

Repair Manual

Bora 1999 ➤ , Bora Variant 1999 ➤ ,
CC 2010 ➤ , CC 2012 ➤ , Eos 2006 ➤ ,
Golf 1998 ➤ , Golf 2004 ➤ ,
Golf 2009 ➤ , Golf 2013 ➤ ,
Golf Cabriolet 2012 ➤ ,
Golf Plus 2005 ➤ , Golf Plus 2009 ➤ ,
Golf Sportsvan 2015 ➤ ,
Golf Variant 1998 ➤ ,
Golf Variant 2014 ➤ , Lupo 1999 ➤ ,
Lupo 3L 1999 ➤ , Passat 1997 ➤ ,
Passat 2006 ➤ , Passat 2011 ➤ ,
Passat 2015 ➤ ,
Passat (NMS - US) 2012 ➤ ,
Passat CC 2009 ➤ ,
Passat Variant 1997 ➤ ,
Passat Variant 2011 ➤ ,
Passat Variant 2015 ➤ , Phaeton 2003 ➤ ,
Polo 1995 ➤ , Polo 2002 ➤ ,
Polo 2010 ➤ , Polo 2014 ➤ ,
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 ➤ , Tiguan 2008 ➤ ,



**Touareg 2003 ➤ , Touareg 2010 ➤ ,
Touareg 2015 ➤ , Touran 2003 ➤ ,
XL1 2015 ➤ , e-Golf 2014 ➤ ,
e-up! 2014 ➤ , up! 2012 ➤**

Electrical Equipment General Information

Edition 04.2015





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.



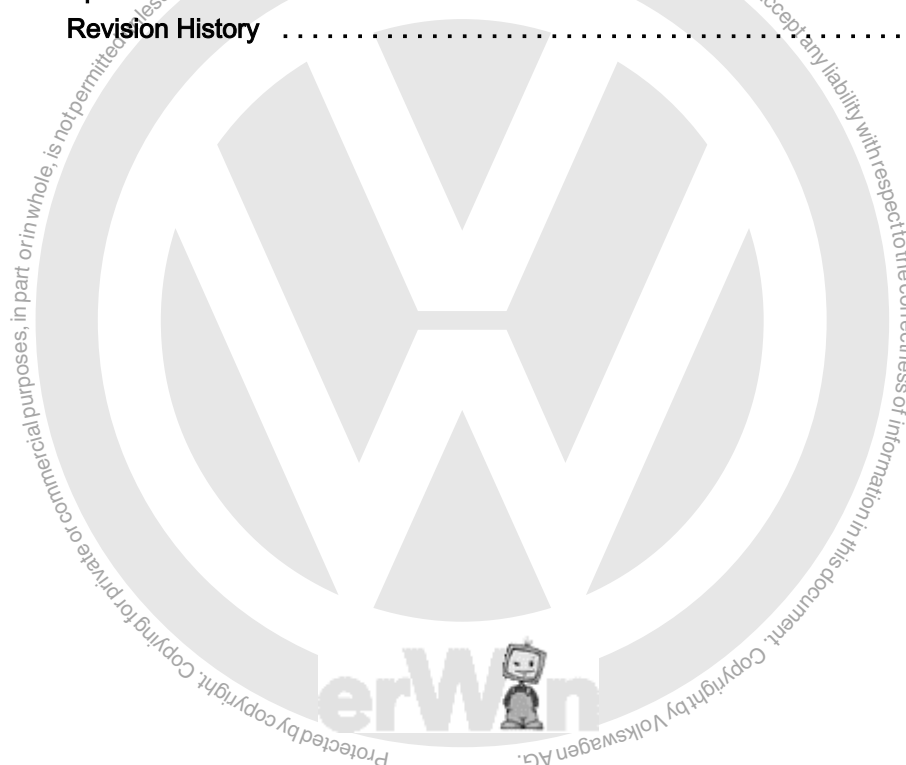


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27 – Battery, Starter, Generator, Cruise Control

1 Battery

(Edition 04.2015)

⇒ [“1.1 Battery General Information”, page 1](#)

⇒ [“1.2 Types of Batteries”, page 1](#)

⇒ [“1.3 Warnings and Safety Precautions”, page 3](#)

⇒ [“1.4 Battery Post/Terminal”, page 5](#)

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 Visual Indicator, Standard

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

⇒ ["2.4 Visual Display in Battery Cover, Checking", page 8](#) .

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 battery electrolyte level.

Visual indicator, checking. Refer to

⇒ ["2.4 Visual Display in Battery Cover, Checking", page 8](#) .



Note

"EFB" batteries are being installed in smaller gasoline engines with the Stop/Start system and a manual transmission 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 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.





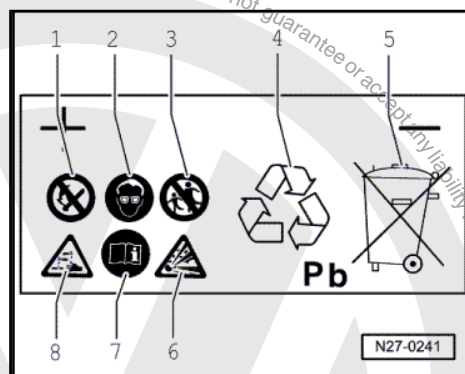
WARNING

- ◆ *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 eyewear 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 Airbag System



WARNING

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

Exceptions: On vehicles with a battery in the passenger compartment, 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.*

Make sure in this case to keep oneself away from 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's 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”, page 6](#)

⇒ [“2.2 Batteries, Checking”, page 6](#)

⇒ [“2.3 Visual Inspection”, page 7](#)

⇒ [“2.4 Visual Display in Battery Cover, Checking”, page 8](#)

⇒ [“2.5 Battery Tester VAS6161”, page 10](#)

⇒ [“2.6 Midtronics Battery Tester MCR340VKT”, page 15](#)

⇒ [“2.7 Current Draw Test”, page 19](#)

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

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

2.2 Batteries, Checking

⇒ [“2.2.1 Battery with Visual Indicator, Checking”, page 6](#)

⇒ [“2.2.2 AGM Battery, Checking”, page 7](#)

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
⇒ [“2.4.1 3-Color Visual Indicator, Checking”, page 8](#); or
“2-color”. Refer to
⇒ [“2.4.2 2 Color Visual Indicator, Checking”, page 9](#).



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 ➔ ["2.5 Battery Tester VAS6161 ", page 10](#) .
4. Depending on the battery test result, "perform a current draw test". Refer to ➔ ["2.7 Current Draw Test ", page 19](#) .

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 ➔ ["2.5 Battery Tester VAS6161 ", page 10](#) .
3. Depending on the battery test result, "perform a current draw test". Refer to ➔ ["2.7 Current Draw Test ", page 19](#) .

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 or tests, perform a visual check of the battery condition, battery terminals and secure mounting of battery.



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.

2.4 Visual Display in Battery Cover, Checking

⇒ ["2.4.1 3-Color Visual Indicator, Checking", page 8](#)

⇒ ["2.4.2 2 Color Visual Indicator, Checking", page 9](#)

2.4.1 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 ⇒ ["2.5 Battery Tester VAS6161", page 10](#).*
- ◆ *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.

2.4.2 "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 state of charge was discontinued on the "2-color".

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

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 ➔ "2.5 Battery Tester VAS6161", page 10 .*
- ◆ *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.

2.5 Battery Tester - VAS6161-

⇒ [“2.5.1 Battery Tester VAS6161 Device Description”, page 10](#)

⇒ [“2.5.2 Battery Test, Performing using Battery Tester VAS6161”, page 11](#)

⇒ [“2.5.3 Warranty Test, Performing”, page 12](#)

⇒ [“2.5.4 Maintenance Test, Performing”, page 12](#)

⇒ [“2.5.5 Service Test, Performing”, page 13](#)

⇒ [“2.5.6 Explanation of Test Results”, page 14](#)

⇒ [“2.5.7 Evaluating Test Results”, page 14](#)

2.5.1 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.

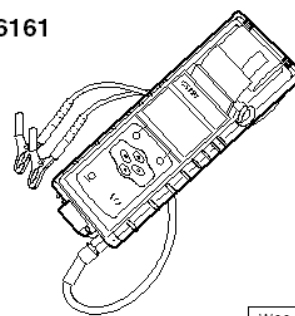
An optional 2D scanner is available to carry over the data from the battery 2D code.



Note

Read the Battery Tester - VAS6161- Operating Instructions.

VAS 6161



W00-10793

2.5.2 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 the following:
 - ♦ Check the original batteries in the warranty mode. Refer to [⇒ “2.5.3 Warranty Test, Performing”, page 12](#).
 - ♦ Check the replacement batteries in the service mode. Refer to [⇒ “2.5.5 Service Test, Performing”, page 13](#).



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.*

2.5.3 Warranty Test, Performing



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 “Warranty Test”.
- Select “inside the vehicle” or “outside of the vehicle”.
- Select “at the battery pole” 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 pole until the temperature is stable.
- Start the test.
- Print out the test report if necessary.

2.5.4 Maintenance Test, Performing



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 “Maintenance Test”.
- 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 pole” 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.

2.5.5 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.





2.5.6 Explanation of Test Results

- 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 on the tester
- 9 - Selected battery.



Note

The printed test results are required for warranty claims.

VAS 6161
EXP
U1.00 EU

TESTBERICHT

VOLKSWAGEN AG
K-SCH
38436 WOLFSBURG
05361-923083
125-500VZ
WERKSTATT ID.
399579A
23/02/2009
10:29

GARANTIE-PRÜFUNG

BATTERIE GUT

SPANNUNG GEMESSEN 12.5V
420 A(DIN)

INNEN-TEMPERATUR 38°C

FAHRZEUG
BITT. STANDORT
TEST POSITION
BATTERIETYP

1
2
3
4
5
6
7
8
9

N27-10799

2.5.7 Evaluating Test Results

Evaluating Battery Test Results for 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 21 . If necessary, search for the cause of the discharging
Perform a current draw test	Perform a current draw test. Refer to "2.7 Current Draw Test", page 19 . Charge the battery completely (refer to "3 Battery, Charging", page 21) 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 Battery Test Results for Maintenance Test

Battery Test Result	Measure
Battery good	No measure
Charge the battery immediately.	Fully charge the battery. Refer to "3 Battery, Charging", page 21 .
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.

2.6 Midtronics Battery Tester - MCR340VKT-

⇒ ["2.6.1 General Information", page 15](#)

⇒ ["2.6.2 Battery, Testing using Midtronics Battery Tester MCR340VKT", page 16](#)

⇒ ["2.6.3 Evaluating Test Results", page 17](#)

⇒ ["2.6.4 Midtronics Battery Tester MCR340VKT, Troubleshooting", page 18](#)

2.6.1 General Information



WARNING

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.

2.6.2 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 ⇒ "2.6.1 General Information", page 15.
- 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 - VASRX3000- 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.

2.6.3 Evaluating Test Results

Battery Test Result

Battery Test Result	Measure
Battery good	None
Good - charge	Charge battery. Refer to ⇒ "3.5 Battery Tester Charger Kit GRX3000VAS", page 52 .



Battery Test Result	Measure
Use in charge	Charge battery. Refer to ⇒ "3.5 Battery Tester Charger Kit GRX3000VAS" , page 52 .
Replace the battery.	Replace the battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery, Removing and In- stalling
Battery cell defective	Replace the battery. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery, Removing and In- stalling

2.6.4 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	<ul style="list-style-type: none"> – Make sure the battery tester terminals are attached securely to the battery terminals. – Make sure the battery pole is tightened to the tightening specification and is not corroded. – Charge battery. Refer to ⇒ "3.5 Battery Tester Charger Kit GRX3000VAS", page 52 .
System noises	<ul style="list-style-type: none"> – 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 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
⇒ ["2.6.2 Battery, Testing using Midtronics Battery Tester MCR340VKT"](#), [page 16](#) .



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.

2.7 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 22 .
- ◆ Battery Charger - VAS5900- . Refer to ⇒ "3.2 Battery Charger VAS5900", page 27 .
- ◆ Battery Charger - VAS5903- . Refer to ⇒ "3.3 Battery Charger VAS5903", page 37 .

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 Battery Tester - 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 Battery Tester with Printer - VAS5097A- shows the following:
 - 1 - Starting power sufficient
 - 2 - Starting power insufficient
 - 3 - Starting power very insufficient
 - 4 - Not able to test - charge the battery and test again- and in cases in which the unit does not switch on (no LED, no printout)
or
- ◆ the test result from the Battery Tester - 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 [⇒ "3.7 Severely Discharged Batteries", page 56](#)) can become operable again by further charging.

Test Prerequisites

- ◆ When charging a battery, the battery temperature must be at least $\geq +10^{\circ}\text{C}$ ($+50^{\circ}\text{F}$).
- ◆ 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 Battery Charger - VAS5095A- , the battery current draw must be measured with a current probe, for example, Test Instrument Set - Current Clamp - 100A - VAS6356/4A- . The Battery Charger - VAS5900- and the Battery Charger - VAS5903- indicate the current draw on the device. The Battery Charger - 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, $> 6.1\text{ A}$ 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 [⇒ "2.5.2 Battery Test, Performing using Battery Tester VAS6161", page 11](#) .

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 $< 5\text{ A}$), then replace the battery. Fill out the battery check sheet for warranty and goodwill cases.



3 Battery, Charging

⇒ [“3.1 Battery Charger VAS5095A ”, page 21](#)

⇒ [“3.2 Battery Charger VAS5900 ”, page 27](#)

⇒ [“3.3 Battery Charger VAS5903 ”, page 37](#)

⇒ [“3.4 Battery Charger VAS5906 ”, page 49](#)

⇒ [“3.5 Battery Tester Charger Kit GRX3000VAS ”, page 52](#)

⇒ [“3.6 Solar Battery Maintainer VAS6102A ”, page 56](#)

⇒ [“3.7 Severely Discharged Batteries”, page 56](#)

3.1 Battery Charger - VAS5095A-

⇒ [“3.1.1 Battery Charger VAS5095A Device Description”, page 21](#)

⇒ [“3.1.2 Battery, Charging with Battery Charger VAS5095A ”, page 22](#)

⇒ [“3.1.3 Severely Discharged Battery, Charging with Battery Charger VAS5095A ”, page 23](#)

⇒ [“3.1.4 Support Mode with Battery Charger VAS5095A ”, page 24](#)

⇒ [“3.1.5 Battery Charger VAS5095A Maintenance Charging”, page 26](#)

3.1.1 Battery Charger - VAS5095A- Device Description



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. Jump starting must not be used!

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 Battery Charger VAS5095A- are described. Refer to Battery Charger - VAS5095A- Operating Instructions for additional information.



Note

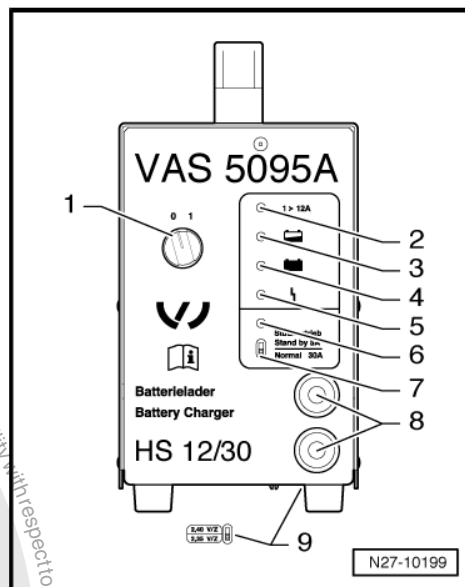
- ♦ *The effective charging current cannot be read out on this unit. The charging current must be measured externally with a current probe.*
- ♦ *Pay attention to the Battery Charger - VAS5095A- Operating Instructions.*

The Battery Charger - 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.

Battery Charger - 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-



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. 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 battery type setting on the battery type selector. Refer to
⇒ [“3.1.1 Battery Charger VAS5095A Device Description”, page 21](#) . 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 21](#) .

Charge current displays. Refer to
⇒ [Fig. “Battery Charger -VAS5095A- ””, page 22](#) -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. “Battery Charger -VAS5095A- ””, page 22](#) -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 21](#) .
- Remove the charger clamps from the battery terminals.

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



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
⇒ **"3.7 Severely Discharged Batteries", page 56**.
- ♦ 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. Jump starting must not be used!

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 22**.

3.1.4 Support Mode with Battery Charger - VAS5095A-

General Information

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

For more information. Refer to Battery Charger - VAS5095A- 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. 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.



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 terminals 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 touch **START/STOP** when battery cables are incorrectly connected! 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 positive terminal and the body ground. Likewise prevent contact between the battery terminals.

- 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.
- 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 21](#) . 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 Battery Support Mode

- Turn off the charger.
- 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.



3.1.5 Battery Charger - VAS5095A- Maintenance Charging



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. Jump starting must not be used!

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

These batteries must be replaced.

During maintenance charging, the Battery Charger - 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 22](#).



Note

- ◆ *If the battery is discharged by an electrical consumer during maintenance charging, the Battery Charger - 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-

⇒ ["3.2.1 Battery Charger VAS5900 Device Description", page 27](#)

⇒ ["3.2.2 Battery, Charging with Battery Charger VAS5900", page 28](#)

⇒ ["3.2.3 Service Charging with Battery Charger VAS5900", page 29](#)

⇒ ["3.2.4 Severely Discharged Batteries, Charging with Battery Charger VAS5900", page 32](#)

⇒ ["3.2.5 Support Mode with Battery Charger VAS5900", page 34](#)

⇒ ["3.2.6 Battery Charger VAS5900 Maintenance Charging", page 36](#)

3.2.1 Battery Charger - VAS5900- Device Description



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. Jump starting must not be used!

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 Battery Charger - VAS5900- are described. Refer to Battery Charger - VAS5900- Operating Instructions for additional information.



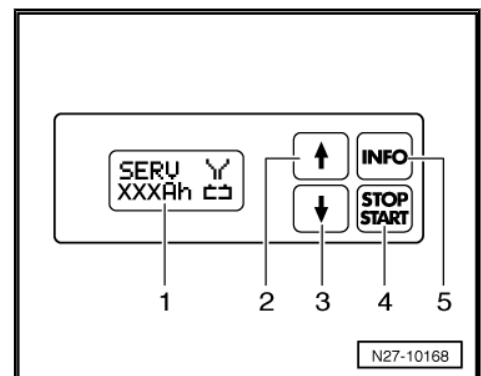
Note

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

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

Battery Charger - VAS5900-

- 1 - Display
- 2 - Adjustment button "Up"
- 3 - Adjustment button "Down"
- 4 -
- 5 -





3.2.2 Battery, Charging with Battery Charger - VAS5900-

Special tools and workshop equipment required

- ♦ Battery Charger - VAS5900-



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. Jump starting must not be used!

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 battery type using **INFO**.

The symbol -1- for "standard charge of wet batteries" or the symbol -2- for "standard charge of Gel/Absorbant Glass Mat (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.

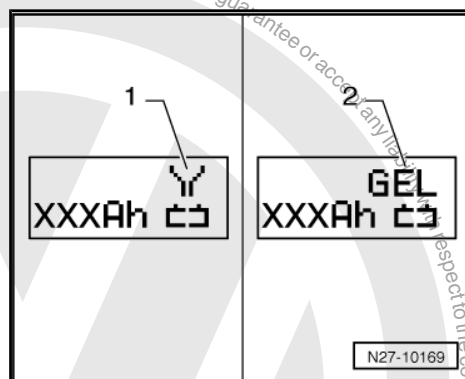


Note

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.

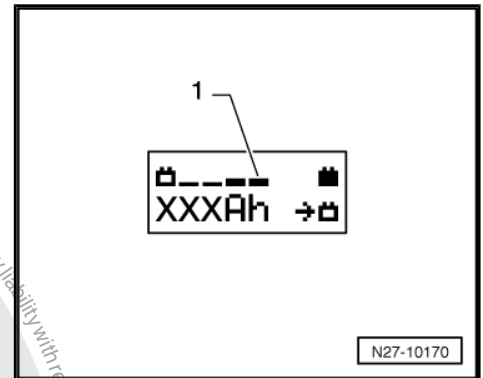
- Connect the black charging clamp "-" to the negative battery terminal.

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





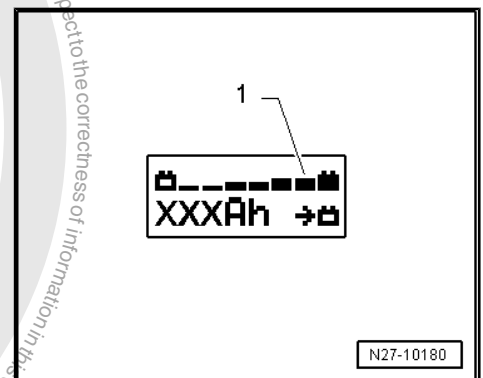
At a charge condition of approximately 80 - 85%, charging unit begins the "Final-charging". The fourth bar is indicated on the display -1-. The battery is now ready to be used.



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



- ◆ 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-

Special tools and workshop equipment required

- ◆ Battery Charger - VAS5900-



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. Jump starting must not be used!

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 Battery Charger - 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

➔ ["2.4 Visual Display in Battery Cover, Checking", page 8](#) .



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 27](#) .



- Select battery type using **INFO**.

The symbol -1- for “service charge of wet batteries” or the symbol -2- for “service charge of Gel/Absorbant Glass Mat (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.

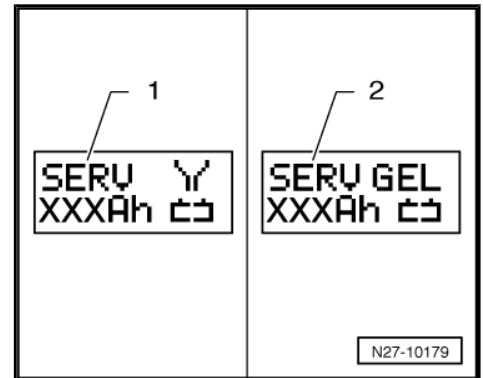


Note

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:

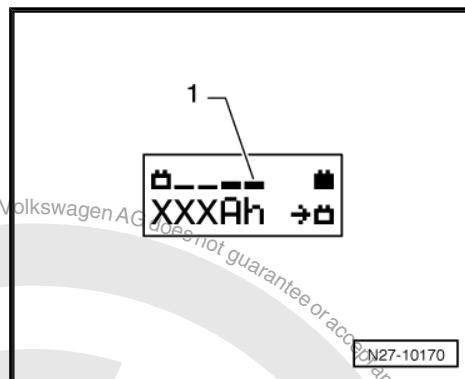
- 1 - Displayed voltage does not match the nominal voltage:
 - Hold the appropriate button "Up"  or "Down"  until the charging process begins.
- 2 - Displayed battery voltage does not match the nominal voltage - the charging process has already begun:
 - Press **START/STOP** twice.
 - Hold the appropriate 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-



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. Jump starting must not be used!

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 terminals correctly according to polarity!*
- ◆ *During the charging process, always set the operation mode corresponding with the battery. Refer to the Battery Charger - VAS5900- Operating Instructions!*
- ◆ *The severely discharged battery is not recognized by the charger. Refer to
⇒ ["3.7 Severely Discharged Batteries", page 56](#) .*
- ◆ *Do not touch **START/STOP** when battery cables are incorrectly connected! The charger can be damaged.*

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



Note

- ◆ *Observe the notes in chapter. Refer to
⇒ ["3.7 Severely Discharged Batteries", page 56](#) .*
- ◆ *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 27](#) .





- Select battery type using **INFO**.

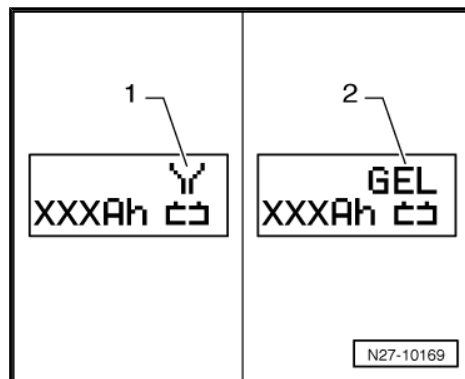
The symbol -1- for “service charge of wet batteries” or the symbol -2- for “service charge of Gel/Absorbant Glass Mat (AGM) batteries” is indicated in the display.

- 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 **START/STOP**.

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 polarity 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-

General Information

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



For more information. Refer to Battery Charger - VAS5900- 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. 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.



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 terminals 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 touch START/STOP when battery cables are incorrectly connected! 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 27 .***



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 terminals.

- 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 **START/STOP**.

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 polarity by pressing **START/STOP**.

The battery charger starts the battery support mode.

End 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 the battery is discharged by an electrical consumer during maintenance charging, the Battery Charger - 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. Jump starting must not be used!

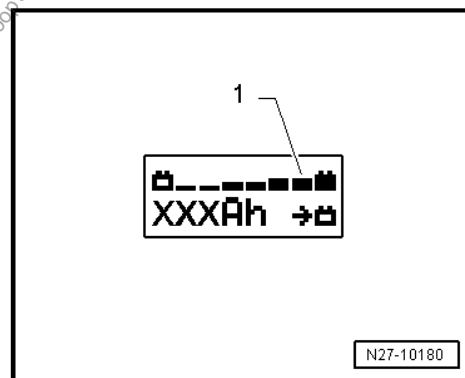
There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

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

- Proceed as when charging the battery. Refer to ➤ **"3.2.2 Battery, Charging with Battery Charger VAS5900", page 28 .**

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



3.3 Battery Charger - VAS5903-

➤ **"3.3.1 Battery Charger VAS5903 Device Description", page 37**

➤ **"3.3.2 Battery, Charging with Battery Charger VAS5903", page 38**

➤ **"3.3.3 Refresh Charging with Battery Charger VAS5903", page 40**

➤ **"3.3.4 Severely Discharged Battery, Charging with Battery Charger VAS5903", page 43**

➤ **"3.3.5 Support Mode with Battery Charger VAS5903", page 45**

➤ **"3.3.6 Battery Charger VAS5903 Maintenance Charging", page 47**

3.3.1 Battery Charger - VAS5903- Device Description



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. Jump starting must not be used!

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 Battery Charger - VAS5903- are described. Refer to Battery Charger - VAS5903- Operating Instructions for additional information.



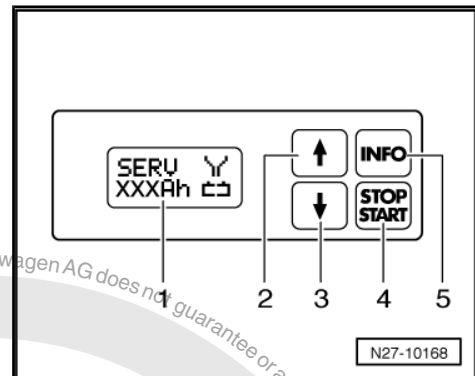
Note

Pay attention to the Battery Charger - VAS5903- Operating Instructions.

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

Battery Charger - VAS5903-

- 1 - Display
- 2 - Adjustment button "Up"
- 3 - Adjustment button "Down"
- 4 -
- 5 -



3.3.2 Battery, 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. Jump starting must not be used!

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 37](#).
- Select battery type using **INFO**.

The symbol -1- for “standard charge of wet batteries” or the symbol -2- for “standard charge of Gel/Absorbant Glass Mat (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.



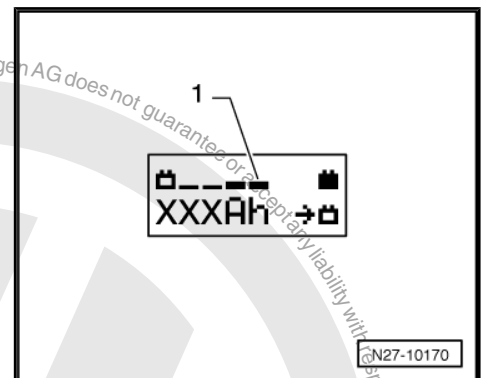
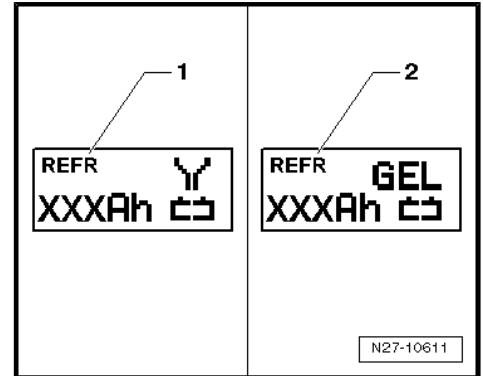
Note

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.



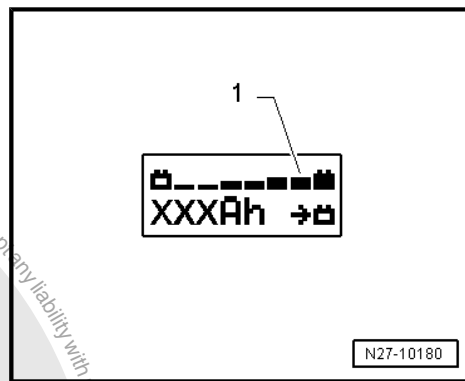


With a charge status of 100%, all bars are indicated on the display.



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 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 - VAS5900-



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. Jump starting must not be used!

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 Battery Charger - 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 37](#).



- Select battery type using **INFO**.

The symbol -1- for “refresh - charging wet batteries” or the symbol -2- for “refresh - charging of Gel/Absorbant Glass Mat (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.

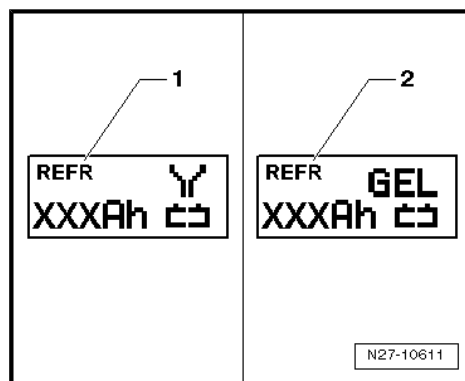


Note

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:

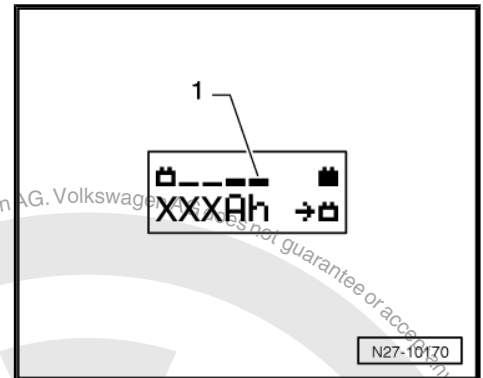
- 1 - Displayed voltage does not match the nominal voltage:
 - Hold the appropriate button "Up"  or "Down"  until the charging process begins.
- 2 - Displayed battery voltage does not match rated voltage - charging process has already begun:
 - Press **START/STOP** twice.
 - Hold the appropriate button "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-



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. Jump starting must not be used!

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

These batteries must be replaced.



Caution

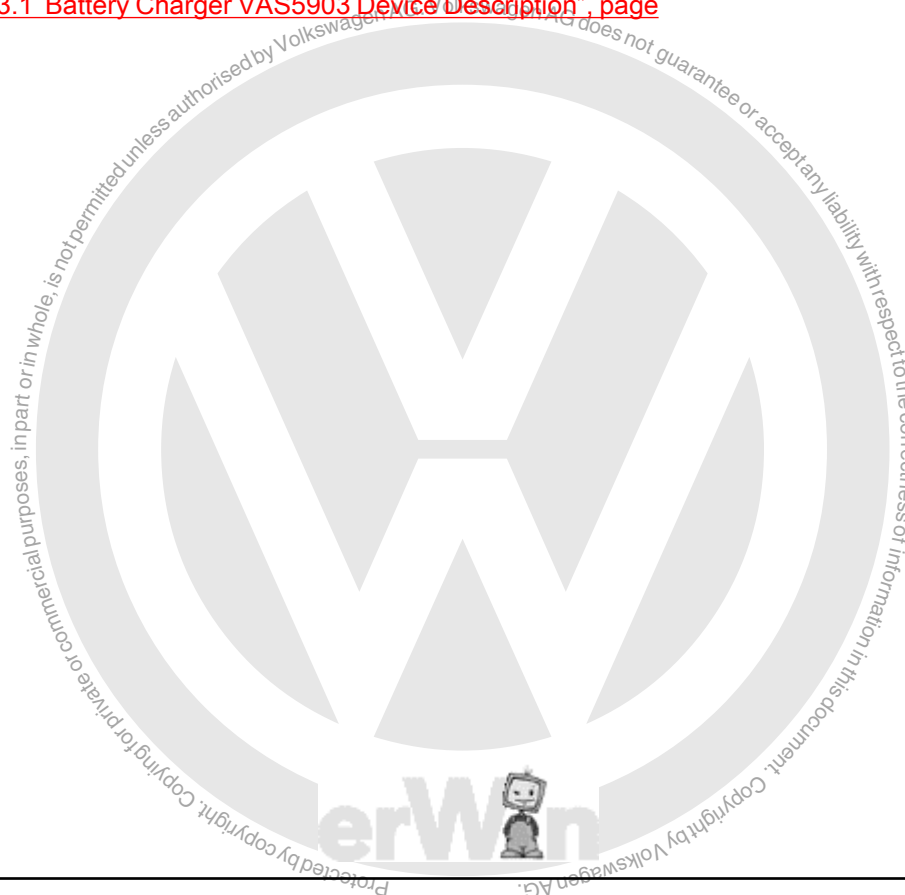
- ◆ *The polarity protection of the charger clamps is not active in the operation mode "charging severely discharged batteries/Support mode". Connect the charger clamps to the battery terminals correctly according to polarity!*
- ◆ *During the charging process, always set the operation mode corresponding with the battery. Refer to the Battery Charger - VAS5903- Operating Instructions!*
- ◆ *The severely discharged battery is not recognized by the charger. Refer to
⇒ ["3.7 Severely Discharged Batteries", page 56](#) .*
- ◆ *Do not touch **START/STOP** when battery cables are incorrectly connected! The charger can be damaged.*

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



Note

- ◆ *Observe the notes in chapter. Refer to
⇒ ["3.7 Severely Discharged Batteries", page 56](#) .*
- ◆ *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 37](#) .

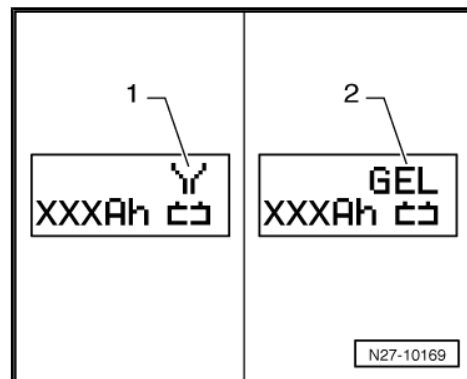




- Select battery type using **INFO**.

The symbol -1- for “service charge of wet batteries” or the symbol -2- for “service charge of Gel/Absorbant Glass Mat (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 **START/STOP**.

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 polarity 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-

General Information

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



For more information. Refer to Battery Charger - 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. 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.



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 terminals 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 touch START/STOP when battery cables are incorrectly connected! 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 27](#).



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 terminals.

- 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 **START/STOP**.

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 polarity by pressing **START/STOP**.

The battery charger starts the battery support mode.

End 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 the battery is discharged by an electrical consumer during maintenance charging, the Battery Charger - 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. Jump starting must not be used!

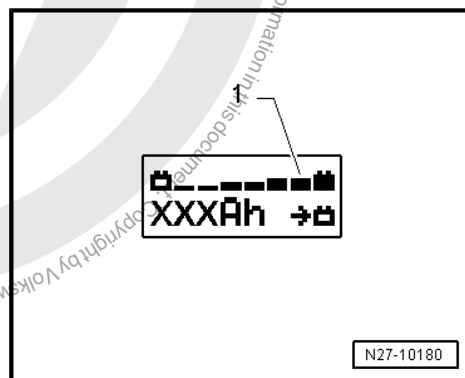
There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

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

- Proceed as when charging the battery. Refer to ➔ **"3.3.2 Battery Charging with Battery Charger VAS5903", page 38**.

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





3.4 Battery Charger - VAS5906-

⇒ ["3.4.1 General Information", page 49](#)

⇒ ["3.4.2 Battery, Charging with Battery Charger VAS5906", page 49](#)

3.4.1 General Information

Battery Charger - VAS5906-



WARNING

Risk of injury. Follow all Warnings and Safety Precautions. Refer to ⇒ ["1.3 Warnings and Safety Precautions", page 3](#).

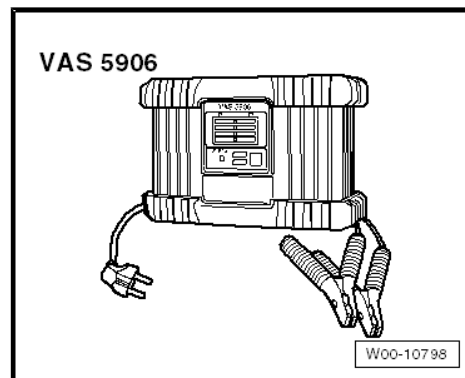


WARNING

Batteries that have a light yellow visual indicator do not have to be tested or charged. 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 Charger - 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 Battery Charger - 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.

For more information. Refer to Battery Charger - VAS5906- Operating Instructions.

3.4.2 Battery, Charging with Battery Charger - VAS5906-



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. Jump starting must not be used!

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

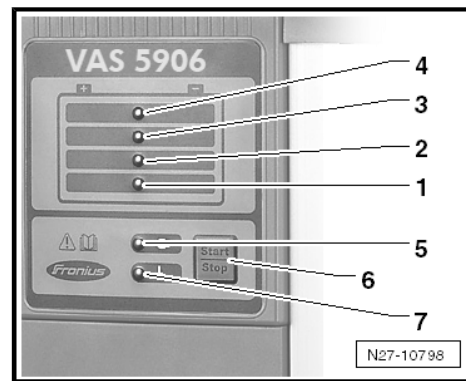
These batteries must be replaced.





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 .

- Turn 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 charge 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 Battery Charger - VAS5906- automatically switches to maintenance charging.



Caution

Sparks can result if the charging terminals are removed too early. Press the stop/start button to end the charging process.

- 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 Tester Charger Kit - GRX3000VAS-

⇒ [“3.5.1 Battery Tester Charger Kit GRX3000VAS General Description”, page 52](#)

⇒ [“3.5.2 Battery, Charging”, page 53](#)

⇒ [“3.5.3 Battery Tester Charger Kit GRX3000VAS Troubleshooting”, page 55](#)

3.5.1 Battery Tester Charger Kit - GRX3000VAS- General Description

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

The Battery Tester Charger Kit - 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 Battery Tester Charger Kit - GRX3000VAS- Operating Instructions.

Carefully read the Battery Tester Charger Kit - 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.



3.5.2 Battery, Charging

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.

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

- General information, checking. Refer to
⇒ [“3.5.1 Battery Tester Charger Kit GRX3000VAS General Description”, page 52](#) .
- 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 Battery Tester Charger Kit - 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 Battery Tester Charger Kit - GRX3000VAS- battery charger to a grounded socket.
- Switch the “ON/OFF” switch on the Battery Tester Charger Kit - 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 *Battery Tester Charger Kit - 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 Battery Tester Charger Kit - 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.
Charging is required	<ul style="list-style-type: none">◆ 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 Battery Tester Charger Kit - GRX3000VAS- battery charger, then refer to chapter. Refer to

⇒ [“3.5.3 Battery Tester Charger Kit GRX3000VAS Troubleshooting”, page 55](#).



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 Battery Tester Charger Kit - 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 Battery Tester Charger Kit - GRX3000VAS- Operating Instructions for more information.

3.5.3 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 Battery Tester Charger Kit - GRX3000VAS- Operating Instructions for messages not listed here.

Display Message	Measure
Check the connection	<ul style="list-style-type: none"> – Make sure the battery charger terminals are attached securely to the battery terminals. – Make sure the battery pole is tightened to the tightening specification and is not corroded.
Terminals connected?	Tester safety function <ul style="list-style-type: none"> – Connect the terminals to the battery before charging.
System noises	<ul style="list-style-type: none"> – 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 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 [“3.5.2 Battery, Charging”, page 53](#).



3.6 Solar Battery Maintainer - VAS6102A-

⇒ [“3.6.1 Solar Battery Maintainer VAS6102A Maintenance Charging”, page 56](#)

3.6.1 Solar Battery Maintainer - VAS6102A- Maintenance Charging

Solar Battery Maintainer - VAS6102A-

General Description

The Solar Battery Maintainer - VAS6102A- supports the vehicle electrical system and prevents the battery from self-discharging.

The Solar Battery Maintainer - VAS6102A- 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 Solar Battery Maintainer - VAS6102A- .

The Solar Battery Maintainer - VAS6102A- is connected to the diagnostic connection 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.

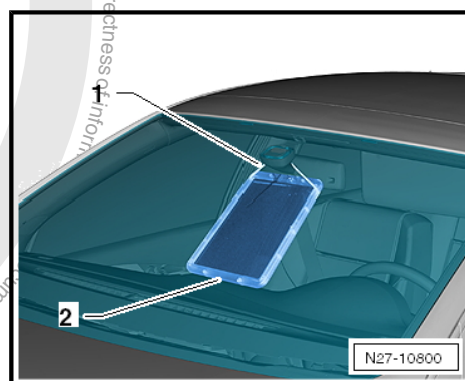
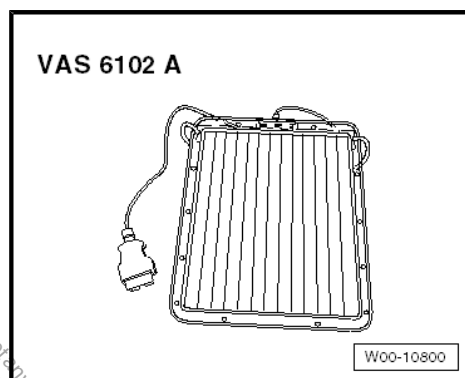
- Secure the Solar Battery Maintainer - VAS6102A- to the interior rearview mirror -1-.
- Lay the bottom on the instrument panel -2-.



Note

The Solar Battery Maintainer - VAS6102A- 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 Solar Battery Maintainer - VAS6102A- is close to the glass.
- Connect the Solar Battery Maintainer - VAS6102A- to the vehicle diagnostic connection. Connecting is the same as with the Vehicle Diagnostic Tester . Refer to [⇒ “1.1 Vehicle Diagnostic Tester , Connecting”, page 77](#) .
- Check the Solar Battery Maintainer - VAS6102A- function. The green LED shows the functionality of the Solar Battery Maintainer - VAS6102A- .



3.7 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 21](#).



4 Cruise Control System

⇒ ["4.1 Cruise Control System, Activating and Deactivating", page 58](#)

4.1 Cruise Control System, Activating and Deactivating

General Description

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

- Cruise control system can be activated/deactivated. Refer to ⇒ ["4.1 Cruise Control System, Activating and Deactivating", page 58](#).

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.

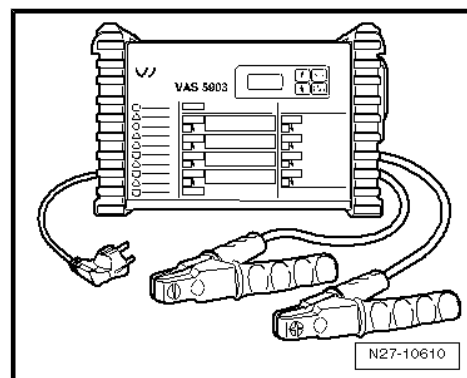
- Connect the Vehicle Diagnostic Tester . Refer to ⇒ ["1 Vehicle Diagnosis, Testing and Information Systems", page 77](#).
- On the Vehicle Diagnostic Tester , select "Guided Fault Finding".
- Using the "GO TO" button, select "Functions/Component selection" and the following menu options in sequence:
 - ◆ 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



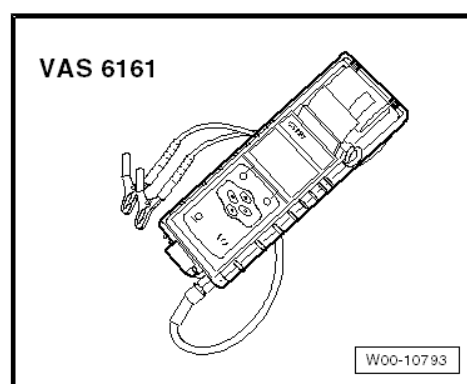
5 Special Tools

Special tools and workshop equipment required

- ◆ Battery Charger - VAS5903-



- ◆ Battery Tester - VAS6161-





92 – Wiper/Washer Systems

1 Washer Fluid Line Hose Connections

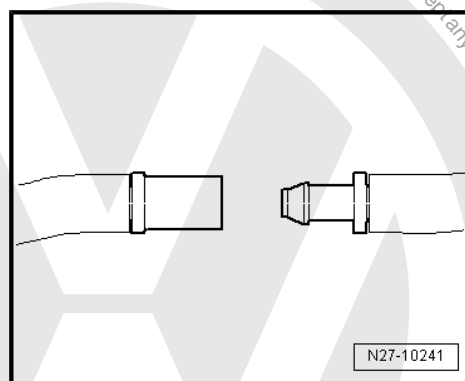
⇒ **"1.1 Windshield and Rear Window Washer System", page 60**

⇒ **"1.2 Headlamp Washer System", page 61**

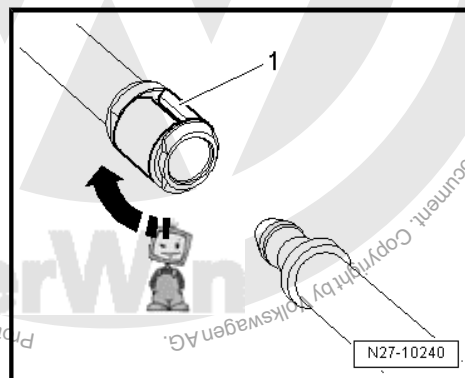
1.1 Windshield and Rear Window Washer System

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

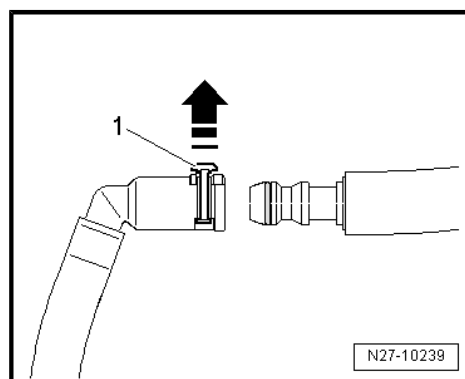
- To loosen the connection, pulling both halves of the coupling apart.
- To secure the connection, push both halves of coupling together until felt and heard to engage.



- To loosen the connection, turn the securing clip -1- 90° -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.

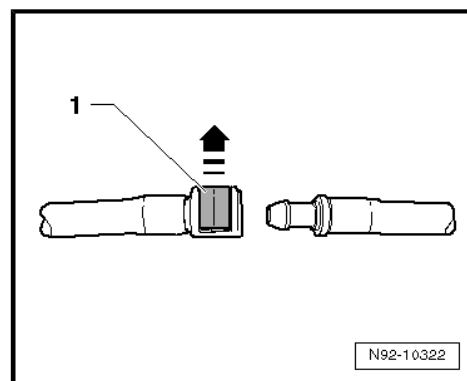


- To loosen the connection, lift the securing clip -1- approximately 1 mm -arrow- and then remove the hose connection.
- To secure the connection, attach the hose connection and press in the securing clip -1- until it engages.
- To secure the connection, attach the hose connection and press in the securing clip -1- until it engages.





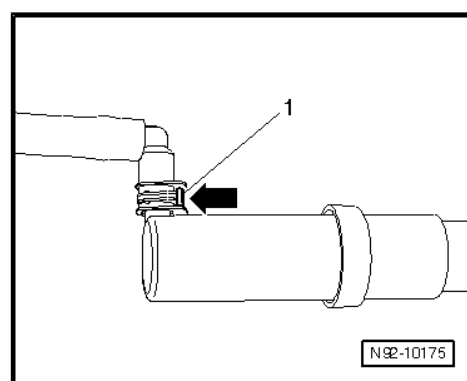
- To loosen the connection, pull the securing clip upward -1- -arrow- and remove the hose connection.
- To secure the connection, attach the hose connection and press in the securing clip -1- until it engages.



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", page 62

⇒ "2.2 Smooth Tube, Repairing", page 62

⇒ "2.3 Corrugated Tube, Repairing", page 62

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.

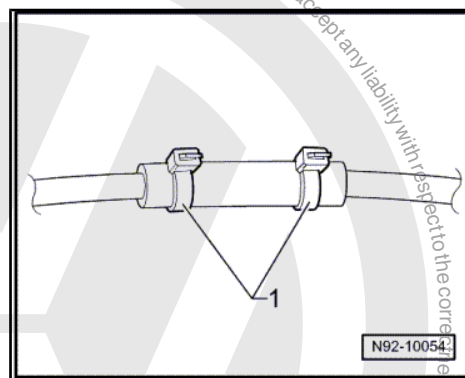
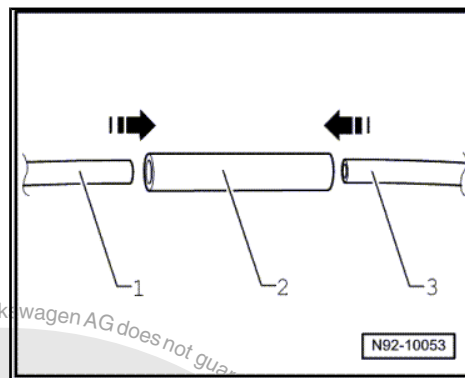
- ◆ The replacement parts can be found in the Parts Catalog.
- ◆ The replacement parts are available both for the repair of a smooth tube as well as for the repair of a corrugated tube.

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 -4-.



2.3 Corrugated Tube, Repairing

Special tools and workshop equipment required

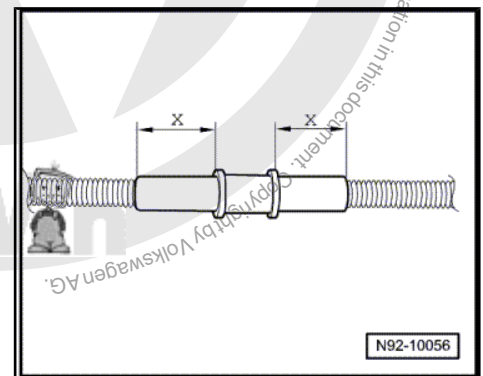
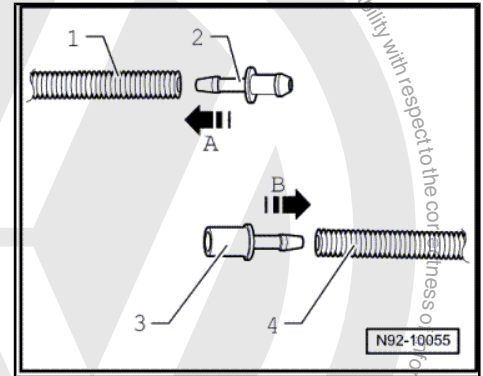
- ◆ Hot Air Blower - VAS5179- or
- ◆ Hot Air Blower - VAG1416/- or
- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-

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- -arrow A-.
- Carefully warm the end of the corrugated tube -4-.
- Insert the connecting piece -3- into the corrugated tube -4- -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.





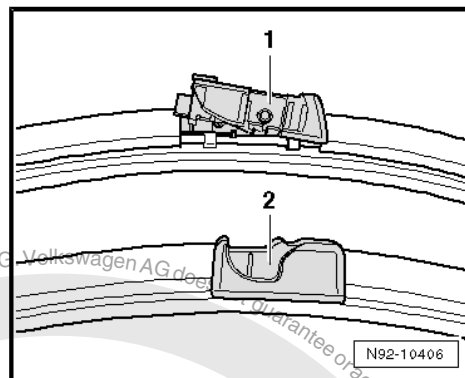
3 Joint-Free Wiper Blade Characteristics

Characteristics for Bosch and Federal Mogul

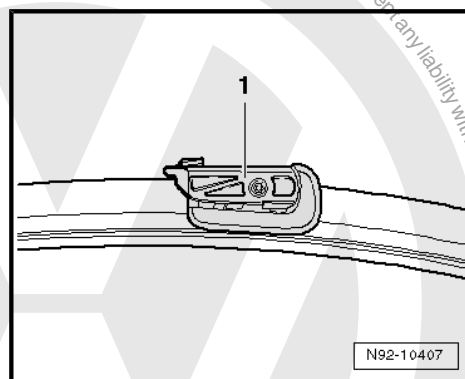
Check the manufacturer when replacing the wiper blades. Always replace them with blades made by the same manufacturer.

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

Bosch Wiper Blades -1 and 2-



Federal Mogul Wiper Blades -1-

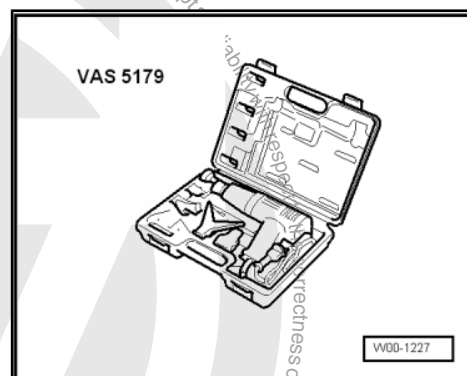




4 Special Tools

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:
- ◆ Notes on hazardous high voltage/currents. Refer to
- ◆ Notes on pressure, temperature and radiation/electric arc. Refer to
- ◆ Assembly instructions for HID headlamp bulbs. Refer to
- ◆ Disposal regulations for HID headlamp bulbs. Refer to



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 69](#)

⇒ [“1.2 Socket Illumination Bulb L42 , Removing and Installing”, page 69](#)

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 70](#) .

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 74](#) .



2 Cigarette Lighter - U1-

⇒ ["2.1 General Information", page 70](#)

⇒ ["2.2 Overview - Cigarette Lighter U1 ", page 71](#)

⇒ ["2.3 Cigarette Lighter Socket, Removing and Installing", page 71](#)

⇒ ["2.4 Cigarette Lighter Illumination Bulb L28 , Removing and Installing", page 74](#)

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

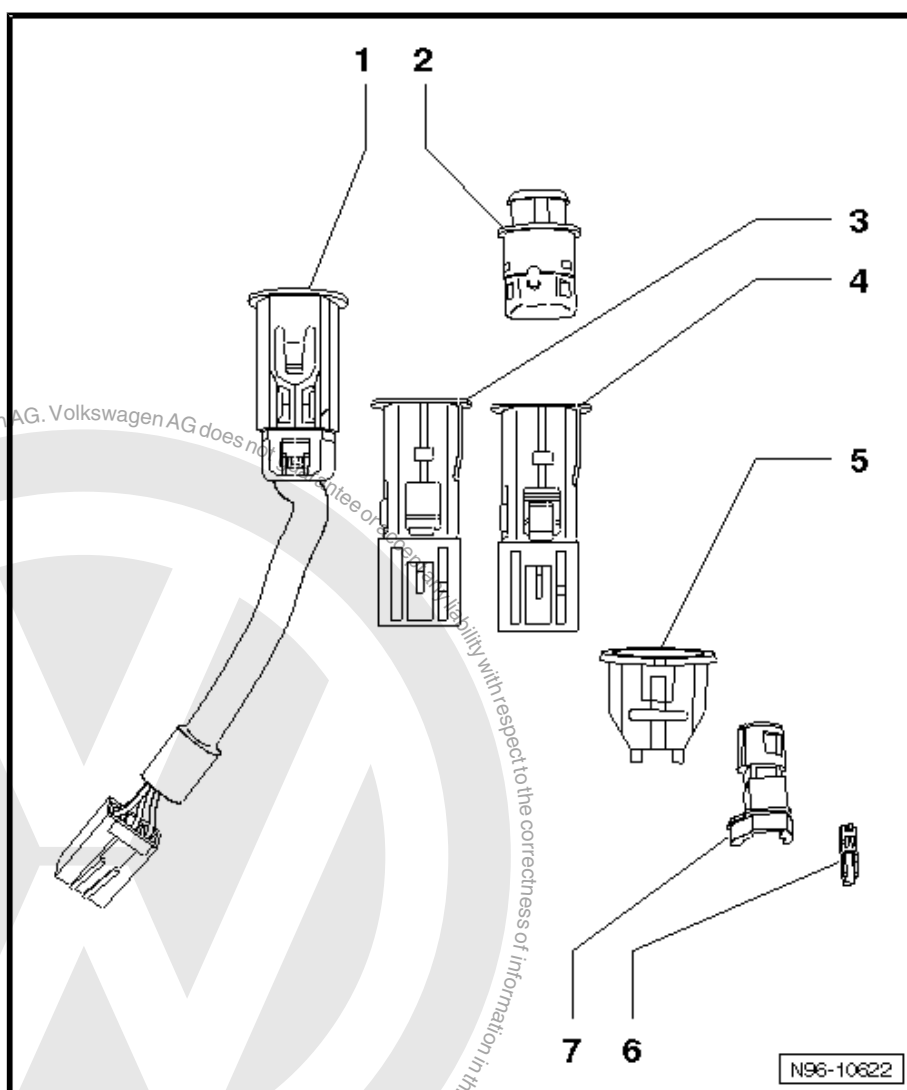
Using force to remove cigarette lighter sockets without illumination can result in damage to the mounting sleeve retainers.

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.

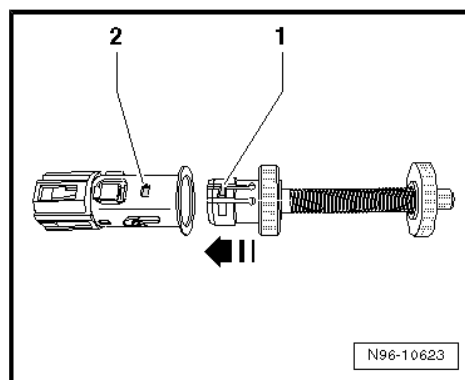


Caution

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 -arrow- in receptacle so retainers -1- engage in recesses -2-.





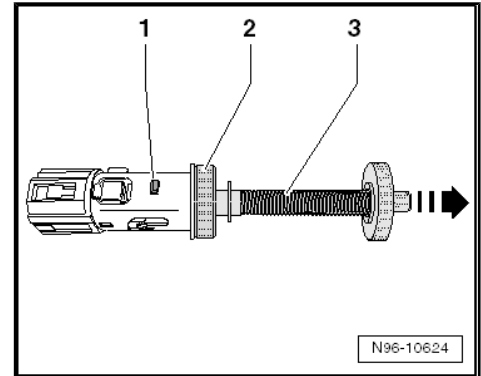
- Release the mounting sleeve retainers by pulling on grip piece -3- in direction of -arrow-.
- Pull receptacle with puller out of mounting sleeve.



Caution

The wiring for the socket could get damaged.

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

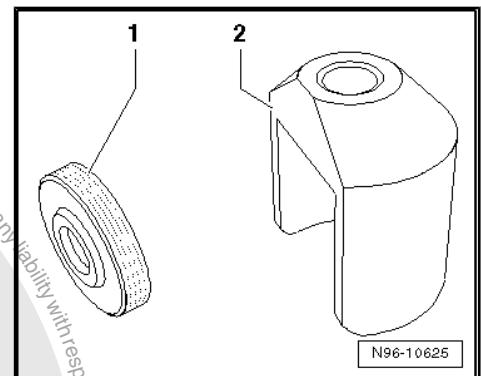


Depending on installation location, it is recommended to use the Thrust Piece - T40148/1- -2- with knurled nut -1-.



Caution

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



- Disconnect electrical connection.



Note

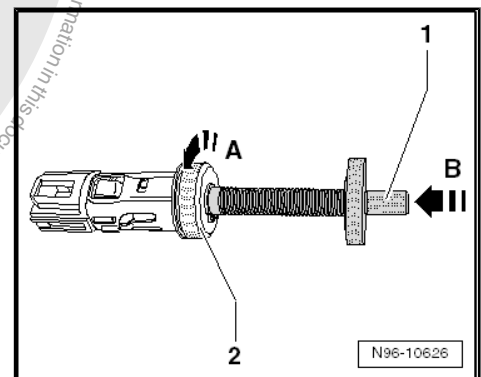
There are different versions of the sockets and cigarette lighter sockets due to different installation locations and construction. The differences are primarily in the length and type of electrical connectors. On sockets or cigarette lighter sockets with an electrical cable pig tail, additional work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

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

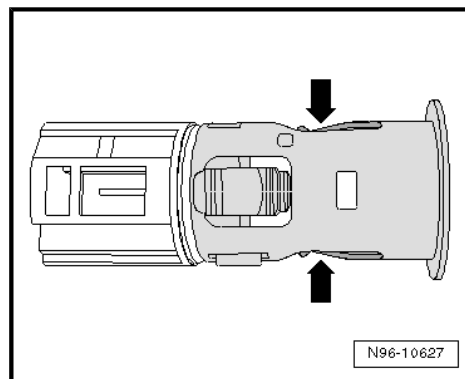
After removing the socket, bend the retainer springs together carefully to tighten them and make sure the insert remains in the socket when the heating cycle is complete.



- 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

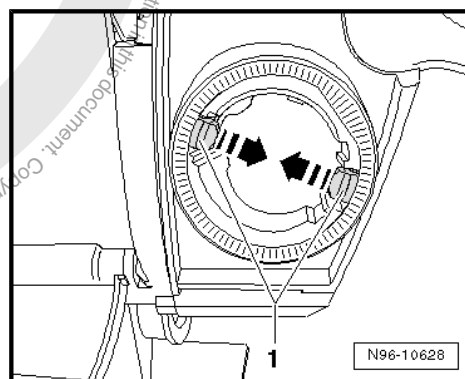


Note

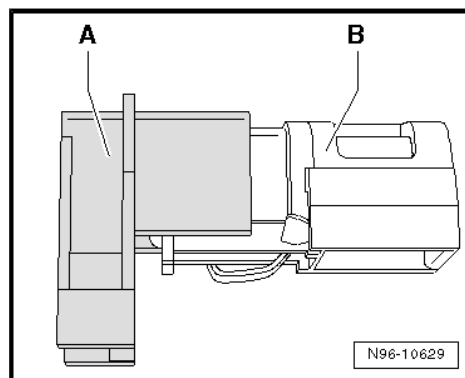
- ◆ On some vehicle equipment levels, socket illumination is via Light Emitting Diode (LED) instead of a bulb. These LEDs are integrated with the illumination housing and cannot be serviced or replaced separately.
- ◆ Various versions of illumination housing with bulb exist. One version allows separate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

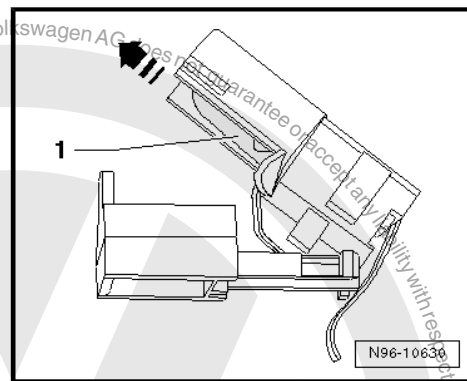




- Remove bulb in direction of -arrow-.

Installing

Install in reverse order of removal.

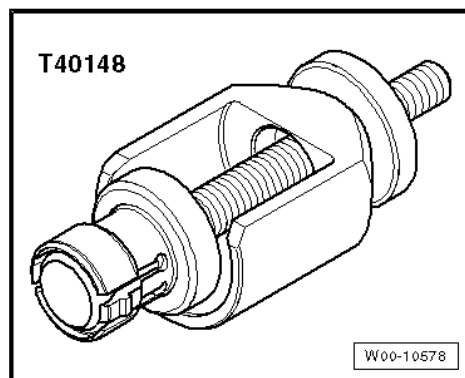




3 Special Tools

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 77](#)

⇒ [“1.2 Vehicle Diagnostic Tester , Connecting, Golf MY 1998 through 2003”, page 78](#)

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 77](#) .



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.

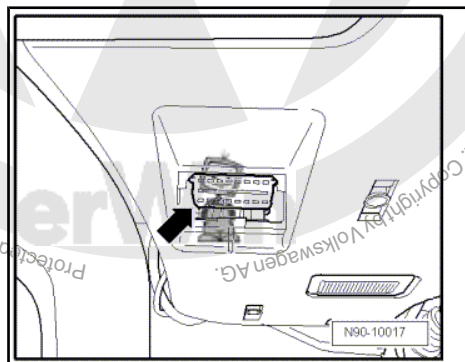
Connect the Vehicle Diagnostic Tester .

- 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 Vehicle Diagnosis System - Diagnostic Cable - VAS5051/6A- to the diagnostic connection -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.



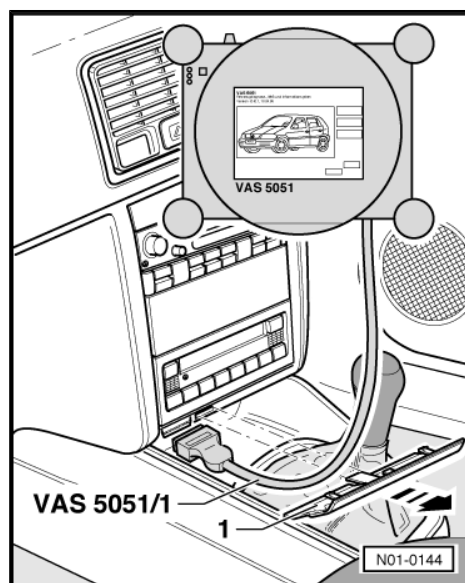
1.2 Vehicle Diagnostic Tester , Connecting, Golf MY 1998 through 2003

- 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 diagnostic connection -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”, page 79](#)

⇒ [“2.2 Wiring Harness Repair Set”, page 82](#)

⇒ [“2.3 Tool Descriptions”, page 84](#)

⇒ [“2.4 Wiring Harnesses, Repairing”, page 88](#)

⇒ [“2.5 Fiber-Optic Cables, Repairing”, page 98](#)

⇒ [“2.6 Antenna Wires, Repairing”, page 104](#)

⇒ [“2.7 Contact Housings and Connectors, Repairing”, page 115](#)

⇒ [“2.8 Contact Housings, Releasing and Disassembling”, page 119](#)

2.1 Vehicle Electrical System, General Repair Information



Caution

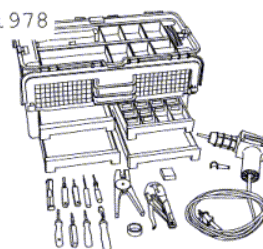
Follow the procedure in the repair manual when disconnecting and connecting the battery.



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.

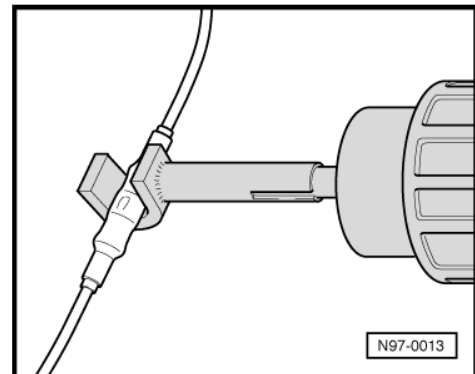
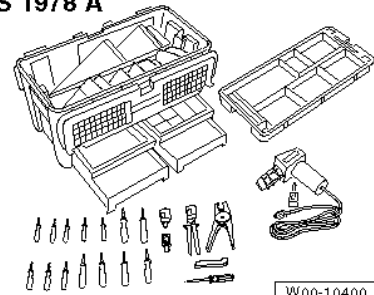
VAS 1978



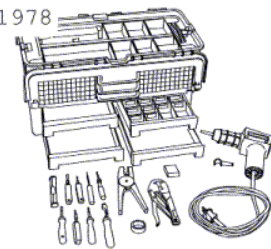
W00-0447



VAS 1978 A

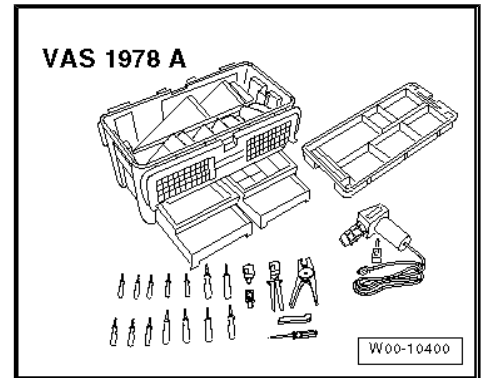


VAS 1978





- ◆ 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 Wiring Harness Repair Set - VAS1978B- and with previous versions. Only use the yellow wires from the Wiring Harness Repair Set - 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 mm². Refer to [⇒ "2.4.4 Wires with Cross Section up to 0.35 mm 2, Repairing", page 92](#) .
- ◆ 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 Wiring Harness Repair Set - 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”, page 82](#)

⇒ [“2.2.2 Upgrade Kit For VAS1978 VAS1978/50”, page 82](#)

⇒ [“2.2.3 Wiring Harness Repair Set VAS1978A”, page 83](#)

⇒ [“2.2.4 Release Tool Set VAS1978/35”, page 83](#)

2.2.1 Wiring Harness Repair Set - VAS1978-

The Wiring Harness Repair Set - 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.



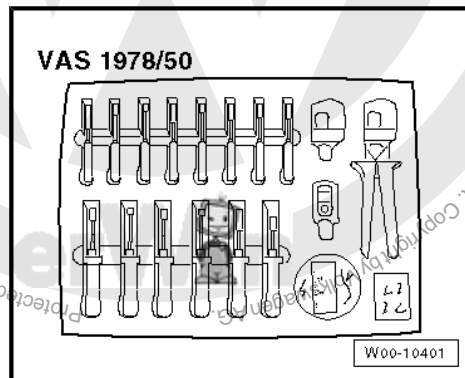
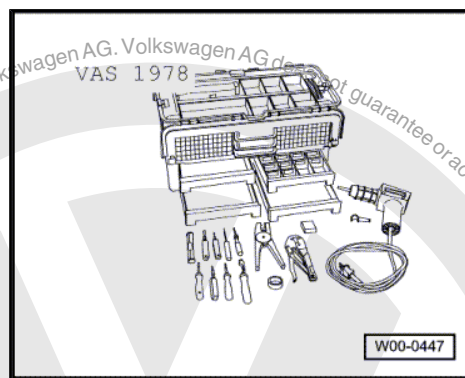
Note

Additional information:

Refer to Wiring Harness Repair Set - VAS1978- Operating Instructions.

2.2.2 Upgrade Kit For VAS1978 - VAS1978/50-

The Upgrade Kit For VAS1978 - VAS1978/50- is required in order to bring the “old” Wiring Harness Repair Set - VAS1978- up to the new standard of the Wiring Harness Repair Set - 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 mm² Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS1978/1-1- , 4.0 - 6.0 mm² Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS1978/2A- and the Wiring Harness Repair Set - Crimping Head - JPT - VAS1978/9-1- . Furthermore it contains new stickers, a new set of user instructions, crimp connections for 0.35 mm²-wire cross sections and a roll of black felt adhesive tape.





2.2.3 Wiring Harness Repair Set - VAS1978A-

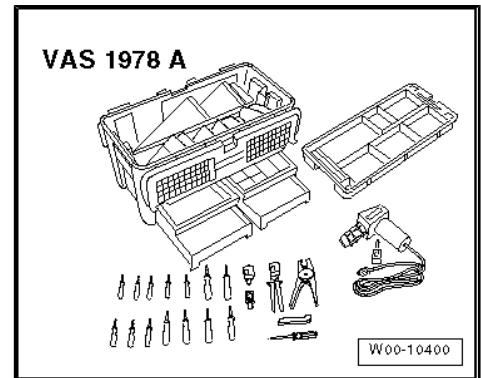
The new Wiring Harness Repair Set - VAS1978A- makes optimal repair quality possible in the realm of vehicle electronics. Using the new pliers, repairs affecting harness connectors and for breaks in wiring can be performed. For this purpose, complete repair wires with terminals already crimped on are 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:

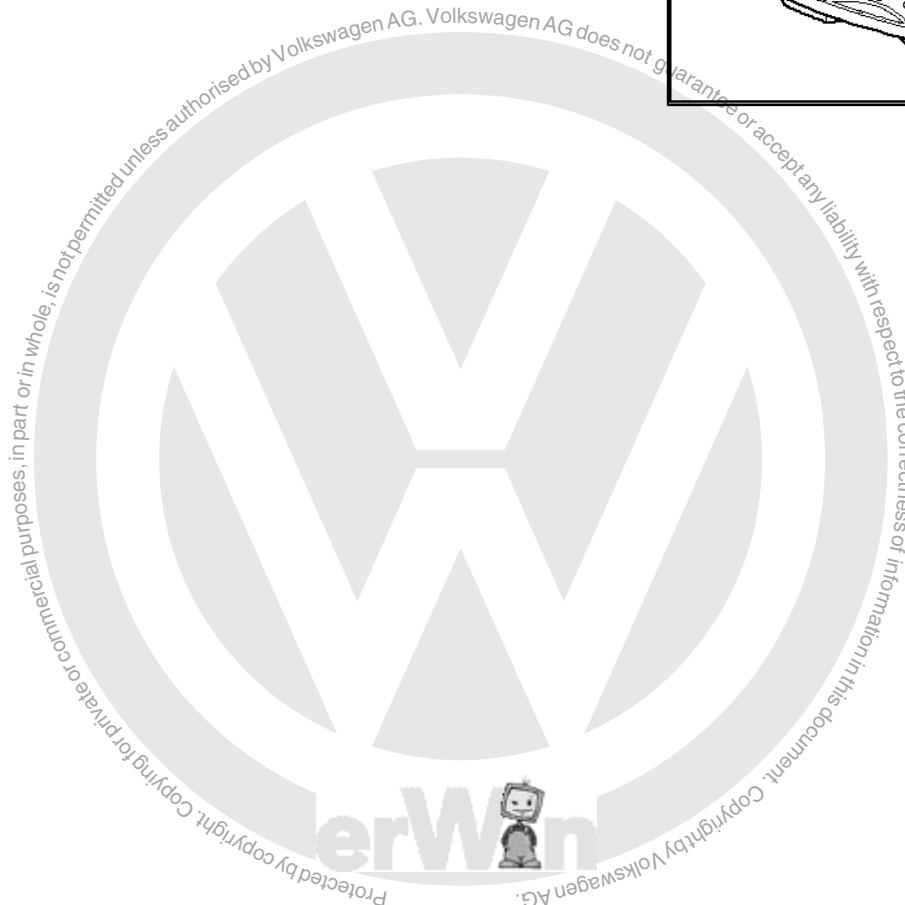
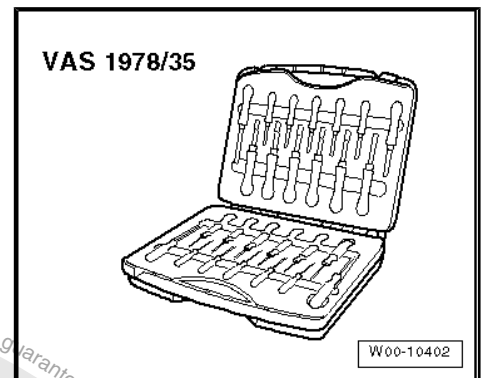
Refer to Wiring Harness Repair Set - VAS1978A- Operating Instructions.



2.2.4 Release Tool Set - VAS1978/35-

The Release Tool Set - 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 e.g. 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 Release Tool Set - VAS1978/35- Operating Instructions.





2.3 Tool Descriptions

⇒ [“2.3.1 Crimping Pliers with Insert”, page 84](#)

⇒ [“2.3.2 Contact Release Tools”, page 85](#)

⇒ [“2.3.3 Single Wire Seal Assembly Tools”, page 85](#)

⇒ [“2.3.4 Wiring Harness Repair Set - Wire Strippers VAS1978/3”, page 85](#)

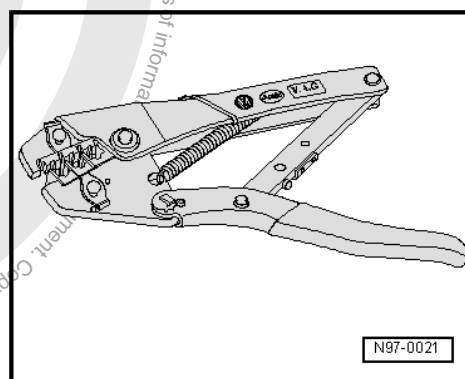
⇒ [“2.3.5 Wiring Harness Repair Set - Hot Air Blower VAS1978/14A”, page 86](#)

⇒ [“2.3.6 Crimping Pliers - .35-2.5mm VAS1978/1A”, page 87](#)

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 87](#).
- ◆ 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

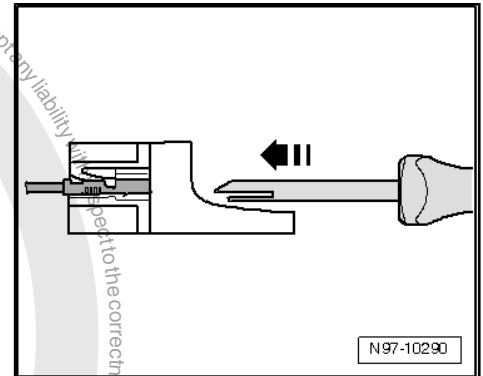
Various release tools are used to remove the different terminals from terminal housings without damage.

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 83](#) .



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.



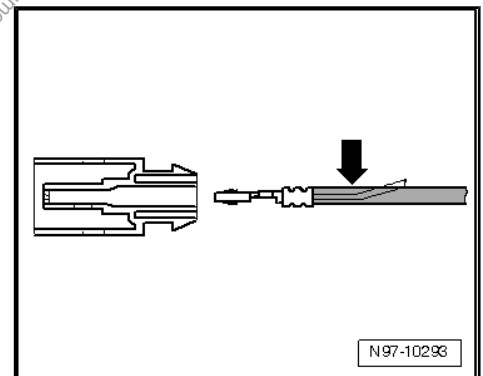
Contact housings, releasing and disassembling. Refer to
⇒ ["2.8 Contact Housings, Releasing and Disassembling", page 119](#) .

2.3.3 Single Wire Seal Assembly Tools

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 Wiring Harness Repair Set - VAS1978B- and its previous versions.

Assembly of single wire seals. Refer to
⇒ ["2.7.3 Single Wire Seals, Installing", page 117](#) .



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

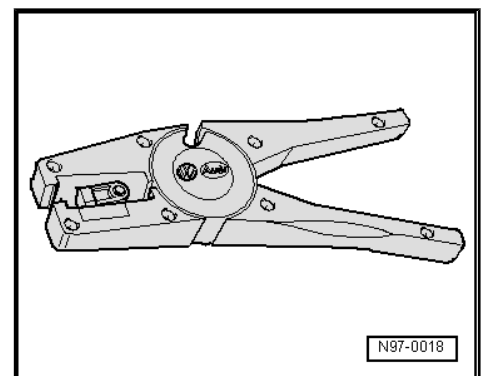
The Wiring Harness Repair Set - Wire Strippers - VAS1978/3- is used for professional stripping and cutting of wires.

The Wiring Harness Repair Set - Wire Strippers - VAS1978/3- is a component of the Wiring Harness Repair Set - 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.

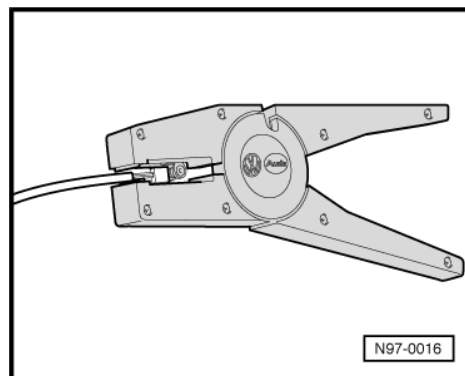
Stripping

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

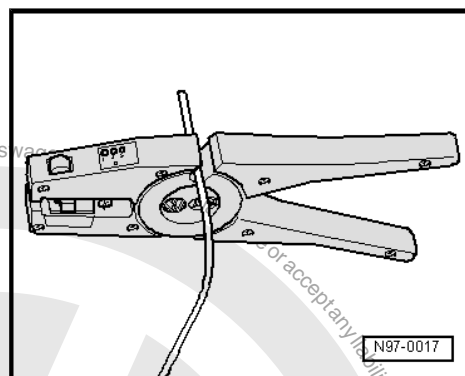




- Insert wire end from front up to stop into jaws of pliers and squeeze the pliers completely.
- Open pliers again and remove the stripped wire end.



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



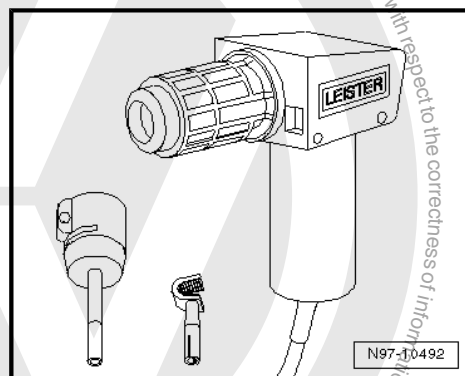
2.3.5 Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-



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 Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- is used together with the Wiring Harness Repair - Blower - Shrink Element - 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 Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- is a component of the Wiring Harness Repair Set - VAS1978B- and its previous versions.

Crimp connectors, heat-shrinking using the Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- . Refer to or ⇒ ["2.4.6 Wire Break with Dual Repair Point", page 96](#) .



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
⇒ ["2.4.6 Wire Break with Dual Repair Point", page 96](#) .

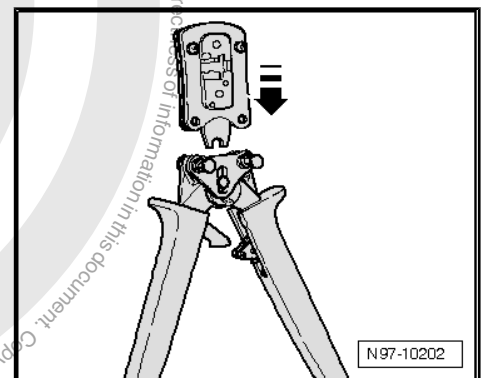
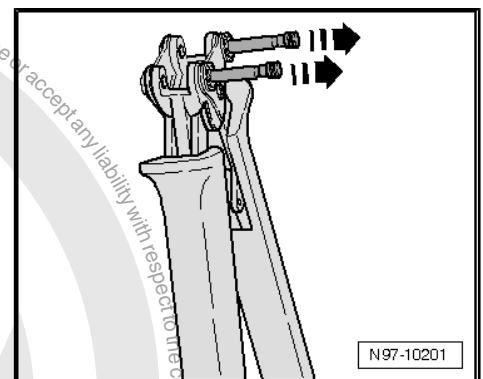
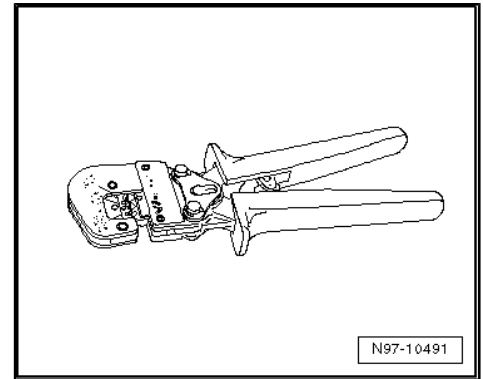
The following crimping heads are available for the Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2-

- ◆ Crimping Head 0.35 mm² - 2.5 mm² Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS1978/1-1-
- ◆ Crimping Head 4.0 mm² - 6.0 mm² 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 mm². Refer to
⇒ ["2.4.4 Wires with Cross Section up to 0.35 mm², Repairing", page 92](#) .

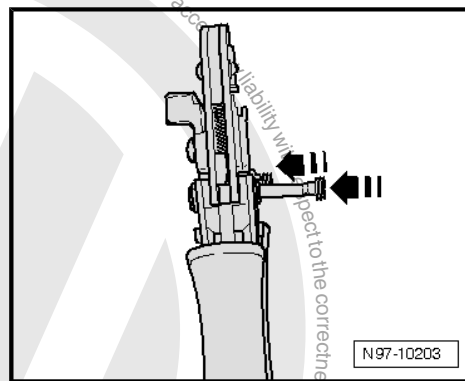
Changing the Crimping Head

- Open crimp pliers completely.
- Disengage both locking pins in direction of -arrows- from crimp pliers basic tool.
- Insert the required crimping head from above -arrow- in crimp pliers basic tool.





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



2.4 Wiring Harnesses, Repairing

⇒ [“2.4.1 Airbag and Belt Tensioner Wire Repair Information”, page 88](#)

⇒ [“2.4.2 CAN Bus Wires, Repairing”, page 91](#)

⇒ [“2.4.3 Antenna Wires, Replacing”, page 91](#)

⇒ [“2.4.4 Wires with Cross Section up to 0.35 mm², Repairing”, page 92](#)

⇒ [“2.4.5 Wire Break with Single Repair Point”, page 95](#)

⇒ [“2.4.6 Wire Break with Dual Repair Point”, page 96](#)

2.4.1 Airbag and Belt Tensioner Wire Repair Information



Note

Observe general notes for repairs on the vehicle electrical system. Refer to

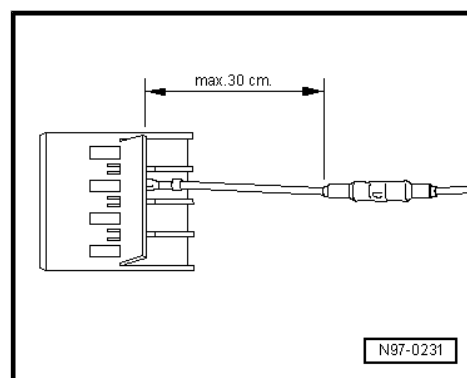
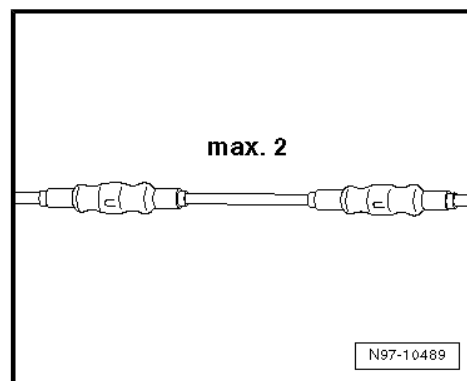
⇒ [“2.1 Vehicle Electrical System, General Repair Information”, page 79](#).

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

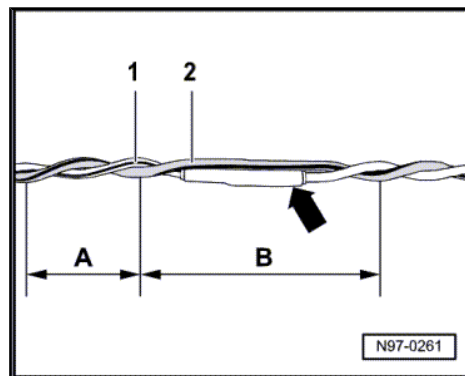
- ◆ *The airbag and seat belt tensioner system can fail.*
- ◆ *Faulty repairs performed on airbag and seat belt tensioner system can lead to malfunction in passenger protection.*
- ◆ *When performing repairs on airbag and seat belt tensioner wiring harness, use only terminals, connectors and wires designated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





Note

- ♦ Air bag wires and the safety belt tensioner wiring harness may be repaired only with the Wiring Harness Repair Set - 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 79](#).
- ♦ 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 $20 \text{ mm} \pm 5 \text{ mm}$ 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- = $20 \text{ mm} \pm 5$ 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.



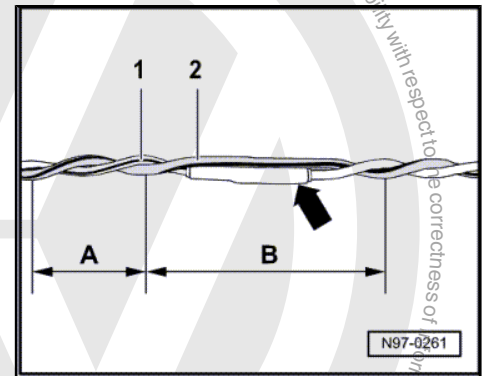


2.4.2 CAN Bus Wires, Repairing

- ◆ Unshielded two-strand wiring -1- and -2- with a cross section of 0.35 mm² or 0.5 mm² 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 104](#) .

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 after-market 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

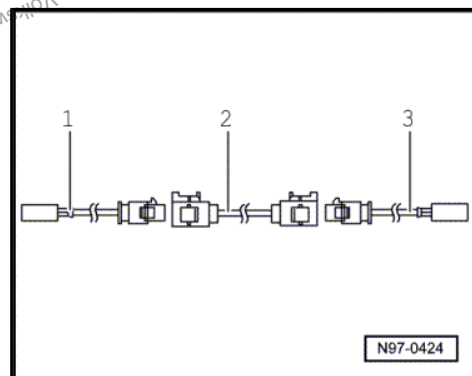
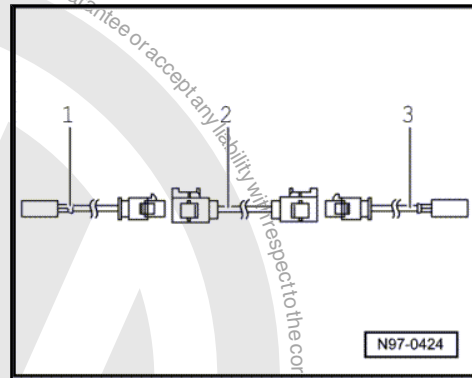
Antenna wires must not be kinked or excessively bent! The bending radius must not be less than 50 mm.

- Connect the connecting wire with the adapter leads.
- Perform a function test.

2.4.4 Wires with Cross Section up to 0.35 mm², Repairing

Special tools and workshop equipment required

- ◆ Crimping Pliers - .35-2.5mm - VAS1978/1A-
- ◆ Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS1978/1-1-





When repairing wires with a cross-section up to 0.35 mm², new contacts must always be crimped on using the Crimping Pliers - JPT - VAS1978/9A- or the Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2- with the Wiring Harness Repair Set - Crimping Head - JPT - VAS1978/9-1- installed. Due to the low current strengths of these wires in the micro- to milli- range, contacts crimped on incorrectly lead to continuity resistances and cause malfunctions or failure of the respective system. The most frequent applications of these contacts are

- ◆ Heated Oxygen Sensor
- ◆ RPM sensor
- ◆ Mass Airflow Sensor

By using the Crimping Pliers - JPT - VAS1978/9A- or the Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2- with the Wiring Harness Repair Set - Crimping Head - JPT - VAS1978/9-1- installed, the correct connection between crimp contact, wire and single wire seal is guaranteed. The tool is to be used only for the purpose described.

i Note

Contacts in a normal and a gold-plated version are crimped onto repair wires. The same version of the contact that was installed at the factory must always be used for repairs.

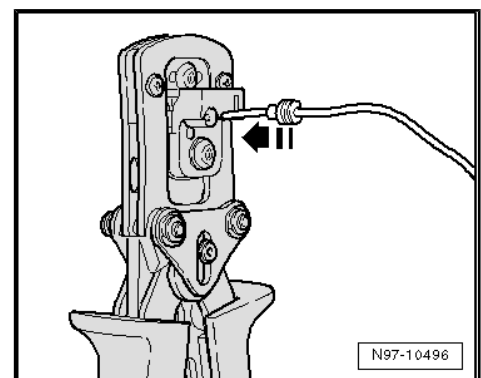
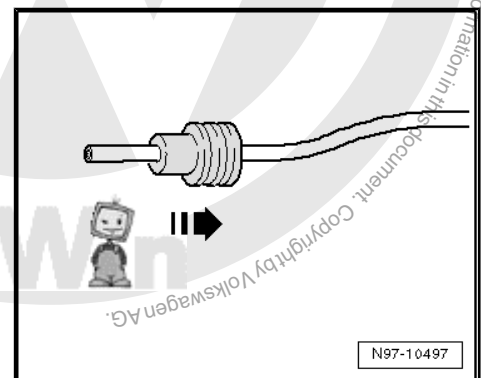
Crimping A New Contact with Single Wire Seal

- Insert the Wiring Harness Repair Set - Crimping Head - JPT - VAS1978/9-1- into the Wiring Harness Repair - Crimping Plier - Base Tool - VAS1978/1-2- . Refer to [⇒ "2.3.6 Crimping Pliers - .35-2.5mm VAS1978/1A " , page 87](#) .
- Place the single wire seal onto the repair wire.

i Note

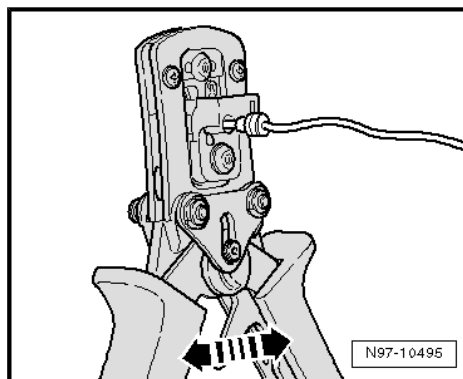
When doing this, the smaller diameter of single wire seal must be facing in the direction of the contact to be crimped on.

- Open crimp pliers and place the repair wire end into stripping slot of crimp pliers.

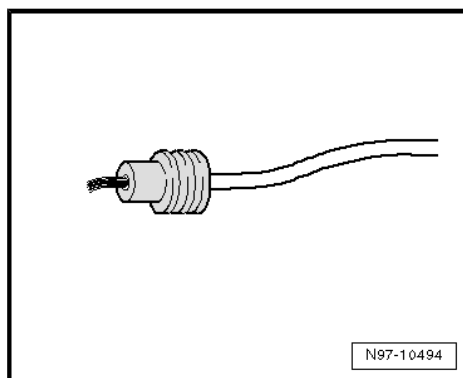




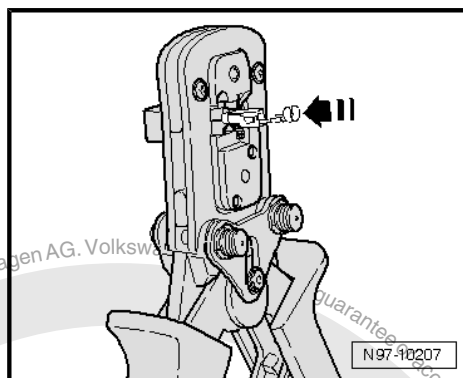
- Close crimp pliers completely.
- Open crimp pliers again and remove the stripped wire end.



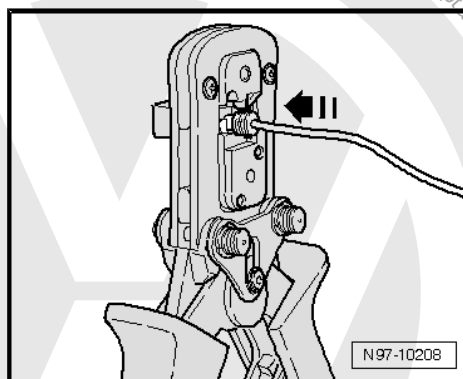
- Slide single wire seal in direction of stripped wire end until it rests flush with the wire insulation.



- Place new crimp contact into mount on crimp pliers.

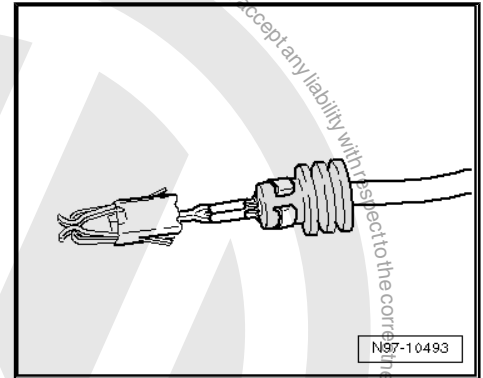


- Insert the stripped wire end with positioned single wire seal into crimp contact until it makes contact on "wire stop".
- Crimp the contact, wire and single wire seal by closing crimp pliers completely.
- Open crimp pliers again and remove the finished crimped-on contact.





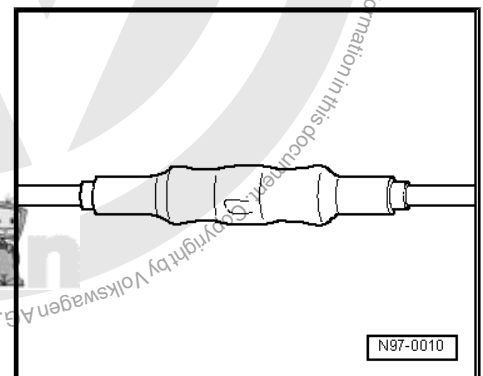
A correctly performed crimp is distinguished by a clean compression of wire and single wire seal in the contact and has an impression on the rear side which identifies that the crimp was performed by a professional using the correct tool.



2.4.5 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.

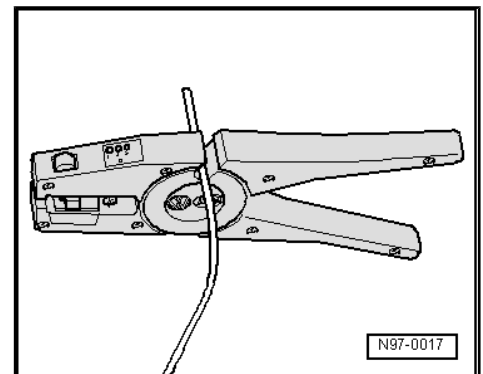


- Cut out the damaged section of wire using the Wiring Harness Repair Set - Wire Strippers - VAS1978/3- .

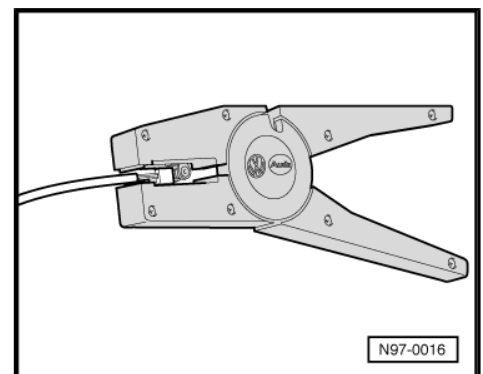


Note

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 ["2.4.6 Wire Break with Dual Repair Point", page 96](#) .



- 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 84](#).
- ♦ Do not crimp wire insulation.

After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

- Place the Wiring Harness Repair - Blower - Shrink Element - VAS1978/15A- on the Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A-.

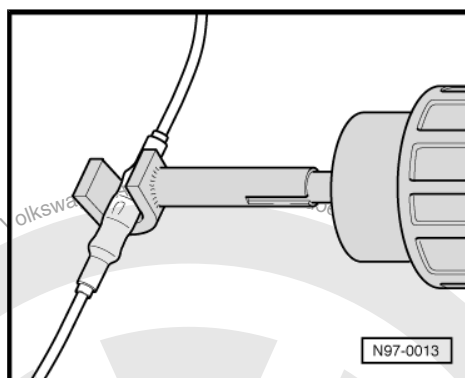
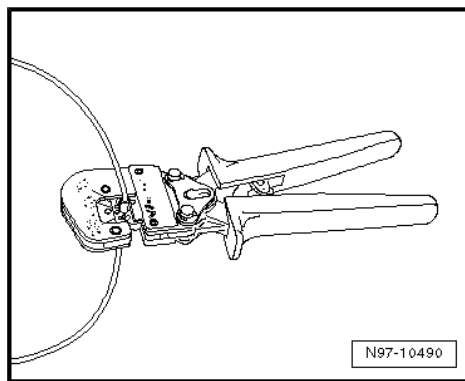
- Heat crimp connection using hot air gun lengthwise from center outward until it is sealed completely and adhesive comes out the ends.



Caution

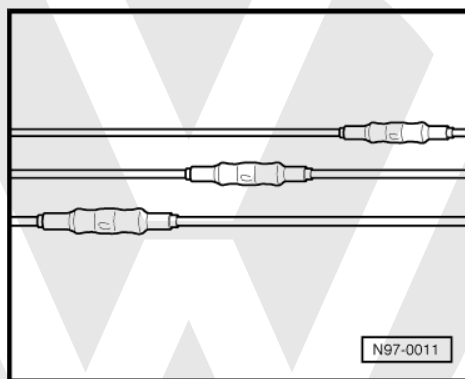
When heat-shrinking crimp connections, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air gun.

Always observe operating instructions of heat gun.



Note

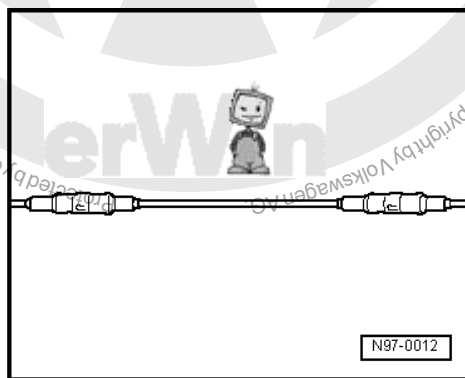
- ♦ Make sure that crimp connections do not lie directly next to each other when several wires need to be repaired. Arrange the crimp connectors at a slight offset so that the circumference of the wiring harness does not become too large.
- ♦ In the event the repair point was previous taped, this point 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.



2.4.6 Wire Break with Dual Repair Point

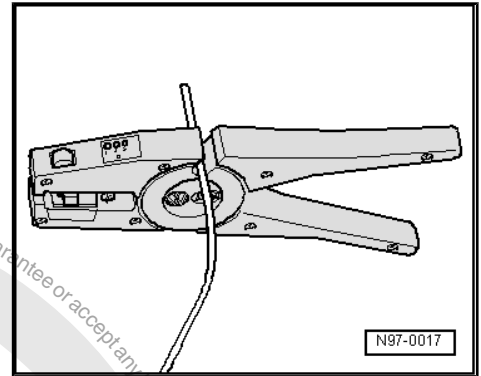
Repair point with intermediate wire section

- 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.

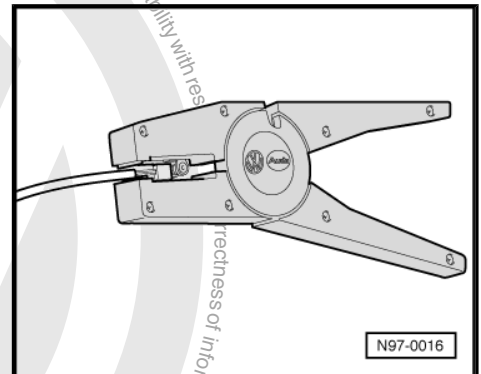




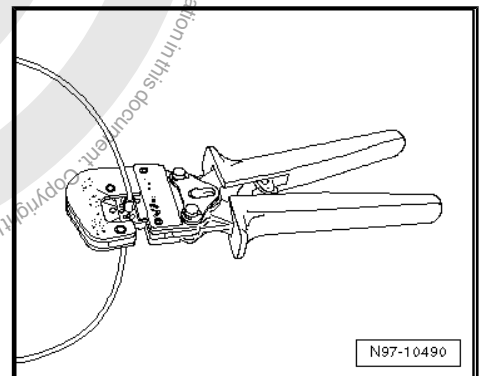
- Route the yellow repair wire next to the damaged wiring harness and cut the repair wire to the required length using the Wiring Harness Repair Set - Wire Strippers - VAS1978/3- .
- Cut damaged wire section from the vehicle-specific single wire.



- 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 84](#) .
- ◆ Do not crimp wire insulation.

After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

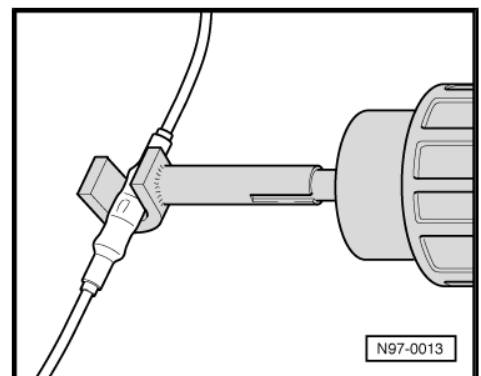
- Place the Wiring Harness Repair - Blower - Shrink Element - VAS1978/15A- on the Wiring Harness Repair Set - Hot Air Blower - VAS1978/14A- .
- Heat crimp connection using hot air gun lengthwise from center outward until it is sealed completely and adhesive comes out the ends.



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.

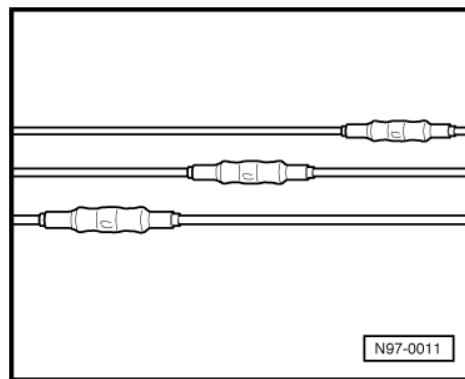
Always observe operating instructions of heat gun.





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 previously 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 98](#)

⇒ [“2.5.2 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector”, page 103](#)

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 98](#) .



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.

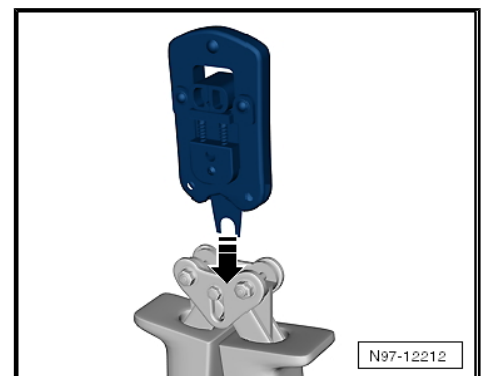
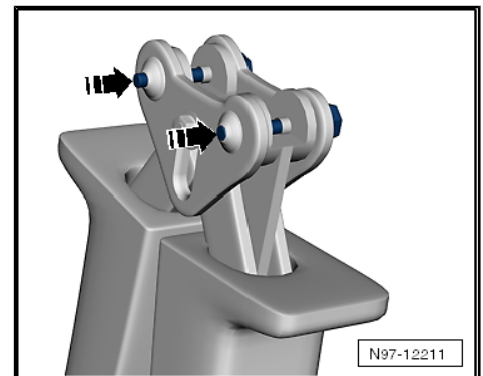
Fiber optic cables may not be heated.

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 Fiber-Optic Repair Set - Pliers - VAS6223/1- .

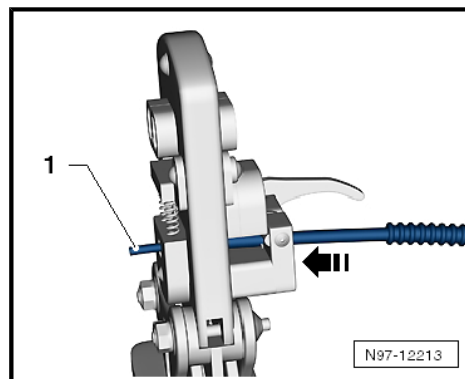
- Remove the locking pin -arrows-.
- Remove the tool set -arrow- and pull the locking pin back.





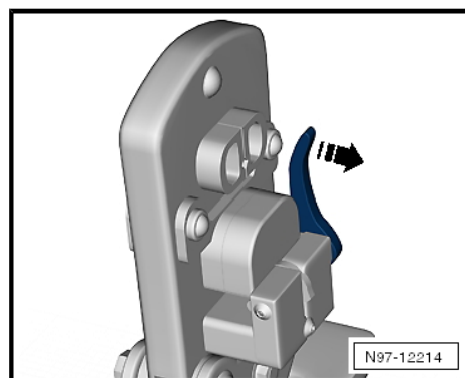
Fiber Optic Cable, Cutting to Length

- Establish length of fiber optic cable required.
- Open the Fiber-Optic Repair Set - Pliers - VAS6223/1- and lay the fiber-optic cable -1- in the mount.
- Close the Fiber-Optic Repair Set - Pliers - VAS6223/1- to cut the fiber-optic cable lengths.

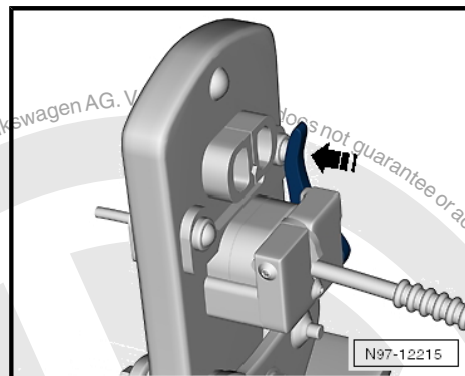


Stripping

- Open the Fiber-Optic Repair Set - Pliers - VAS6223/1- .
- Position the wire stripper in the lower position -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.

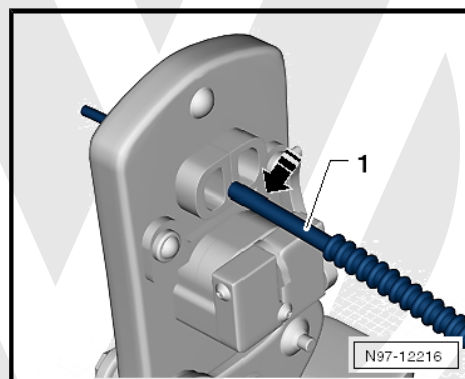


- Close the Fiber-Optic Repair Set - Pliers - VAS6223/1- until the stop and keep closed.
- Bend the wire stripper upward -arrow- and remove the fiber-optic cable.



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 Fiber-Optic Repair Set - Pliers - 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.

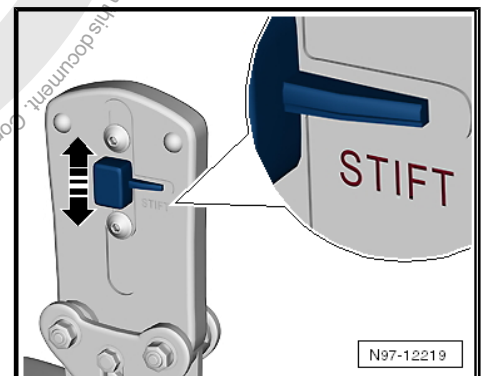
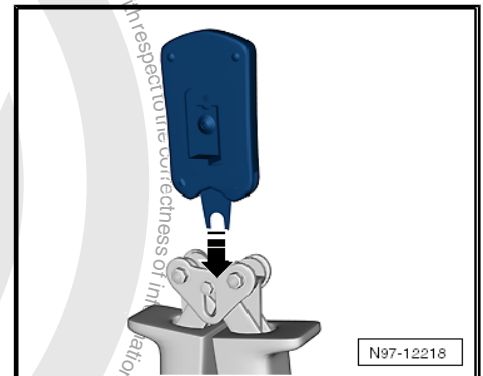
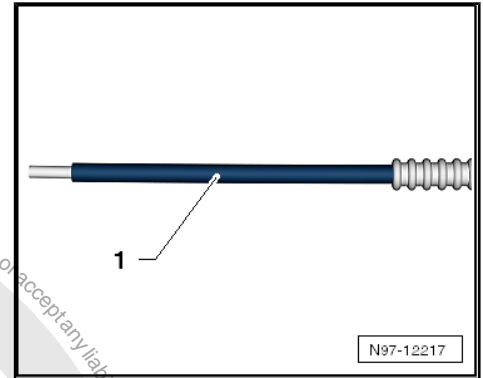


Note

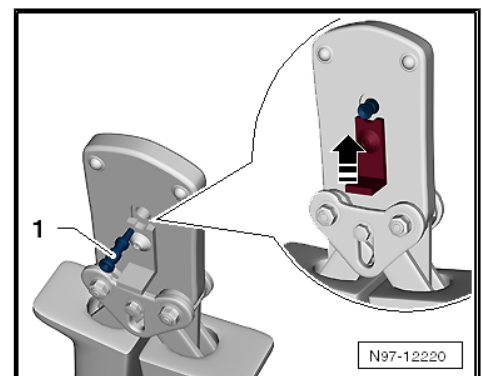
- ◆ *Fiber-optic cable is only to be placed on an absolutely clean surface or held in hand.*
- ◆ *Use the cap if there is a risk of the fiber-optic cable surface becoming dirty.*

Attaching Brass Pin Contact to Fiber-Optic Cable

- Change tool head -arrow-.
- Slide the safeguard on the Fiber-Optic Repair Set - Pliers - 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 Fiber-Optic Repair Set - Pliers - VAS6223/1- in direction of -arrow-.





- Insert the fiber-optic cable into the brass pin contact -arrow- all the way up to the threaded stop and then close the Fiber-Optic Repair Set - Pliers - 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).

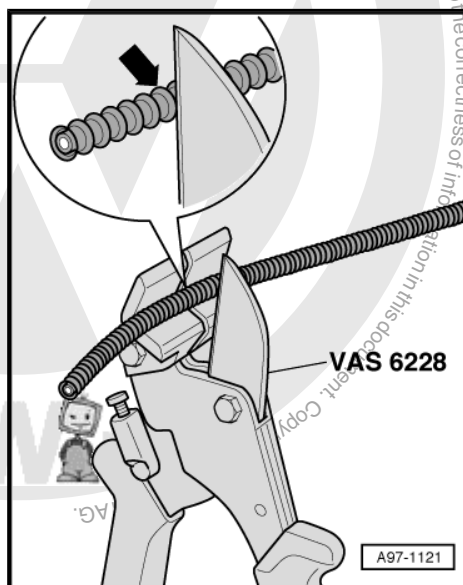
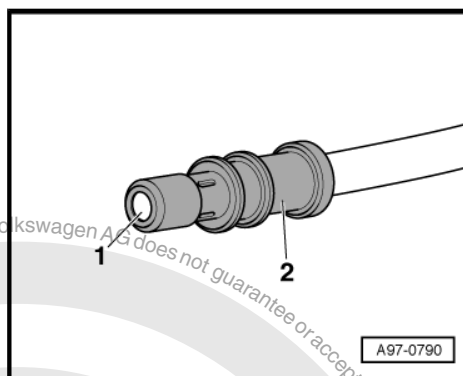
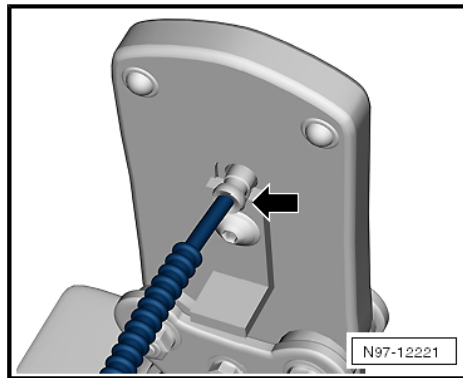


Note

- ◆ 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 103](#) .

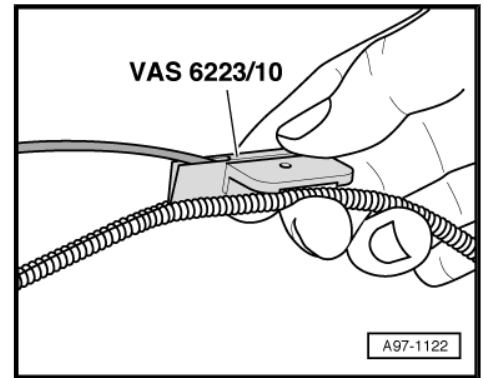
Corrugated Tube, Install on Fiber Optic Cable

- Cut corrugated tube to appropriate length.
- Use the Hose Cutting Pliers -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.





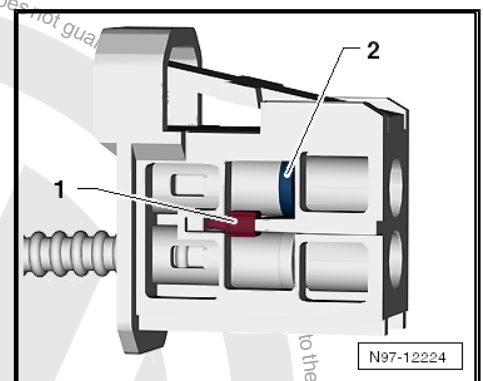
- Guide the fiber-optic cable into the Fiber-Optic Repair Set - Tube Tool - VAS6223/10- as shown.
- Position corrugated tube assembly pliers on slot on the tube.
- Position crimping pliers for fiber-optic cable at slot of corrugated tube. The fiber optic cable is then routed in the corrugated tube.



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

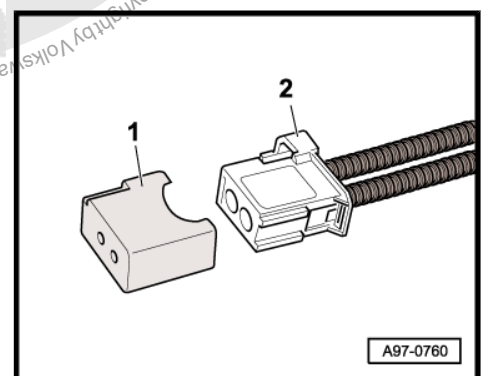
Install in reverse order of removal. Note the following

- 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 Fiber-Optic Repair Set - Connector Protective Caps - VAS6223/9- -item 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 104**

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

Replacing the Tool Head. Refer to

Cutting the Antenna Wire. Refer to

Removing the Insulation from the Shield. Refer to

Removing the Outer Jacket of Insulation. Refer to

Removing the Inner Insulation. Refer to

Crimping the Inner Conductor. Refer to

Crimping the Outer Conductor. Refer to

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:

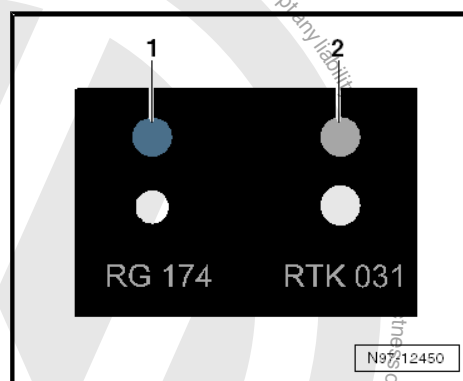
Before starting the repair, determine which antenna wire using the gauge.

- ◆ -1- System RG 174 = blue
- ◆ -2- System RTK 031 = gray

The adjusters on the heads of the tools are color coded on both systems.

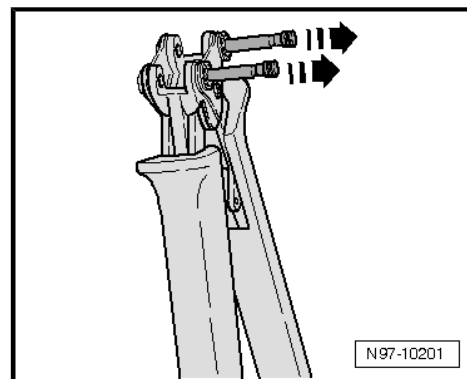
Replacing the Tool Head:

- Select the appropriate tool head based on the antenna wire test. Refer to [⇒ page 104](#).
- Open the handle on the pliers all the way.

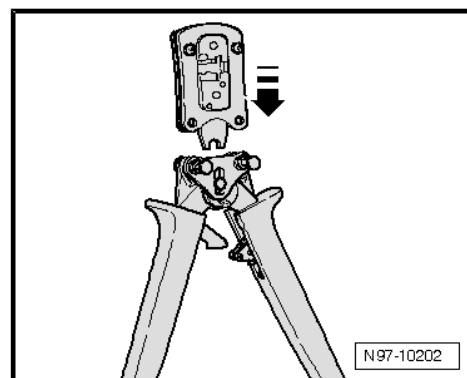




- Release and remove both locking pins in direction of -arrows- from the handle.

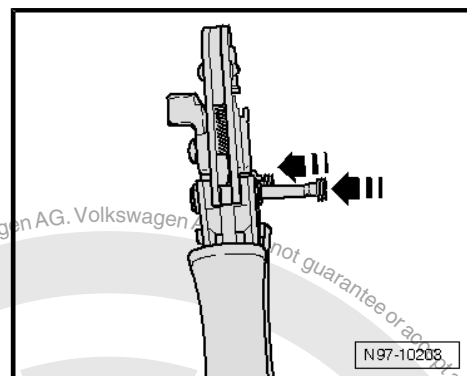


- Attach the necessary tool head to the handle from the top in direction of -arrow-.



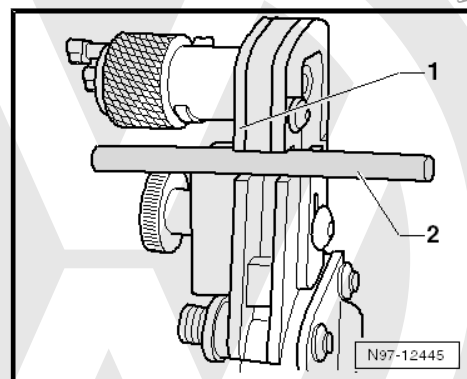
- Insert the pins in direction of -arrows- into the handle in order to lock the tool head into place.

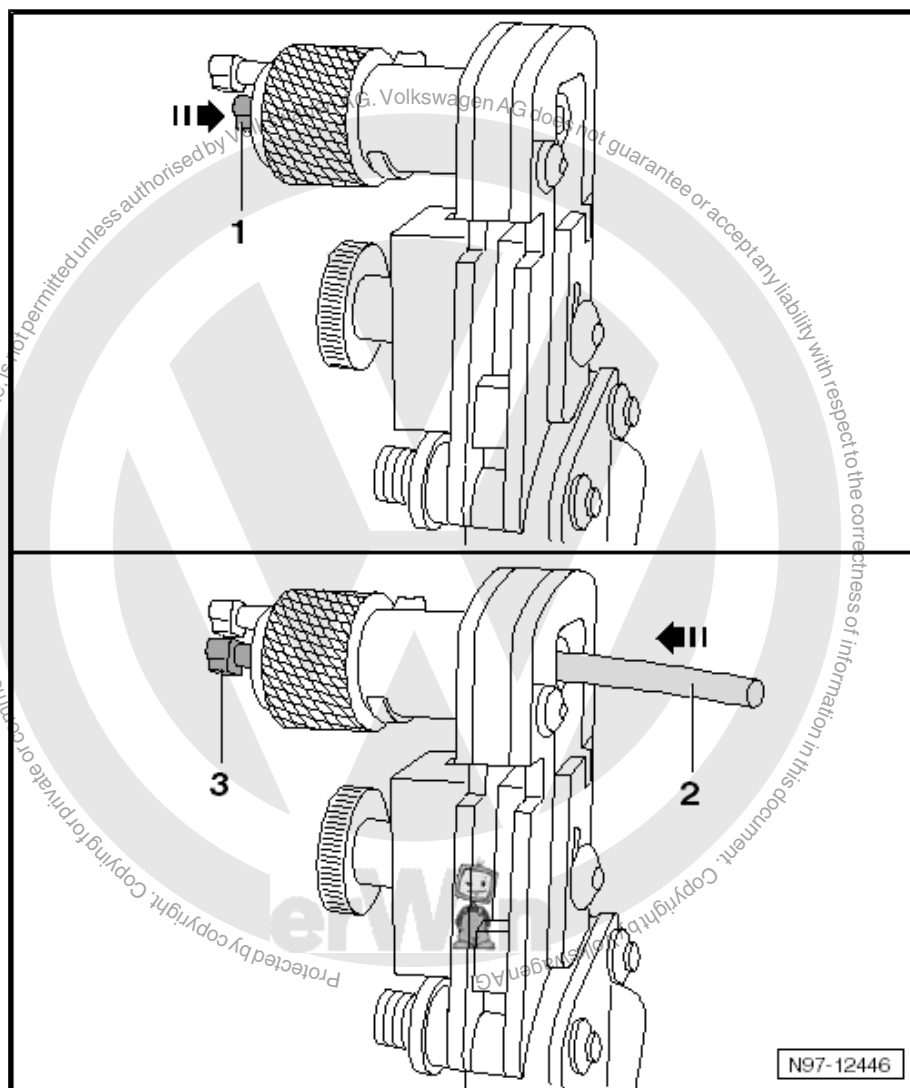
Cutting the Antenna Wire:



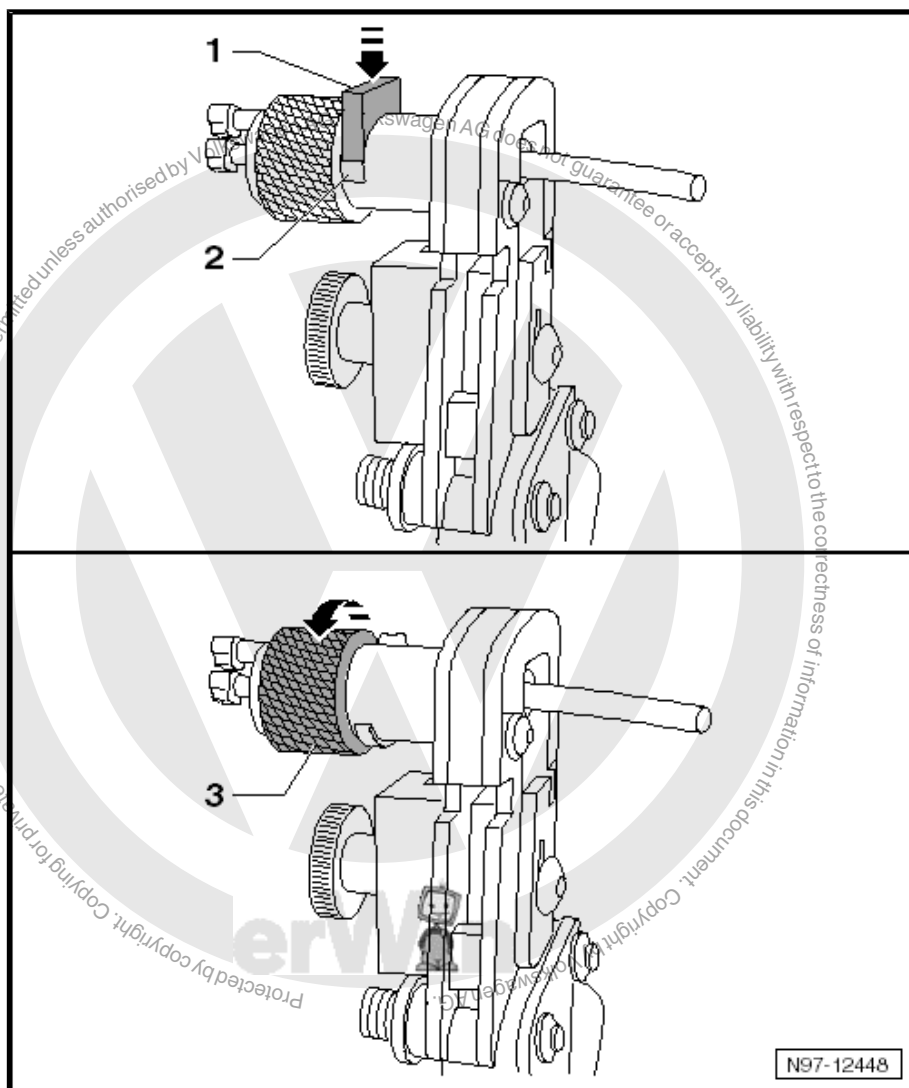
- Slide the antenna wire -2- into the cutting device -1-.
- Close the tool then open it again.
- Pull the antenna wire out of the cutting device.

Removing the Insulation from the Shield:

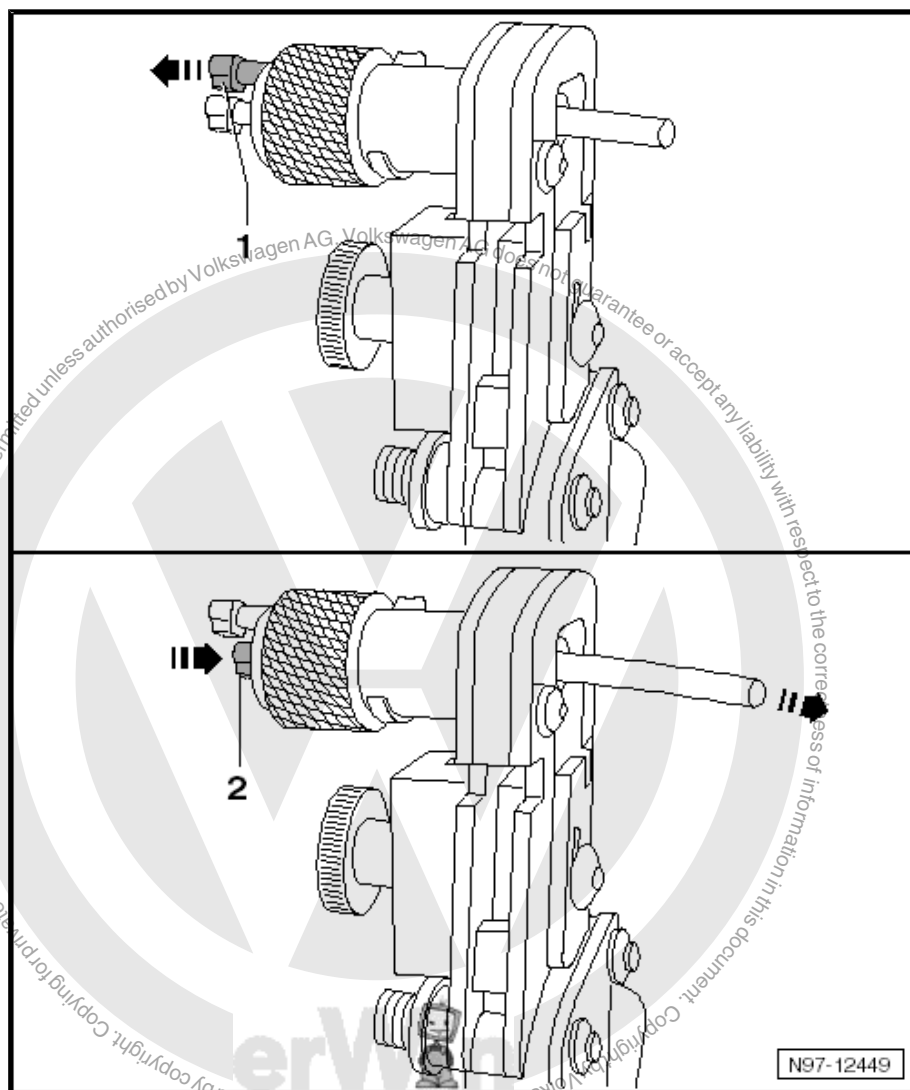




- Push the locking pin -1- all the way into the rotating cutting piece.
- Push the antenna wire -2- all the way into the rotating cutting piece. The locking pin -3- can not be seen completely.

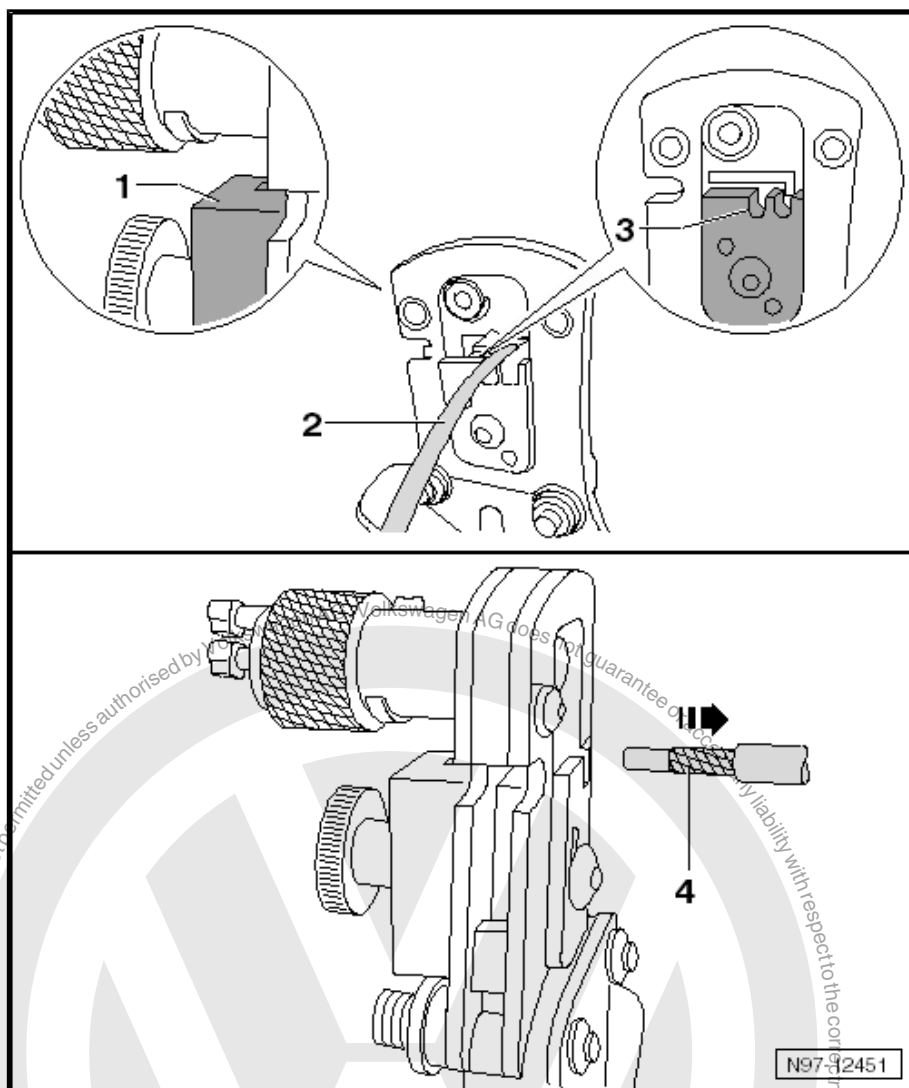


- Push the blade holder -1- against the axle of the rotating cutting segment until it locks into place. The gap -2- under the blade holder is completely closed.
- Hold the antenna wire so that it cannot turn.
- Turn the rotating cutting segment -3- 2 times in direction of -arrow- until it starts to turn easily.



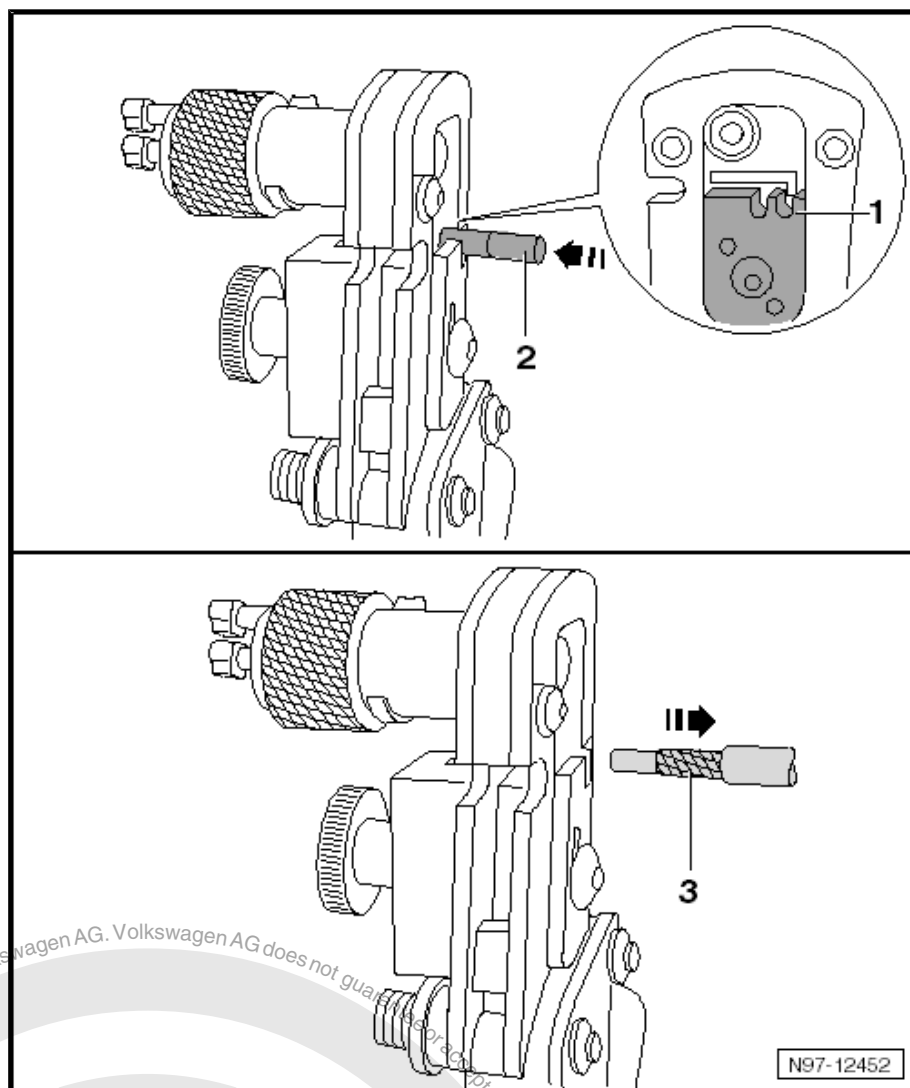
- Pull the release pin -1-. The blade holder unlocks and separates from the antenna wire.
- Push the locking pin -2- all the way into the rotating cutting piece. The antenna wire is pushed out of the rotating cutting segment.
- Remove insulation from the antenna wire.
- Remove any insulation remaining on the rotating cutting segment.

Removing the Outer Jacket of Insulation:



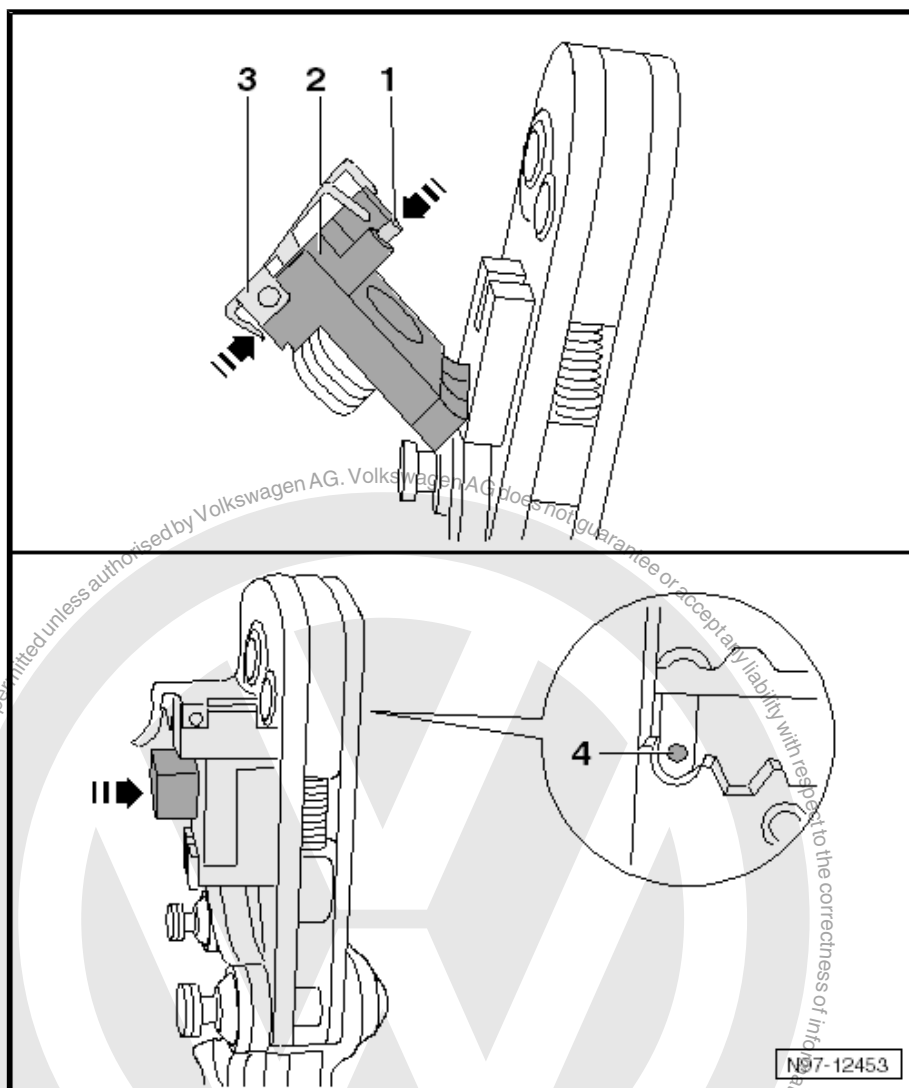
- Slide the antenna wire -2- in the mount -3- into the tool head until it stops -1-.
- Close the tool then open it again.
- Remove the antenna wire -4-.

Removing the Inner Insulation:

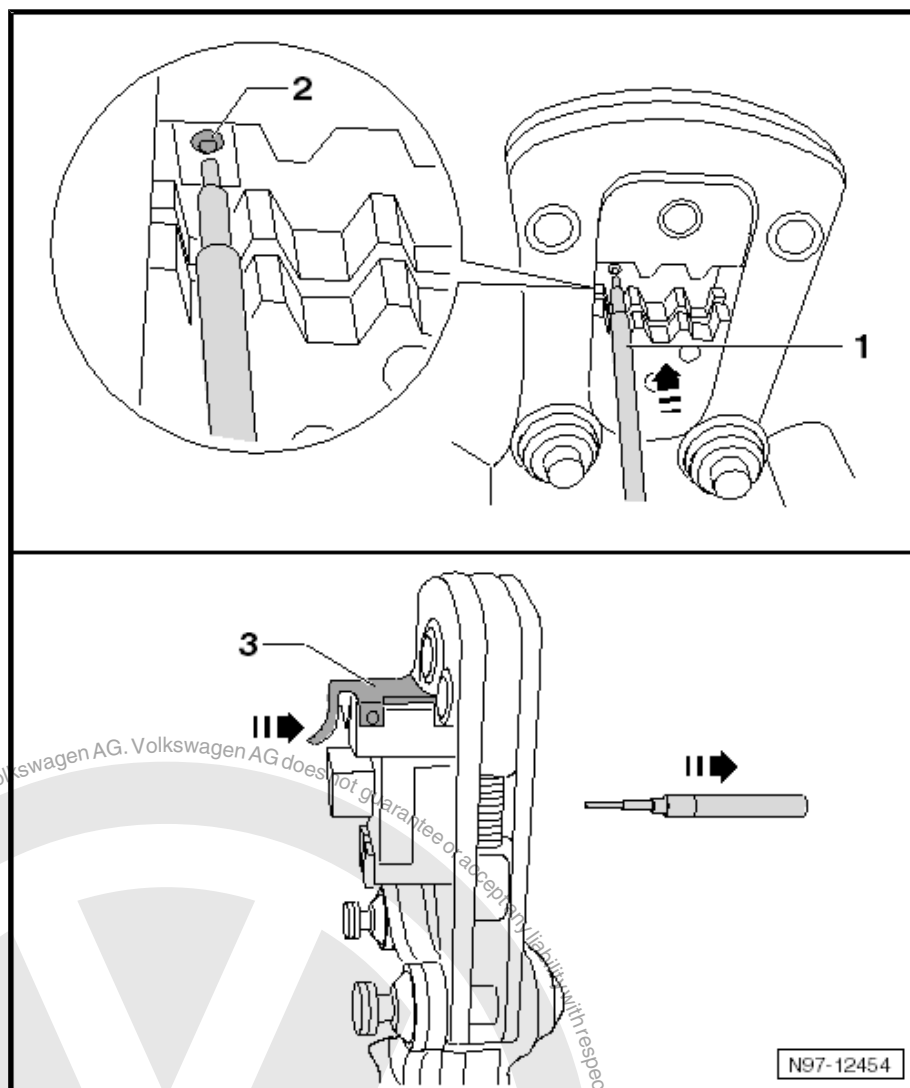


- Push the antenna wire -2- in the mount -1- all the way into the tool head.
- Close the tool then open it again.
- Remove the antenna wire -3-.

Crimping the Inner Conductor:

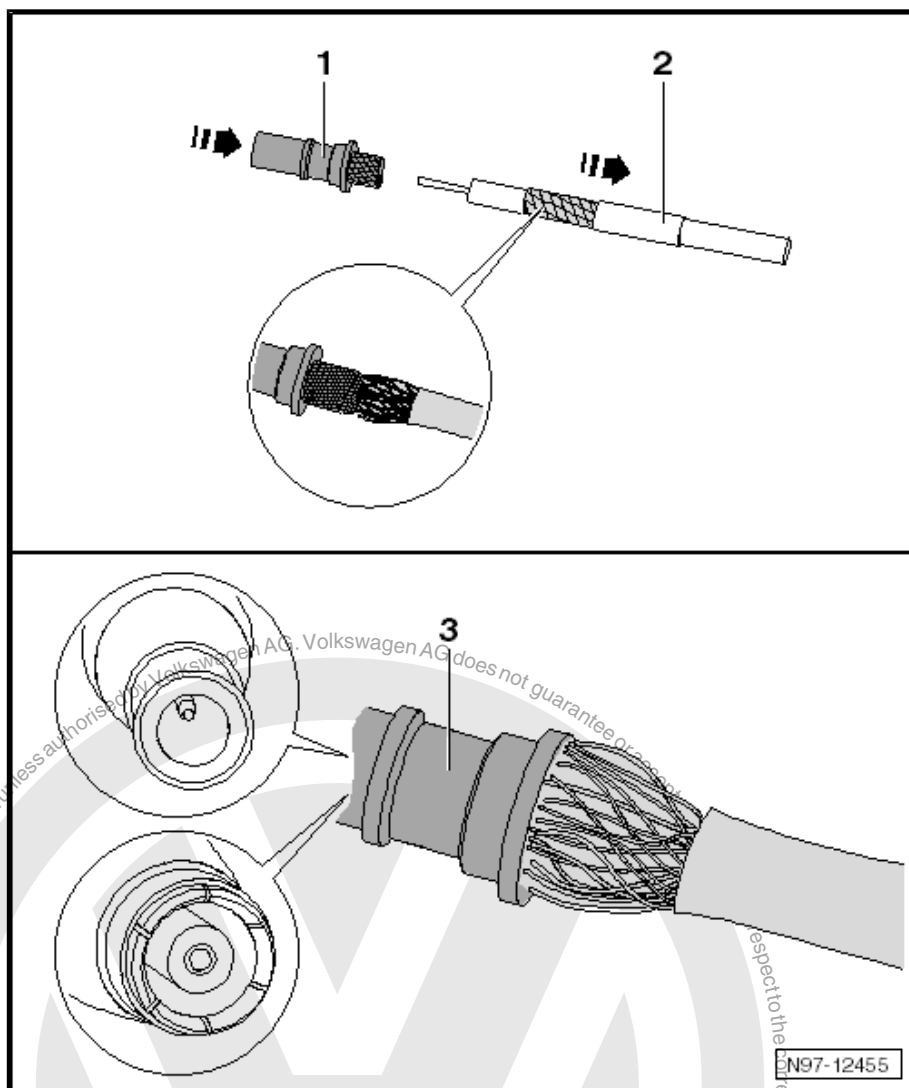


- Select the appropriate tool head based on the antenna wire test. Refer to ➤ [page 104](#) .
- Unfold the positioner -2-.
- Open the positioning plate -3-. The positioning plate swivels upward.
- Push the inner contact -1- all the way into the positioner and loosen the positioning plate. The inner contact is attached.
- Fold the positioner back in. The inner contact -4- is positioned inside the tool head.

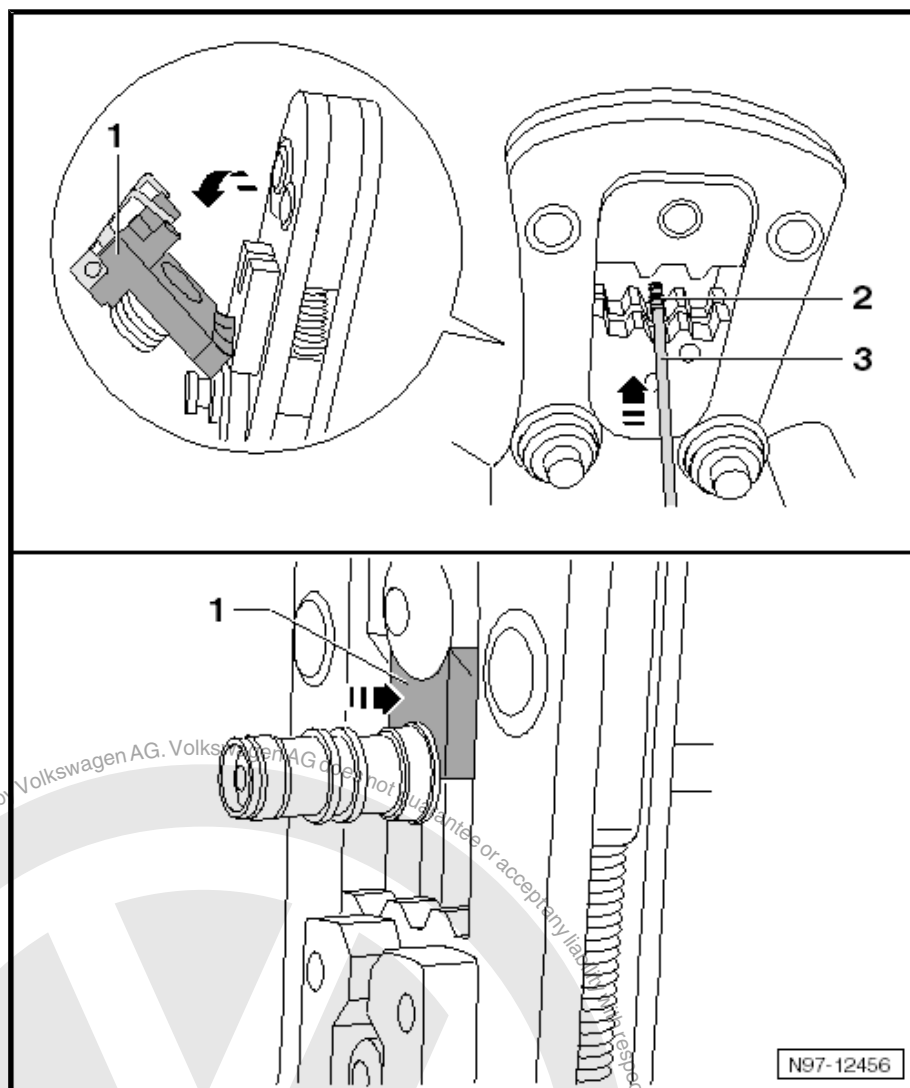


- Slide the antenna wire -1- into the inner contact -2- in the tool head. Hold the positioner tight while doing this.
- Lock the tool until it opens by itself.
- Open the positioning plate -3- and pull out the antenna wire.

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 115](#)

⇒ [“2.7.2 Contacts in Contact Housing, Repairing”, page 115](#)

⇒ [“2.7.3 Single Wire Seals, Installing”, page 117](#)

⇒ [“2.7.4 Contact Housings, Repairing Wire Terminals”, page 118](#)

2.7.1 Contact Housings and Connectors, Repair Information



Note

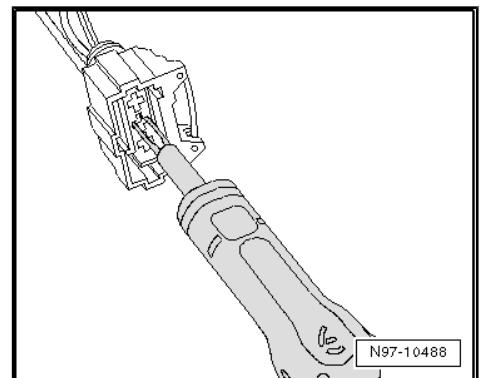
- ◆ *Observe general notes for repairs on the vehicle electrical system. Refer to*
⇒ [“2.1 Vehicle Electrical System, General Repair Information”, page 79](#).
- ◆ *Allocation of crimp contacts with correct fit to contact housing is performed according to the part number stamped in on the contact housing. 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 119](#).
- Release contact (primary lock) using the appropriate release tool. Refer to
⇒ [“2.8 Contact Housings, Releasing and Disassembling”, page 119](#).

Pull contact at single wire out of contact housing.

- Take the yellow repair wire with the correct contact out of the Wiring Harness Repair Set - 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.





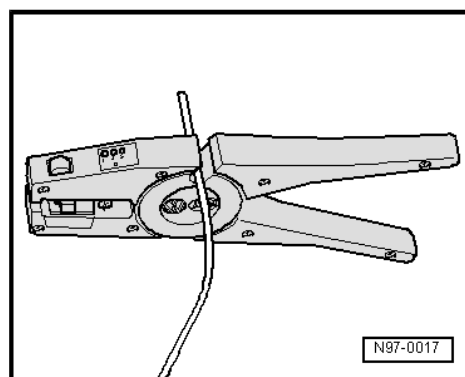
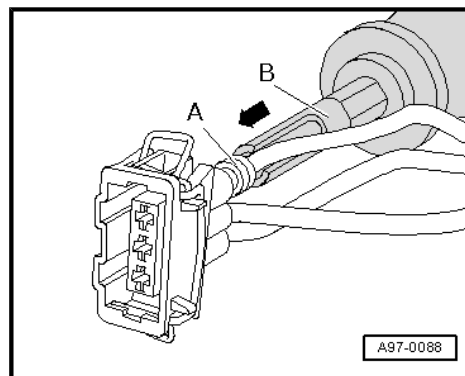
- Insert new contact of repair wire into contact housing until it engages.
- Slide a single wire seal onto the repair wire.



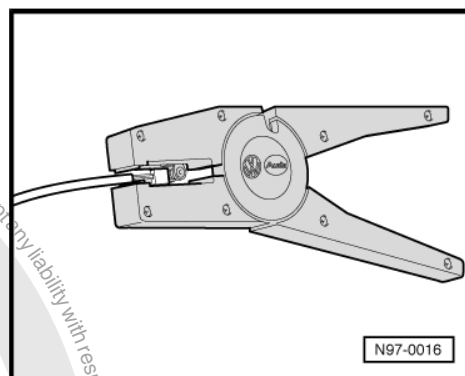
Note

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 117](#) .
- Shorten the repair wire and the vehicle-specific wiring harness single wire as needed using the Wiring Harness Repair Set - Wire Strippers - VAS1978/3- .

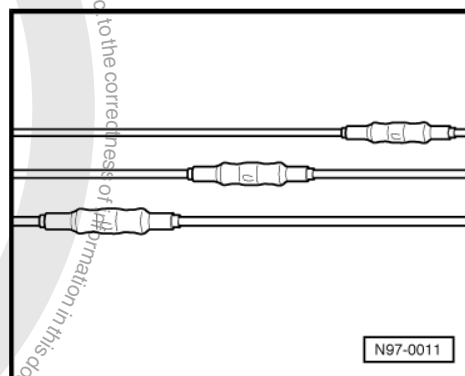


- Strip ends of repair wire and of vehicle-specific single wire using 6 - 7 mm wire stripper.
- Crimp the stripped ends of repair wire and single wire of vehicle-specific wiring harness using crimp pliers and a crimp connection as described in chapter “Wire break with single repair point”. Refer to
⇒ [“2.4.5 Wire Break with Single Repair Point”, page 95](#) .



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

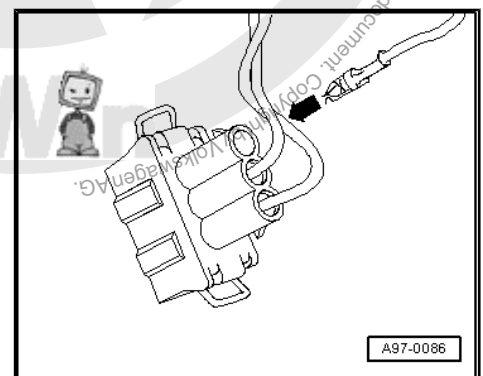
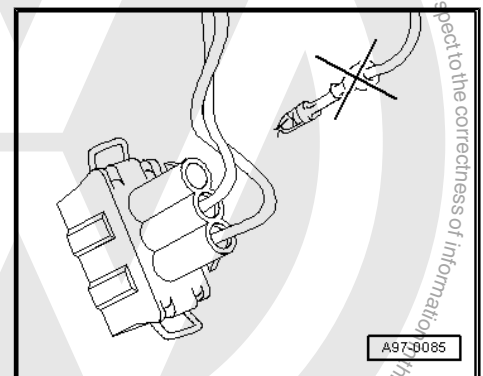
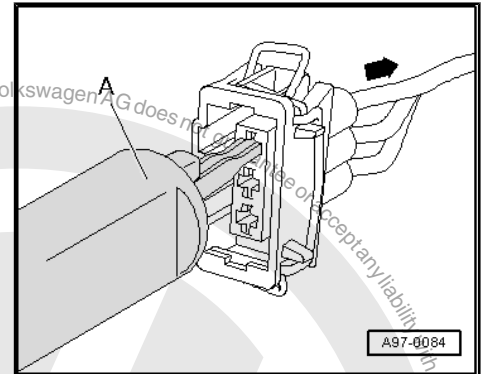


Note

- ◆ *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

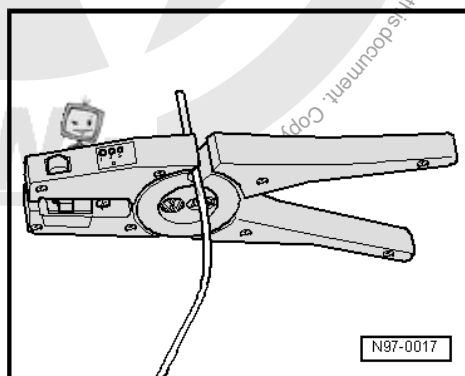
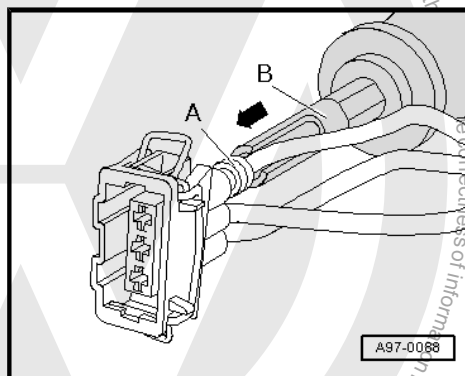
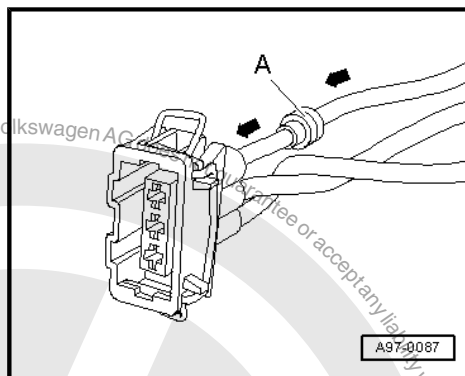
When doing this, small diameter of single wire seal must point toward contact housing.

- 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 Wiring Harness Repair Set - Wire Strippers - 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
⇒ ["2.4.5 Wire Break with Single Repair Point", page 95](#) .

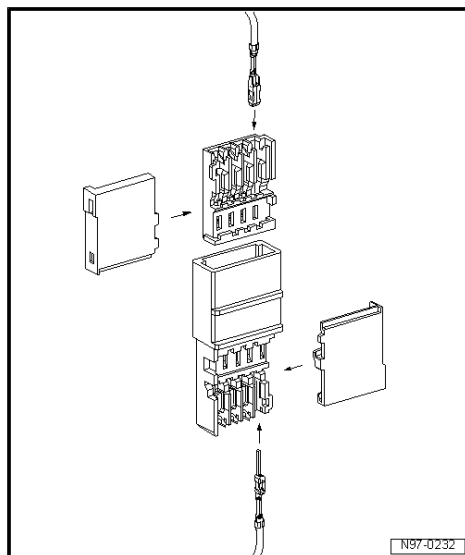


2.7.4 Contact Housings, Repairing Wire Terminals



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”, page 119](#)

⇒ [“2.8.2 Secondary Lock”, page 119](#)

⇒ [“2.8.3 Primary Lock”, page 120](#)

⇒ [“2.8.4 Round Connector Systems”, page 121](#)

⇒ [“2.8.5 Flat Connector Systems”, page 121](#)

⇒ [“2.8.6 Special Connector Systems”, page 123](#)

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 79](#).
- ◆ *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 Release Tool Set - 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.

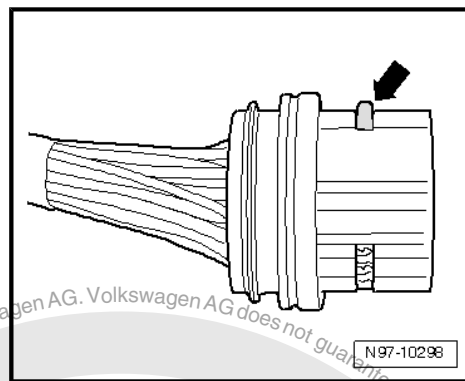
Secondary lock is distinguished by a different color from the rest of the contact housing. It simplifies recognizing the secondary lock and clarifies its function.

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.



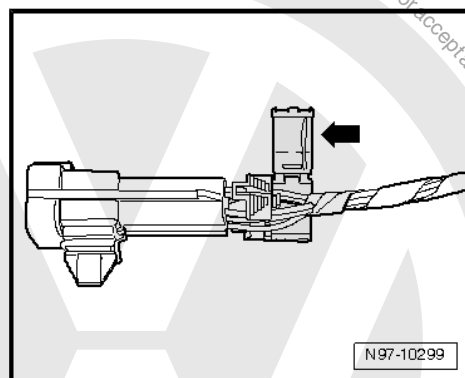
Example 1

Housing securing mechanism is released by removing a “comb” -arrow-.



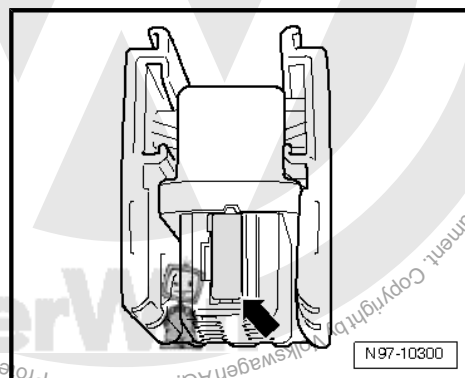
Example 2

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 119](#) .

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 121](#) .
- ◆ Flat connector systems. Refer to [⇒ “2.8.5 Flat Connector Systems”, page 121](#) .
- ◆ Special connector systems. Refer to [⇒ “2.8.6 Special Connector Systems”, page 123](#) .

The allocation of the correct release tool for the respective locks can be found in the table in the Release Tool Set - VAS1978/35-Operating Instructions.



2.8.4 Round Connector Systems

Note

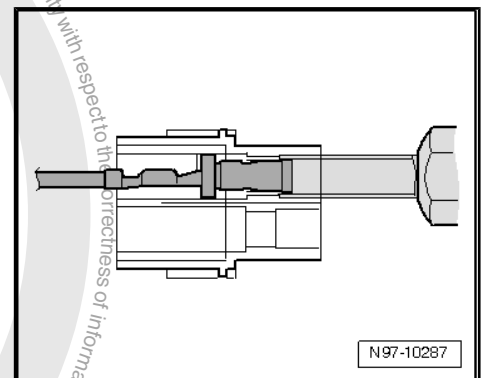
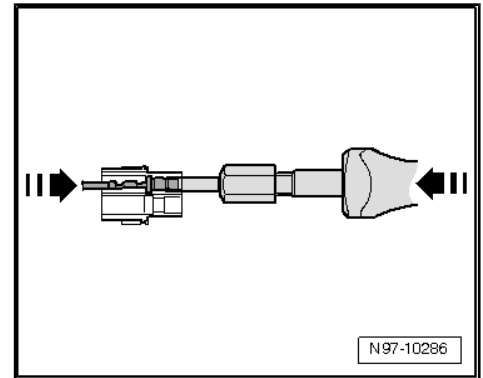
If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ➔ ["2.8.2 Secondary Lock"](#), page 119.

- 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-.

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

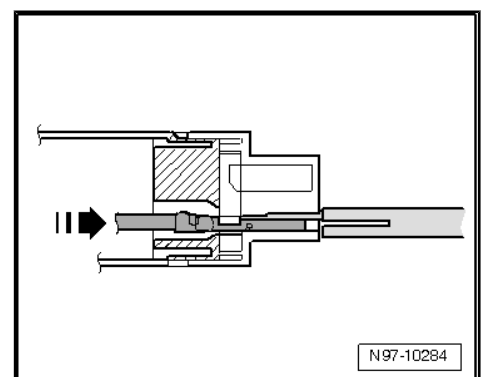
If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ➔ ["2.8.2 Secondary Lock"](#), page 119.

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 -arrow-.

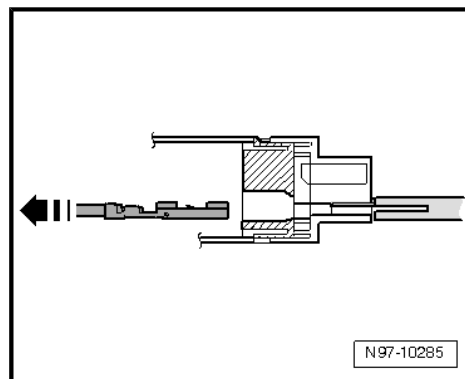
Note

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 -arrow-.
- After removing the contact, release tool can be pulled out of the contact housing again.



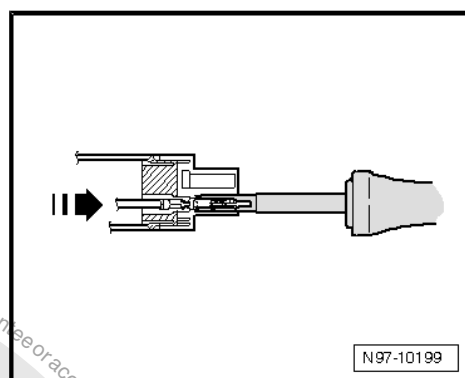
Flat Connector System with Two Retaining Tabs

- 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-.

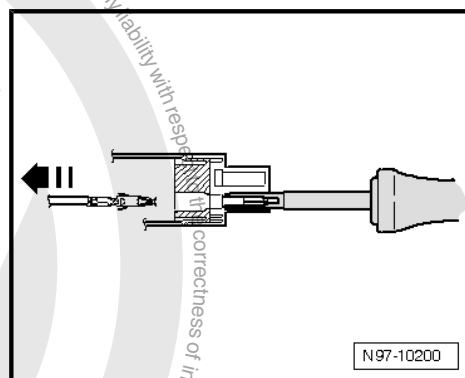


Note

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.



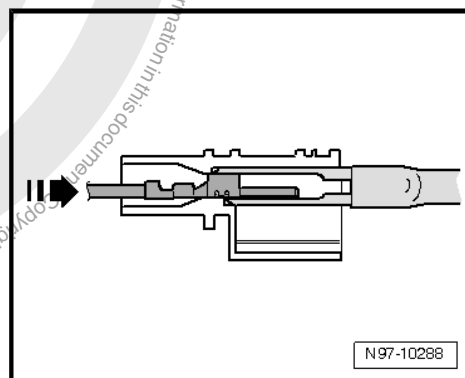
Asymmetrical

- 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-.



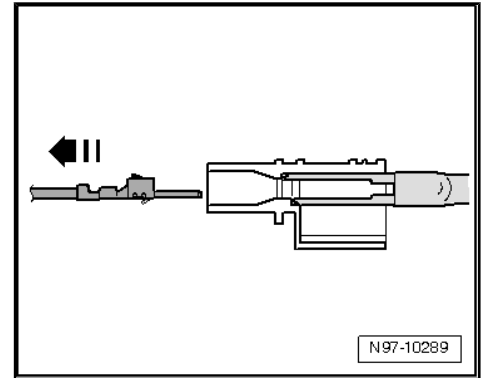
Note

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 -arrow-.
- After removing the contact, release tool can be pulled out of the contact housing again.



2.8.6 Special Connector Systems

Note

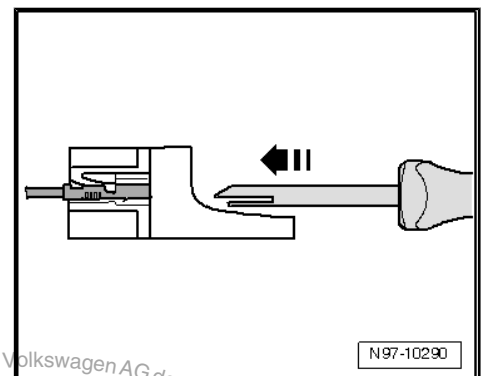
If necessary, housing securing mechanisms (secondary locks) must be released or removed using specified tool before releasing the contacts. Refer to ➔ [“2.8.2 Secondary Lock”, page 119](#).

Faston Contacts

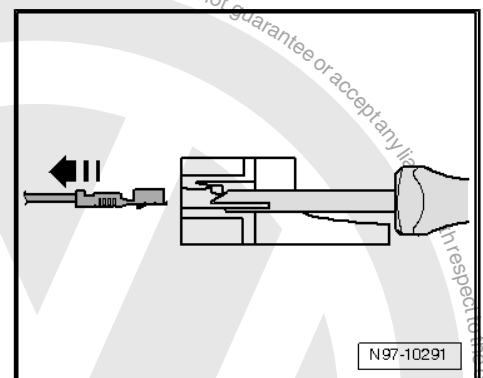
- Guide the release tool which fits the contact housing into release channel on contact housing.
- Grasp contact at wire and push it gently into contact housing.

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.

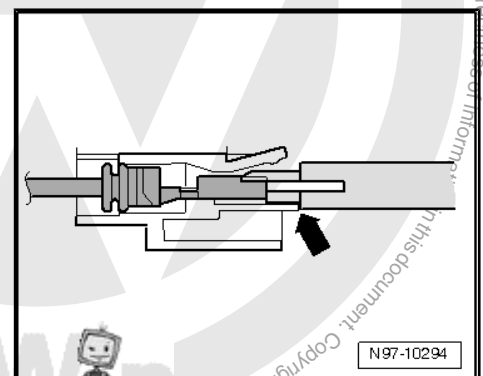


- At the same time, push release tool in direction of contact housing and pull the released contact out of contact housing -arrow-.
- After removing the contact, release tool can be pulled out of the contact housing again.



GT 150/280 Contacts

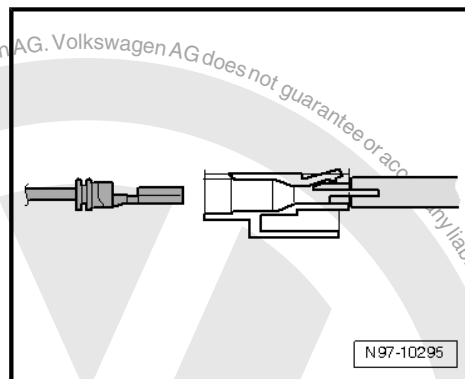
- Guide the release tool which fits the contact housing under retaining tab into contact housing.
- Push tool into contact housing until it stops -arrow-.





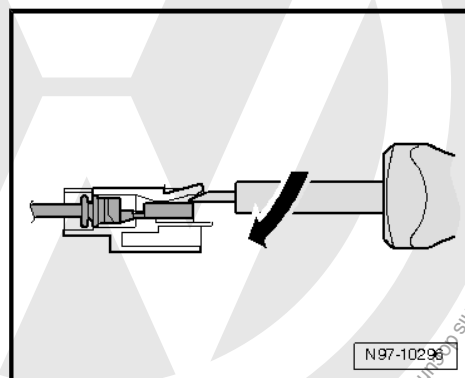
Contact is ejected from the contact housing.

- After ejecting the contact, release tool can be pulled out of contact housing again.

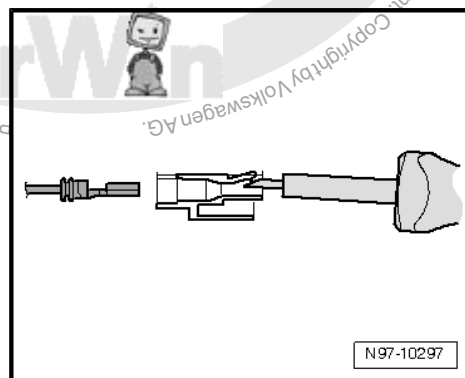


Contacts without Retaining Tabs

- 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 125](#)

3.1 Contact Surface Cleaning Set - VAS6410- , Using

⇒ ["3.1.1 Wiring Eyelets, Repairing", page 125](#)

⇒ ["3.1.2 Threaded Connections, Repairing", page 127](#)

⇒ ["3.1.3 Battery Terminal Clamp and Battery Terminal, Cleaning",
page 128](#)

⇒ ["3.1.4 Protecting", page 130](#)

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

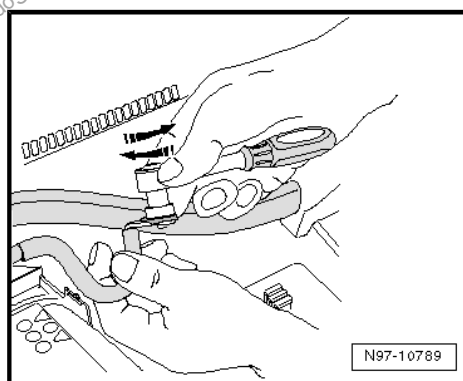
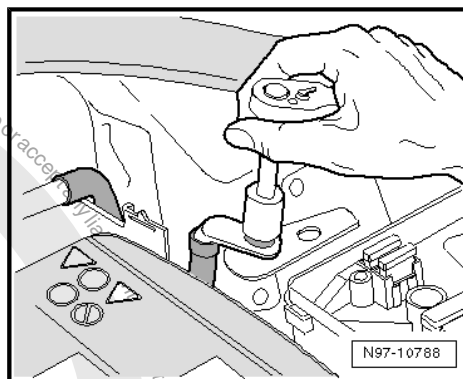
Make sure the tin layer is not worn down too much and the copper is not visible. A galvanic element can form from this, destroying the metal and causing incorrect repairs.



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.



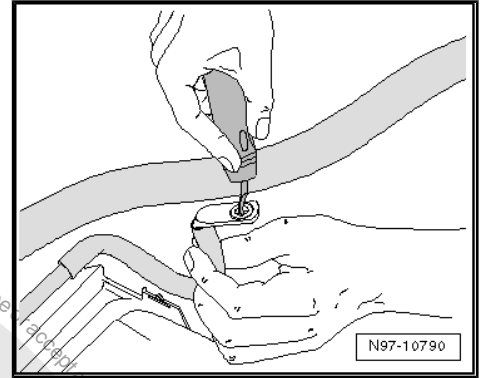


- If necessary, remove the burr on the wiring eyelet with the deburring tool.
- Reinstall the wiring eyelet with the specified torque. Refer to

i 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 130](#).
- 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.

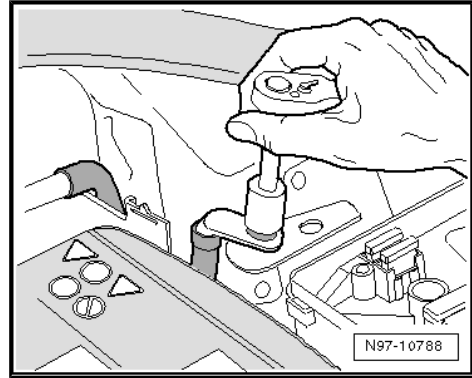


- Loosen the cap nut and remove the wiring eyelet from the threaded connection.
- Check the threaded connection for corrosion, contamination, etc.
- Select the corresponding adapter and the corresponding sanding pad for the threaded connection.



Caution

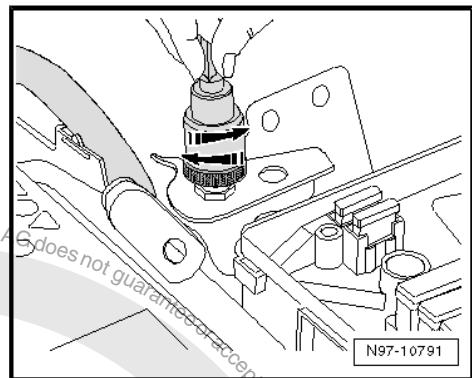
Make sure the tin layer is not worn down too much and the copper is not visible. A galvanic element can form from this, destroying the metal and causing incorrect repairs.



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.



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 130](#).
- 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-

The Contact Surface Cleaning Set - 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 Contact Surface Cleaning Set - VAS6410- is adapted to the vehicle structural





measurements and ensures correct servicing and a comfortable procedure.

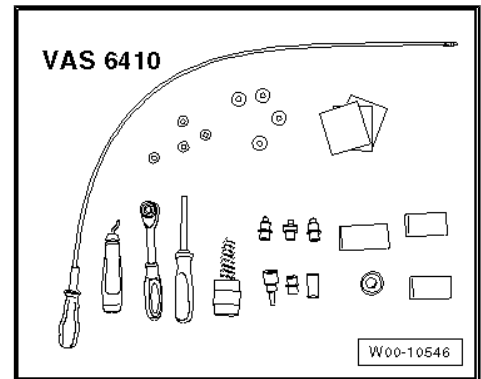
i Note

The illustrations of the service work only serve as examples.

Contact Surface Cleaning Set VAS6410

i 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.

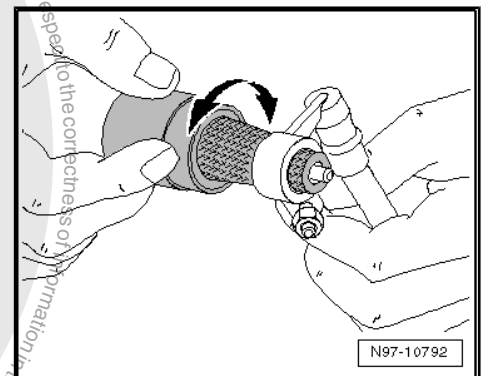


WARNING

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 pole for corrosion or dirt.

The battery terminal clamp is cleaned with the battery terminal cleaner wire brush using circular motions.



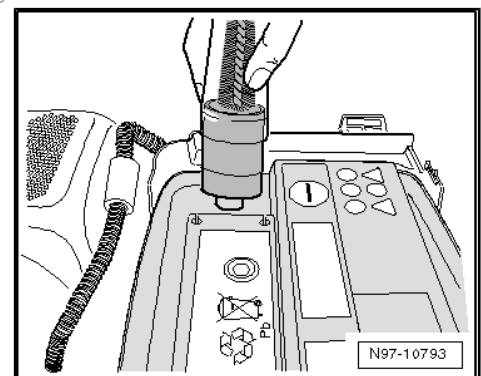
- The battery terminal is cleaned with the bottom side of the terminal cleaner using circular motions.



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.



i Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.



3.1.4 Protecting



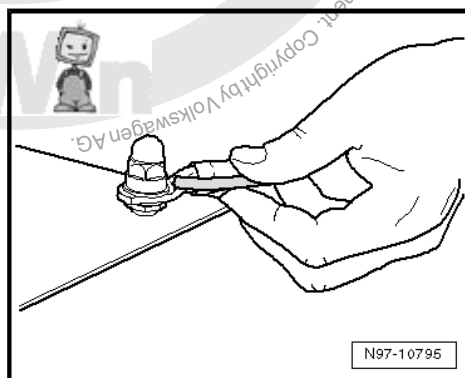
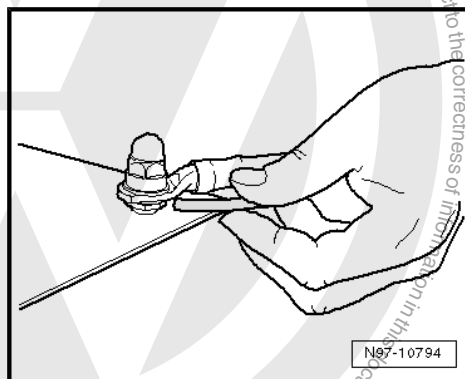
Caution

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 131](#)

⇒ [“4.2 6-Pin Universal Oxygen Sensor, Removing and Installing”, page 132](#)

⇒ [“4.3 Oxygen Sensor Unit Protective Pipes”, page 132](#)

4.1 4-Pin Heated Oxygen Sensor (HO2S), Removing and Installing



Note

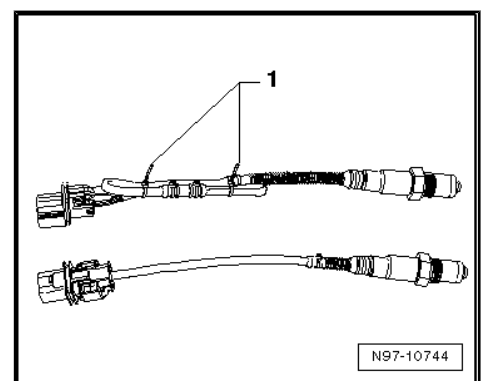
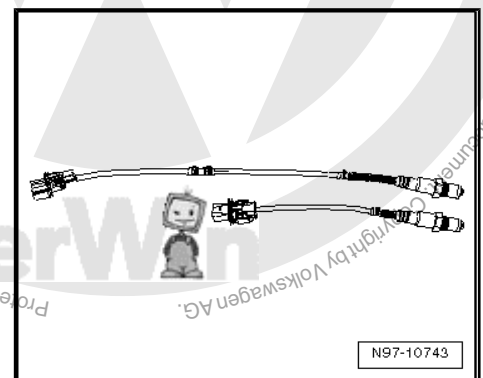
- ◆ *Do not repair the heated oxygen sensor wires. Repairing may result in malfunctions.*
- ◆ *Use the faulty sensor as a guide for installing all of the accompanying attachments, cable ties or marking bands.*
- ◆ *If necessary, identify the heated oxygen sensor (HO2S) using the protective tube. Refer to*
⇒ [“4.3 Oxygen Sensor Unit Protective Pipes”, page 132](#).
- 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 115](#).



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.



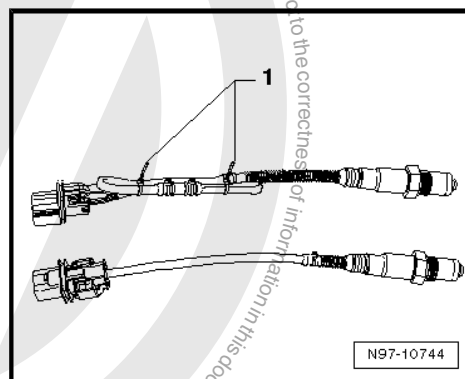
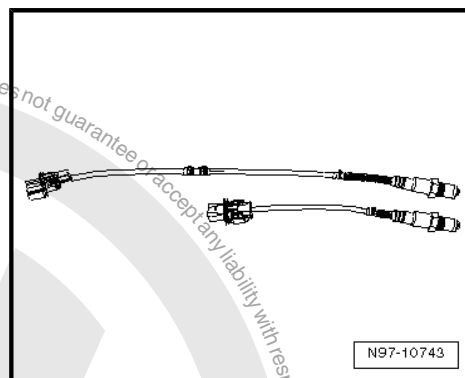


4.2 6-Pin Universal Oxygen Sensor, Removing and Installing



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

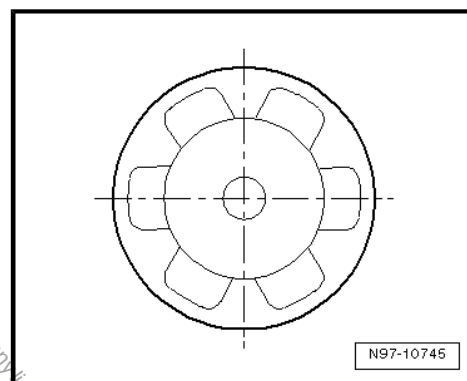
In addition to using the part number, the protective pipe can also be used for identification.

Version D1, 6 openings, 3.5 mm each



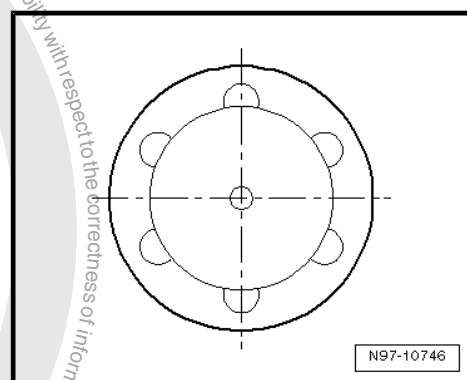
Only used with the 4-pin oxygen sensor

Version D2, 6 openings, 2 mm each

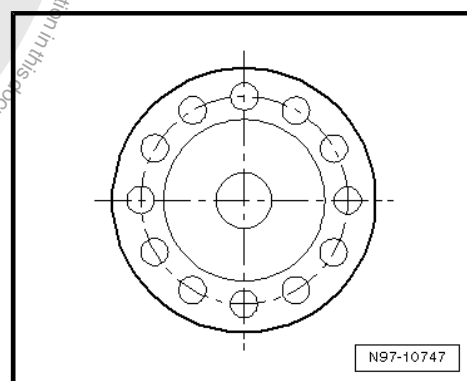


Used with 4-pin and 6-pin universal oxygen sensors.

Version D4, 12 openings, 1.4 mm each



Used with 4-pin and 6-pin universal oxygen sensors.

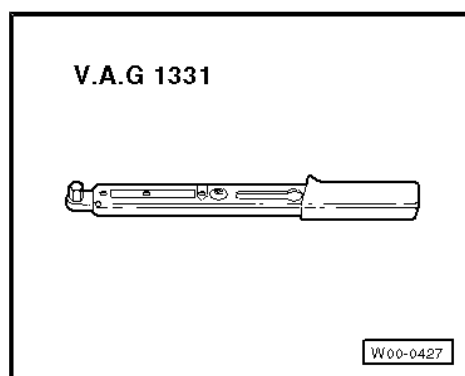




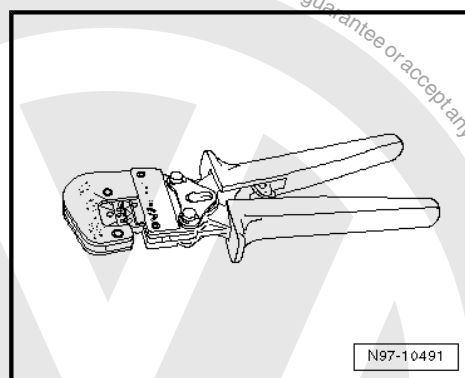
5 Special Tools

Special tools and workshop equipment required

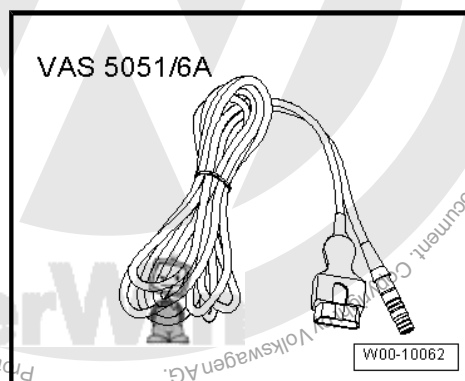
- ◆ Torque Wrench 1331 5-50Nm - VAG1331-



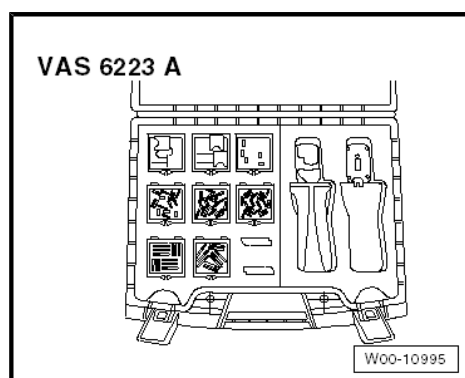
- ◆ Crimping Pliers, Complete - VAS1978/1A-
- ◆ Exchangeable Head, 0.35mm² - 2.5mm² - VAS1978/1-1-



- ◆ Diagnostic Cable - VAS5051/5A- (3 m) (10 ft.)
- ◆ Diagnostic Cable - VAS5051/6A- (5 m) (16 ft.)

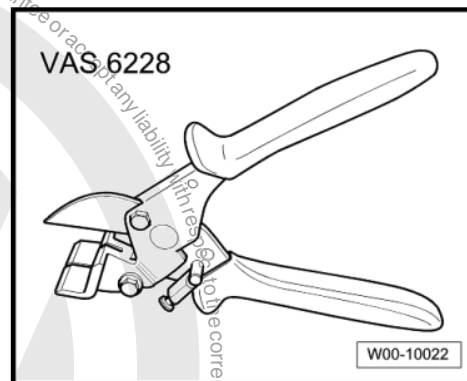


- ◆ Fiber Optic Pliers Repair Set - VAS6223A-





◆ Air Hose Pliers - VAS6228-



◆ Repair Set, Aerial Cable - VAS6720-

Edition: K0059101321 - FU - 5/8/2014 – JLH





6 Revision History

Re vi- sion	Date	Job Type	Feedback #	Notes	Editor
4	5/8/ 2015	Factory Up- date			Jim Harder
3	10/ 20/ 2014	Factory Up- date			Tom Perry
2	08/ 14/ 2014	Factory Up- date			Yam- brick
1	6/1 1/2 013	Factory Up- date CO			Yam- brick

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.

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.

