tabs

– Insert release tool under retaining tab of terminal housing.

– Push release tool through until it stops by gently lifting -arrow-.



Contact is ejected from the contact housing



3 Contact Surface Cleaning Set - VAS6410-

⇒ “3.1 Contact Surface Cleaning Set VAS6410 , Using”, page 151

3.1 Contact Surface Cleaning Set - VAS6410- , Using

⇒ “3.1.1 Wiring Eyelets, Repairing”, page 151

⇒ “3.1.2 Threaded Connections, Repairing”, page 153

⇒ “3.1.3 Battery Terminal Clamp and Battery Terminal, Cleaning”, page 154

⇒ “3.1.4 Protecting”, page 156

3.1.1 Wiring Eyelets, Repairing

Special tools and workshop equipment required

♦ Torque Wrench 1331 5-50Nm - VAG1331-

Note

♦ *Do not use rust remover, contact spray or grease because the lack of friction will cause the torque to be exceeded when installing and this will lead to the threaded connection breaking.*

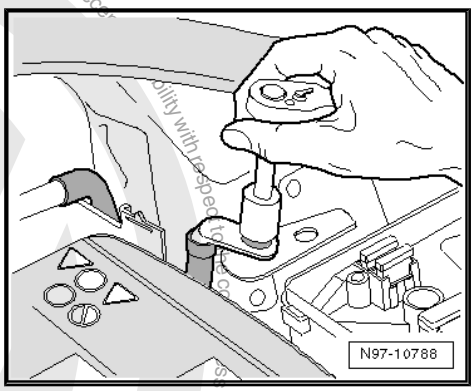
♦ *The gray sanding pads are for slight contamination and suitable for "soft surfaces". The red sanding pads are for heavy contamination and suitable for "hard surfaces".*

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to *⇒ “1.3 Warnings and Safety Precautions”, page 3* *.*

– Disconnect battery.

– Loosen the cap nut and remove the wiring eyelet from the threaded connection.
– Check the wiring eyelet for corrosion, contamination, etc.
– Select the corresponding adapter and the corresponding sanding pad.



Note

The sanding block can be used instead.

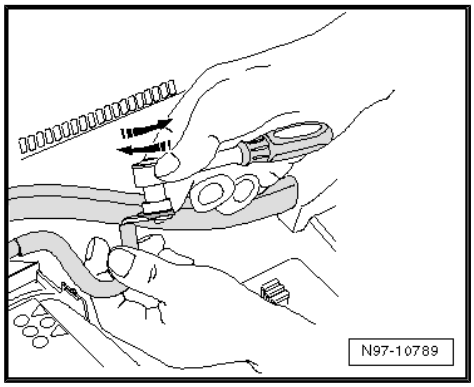
Caution

Make sure the tin layer is not worn down too much and the copper is not visible. A galvanic element can form from this, destroying the metal and causing incorrect repairs.

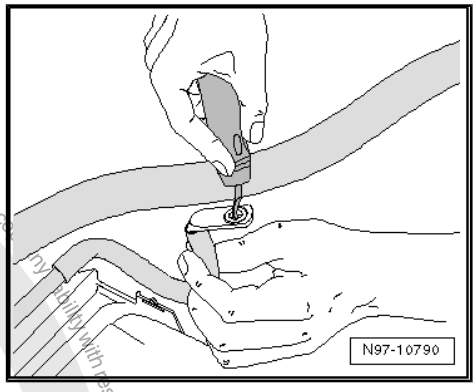
Note

Due to the different thicknesses of the tin layer, the cleaning process must be performed in several steps and a visual inspection of the wiring eyelet between steps is necessary.

– Insert the adapter in the wiring eyelet and sand off the corrosion and contamination with circular motions.
– Check the wiring eyelet and sand it again if necessary.



– If necessary, remove the burr on the wiring eyelet with the deburring tool.
– Reinstall the wiring eyelet with the specified torque. Refer to



Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.

– Apply protection material to the connection. Refer to ⇒ “3.1.4 Protecting”, page 156 .
– Reconnect the battery.

WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

– Reprogram the window regulators, enter the radio code, set the clock and, if necessary, code control modules that have error messages.

3.1.2 Threaded Connections, Repairing

Special tools and workshop equipment required

♦ Torque Wrench 1331 5-50Nm - VAG1331-

Note

♦ *Do not use rust remover, contact spray or grease because the lack of friction will cause the torque to be exceeded when installing and this will lead to the threaded connection breaking.*
♦ *The gray sanding pads are for slight contamination and suitable for "soft surfaces". The red sanding pads are for heavy contamination and suitable for "hard surfaces".*

WARNING

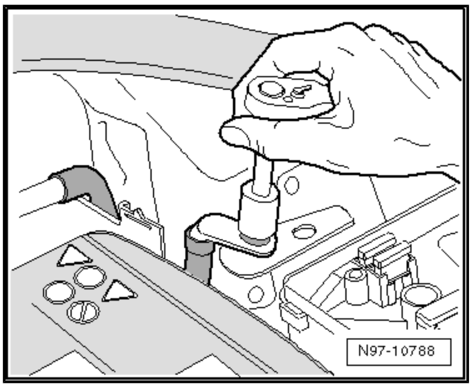
Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

– Disconnect battery.

– Loosen the cap nut and remove the wiring eyelet from the threaded connection.

– Check the threaded connection for corrosion, contamination, etc.

– Select the corresponding adapter and the corresponding sanding pad for the threaded connection.



⚠ Caution

Make sure the tin layer is not worn down too much and the copper is not visible. A galvanic element can form from this, destroying the metal and causing incorrect repairs.

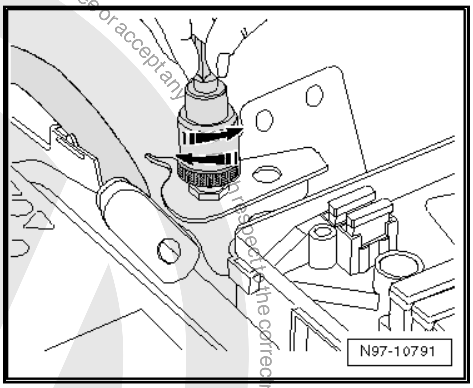
ℹ Note

Due to the different thicknesses of the tin layer, the cleaning process must be performed in several steps and a visual inspection of the wiring eyelet between steps is necessary.

– Place the adapter on the threaded connection and sand off the corrosion and contaminants with circular movements.

– Check the threaded connection and sand it again if necessary.

– Retighten the connection and, if necessary, the anti-rotation protection to the specified torque. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.



ℹ Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.

– Apply protection material to the threaded connection. Refer to ⇒ “3.1.4 Protecting”, page 156 .

– Reconnect the battery.

⚠ WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3 .

– Reprogram the window regulators, enter the radio code, set the clock and, if necessary, code control modules that have error messages.

3.1.3 Battery Terminal Clamp and Battery Terminal, Cleaning

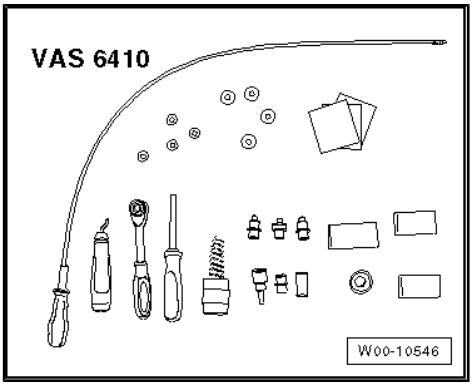
Special tools and workshop equipment required

♦ Torque Wrench 1331 5-50Nm - VAG1331-

♦ Contact Surface Cleaning Set - VAS6410-

The -VAS6410- makes optimal repair quality possible in the realm of vehicle electronics. Using the tools, service work can be performed in the area of the contact sensor on the threaded connection wiring harnesses in the high current circuit (starter and

charging current). The -VAS6410- is adapted to the vehicle structural measurements and ensures correct servicing and a comfortable procedure.



Note

The illustrations of the service work only serve as examples.

Contact Surface Cleaning Set VAS6410

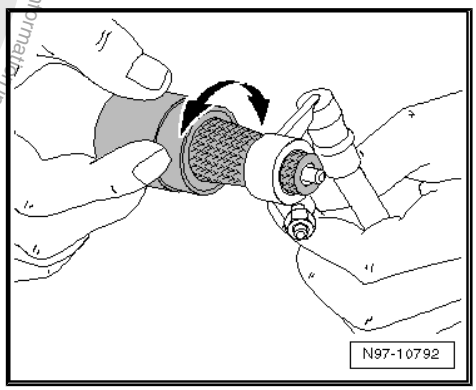
Note

Do not use rust remover, contact spray or grease because the lack of friction will cause the torque to be exceeded when installing and this will lead to the threaded connection breaking.

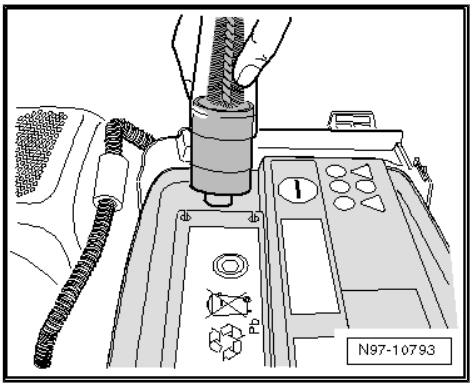
WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

– Disconnect battery.
– Check the battery terminal and the battery post for corrosion or dirt.
– The battery terminal clamp is cleaned with the battery terminal cleaner wire brush using circular motions.



– The battery terminal is cleaned with the bottom side of the terminal cleaner using circular motions.



WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions", page 3 .

– Reconnect the battery and tighten the terminals to the specified torque.

Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.

3.1.4 Protecting

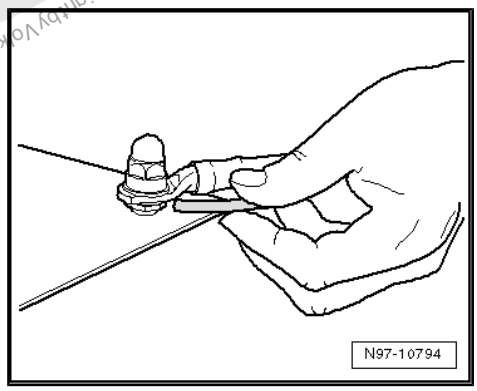
Caution

Missing protection leads to the electrical system damage.

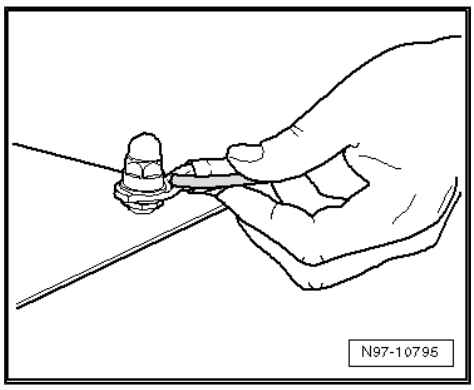
Note

- *All threaded connections must be tightened to the specified torque.*
- *When applying protection, always use the accompanying hose on the protection container.*
- *Protection wax is used in the cool area.*
- *Cavity protection wax is used in the warm area.*
- *The protection material draws itself into the affected places by capillary action.*

– Hold the injector under the wiring eyelet and spray all around the pins.



– Hold the injector above the wiring eyelet and spray all around the pins and wiring eyelet.



4 Heated Oxygen Sensor, Replacing

⇒ “4.1 4-Pin Heated Oxygen Sensor (HO2S), Removing and Installing”, page 157

⇒ “4.2 6-Pin Universal Oxygen Sensor, Removing and Installing”, page 158

⇒ “4.3 Oxygen Sensor Unit Protective Pipes”, page 158

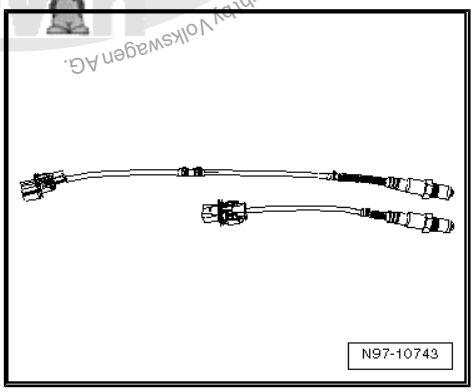
4.1 4-Pin Heated Oxygen Sensor (HO2S), Removing and Installing

Note

- *Do not repair the heated oxygen sensor wires. Repairing may result in malfunctions.*
- *Use the faulty sensor as a guide for installing all of the accompanying attachments, cable ties or marking bands.*
- *If necessary, identify the heated oxygen sensor (HO2S) using the protective tube. Refer to ⇒ “4.3 Oxygen Sensor Unit Protective Pipes”, page 158 .*

– Remove the faulty oxygen sensor.

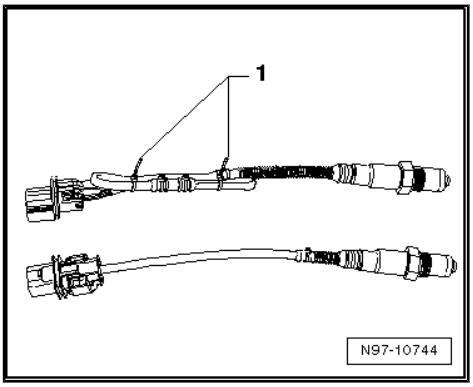
– Lay both of the oxygen sensor next to each other so the sensor housings are the same level.



– Tie the excess length of the sensor (approximately 50 to 250 mm) back so it is the same length as the faulty sensor and secure it with cable ties -1-.

– Check if the oxygen sensor connector housing is compatible with the vehicle electrical system side.

– If necessary, replace the vehicle electrical system connector with the provided oxygen sensor connector housing. Refer to ⇒ “2.7 Contact Housings and Connectors, Repairing”, page 141 .



Note

- *Only replace the connector housing on older vehicles. The connector housing is correct on new vehicles.*
- *Check the pin assignment. The pins in the new connector housing are color coded.*
- *The packaging for the new heated oxygen sensor contains additional information.*

– Install the new oxygen sensor in the vehicle.

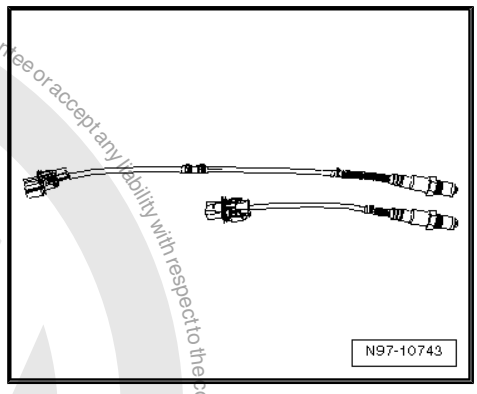
4.2 6-Pin Universal Oxygen Sensor, Removing and Installing

Note

- *Use the faulty sensor as a guide for installing all of the accompanying attachments, cable ties or marking bands.*
- *Do not crimp or cut the wires otherwise the functionality of the heated oxygen sensor (HO2S) will be diminished.*

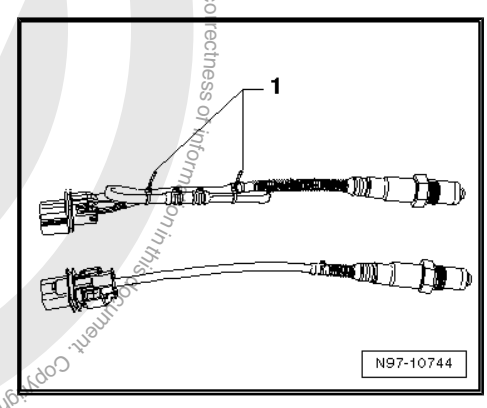
– Remove the old heated oxygen sensor (HO2S).

– Lay both of the oxygen sensor next to each other so the sensor housings are the same level.



– Tie the excess length of the sensor (approximately 50 to 250 mm) back so it is the same length as the faulty sensor and secure it with cable ties -1-.

– Install the new oxygen sensor in the vehicle.



4.3 Oxygen Sensor Unit Protective Pipes

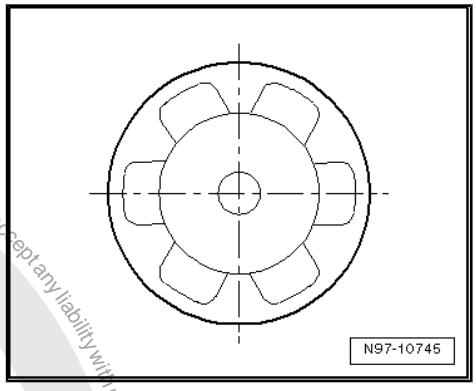
Note

In addition to using the part number, the protective pipe can also be used for identification.

Version D1, 6 openings, 3.5 mm each

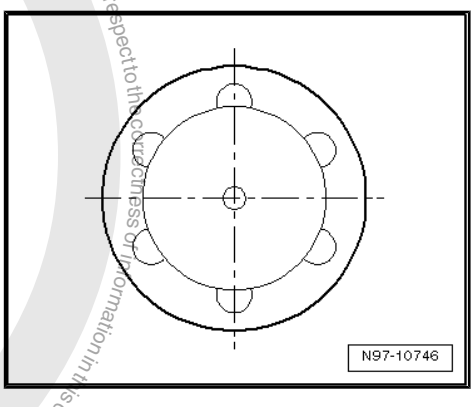
Only used with the 4-pin oxygen sensor

Version D2, 6 openings, 2 mm each

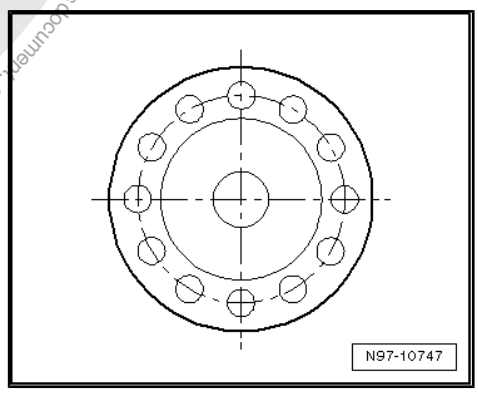


Used with 4-pin and 6-pin universal oxygen sensors.

Version D4, 12 openings, 1.4 mm each



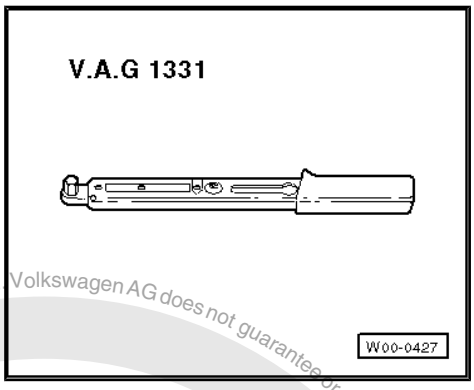
Used with 4-pin and 6-pin universal oxygen sensors.



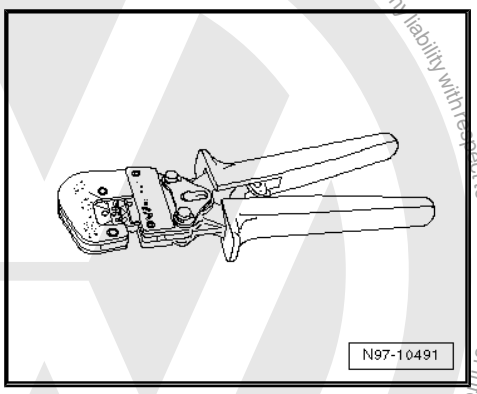
5 Special Tools

Special tools and workshop equipment required

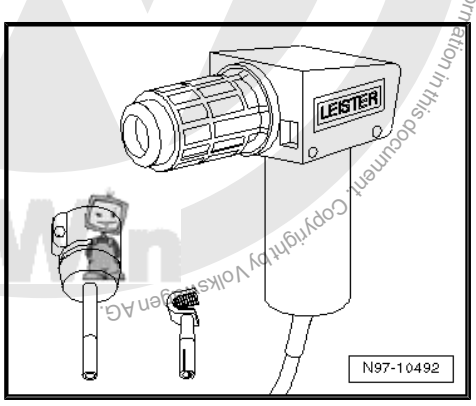
- Torque Wrench 1331 5-50Nm - VAG1331-



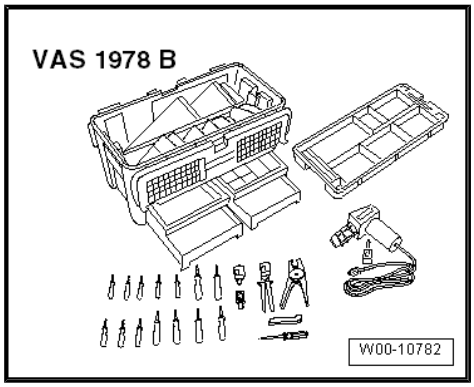
- Crimping Pliers, Complete - VAS1978/1A-
- Exchangeable Head, 0.35mm² - 2.5mm² - VAS1978/1-1-



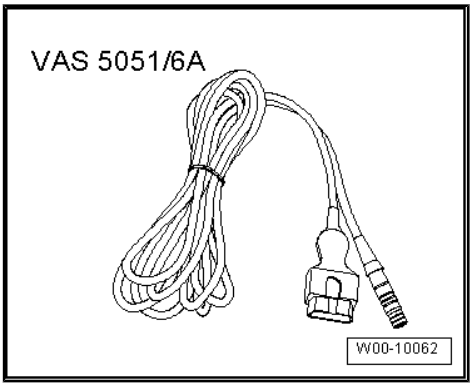
- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-



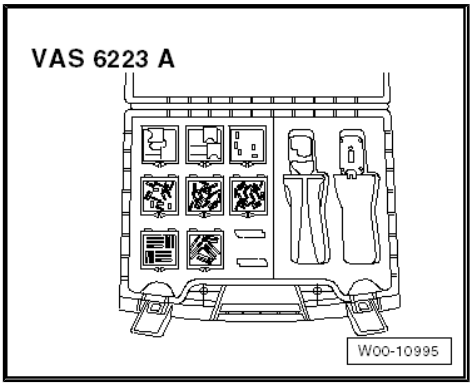
- Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- from the Wiring Harness Repair Set - VAS1978B-



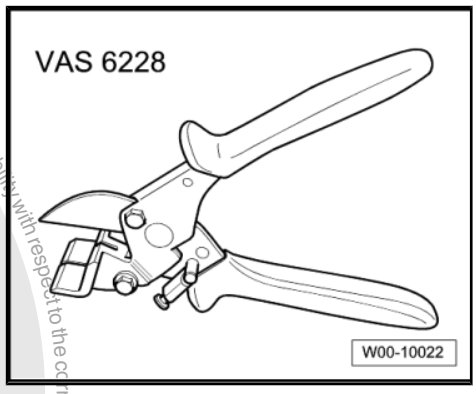
- Wiring Harness Repair - Blower - Shrink Element - VAS1978/15A- from the Wiring Harness Repair Set - VAS1978B-
- Diagnostic Cable - VAS5051/5A- (3 m) (10 ft.)
- Diagnostic Cable - VAS5051/6A- (5 m) (16 ft.)



- Fiber Optic Pliers Repair Set - VAS6223A-



- Air Hose Pliers - VAS6228-



- Repair Set, Aerial Cable - VAS6720-

Wiring Harness Repair Set VAS631003 - VAS631003-

6 Revision History

DRUCK NUMBER: K0059101321

Factory Edition	Edit Edition	Job Type	Feedback	Notes	Quality Checked By
01.2018	03/30/2018	Factory Update	N/A		Eric P.
10.2017	11/30/2017	Factory Update	N/A		Eric P.
06.2017	08/11/2017	Factory Update	N/A		Eric P.
05.2017	06/19/2017	Factory Update	N/A		Eric P.
04.2017	05/05/2017	Factory Update	N/A		Eric P.
11.2016	01/26/2017	Factory Update	N/A		Joe Y
08.2016	08/26/2016	Factory Update	N/A	Factory update - Added vehicles to metadata	Eric P.
05.2016	06/13/2016	Factory Update	N/A	Factory update - Only added vehicles to metadata that are not for NAR.	Eric P.
03.2016	04/25/2016	Factory Update	N/A		Eric P.
06.2015	7/2/2015	Factory Update	N/A		Jim H
04.2015	5/8/2015	Factory Update	N/A		Jim H
	10/20/2014	Factory Update	N/A		Tom P
	08/14/2014	Factory Update	N/A		Joe Y

Factory Edition	Edit Edition	Job Type	Feedback	Notes	Quality Checked By
	6/11/2013	Factory Update CO	N/A		Joe Y

Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Volkswagen retailer or other qualified shop. We especially urge you to consult an authorized Volkswagen retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Volkswagen.

- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.

- Volkswagen is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Volkswagen retailer parts department for the latest information.

- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the VAG 1551 Scan Tool (ST).

- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.

- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.

- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.

- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.

- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.

- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.

- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.

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Cautions & Warnings

- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly; do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Volkswagen specifications. Makeshift tools, parts and procedures will not make good repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.
- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Volkswagen Service technicians should test, disassemble or service the airbag system.

Cautions & Warnings

- Do not quick-charge the battery (for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached. Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Volkswagen Service technicians using the VAG 1551 Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

I have read and I understand these Cautions and Warnings.

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